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Currency Internationalisation and Currency Hierarchy in Emerging Economies

The Role of the Brazilian Real

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ABSTRACT

Currency internationalisation, often defined by the use of a local currency beyond the national frontier, has been a topic widely discussed in the literature. The recent rise of currencies from emerging market economies in the international market has suggested that some peripheral currencies have become more internationalised. However, their position in the currency hierarchy, which is formed by the US dollar at the top and other central currencies in an intermediate position, has remained the same. Despite the growing participation of emerging currencies in the international market, the literature focuses primarily on the internationalisation of central currencies, with the exception of the Chinese renminbi. Additionally, most empirical studies in this literature focus on a single dimension or analyse a general degree of currency internationalisation. The general objective of this thesis is to investigate the nature and the determinants of the internationalisation of central and peripheral currencies. This thesis focuses on the types of currency internationalisation, which are reflected in the currency hierarchy, and adopts a Post Keynesian perspective to shed light on the subordinate position of peripheral currencies in the International Monetary System. A cluster analysis is applied to evaluate the different types of currency internationalisation, followed by a panel data on the determinants of each of these dimensions. Lastly, this thesis conducts semi-structured interviews to understand the nature of the internationalisation of the Brazilian real, which is an emerging currency that has been more used by non-residents recently. As a general conclusion, this thesis suggests that emerging market currencies are mainly internationalised as a short-term investment currency, which reinforces their subordinate position in the currency hierarchy.

Keywords: currency internationalisation, currency hierarchy, peripheral currencies, emerging market economies, cluster analysis, panel data, semi-structured interviews.

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CHAPTER I
INTRODUCTION

I-1 Objectives & Motivation

The international use of currencies, currency internationalisation, has been a topic which has fascinated researchers over the years, from the gold standard, to Bretton Woods and to the current regime dominated by the US dollar, the 'floating dollar standard'[1]. More recently, the rise of emerging market currencies, in particular the Chinese renminbi, has emphasised their growing internationalisation. However, these currencies occupy the lowest position in the currency hierarchy, where the US dollar stands at the top. Thus, the recent internationalisation of peripheral currencies raises the question as to whether they can overcome their subordinate position in the International Monetary System (IMS). As a general objective, this thesis aims at investigating the process of internationalisation of central and peripheral currencies with a Post Keynesian perspective, which emphasises the hierarchical feature of the IMS.

The literature on currency internationalisation often defines it as a process wherein domestic currencies are used beyond the national frontier for transactions between international agents (Cohen, 1998). Given this definition and the growing participation of non-residents in the trade of currencies issued by emerging market economies (EME), one can infer that these currencies have become more internationalised (Prates, 2010, Maziad et al., 2011, McCauley and Scatigna, 2011, Mohan et al., 2013, Kaltenbrunner, 2015). The process of currency internationalisation has been analysed, in the main, by scholars working within three different academic fields: mainstream economics, International Political Economy (IPE) and Post Keynesian (PK) economics.

Mainstream economics are the most dominant concepts and ideas taught in academia, politics and government institutions, though it does not represent a particular school of economic thought. Mainstream economists in the field of currency internationalisation are often associated with the concept of 'invisible hand' and rigorous mathematical formalisation, such as in Kenen

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[1] Terminology suggested by Medeiros and Serrano (2003).

(1983), Krugman (1984), Rey (2001) and others. IPE scholars focus on drawing a connection between economics and politics, which were treated as completely different sciences prior to the 1970's (Cohen, 2008). The most prominent academics in this field who have contributed with the literature on currency internationalisation are Benjamin Cohen, Susan Strange and Eric Helleiner. Finally, Post Keynesian economics is a heterodox school of economic thought that builds on the theory proposed by John Maynard Keynes. The Post Keynesian economists, who have largely contributed to the debate on currency internationalisation and currency hierarchy, particularly study the currencies from developing and emerging market economies, the so-called 'peripheral currencies'. Among other Post Keynesians, the work developed by the academic researchers such as Fritz, Prates, De Conti and Kaltenbrunner have been particularly insightful to analyse the use of these currencies in the international market.

While the scholars from these three fields use different models and approaches, most of them analyse this process in terms of the extent to which a currency fulfils the 'functions of international money'. This term is adopted in this thesis in reference to the traditional functions of money, i.e. medium of exchange, unit of account and store of value, which are applied to the international context, following the pioneering work of Cohen (1971).

The central currencies perform each of these functions in the international market, whereas peripheral currencies, at best, fulfil only a subset of the functions of international money. Despite the growing participation in the international market of currencies issued by emerging countries (the vast majority can be classified as peripheral), the literature focuses primarily on the internationalisation of central currencies. An exception to this rule about the paucity of studies on EME currencies is the Chinese renminbi, due to the sharp increase in its internationalisation over the past several decades (Chen and Peng, 2010, Li and Liu, 2010, McCauley, 2011, He et al., 2016).

As a **general** contribution to the literature, this thesis represents one of the first studies to provide a comprehensive analysis of the internationalisation process of currencies from the perspective of developing and emerging economies. As discussed above, thus far the literature has largely focused on the key currencies of the IMS: the Pound Sterling in the 19th century and currently the US dollar. This thesis adopts a different approach in the sense of providing both a theoretical and empirical analysis of the nature and determinants of the internationalisation of central and, particularly, peripheral

currencies. By doing so, this thesis presents five **specific** contributions to the literature on currency internationalisation and currency hierarchy, two of which are theoretical and the other three are empirical.

In the currency internationalisation literature, many researchers not only focus on central currencies but also analyse data on a single dimension of the functions of international money – typically the use of reserve currency – as a proxy for a general degree of currency internationalisation (Chinn and Frankel, 2008, Chen and Peng, 2010, Li and Liu, 2010, Subramanian, 2011, Eichengreen et al., 2016). Other researchers, often mainstream economists, simply focus on the study of the invoice currency, i.e. the currency that denominates the trade contracts of goods and services, and overlook other types of currency internationalisation and the literature on this phenomenon (Kamps, 2006, Gopinath, 2015, Goldberg and Tille, 2008).

The **first** theoretical contribution of this thesis is to stress that currency internationalisation is not a linear process, and a general degree of internationalisation alone does not describe the role of currencies in the IMS. Instead, currencies may internationalise in various ways, i.e. they can assume different types of currency internationalisation. While a few central currencies are widely used for many purposes in the international market, the roles of currencies from emerging market countries remain rather limited and concentrated in certain international operations. Moreover, central currencies are themselves heterogeneous (De Conti and Prates, 2018). Within the category of central currencies, the key currency of the system, currently the US dollar, is used for most transactions; and the remaining currencies have a secondary role.

Although IPE scholars were the pioneers in illustrating the asymmetries between international currencies in a 'currency pyramid'[2], Post Keynesian economists have been the primary developers of the literature on currency hierarchy. These economists, who emphasise the monetary subordination of issuers of peripheral currencies, focus particularly on the situation of emerging and developing countries. Post Keynesian scholars use the concept of currency internationalisation originally proposed by IPE scholars in building their analyses of currency hierarchy. However, the scholars in the IPE academic field have largely neglected PK contributions to the literature –

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[2] Strange (1971a, 1971b) and Cohen (1998).

explained to some extent by the fact that the currency hierarchy literature is more recent. The currency hierarchy is composed of a key currency standing at the top, which is widely used in all functions of international money, then followed by other central currencies that are less used. The peripheral currencies, which have limited use across these functions proposed in the IPE literature, have a subordinate position at the lower end of the hierarchy.

There seems to be an implicit consensus in the IPE and Post Keynesian literature that often assumes that the greater use of currencies in the international market implies a higher position in the currency hierarchy. However, the increasing use of peripheral currencies in the international market has arguably not improved their position in the currency hierarchy. This thesis argues that the reason for rigidity is that currencies from developed and emerging economies are internationalised on different functions. Hence, the presupposition of a positive and linear relationship between currency internationalisation and currency hierarchy appears to be neither clear nor accurate.

The **second** theoretical contribution of this thesis is to extend the theoretical literature to analyse currency internationalisation and currency hierarchy with an additional function of international money – that of a short-term investment currency. Based on a Post Keynesian theoretical framework, this thesis argues that given the low liquidity premium of peripheral currencies, the use of EME currencies in the international market is mostly restricted to this dimension. This argument both reflects their lower position in the currency hierarchy and sustains their subordinate role in the IMS through the creation of negative implications, such as exchange rate volatility and external vulnerability.

When a peripheral currency is expected to have relatively low levels of inflation and less exchange rate volatility, this thesis argues that it performs the store of value function for a short period. From a Post Keynesian perspective, countries that issue short-term investment currencies generally offer higher interest rates to compensate for the lower liquidity premium. In moments of low international liquidity preference, capital flows move towards these countries to profit from the interest rate differential. However, in periods of rising international liquidity preference, capital flees for quality, which causes more exchange rate volatility for these currencies and reinforces their role as a short-term investment currency.

One of the main arguments of this thesis is that currencies internationalised as short-term investments do not improve their position in the currency hierarchy. The reason for this negative relationship lies in the fact that when a currency is internationalised with the purpose of short-period investments, as in carry trade operations, there is not an increase in the confidence of international actors in these currencies. Instead, these agents are attracted by higher returns in periods of international liquidity, when they are less averse to risk. In this vein, the different types of currency internationalisation are reflected in the different positions in the currency hierarchy, in which the liquidity premium manifests itself in different ways.

The **third** contribution of this research is empirical. Based on the theoretical argument presented above, this thesis attempts to empirically assess all the types of internationalisation for those currencies for which data is available. This comprehensive database includes peripheral currencies, particularly from EMEs, which are often neglected in the literature. To the best of our knowledge, this study presents the most extensive mapping of the recent process of internationalisation for emerging market currencies. Additionally, data were collected for each of the four types of currency internationalisation proposed in the IPE literature[3], i.e. vehicle, trade settlement, invoice and investment currency, in addition to other two types – the funding currency, in the definition proposed by Kaltenbrunner (2015), and the short-term investment currency suggested in this thesis.

Within this contribution, this thesis uses the data collected for all the six types of currency internationalisation in a sophisticated empirical technique, the cluster analysis. This methodology allows the analysis of clusters of similar currencies according to their type of internationalisation, which can be understood as a representation for currency hierarchy. While a rigorous quantitative approach to measure the absolute status of a currency does not help in understanding the relative role and position of a currency in the IMS, a currency hierarchy can be approximated by the data on different types of currency internationalisation. The conclusions of this analysis shed light on the type of currency internationalisation of peripheral currencies and their

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[3] This database includes only the types of currency internationalisation from the private sector. Data on the public sector is not available for many currencies and it is often qualitative.

position in the hierarchy. This raises the question as to which factors determine the subordinate role of peripheral currencies in the hierarchy.

On the one hand, the theoretical literature on the determinants of currency internationalisation has been discussed by mainstream, IPE and Post Keynesian scholars. The 'economic determinants', in a typology suggested by IPE scholars, are widely analysed in the literature, though they only refer to the factors suggested by mainstream economists. In a different approach, Post Keynesian economists put forward the theory of international liquidity, which uses the concept of the 'own rate of interest' in the international market to explain the demand for peripheral currencies. This theory emphasises the key role of interest rates, which attract capital flows to countries that issue peripheral currencies, and the liquidity premium in the international market, which shapes currency hierarchy. Some researchers argue that it is crucial that policymakers use instruments such as foreign exchange reserves or capital controls to smooth the exchange rate volatility and discourage speculative capital flows (Fritz et al., 2014, De Paula et al., 2015). These are necessary conditions for reaching a current account surplus, which may, in turn, change the liquidity premium and the position of a currency in the hierarchy.

On the other hand, the empirical literature on the determinants of currency internationalisation has mainly been explored by mainstream economists. These scholars generally focus on a single specific function, very often that of an invoice or reserve currency, as a general representation of the overall use of a currency in the IMS (Eichengreen, 1998, Goldberg and Tille, 2008, Ito and Chinn, 2014). Many of these analyses do not attempt to comprehensively identify the determinants of different types of currency internationalisation[4]. Additionally, most of the empirical literature focuses on the determinants of the internationalisation of central currencies in an effort to address research questions such as whether the euro will overcome the role of the US dollar (Chinn and Frankel, 2007, Papaioannou and Portes, 2008a).

Whilst the IMS presents a clear hierarchy between currencies, the determinants of these asymmetries are rather mixed. Post Keynesians often focus on different functions of international money to explain currency

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[4] An exception, perhaps, is the work of Li and Liu (2010), who analysed the determinants of a few types of currency internationalisation.

hierarchy, though the different perspectives are complementary, rather than mutually exclusive. Given the competing theories on the determinants of currency internationalisation, the **fourth** contribution of this thesis is to empirically evaluate the economic factors suggested by the mainstream and, particularly, Post Keynesian economists in determining the role of peripheral currencies in the currency hierarchy. For instance, the interest rate is considered an important factor for internationalisation as a short-term investment currency. Moreover, in contrast to the existing literature which frequently focuses on one single function, this thesis contributes to the literature by analysing which factors might determine each type of currency internationalisation for central and peripheral currencies.

The research question regarding the kind of factors that shape the type of internationalisation of a currency is also the focus of the final contribution of this thesis. Most mainstream economists mostly understand currency internationalisation as primarily a result of the 'invisible hand', which is in agreement with the argument put forward by Cohen (2003: p. 9) that it is "a Darwinian process of natural selection" (Krugman, 1984, Matsuyama et al., 1993, Rey, 2001). Other scholars, in particular, IPE and Post Keynesian, stress that currency internationalisation is not simply a market-driven process (Bénassy-Quéré and Deusy-Fournier, 1994, Helleiner and Kirshner, 2012, De Conti et al., 2013b). Instead, they argue that the use of currencies in the international market is influenced by historical and institutional features of each issuing country, wherein policy decisions also play a crucial role. Given these intrinsic characteristics of a domestic currency, international agents decide on the currency composition of their portfolios.

An additional factor stressed by both IPE and Post Keynesian scholars is the political power to promote the use of the domestic currency beyond the national territory. It is clear that countries that issue central currencies have the economic and political power to influence the use of their currencies outside their frontier. A question that remains unanswered is whether and how emerging economies can promote the internationalisation of their peripheral currencies. Using a Post Keynesian and institutionalist approach, De Conti et al. (2013b) further suggest that another factor to be taken into consideration is the inclination of policymakers to promote currency internationalisation as a policy objective, which they refer to as 'political will'.

However, the role of political power and policy decisions in shaping currency internationalisation are hardly ever investigated. The **fifth** contribution of this

thesis is to analyse not only how but also the extent to which policymakers can influence the type of internationalisation their currency undergoes, particularly when it is issued by an EME. To provide an in-depth analysis of the impact of policy variables on currency internationalisation, this research provides a case study of the Brazilian real (BRL), which is mainly internationalised as a short-term investment currency.

To summarise, this thesis is guided by the following research questions (RQ):

RQ 1. How can one describe and measure the process of internationalisation of peripheral currencies in the international monetary system?

RQ 2. What is the relationship between currency internationalisation and currency hierarchy?

RQ 3. What are the economic determinants of the different types of currency internationalisation?

RQ 4. What is the role of policy decisions in determining currency internationalisation?

I-2 Methodology

To address the research questions summarised in the previous section, this thesis applies different methodologies for each chapter. Chapter II, which explores the concept and determinants of currency internationalisation and currency hierarchy from a theoretical perspective, consists of a critical engagement with the literature on these topics. As such, it serves as the foundation for the three other remaining chapters in this thesis.

Chapters III attempts to understand the type of internationalisation of central and peripheral currencies in the IMS by conducting **cluster analysis**. This methodology groups currencies with similar degrees and types of internationalisation. These currency groupings are then organised in a dendrogram, which displays the currencies in hierarchical order by their similarity in terms of the variables analysed, i.e. the different types of currency internationalisation. The result of this analysis can be understood as a measure for currency hierarchy, in which every group of currencies with similar types of internationalisation can be organised in a hierarchical order, justified by a theoretical framework. Currencies that are widely used in many functions of international money are positioned at the top. Conversely,

currencies that are generally less used across all functions or those that are only internationalised as a short-term investment currency are located at the end of the hierarchy.

Chapter IV presents a quantitative methodology for analysing the determinants of each type of currency internationalisation. This chapter analyses a **panel data model** on central and peripheral currencies across time. The dependent variables encompass each of the types of currency internationalisation for which data is available. In total, four models are developed, one for each function of international money, as well as a model for the short-term investment currency, which represents another aspect of the store of value function. The independent variables are the 'economic determinants' suggested by the mainstream literature and other determinants stressed in the Post Keynesian literature, such as interest rates and current account balance.

The empirical literature on the determinants of currency internationalisation generally applies different panel data estimators, usually the traditional pooled OLS estimator. It is argued in Chapter IV that currencies have intrinsic characteristics that are rather rigid in the short-term, such as the liquidity premium. For this reason, the fixed-effects (FE) estimator would be more appropriate to evaluate the models. However, the inclusion of the lag of the dependent variable that represents the inertia of currency internationalisation may bias the FE estimator, but not the pooled OLS. Thus, to verify and corroborate the results, both estimators were applied for each model, namely pooled OLS and fixed-effects.

Whilst Chapters III and IV present quantitative approaches, Chapter V employs a qualitative methodology to analyse the influence of political power and policy decisions on currency internationalisation. Chapter V utilises the results from **semi-structured interviews** undertaken to implement a case study of the Brazilian real (BRL). This case is chosen because of Brazil's growing participation in the international market, particularly as a short-term investment currency. Twenty-four semi-structured interviews were conducted with participants mostly from the Brazilian Central Bank (BCB) and with some participants of the private sector. The participants from BCB provided detailed information about regulation and active policies that shape the type and degree of internationalisation of the BRL. The private sector participants contributed with their perspective on the consequences of the regulations and other policies adopted by BCB for the international use of BRL. Our analysis

of these interviews sheds shed some light on the use of BRL in financial markets.

This study complements the results from the quantitative analysis in two aspects. First, it provides further information to understand the type of internationalisation of the BRL and the factors limiting the use of this currency in the international market. This analysis provides insights into the relationship between this type of internationalisation and the position of BRL in the currency hierarchy. Second, it also complements the analysis of the determinants of currency internationalisation, as this study evaluates whether political power and policy decisions have any influence on this process.

I-3 Thesis Structure

Apart from this introduction (Chapter I) and the conclusion (Chapter VI), this thesis is comprised of four other chapters. While these chapters present individual contributions to the literature, their content is entirely interrelated, and complementary.

Chapter II presents a critical review of the existing literature regarding concepts and determinants of currency internationalisation and currency hierarchy. This chapter consists of a comprehensive literature review, which critically evaluates the mainstream, International Political Economy (IPE) and Post Keynesian contributions to the literature. Though each of these presents a different perspective on currency internationalisation, most researchers analyse this process through the functions of international money, which this thesis refers to as the 'types of currency internationalisation'. Although this phenomenon is intertwined with currency hierarchy, the literature lacks a clearer relationship between them, which is analysed in depth in this chapter. Using a Post Keynesian approach combined with the functions of international money, an additional type of currency internationalisation is suggested: the short-term investment currency. It is argued that this type of internationalisation accounts for the use of peripheral currencies in the international market, particularly those issued by emerging market economies. In addition, this chapter argues that the different types of internationalisation assumed by currencies in the IMS could be an indication of their position in the international currency hierarchy.

Chapter III consists of an empirical analysis assessing the types of currency internationalisation discussed in Chapter II, as these are fulfilled by the various

currencies being traded and held in international markets[5]. A cluster analysis is conducted to categorise these currencies into groups and find which of them have similar roles in the international monetary system (IMS), also including the short-term investment currency. The different degree and types of currency internationalisation illustrate the asymmetries between currencies in the IMS, which can be understood as a measure for currency hierarchy. Another objective of this chapter is to evaluate the outcomes from the theoretical discussion in Chapter II regarding the relationship between currency internationalisation and currency hierarchy. So this raises the question of why and how some currencies are more internationalised than others.

Chapter IV addresses this question through a panel data estimation of the determinants of each type of currency internationalisation. This approach contrasts with most of the empirical literature, which often analyses the determinants of only one type of currency internationalisation. As discussed in detail in Chapter II, the mainstream theory identifies several 'economic determinants' of currency internationalisation, such as market size, sound financial markets and currency stability. Though IPE researchers bring the importance of political factors to the discussion, they generally overlook the contribution of Post Keynesian economists to the debate on the determinants of this process. The Post Keynesian literature introduces the concept of liquidity premium in the international market, as one of the factors shaping the currency hierarchy. This literature also stresses other variables that affect the demand for a currency and its liquidity premium, e.g. interest rates and current account balances, which are included as independent variables in the panel data models. A drawback of this chapter is that it lacks a variable that directly accounts for the influence of political power and policy decisions on currency internationalisation – a dimension which is hard, if not impossible, to quantify and include in the model. This raises the question as to whether and how policymakers can influence the internationalisation of their currencies.

Chapter V addresses this research question by conducting 24 semi-structured interviews with participants drawn from the Brazilian Central Bank, as well as some financial market participants[6]. The Brazilian real is a

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[5] The sample size was chosen based on data availability.

[6] Only 2 out of 24 interviews were conducted with private market participants.

promising case of a peripheral currency that is becoming more attractive, despite its exchange rate volatility, low liquidity and high domestic interest rate. The objective of this chapter is to analyse the extent to which policymakers in Brazil can influence the internationalisation of the Brazilian real. This chapter contributes to the literature on the determinants of currency internationalisation with a qualitative analysis on whether and how policy decisions play a role in determining currency internationalisation, which is stressed by IPE and, particularly, Post Keynesian scholars.

Finally, **Chapter VI** concludes by reviewing the main findings of each chapter of this thesis, as well as their limitations and policy implications. It also recommends avenues for future research.

CHAPTER II
A CRITICAL VIEW ON THE VARIOUS CONCEPTS AND DETERMINANTS OF CURRENCY INTERNATIONALISATION AND CURRENCY HIERARCHY

II- 1   Introduction to Currency Internationalisation and Currency Hierarchy

This chapter explores the extent and determinants of currency internationalisation – that is, the increasing use of national currencies in transactions outside that currency's country of issue (Cohen, 1998). While currency internationalisation is widely discussed in different fields of academic research, scholars in these fields adopt different definitions of this phenomenon. They also present different perspectives both on the use of domestic currencies in the international market and on the determinants of currency internationalisation. Although most of the literature analyse currency internationalisation through the functions of international money proposed by Cohen (1971), there is less consensus regarding the determinants of this process.

Benjamin J. Cohen, who has a background in economics, was a pioneer scholar from the International Political Economy (IPE) field in theorising currency internationalisation in terms of the functions of international money: medium of exchange, unit of account and store of value, as explained in detail in section II- 2.2.1[7]. This approach was refined by other researchers, such as Kenen (1983) and Krugman (1984), and it was also adopted by many other researchers, from both mainstream and Post Keynesian economics.

Susan Strange (1971c) was also a pioneer scholar from the IPE field to identify the need for a political theory of international money that goes beyond the economic functions of international currencies. She categorised international currencies in accordance with their economic and political power in order to understand their use and determinants in the international monetary system (IMS). Cohen (1998: p. 114) developed these categories

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[7] Cohen (1971) applied the three functions of money, which were generally analysed in the context of a country, to the international market. Thus, the definition of the functions of national and international money are not strictly identical, but rather comparable.

into a 'currency pyramid', which reflects the "hierarchy among the world's diverse moneys".

This concept, which illustrates the asymmetries of the IMS though hard to measure, is widely studied by Post Keynesian economists, who are the main founders of the 'currency hierarchy' literature. In fact, the currency hierarchy literature is rooted in the currency internationalisation literature, but not vice versa. Many Post Keynesian economists, such as Andrade and Prates (2013), De Conti and Prates (2018) and others, as well as IPE scholars, implicitly or explicitly understand that these two concepts have a linear and positive relationship. The greater degree of currency internationalisation leads to higher positions in the currency hierarchy. Thus, the currency hierarchy literature is essentially the analysis of Post Keynesian attributes to currency internationalisation, which are overlooked by both mainstream economists and IPE scholars.

Although many authors analyse currency internationalisation through the lenses of the functions of international money, the different approaches of each research field have led to different determinants of this process. As discussed in detail in Chapter IV, the empirical literature on the determinants of currency internationalisation was predominantly developed by mainstream economists. However, they often do not refer to the currency internationalisation literature. Instead, mainstream economists frequently use alternative expressions such as the 'international status of a currency', 'invoice currency' or 'reserve currency, though they do not attribute these types of currency internationalisation to the functions of international money (Eichengreen, 1998, Goldberg and Tille, 2008, Ito and Chinn, 2014).

Helleiner (2008) called these factors proposed by mainstream economists as 'economic determinants' of currency internationalisation to distinguish from the 'political determinants' that are stressed in the IPE literature. In addition to the negligence of the literature on currency hierarchy, both mainstream economists and IPE scholars also fail to account for Post Keynesian contributions to currency hierarchy. The justification for overlooking the concept and determinants of currency hierarchy proposed by Post Keynesian scholars may be explained by two reasons. First, IPE scholars mostly have a background in mainstream economics. Second, the core of the Post Keynesian literature on currency internationalisation is more recent, which does not justify contemporary research on currency internationalisation that does not account for the literature on currency hierarchy.

Although there is no consensus in the literature regarding the concept and determinants of currency internationalisation, certainly there are signs of a greater role of peripheral currencies in the international monetary system (IMS), particularly those issued by emerging countries (Maziad et al., 2011). The internationalisation of peripheral currencies is unlikely to change the IMS into a multi-currency system as they have very limited roles in the international market. However, the types of currency internationalisation experienced by peripheral currencies have significant consequences for emerging and developing economies. Post Keynesian research on currency hierarchy often focuses on peripheral currencies and the implications of the asymmetries in the IMS for the countries that issue these currencies. Yet, the literature does not acknowledge that currencies might internationalise in different dimensions, i.e. across different types of currency internationalisation. It particularly lacks a clearer definition of the role of peripheral currencies in the international market.

Chapter II provides a comprehensive literature review of currency internationalisation and currency hierarchy to serve as a foundation for the remaining chapters of this thesis. The first objective of Chapter II is to understand the relationship between currency internationalisation and currency hierarchy, which is taken for granted in the literature in a positive relationship. The second objective of this chapter is to contribute to the development of the functions of international money in order to embrace the internationalisation of peripheral currencies that are issued by emerging countries. Using a Post Keynesian framework, it was identified another type of currency internationalisation that shed some light on the role of these peripheral currencies in the international market: the short-term investment currency. This theoretical analysis of international currencies motivates an estimation of the different types of currency internationalisation, which are empirically analysed in Chapter III. The third objective of Chapter II is to analyse in depth the different determinants suggested by competing theories on currency internationalisation and currency hierarchy. The determinants proposed by the different academic fields are evaluated in an econometric model for each type of currency internationalisation in Chapter IV.

This chapter is organized as follows. After this introduction, section 2 reviews the definitions of currency internationalisation and currency hierarchy for the three main academic fields in this topic: mainstream economics, IPE and Post Keynesian economics. At the end of this section, it is suggested an additional

type of currency internationalisation that accounts for the internationalisation of peripheral currencies, which explains the non-linear relationship between currency internationalisation and currency hierarchy. Section 3 also presents a theoretical review of the determinants of currency internationalisation, which serves as a foundation for the discussion on the empirical determinants of this process in Chapter IV. The final section presents the main conclusions and theoretical contributions to the analysis of currency internationalisation and currency hierarchy.

II- 2   Various Concepts of Currency Internationalisation and Currency Hierarchy

II- 2.1 The Mainstream Economic Theory on Currency Internationalisation

The mainstream literature on currency internationalisation generally discuss the determinants of this process[8]. However, the theoretical conceptualisation of currency internationalisation in the mainstream theory is rather limited. Mainstream researchers on this topic mostly follow the functions of international money proposed by the International Political Economy (IPE) literature, namely medium of exchange, unit of account and store of value. This typology, which was firstly introduced by Cohen (1971), was also analysed by other mainstream economists, such as Kenen (1983) and Krugman (1984).

The mainstream monetary theory stresses that the absence of money in imposes limitations to the economy, as trade depends on a 'double coincidence of wants' (Jevons, 1877). The difference between the barter and the monetary economy is that the latter is characterised by the presence of an asset that is widely accepted as a medium of exchange. In the context of a closed economy, money arises as an optimal solution to lubricate trade and reduce market inefficiencies (Smithin, 2003). However, money must also serve as a store of value at least temporarily, so that economic agents can accept it as a medium of exchange (Friedman, 1971). Thus, the unit of account and store of value functions are not absent, but rather implicit and in a secondary role in the mainstream monetary theory.

The implicit store of value function does not suggest, however, that money is the best store of value. Money is regarded as only one possible form of store value among other assets (Smithin, 2003). Hence, there is no reason why investors would hold money instead of other assets that function as a store of value and offer higher returns. The conclusion that individuals are indifferent between money and other assets that have a stable value clearly neglects a

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[8] This thesis understands the mainstream economics as the dominant schools of thought, which share some common features, such as the rigour of mathematical formalisation (Dequech, 2007). Thus, it is often associated with the neoclassical economic theory.

fundamental attribute of money stressed by Keynes (1936) and Post Keynesian economists: the liquidity preference.

In the context of an open economy, similar to the closed economy approach, the mainstream theory on currency internationalisation also stresses the medium of exchange as an essential feature of money (Kiyotaki and Wright, 1989, Galati and Wooldridge, 2009)[9]. Matsuyama et al. (1993) argue that, in the international economy, the primary function of money is to 'lubricate the wheels of commerce'. In a similar vein, Galati and Wooldridge (2009) stress that the more a currency is used as a medium of exchange, the lower are the transactions costs and the higher its liquidity. Thus, the mainstream theory on international money seems to be an extension of the analysis in a closed economy, where the addition of foreign currencies in their economic models is just a further complication that would not invalidate the conclusions from the barter analysis (Wray, 1999, Davidson, 2002).

Galati and Wooldridge (2009) also emphasise that, historically, the currency that fulfils the medium of exchange function normally also work as the main store of value. A key problem with this argument concerns the order of this causality. It is more likely that the currency used as the main store of value will also be used as a means of payment. The rationale for this inverse causality lies in the argument that agents will store their wealth in a currency in which they believe to maintain its value over time. In turn, this currency may also be used as a means of payment because it is mostly accepted by other agents. Chinn and Frankel (2008), however, recognise that it is indeed the reserve currency status of the US dollar that creates a continuous demand for it, which allows the United States to continue to finance deficits in its current account.

Some mainstream economists argue that the literature on currency internationalisation lacks a mathematical formalisation. To address this issue, Matsuyama et al. (1993) proposed a two-country and two-currency model of the international economy. Rey (2001) also attempted to model the use of national currencies in international trade, which builds on the model on the vehicle currency proposed by Krugman (1980). In their perspective, international currencies arise as a solution to the 'double coincidence of wants' problem, where the acceptance of this currency depends on the economic

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[9] Also in Marimon et al. (1990), Kiyotaki and Wright (1991, 1993).

size and degree of integration of the issuing country (Eichengreen et al., 2016).

In short, the theoretical contributions of mainstream economics to the currency internationalisation literature is minimal. The mainstream literature overemphasises the medium of exchange function at the expense of the unit of account and store of value functions, though the empirical literature on the determinants of this process often analyses each of these functions, as it is discussed in Chapter IV- 2. This literature typically neglects other types of currency internationalisation, which play an important role in determining the position of a currency in the hierarchy, as it is discussed in the following sections of Chapter II.

Additionally, an examination of mainstream economic research in the area of international economy reveals virtually no usage of the term 'currency internationalisation'. Certainly, mainstream economists have examined many aspects of processes wherein goods, services, and financial assets are bought and sold using different currencies. They have often examined the empirical determinants of this process, which is discussed in section II- 3.1. However, the term 'currency internationalisation' has not emerged as an analytical category in this approach. A bibliometric review of the last 20 years of main academic journals using this term as a search word reveals only a handful of articles researching about this topic. Instead, the limited mainstream literature in this topic often refers to an 'international medium of exchange' or a 'universally accepted means of payment' (Matsuyama et al., 1993, Rey, 2001).

II- 2.2 The International Political Economy Theory on Currency Internationalisation and Currency Hierarchy

II- 2.2.1 Functional Conceptualisation of International Money

The concept of currency internationalisation normally refers to the process whereby currencies are used abroad for transactions across countries (Cohen, 1998). The literature on currency internationalisation is widely discussed in IPE, which establishes a bridge between international relations and international economics. IPE researchers are mainly interested in the relationship between political power and the international use of currencies,

although they also take into consideration the economic factors that contribute to the internationalisation process.

Cohen (1971) originally proposed to analyse currency internationalisation through the three functions of money, i.e. medium of exchange, unit of account and store of value, in the international market. In his analysis, a currency is fully internationalised when it fulfils all the three functions of money outside the domestic economy. These three functions of international money are analysed in both the private and the public sector[10] and each function is described by one or two roles of international money, which sums in total the seven roles of international money summarised in Table 1. The private sector considers the functions of money in terms of the choices of individuals to use one currency or another, whilst the official sector focuses on monetary authority decisions regarding foreign currencies.

Table 1: The Roles of International Money

Function	Private	Official
Medium of Exchange	Vehicle currency Trade Settlement	Intervention currency
Unit of Account	Trade Invoicing currency	Exchange Rate Anchor
Store of Value	Investment currency	Reserve currency

Source: Cohen and Benney (2013)

The first function of money, the medium of exchange, refers to the ability of money to facilitate trade by serving as a general payment method in the international market. In the private level, this function of international money initially gave rise to the 'transaction currency', which is a currency that circumvents the 'double coincidence of wants' problem (Cohen, 1971). Without an international currency that emerges as medium of exchange, a transaction between two countries would only happen if one of these countries is willing to hold the currency issued by the other, similar to a barter economy.

More recently, the 'transaction currency' was divided in two other roles of international money. A currency is an international medium of exchange when

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[10] Cohen (1971) denominates the public sector as the 'official sector'.

it is used as a vehicle for foreign exchange (forex) operation and/or an instrument for trade settlement. Although these two roles are closely related, they are not synonyms (Cohen, 2013). The vehicle currency serves as an intermediary to triangulate the currency pairs that are not traded directly (Goldberg and Tille, 2005). The trade settlement currency is the one used as a medium of exchange for international transactions of goods and services. In the official sector, an international currency fulfils the medium of exchange function when central banks from other countries use it for foreign exchange interventions.

The second function of money is to measure the relative value of assets, goods and services in the international market – the unit of account function, also called 'quotation currency' in this literature (Cohen, 1971). In the private sector, a currency is internationalised when foreign investors use it to invoice trade operations. Although the currency used as trade settlement may differ from the currency used as trade invoicing, empirical evidence suggests that they are normally the same (Friberg and Wilander, 2008, Ito and Chinn, 2014). Regardless of the trade settlement currency, an international unit of account is used whenever there is a foreign transaction, as contracts must be denominated in a single currency (Cohen, 1971). A currency also performs an international unit of account when other countries adopt it as an exchange rate anchor, i.e. when the monetary authority pegs its currency to an international currency.

The third function of money is about its ability to preserve value through time – the store of value. Economic agents store their wealth by investing in assets which not only store value themselves but are also denominated in the currency that they believe to have a stable value, both with regards to exchange rate stability and domestic inflation. This role of international money, which later was referred to the 'investment currency' by Cohen and Benney (2013), was initially called the 'asset currency' (Cohen, 1971). In the official sector, central banks also hold foreign exchange reserves in those currencies that can preserve their wealth, the 'reserve currency'.

Cohen (2011a) distinguishes between two purposes of international currencies: the use for transactions between countries and within a single country. Whilst the former refers to the process of currency internationalisation per se, the latter is called 'currency substitution'. The most internationalised currencies are usually the ones used with the purpose of substituting national currencies that do not fulfil the functions of money in the domestic market.

Thus, the currency chosen for substitution is a consequence of currency internationalisation and not vice-versa. The episode of dollarisation experienced in Latin America reinforces the power of the US dollar, but it is not the foundation of its internationalisation. For this reason, this thesis focuses on the analysis of the internationalisation of currencies, and leave currency substitution for further research.

This research draws attention to four main implications of the functional analysis of international currencies in IPE literature presented above. Firstly, only a few currencies perform all the functions of international money in the international market. Since most currencies do not fulfil or partially fulfil these functions, currency internationalisation is not a binary concept, where currencies are regarded as internationalised or not. Instead, it is an ordinal process where currencies have different degrees of internationalisation across different functions[11]. Therefore, one should not focus only on the degree of internationalisation, but also consider the different roles of currency internationalisation, which are referred to in this research as the 'types of currency internationalisation'[12].

Secondly, the medium of exchange, unit of account and store of value functions are typically intertwined. For instance, in the official sector, the intervention currency and the anchor currency are usually a large share of foreign exchange reserves (Bénassy-Quéré et al., 1998). In the private sector, the invoice currency is closely related to the trade settlement currency. Thus, each function of international money reinforces the other types of currency internationalisation (Helleiner, 2008, Norrlof, 2014). The fact that the functions are intertwined gives evidence for an inertial component of currency internationalisation, as agents in the international market are reluctant to relinquish the use of the most internationalised currencies.

Thirdly, the fact that only a few currencies fulfil all or most of functions of money (central currencies) comes at the expense of many currencies playing a small role in the international market (peripheral currencies). This conclusion implies an inherent hierarchical feature of the international monetary system,

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[11] Currencies that do not perform any of the functions of international money are not used in the international market and, thus, considered non-internationalised currencies.

[12] This term was firstly used by Genberg (2010) and also by Belfrage et al. (2016).

where only a few international currencies are generally used in the international market, whilst the majority of currencies are considered irrelevant. For Cohen (2003), the internationalisation of currencies accentuates the hierarchy between them in the international market. Thus, currency internationalisation holds a linear and positive relationship with currency hierarchy.

Fourthly, the IPE literature on currency internationalisation is mainly concerned with the currencies that fulfil the functions of international money, given their importance in the international market. Other currencies that partially fulfil the functions of money, which are issued by emerging countries, are not discussed in this literature. For the reasons abovementioned, one of the aims of this research is to analyse the different types of currency internationalisation for emerging countries.

II- 2.2.2 Hierarchical Conceptualisation of International Money

The literature on currency hierarchy was firstly introduced by the IPE literature, also called the 'currency pyramid' (Cohen, 1998). Susan Strange (1971b) was the pioneer of classifying currencies into categories in an attempt to contribute with a political theory of international currencies, which was also referred to as 'types of currency'. She criticises the purely economic analysis of international currencies, as economists seem to focus on rigorous mathematical models and take for granted historical and political factors that influence currency internationalisation[13].

Strange (1971a, 1971b, 1971c) proposed four main categories of international currencies, as in Figure 1, which are mainly influenced by economic and political factors. The 'top currency' is the money issued by countries that have an economic leadership status, particularly in terms of trade and capital accumulation. Though political factors, such as the territorial size of the state, contributes to the confidence of international agents in this currency, the crucial factor that influences a top currency is economic. Examples of top

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[13] These factors stressed by mainstream economists are called 'economic determinants' of currency internationalisation, which are discussed in section II-3.1.

currencies are the British pound before World War I and the US dollar after World War II.

In the second category, the 'neutral currency' has little political influence and is mostly determined by economic factors. The issuing state does not necessarily have a leading economic position, but it must have a position that inspires the confidence of private agents. In this category, the state has no intention of globally expanding the influence of its currency and, given its limitations, the government is more concerned about the stability of the international monetary system (IMS). This is the most common type of international currency in the IMS.

The third category, the 'master currency', is derived from the political relationship of hegemonic or imperial power that the issuing country has over subordinate countries. Thus, the country issuer of the master currency can impose the use of its currency in another state, whether these are allied states or colonies. The fourth category, the 'negotiated currency' is the currency that used to be a former top or master currency, issued by those countries that once had political or economic dominance in the past. The currency emerges as a result of political and economic negotiation to promote its use beyond the national territory.

Figure 1: Types of International Currency
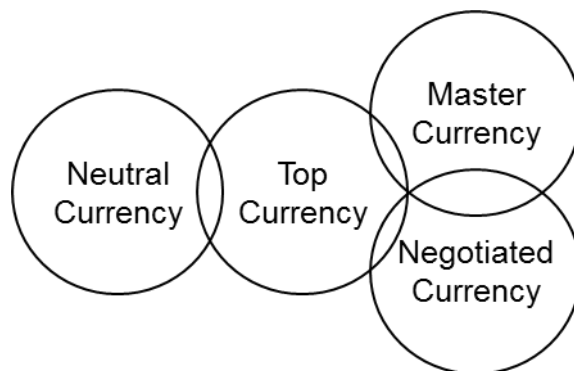
Source: Strange (1971a, 1971b, 1971c)

Three main points must be stressed from the analysis of these four categories. First, Strange (1971b) did not intend to have rigid categories to describe international currencies. Instead, she argues that these four circumstances when an international currency is used are flexible and not mutually exclusive. For instance, in general, the top currency also fits into each of the other three categories.

Second, although Strange (1971b) does not define an order of importance for these categories, the definition of each group of currencies suggests an implicit hierarchical relationship. She argues that the rationale for currency classification is to emphasise the need for a greater understanding of currency internationalisation than just analysing the functions of international money. Third, the four categories proposed by her do not include the features of those currencies with little or no role in the international market, which are generally issued by emerging and developing countries. Thus, the aim of her qualitative analysis was to emphasise the relevance of political power in the international monetary system rather than ranking international currencies.

Cohen (1998) further developed the categories proposed by Strange (1971b) into a more detailed classification, which is represented in Figure 2. His aim was also to provide a better understanding of the structures of governance and political power in the international monetary system. Although Cohen (2003) recognized that the formulation of a currency pyramid is difficult to operationalise, he argues that it helps to illustrate currency competition in the international market. Thus, whilst quantifying the absolute status of a currency is impossible, a currency pyramid may shed some light on their relative positions.

Figure 2: Currency Pyramid

Top Currency

Patrician Currency

Elite Currency

Plebeian Currency

Permeated Currency

Quasi-Currency

Pseudo-Currency
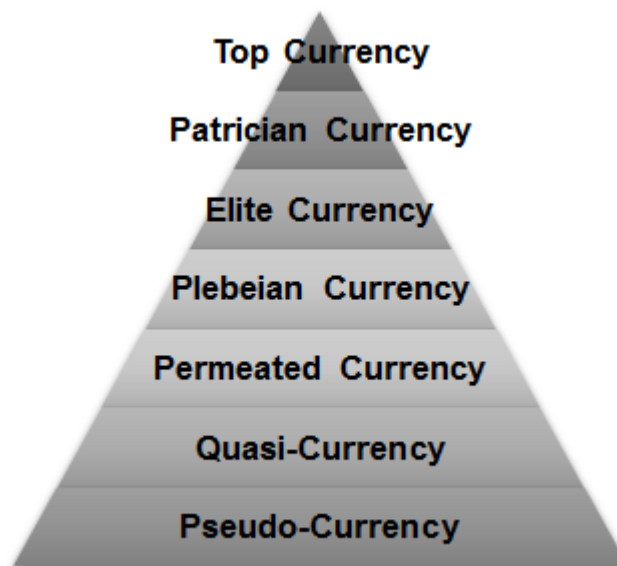
Source: Cohen (1998), author's elaboration.

Firstly, at the top of the currency pyramid, Cohen (1998) categorizes those currencies that are accepted in most or all cross-border purposes, i.e. the currencies that fulfil most or all functions of international money. The 'top

currency' is largely used worldwide and not limited to the region where it is issued. In contrast, the 'patrician currency' has a secondary role in terms of the functions of international money and it is mostly limited to a single region, such as the euro. The 'elite currency' is the periphery of the international currencies. It fulfils some functions of money in the international market, but it has limited use beyond its national frontier.

Following this rank in the currency pyramid is the 'plebeian currency', which has limited use in the international market apart from some role in invoicing trade. This category includes currencies issued by smaller industrial countries (e.g. Australia and Scandinavian countries), middle-income developing countries (e.g. South Korea and Singapore) and oil exporters (e.g. Kuwait and Saudi-Arabia). The remaining categories, 'permeated currency', 'quasi-currency' and 'pseudo-currency' are those that do not fulfil at least one of the functions of money in the domestic economy. The 'permeated currency' is the one that does not fulfil the store of value function, but it still works as a medium of exchange and a unit of account. The 'quasi-currency' does not fulfil any of these functions in the domestic market and are mostly substituted by an internationalised currency, generally the top currency. Finally, the 'pseudo-currency' is the one that almost ceases to exist, and it has no role at all in both international and domestic market.

One can observe that some, if not all, categories described by Cohen (1998) are similar to those initially proposed by Strange (1971b), as both researchers particularly stress the importance of political power. However, there are two main differences between their approaches on currency hierarchy. First, Cohen explicitly stresses the hierarchical feature of the international monetary system, where a few currencies are widely used whilst other currencies have a secondary role. Though the 'top currency' proposed by Strange (1971b) reveals an implicit hierarchy, she did not propose to rank the other categories. Second, the last four categories of his currency pyramid embrace currencies issued by emerging and developing countries, which are not discussed by Strange (1971b).

In conclusion, IPE researchers originally developed the literature on currency hierarchy to stress the role of political power on currency internationalisation. Although mainstream economists generally recognise the dollar as the key currency of the system, which implicitly reveals an asymmetry between currencies, they overlook the existence of a currency hierarchy and mostly neglect the influence of political power on currency internationalisation. On the

other hand, it is clear that the IPE literature on currency internationalisation and currency hierarchy focus on the categories that cluster currencies issued by countries with greater political power.

The major drawback of the IPE literature is that the internationalisation of several currencies issued by countries with lower political power is represented in just a few categories. Particularly, the 'plebeian currency' comprises currencies that have different roles in the international market but with a single main characteristic in common – the political weakness. The currency hierarchy introduced by the IPE field brings political power as an important determinant of currency internationalisation. However, it does not consider the differences in the process of internationalisation of currencies issued by emerging market economies, which has been growing albeit their political weakness.

II- 2.3 The Post Keynesian Theory on Currency Hierarchy

The Post Keynesian literature on currency internationalisation is essentially intertwined with currency hierarchy. Similar to IPE scholars, most Post Keynesian researchers understand that currency internationalisation has a positive and linear relationship with currency hierarchy. The more functions of international money a currency fulfils, the greater will be its position in the hierarchy (Andrade and Prates, 2013). The Post Keynesian theory, however, relies on a completely different economic apparatus from the mainstream economic theory, in which they focus on currency hierarchy rather than just currency internationalisation. In this heterodox apparatus, Post Keynesian economists contribute to the debate by stressing three main elements: uncertainty, liquidity preference and liquidity premium in the international market.

The concept of uncertainty was firstly introduced by Keynes (1936) to distinguish it from the notion of risk, which can be calculated in terms of probability. Under uncertainty, the set of possible events that may occur is unknown and, for this reason, it cannot be quantified. In the context of a closed economy, money, which is the pure form of purchasing power, ensures agents against the lack of confidence in their expectations (Carvalho, 2015). Particularly in times of greater preference for international liquidity, agents will seek protection against potential adversity by hoarding money.

In the General Theory, Keynes (1936) introduced the concept of the 'own rate of interest' (r), which is a result of the nominal yield (q), carrying costs (c), expected appreciation (a) of the asset and liquidity premium (l), as expressed in Equation 1. One of the main contributions of the Keynesian theory is to emphasise liquidity premium (l) as an essential attribute of money. This term is defined as the price[14] that agents are willing to pay to hold an asset that can be easily sold without significant losses (Carvalho, 2015). Thus, more liquid assets have a higher liquidity premium.

Equation 1: The 'Own Rate of Interest'

$$r = q - c + a + l$$

The preference of individuals for liquidity increases in periods of economic distress, as more liquid assets allow them to quickly meet their obligations at a lower cost. For instance, in times of economic or financial distress, there is a growing preference for assets with higher liquidity premium. Liquidity is, therefore, a protection against any kind of adversity, both risk and uncertainty. Although uncertainty and liquidity preference were also defined in the context of a closed economy, these concepts are applied by Post Keynesians to the context of an open economy to understand the preference of individuals regarding assets with different degrees of liquidity (Dow, 1999)[15].

The Post Keynesian literature on currency internationalisation and currency hierarchy was developed after the contributions of IPE scholars on these topics. Davidson (1982) was among the first heterodox economists to identify the need to develop a theory of international liquidity preference. However, his aim was not to develop a theory on currency internationalisation, but rather an international money theory. He argues that in a closed economy or a 'unionized monetary system' (UMS), such as the Eurozone, the national currency is the most liquid asset. By contrast, in an open economy or in a 'non-unionized monetary system' (NUMS)[16], where multiple currencies are

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[14] This price can be understood as the opportunity cost that arises when agents choose to hold more liquid assets instead of more profitable assets.

[15] Bell (2001) used a Post Keynesian framework to define a hierarchy of monies in a closed economy.

[16] NUMS refers to countries that have foreign trade partners in a context of a multiple-currency world with volatile exchange rates.

available for transactions, individuals have to deal with an extra uncertainty: the exchange rate. In his view, the international liquidity of currencies depends on the confidence of foreign agents in the ability of the central bank to work as a lender of last resort by using its reserves to preserve the currency value (Davidson, 2002).

As a result of the different degrees of liquidity, currencies have different levels of attractiveness for international agents. In an open economy, international agents hold and trade currencies as an asset class per se, which Andrade and Prates (2013) named as 'currency assets'[17]. Contemporary Post Keynesian researchers on currency hierarchy analyse the 'own rate of interest' (r) in the international context to explain currency asset pricing and exchange rate determination (Andrade and Prates, 2013, De Conti et al., 2013a, Fritz et al., 2014, De Paula et al., 2015, Kaltenbrunner, 2015).

In this context, the expected appreciation variable (a) refers to exchange rate movements against the most stable currency in the system, the key currency. Another relevant variable is the asset return (q), such as the interest rate. When the central bank increases the policy rate (q), the exchange rate tends to appreciate (a), *ceteris paribus*. The carrying costs (c) of an asset denominated in a foreign currency can be understood as a measure of the degree of openness[18]. For instance, capital controls increase the costs of international investors to access the domestic currency and, consequently, it reduces the returns (r) on assets denominated in the currency issued by this country (De Paula et al., 2015). The main difference between money and other assets is that money has a significantly smaller carrying cost than its liquidity premium. In parallel to the international market, the costs of holding the key currency must be significantly lower than its liquidity premium (l). Finally, analogous to its definition for a closed economy, this last term expresses the price agents are willing to pay for the 'power of disposal', which provide

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[17] This terminology was also used by Cohen (1971) to refer to the investment currency in the context of the functions of international money.

[18] Kaltenbrunner (2015) understands that the carrying costs are negligible for international money and short-term financial instruments.

security to them (Keynes, 1936). This term it is often called 'currency premium'[19].

In this theory, international agents hold currency assets in accordance with their expected returns (r). The exchange rate behaviour, i.e. the price of currency assets, is a result of the four variables suggested in the Post Keynesian literature: *q, c, a* and *l*. For instance, if the return of an asset denominated in a central currency *c* (r_c) is greater than the return of an asset denominated in a peripheral currency *p* (r_p), *ceteris paribus*, the currency *c* appreciates against currency *p*. The liquidity preference essentially represents a trade-off between monetary returns ($q - c + a$) and the international liquidity premium of a currency (*l*), which stems from Andrade and Prates (2013).

When the liquidity preference theory is applied to the international level, currencies can be ranked in accordance with their liquidity premium to shape a currency hierarchy (Fritz et al., 2018). The hierarchy is formed by a top currency, nowadays the US dollar, which has the highest liquidity premium. This currency is followed by some intermediate currencies, with a relatively good capacity to store their value, but with lower liquidity premium. Lastly, the unstable currencies, whose liquidity premium are even smaller, are located at the bottom of the hierarchy (Kaltenbrunner, 2015). These currencies issued by countries with credible monetary policy and exchange rate stability, such as in most developed economies, are called 'central currencies'. Consistently, the currencies located at the bottom of the hierarchy are the 'peripheral currencies', which are essentially issued by emerging and developing economies (De Paula and Prates, 2015).

Countries that issue peripheral currencies must compensate for the lower liquidity premium (l_p) to create conditions to attract capital flows. Whilst the liquidity premium is a variable rigid in the short-term, policymakers may have a direct influence on the degree of openness, interest rates and exchange rate. In this vein, according to the Post Keynesian theory of currency hierarchy, the central bank issuer of a peripheral currency can raise interest rates (*q*) to encourage exchange rate appreciation (*a*) and, thus, increase the expected returns (*r*) of the currency asset. Another alternative is to remove barriers to capital inflows and outflows, which increases the degree of

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[19] Terminology used by 'German Monetary Keynesian' (GMK) scholars, following the work of Riese (Kaltenbrunner, 2015).

openness and reduces the costs (*c*) of operating with the currency (Fritz et al., 2014). Expected exchange rate appreciation (*a*) in emerging and developing economies are, however, highly volatile. For this reason, removing capital controls may not be an option for the countries that issue peripheral currencies, particularly in times of higher international liquidity preference. In equilibrium, which is just a possibility, not a tendency, the returns on both currency assets of centre (r_c) and periphery (r_p) are equal, as represented in Equation 2:

Equation 2: The International 'Own Rate of Interest' in Equilibrium

$$q_c - c_c + a_c + l_c = q_p - c_p + a_p + l_p$$

$$(l_c - l_p) = (q_p - c_p + a_p) - (q_c - c_c + a_c)$$

In short, the monetary returns of the assets denominated in the periphery currency ($q_p - c_p + a_p$) must compensate for the lower liquidity premium (l_p) in relation to the central currency. Only under this condition, the returns of both assets can reach an equilibrium.

At this point, it is important to distinguish two terms stressed by the Post Keynesian literature – the liquidity preference and the liquidity premium. The liquidity preference refers to "the demand of a perfectly tradable asset with stable value", which is a choice of international agents based on their expectations (Dow, 1999: p. 154). The liquidity premium is instead a characteristic of an asset, which is a result of the degree of trust of international agents in the ability of this asset to fulfil the functions of international money. Whilst the liquidity preference varies with the economic cycle, the liquidity premium is rather rigid in the short-term, which may explain the inertial component of currency internationalisation. For instance, Brexit has led to strong political instability in the United Kingdom and it changed the liquidity preference of international investors. Nevertheless, the British pound is still regarded as a central currency in the international monetary system. The exchange rate may depreciate and even become more volatile, but the confidence of international agents in the pound is not affected in the short term. Hence, liquidity premium can only be influenced by policy variables in the long term (Fritz et al., 2018).

One must notice, however, that the liquidity preference is not a theory on the demand for money, but an asset price theory, which is determined by factors such as expectations of yield and liquidity premium (Carvalho, 2015). Post

Keynesian scholars have developed an international liquidity preference theory to determine the demand for assets denominated in the domestic currency. On the theory of demand for money in a closed economy, Keynes (1936) defined three motives of domestic agents to demand money: transaction, precaution and speculation[20].

The same motives can be applied to the international context and analysed in terms of the functions of international money. Dow (1999) analyses these three motives for international currencies to explain the international demand for liquidity. In the first motive, she argues that the transaction demand for international money is related to the need of a vehicle for international payments, which increases with the instability of financial market and the greater volume of capital flows. In parallel to the functions of international money proposed by Cohen (1971), agents demand a currency that can perform the means of payment function in the international market for transaction purposes.

The second motive, the precautionary motive to demand an international currency, is motivated by the concern of international agents about meeting unforeseen imbalances and contractual obligations (Davidson, 2002). In the private sector, the lower the confidence regarding exchange rates, the more international agents demand an investment currency, which fulfils the store of value function. The precautionary demand for an international currency is also related to the unit of account function. Kaltenbrunner (2015) uses a Minskyan approach to stress the importance of the currency denomination of international debt contracts, which she refers to as the 'funding currency'. International agents generally maintain in their savings the currency that denominated their debt contracts. Correspondingly, the foreign reserves of central bank reflect the precautionary demand for an international currency in the public sector.

Lastly, the speculative demand for money is also related to the ability of a currency to perform the store of value function. Agents have to decide which stable currency will denominate their short-term assets, instead of long-term assets. From the perspective of the domestic investors, exchange rate volatility leads to greater prospects of speculative gains when domestic agents

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[20] Although initially Keynes said that any other motive could derive from these three motives, he recognised later the need to define a fourth motive, the finance motive, which is distinguished from the transaction motive (Davidson, 2002).

hold foreign currency (Dow, 1999). In periods of lower liquidity preference, foreign investors may engage in speculative operations when the domestic currency is expected to appreciate, even if it is more volatile. Particularly in countries that issue peripheral currencies, foreign agents profit from interest rate differentials, such as carry trade operations.

Although Davidson (2002) and Dow (1999) do not refer to the currency hierarchy literature, their analysis on liquidity preference and the demand for international currencies implicitly creates a hierarchical relationship between them. More stable currencies are positioned at the top whereas more volatile currencies are found at the bottom of the currency hierarchy.

In a nutshell, uncertainty, liquidity preference and liquidity premium, which are mostly overlooked by the mainstream and IPE literature, are, therefore, key concepts used by Post Keynesian economists to explain the hierarchical structure of the international monetary system. As a result of the emphasis on the asymmetries between currencies, Post Keynesian researchers have greatly contributed to the literature on the internationalisation of peripheral currencies, which, once again, is mostly ignored in the mainstream and IPE literature. This approach allows them to investigate the specific functions of international money performed by emerging market currencies in order to understand the role of their currencies in the international monetary system.

II- 2.4 A Critical Engagement with the Literature on Currency Internationalisation and Currency Hierarchy

II- 2.4.1 A Critical Conceptualisation of Currency Internationalisation and Currency Hierarchy

Currency internationalisation is often understood as to the degree that a national currency is used by foreign agents. As described by McCauley (2006), an internationalised currency is the one that can be freely traded for other currencies for many purposes, which are described by the functions of international money proposed by Cohen (1971)[21]. Though the literature on

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[21] Another definition of currency internationalisation is in terms of currency convertibility (Prates, 2002, Carneiro, 2008). However, there is no consensus about the definition of currency convertibility, and this discussion is not in the scope of this thesis (Arraes, 1994).

currency internationalisation generally analyses this process in terms of the functions of international money, the actual concept is generally implicit in their analysis.

This chapter refers to this general definition as the **broad concept** of currency internationalisation. Kenen (2011) complements this definition by arguing that a currency is particularly internationalised when it is used in transactions between non-residents. For instance, in the securities market, the greater share of non-residents holding bonds denominated in a domestic currency provides evidence for its internationalisation. However, a stronger evidence of currency internationalisation is when non-residents become significant issuers of international securities denominated in the domestic currency, especially when these are negotiated off-shore with other non-resident investors (Lim, 2006, McCauley, 2006, Kenen, 2011). For instance, the internationalisation of the US dollar is evident when a non-resident issue bonds denominated in this currency. The internationalisation of the US dollar is particularly reinforced when this bond issued by a non-resident is negotiated with another non-resident. This thesis refers to the latter definition as the **refined concept** of currency internationalisation.

The distinction between these two concepts is relevant for this thesis because of their implication for the criterion as to whether a currency is considered internationalised. Whilst peripheral currencies issued by EME have recently become more internationalised in the broad concept, with perhaps the exception of the Chinese renminbi, they are mostly not internationalised in the refined concept. Ma and Villar (2014), who analyse the internationalisation of EME, also adopt a 'less restrictive' and a 'stricter' definition of this process, in which the strict definition refers to the use of a national currency between non-residents across all the functions of international money. The definition of currency internationalisation in terms of the broad and refined concepts raises two other factors that must be considered in the analysis of international currencies.

First, currency internationalisation can be defined in terms of the nationality (foreign vs domestic) or residency (non-resident vs resident) of the agents operating with the domestic currency. The difference between these two terms is relevant to understand the operational side of currency internationalisation and the implications of regulation for this process, which is discussed in detail in Chapter V- 3. The international financial relations are generally given by residency, not nationality. Subsidiary banks that are owned by domestic banks

are considered non-residents and their demand for the domestic currency would imply currency internationalisation. Although this thesis often discusses currency internationalisation in terms of nationality, it is acknowledged that the most accurate definition refers to residency, such as in Lim (2006), McCauley (2006), Kenen (2011).

Second, currency internationalisation is not a binary variable in the sense that a currency is either internationalised across all functions of international money or it is not used in for any purposes in the international market. Instead, currencies not only have different degrees of internationalisation but they are also internationalised on different dimensions, i.e. across the roles of international money proposed by Cohen (1971). The concept of currency internationalisation adopted in this thesis not only analyses the extent to which a currency is used by non-residents but also the type of internationalisation. Thus, a domestic currency is fully internationalised when it is widely traded between non-residents for several purposes, such as the US dollar, or just in one dimension, such as the Brazilian real[22].

II- 2.4.2 A Theoretical Contribution to the Different Types of Currency Internationalisation

In the context of a closed economy, the three functions of money, namely medium of exchange, unit of account and store of value, are widely discussed in macroeconomics textbooks. IPE researchers were the pioneers to apply this concept to the international market and define three roles of international currencies in the private and the public sector, as thoroughly explained in section II- 2.2.1 (Cohen, 1971). Whilst the former corresponds to the purposes that private agents use international currencies, the latter reflects the role of international currencies for monetary authorities. Given the primary importance of the private roles of international money and the fact that data in the public sector is mostly qualitative[23], this thesis focus on the roles of international currency for the private sector.

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[22] An empirical study on the different types of currency internationalisation is presented in Chapter III.

[23] The exception is the 'reserve currency', which is a public role of international money widely studied in the literature. See Chapter IV- 2 for more details.

The functions of international money are widely used in the currency internationalisation and currency hierarchy literature. There is a consensus between IPE and most of the Post Keynesian literature that currency internationalisation and currency hierarchy hold a linear and positive relationship. The more functions of international money a currency fulfils, the more internationalised it is and the higher its position in the hierarchy. The linear relationship between these two terms is, however, often implicit in this literature and currency internationalisation is often assumed to be an accurate proxy for currency hierarchy.

The globalization process has increased the volume of capital flows around the world, in both developed and emerging counties. As a result, some peripheral currencies, particularly the ones issued by emerging markets, have become more internationalised in the broad sense of this concept, with an increasing volume of the participation of non-resident investors in their foreign exchange markets. Herr and Ruoff (2018) recognize that among the roughly 180 existing currencies in the world, they have different functions of international money, i.e. they are internationalised according to different types. Yet, only 20 currencies completely fulfil the functions of money at the domestic level. In their view, at the international level, the vast majority of currencies do not fulfil any function of international money. Thus, the type of currency internationalisation plays a crucial role to understand these asymmetries between currencies in the IMS and their position in the hierarchy.

However, the roles of international money proposed by Cohen (1971) mostly describe the private and public use of central currencies. Thus, the literature lacks a type of currency internationalisation that describes the role of some peripheral currencies in the international monetary system. This chapter addresses this issue by using a Post Keynesian framework to propose an additional type of currency internationalisation: the short-term investment currency. The rationale for the focus of this research on the role of peripheral currencies does not lie on their importance for the international monetary system. Instead, analysing the role of these currencies is crucial to understand the reason they are located at the bottom of the hierarchy, which clearly has major economic implications for emerging countries. For instance, as discussed in section II- 2.3, countries that issue currencies with lower liquidity premium must compensate for that feature by using policy instruments, such as the interest rates. The implications of being located at the bottom of the currency hierarchy are not, however, part of the scope of this thesis.

In the Post Keynesian framework of currency internationalisation proposed in this thesis, the definition of all the types of currency internationalisation originally suggested by Cohen (1971) remains the same. There are, however, two additional types of currency internationalisation that are absent from the IPE literature: the funding currency and the short-term investment currency, as presented in Table 2. In this view, each of the three functions of money in the private sector has two roles in the international monetary system, which comprises six types of currency internationalisation.

Another different aspect in in Table 2 is with respect to the terminologies used for the functions of international money. This research adopts the term 'means of payment' as opposed to 'medium of exchange' because of its broader definition. As discussed in section II- 2.1, the mainstream economics literature mostly focus on the medium of exchange function, which stresses the use of money for trade. This analysis implies that a commodity – money – serves the primary function of being exchange by other commodities. Heterodox economists, however, present a different perspective of the functions of money in a closed economy (Keynes, 1930, Riese, 1998, Graziani, 2003, Fontana and Realfonzo, 2005, Fontana, 2009). In their perspective, the means of payment function refers to the ability of money not only to be exchanged for goods and services but, particularly, to settle debt contracts. This argument emphasises the use of money as a means of discharging a debt, which is related to the funding currency described within the unit of account function.

Moreover, when a currency is analysed beyond its national scope, it is perceived as an asset instead of a pure form purchase power. Thus, the 'store of wealth' function better defines the 'store of value' function in the international market, as global private and public agents seek to preserve, if not increase, their wealth. The functions of money in the context of a nation are widely discussed in the literature. The literature lacks, however, a reformulation of the functions of international money in the presence of the factors stressed by Post Keynesian economists, such as liquidity premium and uncertainty. Though thesis presents some thoughts regarding the applicability of these functions to the international market, this discussion requires a more in-depth analysis, which is left for future research.

Table 2: Types of Currency Internationalisation

Function	Private Sector
Means of Payment	Vehicle currency
	Trade Settlement currency
Unit of Account	Invoice currency
	Funding currency
Store of Wealth	Long-term Investment currency
	Short-term Investment currency

Source: Author's elaboration, adapted from Cohen and Benney (2013) and Belfrage et al. (2016).

The first additional role of international money is with respect to the unit of account function, which can be analysed in terms of the commercial and the financial sector. The definition of 'invoice currency' proposed in the IPE literature refers to the currency denomination of trade. The reason for defining this function only in terms of trade may lie on the argument that IPE scholars bases themselves on the mainstream economics apparatus, in which money arises as a solution to 'lubricate the wheels of trade'. In a different approach to the unit of account function, Post Keynesian scholars stress the importance of the use of an international currency in the financial sector.

Although some research has been conducted on the currency choice for international debt securities[24], Kaltenbrunner (2015) originally proposed a theoretical definition for another type of currency internationalisation, the **'funding currency'**. This additional role of international money refers to the ability of a currency to denominate the liabilities of foreign investors. For that reason, it is crucial that the currency internationalised for funding purposes is a low-yielding currency (McCauley and McGuire, 2009).

Another rationale for separating the funding currency from the invoice currencies lies in the self-reinforcing power of the former type of currency internationalisation. Ultimately, the agents who borrowed in a foreign currency

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[24] See Cohen (2005) from the Bank for International Settlements, Thimann (2009), He, Luk and Zhang (2016).

will have to demand it in order to honour their debt contracts. As currency mismatch carry additional risks, borrowing agents tend to hold assets denominated in the same foreign currency that denominates their liabilities (Kaltenbrunner, 2015). Hence, the funding currency reinforces its use among other types of currency internationalisation, such as investment currency and vehicle currency. This self-reinforcing power is analogous to the public sector. Monetary authorities normally maintain their reserves denominated in the foreign currency in which they borrowed funds, which is probably the currency used for interventions in the foreign exchange market.

From the perspective of the lending agents, the 'funding currency' can be understood in terms of the store of wealth function because international debt securities are international assets. However, from the perspective of the borrowing agents, the debt security is a liability denominated in a currency that performs the unit of account function. This thesis focus on the latter perspective, as the 'investment currency' is a choice of the lending agent whilst the 'funding currency' is imposed by the market to the borrowing agent, particularly in the context of developing and emerging economies.

The second additional type of currency internationalisation discussed in this chapter, which uses elements from the Post Keynesian theory on currency hierarchy, is with regards to the short-term demand for peripheral currencies. As discussed in detail in section II- 2.3, one of the reasons agents demand money is for speculative purposes (Keynes, 1936). In a closed economy, the speculative motive refers to the trade-off between holding money or other assets, which is based on their expectations of the future interest rate[25]. In an open economy, where multiple currencies are available for transactions and these currencies denominate a range of underlying assets, the trade-off is not only between several currency assets but also between short and long-term assets (Dow, 1999). Put differently, in the open economy, agents cannot only choose whether to hold money or a yielding asset. International actors must also decide on which international currency and the type of underlying assets (short-term or long-term) they would like to hold.

The investment currency is defined in the IPE literature by the currency assets that preserve their value through time, with respect to both inflation and

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[25] The literature lacks a more extensive study on the relationship between the functions of international money and the motives for holding international money, which is not the focus of this thesis.

exchange rate stability. The international demand for an asset currency that fulfils the store of value in the long term is limited to the most liquid currencies in the international monetary system. However, the international demand for an asset currency that is motivated by opportunities of higher returns, particularly in periods of lower preference for liquidity, is mostly fulfilled by peripheral currencies, which have a lower liquidity premium. Therefore, it is proposed in this thesis an additional role of international money that accounts for the type of internationalisation particularly experienced in currencies issued by emerging countries: the **short-term investment currency**.

This theoretical contribution to the literature on currency internationalisation and currency hierarchy builds on the analysis proposed by Belfrage et al. (2016), who differentiates between short and long-term financial actors in the store of value function. This thesis suggests that this function in the private sector should be divided into two subcategories: the short and long-term investment currency. The long-term investment currency is essentially the definition of 'investment currency' proposed by the IPE literature, i.e. it refers to the ability of a currency to perform the store of wealth function in the long run. Conversely, currencies that occasionally experience low levels of inflation and exchange rate volatility are said to perform the store of wealth function for a short period. The short-term investment currency is related to the speculative demand for money in the international market, which attracts international investors with prospects of higher returns[26].

As discussed in section II- 2.3, countries that are issuers of currencies with low liquidity premium can compensate for this feature by increasing the interest rate. In a world of low-yield in the countries that issue central currencies, the high-yields offered in emerging countries that are issuers of peripheral currencies may attract "unwanted attention" of international investors, i.e. speculative capital flows (McCauley and Scatigna, 2011: p. 74). The higher demand for investment in less liquid currency assets normally occurs in periods of economic prosperity, when the liquidity preference of international agents is lower.

The liquidity preference cycle can be understood in a Minskyan financial cycle framework (De Conti et al., 2013a). In periods of an excess of liquidity,

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[26] As an international asset, the short-term investment currency is also influenced by the degree of financial liberalisation and financialisation, which are not, however, in the scope of this thesis.

international agents have a greater appetite for risk. Although peripheral currencies have lower liquidity premium, it can be compensated by monetary returns, such as higher interest rates. During the economic and financial 'boom', when international investors are 'searching for yield', capital flows move towards emerging countries as they expect exchange rate appreciation (*a*) of peripheral currencies.

In the downturn phase, when international agents become more risk-averse, the liquidity preference increases. Consequently, the speculative operations that were profiting from interest rate differentials in countries issuers of peripheral currencies ('target currencies') tend to return to countries issuers of central currencies ('funding currencies') (De Conti et al., 2013a). As currencies from emerging economies have lower liquidity premium, these are the first ones to deteriorate from the 'flight to quality' movement of capital flows (Andrade and Prates, 2013). Whenever currencies experience an exchange rate depreciation, particularly peripheral currencies, economic agents become more pessimistic about its future value. As a result, these agents substitute transactions and assets denominated in the weakened currency for currencies that are perceived as strong. This substitution accentuates the weakness of the depreciated currency, which leads to more volatility and depreciation (Davidson, 1982).

The influence of international liquidity preference on the demand for a currency can arise from two main sources (Dow, 1999). The first one refers to the extent to which a currency satisfies the preference for liquidity. For a certain degree of liquidity preference, the deterioration of domestic or foreign market conditions may affect the relative demand for currencies, but their liquidity premium remains rigid in the short-term. In the second source, given the extent to which a currency satisfies the preference for liquidity, changes in the international liquidity preference affect asset currency demand. Whilst the former source depends on the inherent characteristics of the currency, the latter source is independent of the economic and financial conditions of the issuing country, which are vulnerable to changes in the international liquidity preference.

By contrast with the funding currency, the short-term investment currency, also known as 'target currency', most often is a high-yielding currency (McCauley and McGuire, 2009). Although the literature does not refer to this type of currency internationalisation, several authors have analysed speculative operations in emerging market economies, such as the carry trade

(McCauley and McGuire, 2009, McCauley and Scatigna, 2011, He et al., 2016).

One may argue, on the one hand, that the holders of short-term investment currency are not interested in its ability to store their wealth, but its ability to increase their wealth[27]. Indeed, the interest of speculative investors in the short-term investment currency lies in the high yields offered in the countries issuers of these currencies. On the other hand, the ability of a currency to store wealth in the short term, i.e. expectations of low inflation and exchange rate stability (or at least exchange rate appreciation) is a pre-condition for a short-term investment currency.

In sum, this section has stressed two main arguments. First, this chapter argues that the currency internationalisation and currency hierarchy hold a non-linear relationship. In other words, an increase in the degree of currency internationalisation cannot be understood as an increase in the position of this currency in the hierarchy. In this approach, the currency hierarchy is instead shaped by the types of currency internationalisation, which are influenced by the liquidity premium of each currency. Second, this section also suggests an additional type of currency internationalisation, the short-term investment currency, which accounts for the demand of international actors for peripheral currencies. An important conclusion of this theoretical approach is that when a currency is used as a short-term investment, international agents do not expect it to store their wealth in the long term. Thus, the liquidity premium of this currency remains rather low and its position in the hierarchy does not improve. A question that arises from this Post Keynesian analysis on currency hierarchy is with regards to the determinants of the liquidity premium, which manifests itself in different ways for each type of currency internationalisation.

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[27] Though the 'store of value' function is linked with the short-term investment currency, this type of currency internationalisation could be better described in another function of international money. The short-term investment currency can also be understood in a Marxist framework. Shaikh (2016) defines three functions of money that are also found in Marx (1887): medium of circulation, medium of pricing and medium of safety. Yet, one can identify in Marx (1887) a fourth function of money that also applies to the international market: the means of accumulation function (Van Staveren, 2014). The main focus of this thesis is on the types of currency internationalisation as opposed to their respective functions of international money. Thus, a deeper discussion on this issue is left for future research.

II- 3 Various Determinants of Currency Internationalisation and Currency Hierarchy

II- 3.1 Economic Determinants of Currency Internationalisation

As a consequence of the various concepts of currency internationalisation and currency hierarchy, researchers often emphasise different determinants of the use of international currencies. IPE scholars identified four main determinants of currency internationalisation that are widely discussed in the literature, particularly by mainstream economists[28]. Helleiner (2008) refer to these as the 'economic determinants' of currency internationalisation, which can be understood as an extension of the mainstream approach by IPE scholars (Cohen, 1998, Cohen, 2003, Cohen, 2011a, Krugman, 1984).

The first determinant is the confidence of agents in **currency stability**. This determinant is influenced by a domestic component, the level of inflation, and an international component, the exchange rate volatility. Though the confidence in the currency value certainly depends on sound fundamentals[29], it is enhanced by the political power of the issuing country (Helleiner, 2008). Some Post Keynesians also stress the importance of macroeconomic policy credibility for currency internationalisation, which reflects the confidence of international agents in the ability of a country to maintain exchange rate and inflation stability (Kaltenbrunner, 2015). Thus, the confidence of international agents in currency stability is not only an economic determinant, but it also depends on political power and macroeconomic policy decisions.

The second economic determinant of currency internationalisation is related to **openness**, **depth** and **liquidity** of financial markets. Market openness is a necessary condition because it offers free capital movements to foreign

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[28] Post Keynesian economists also recognise the importance of the 'economic determinants' of currency internationalisation, though they stress other variables that are crucial for this process too, such as the liquidity premium.

[29] The concept of fundamentals is not well defined in the IPE literature. For Krugman (1984), economic size, openness and efficiency of capital markets and exchange rate stability are examples of fundamentals adopted by the mainstream theory. In a more general approach, Post Keynesians understand that this concept refers to "whatever economic agents expect them to be embedded in the specific context and temporality", such as economic growth, trade balance deficits and inflation (Kaltenbrunner, 2015: p. 427).

investors. The depth component refers to the large volume and quantity of operations in the financial market, which prevents price volatility, as only outsized operations can cause changes in prices. Thus, deep foreign exchange markets can also contribute to currency stability. Some researchers also mention the importance of financial market development, which refers to the degree of sophistication and variety of financial products available to international investors (Chinn and Ito, 2006, Goldberg and Tille, 2008, Chinn and Frankel, 2008, Norrlof, 2014, Ito and Chinn, 2014).

Lastly, the definition of the liquidity component is mixed. In the domestic market, the local currency is the most liquid asset by definition because it fulfils the three functions of money[30]. In the IPE and mainstream economics perspective, international liquidity is defined by the capacity of a currency to be easily exchanged by other assets, including other currencies, without significant costs (Helleiner, 2008, Chinn and Frankel, 2008). This form of liquidity depends on the characteristics of the market and it can be achieved through liberal policies in foreign exchange markets that aims to reduce transaction costs. De Conti et al. (2014) define it as 'market liquidity' in contrast with another form of liquidity, the 'currency liquidity', which depends on the ability of a currency to fulfil the functions of international money.

In a Post Keynesian perspective, market liquidity, as well as the openness, depth and development of financial markets, are essentially represented by the costs of operating with a currency in the 'own rate of interest' in Equation 1. The carrying costs are any obstacles to capital flows, e.g. capital controls (Fritz et al., 2018). Whilst this form of liquidity clearly depends on the degree of liberalisation promoted by the issuing state, the extent to which policymakers can influence currency liquidity, i.e. the international demand for the domestic currency, is rather vague in the literature.

The third economic determinant of currency internationalisation discussed in the 'mainstream' IPE literature is the **economic power**. This factor depends on the absolute market size, often measured by Gross Domestic Product (GDP), and transactional network, which refers to the agents (private and public) that choose to use a currency for at least one of the functions of international money. When an economy is well integrated into the rest of the

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[30] In economies with high level of inflation, the domestic currency may be substituted by another international currency, such as the US dollar. Therefore, the local currencies would no longer be the most liquid asset in the economy.

world, the prospect of currency acceptability by several other agents enhance currency internationalisation in a self-fulfilling prophecy. The large volumes of transactions increase the gains from economies of scale, which are often referred by economists as 'network externalities' (Cohen, 2011a, Cohen, 2011b). "For better or worse - and opinions differ on this - the choice of which language and which currency is made not on merit, or moral worth, but on size" (Kindleberger, 1967: p. 11).

When a key currency is used for most transactions, it can be costly and inefficient to switch to another currency, which creates an inertia tendency for agents to keep using the same international currency. Chinn and Frankel (2008) illustrate currency internationalisation in an interesting metaphor about the international use of languages. Although English may not be the most appropriate language for international communication, the cost of changing it to another one is so high that it remains as the key-language of the world.

This **inertia** factor is the fourth economic determinant discussed in the currency internationalisation 'mainstream' literature. Krugman (1984) refers to inertia as 'circular causation' whilst other authors such as Chinn and Frankel (2008) call it 'network externalities', where the international use of a currency reinforces the benefits of using it. Cohen (2011a) argues that inertia is also triggered by uncertainty, which causes risk-averse agents to imitate the behaviour of other agents based on past experience – a phenomenon that psychologists called 'mimesis'. It is interesting to notice that he acknowledges the role of uncertainty in the process of currency internationalisation, which is a factor widely discussed by Post Keynesian economists, but not in the IPE literature.

Cohen (1998) argues that currency internationalisation follows a 'Darwinian' process of natural selection where national currencies are subjected to international competition. Thus, market forces define the international currencies, i.e. the 'survival of the fittest' currencies. The international demand for national currencies is then shaped by three of the abovementioned determinants of currency internationalisation: confidence in the currency value, market liquidity and a broad transactional network. In a similar vein, other mainstream economists such as Krugman (1984), Matsuyama et al. (1993), Rey (2001) emphasise that the demand for an international currency is a result of the 'invisible hand'. As a result of this international competition, only a few currencies are generally used beyond their issuing country. Hence,

currency internationalisation accentuates the hierarchal feature of the international monetary system (Cohen, 2003).

In summary, the four determinants of currency internationalisation discussed in this section, namely currency stability, financial market development, economic size and inertia, are widely discussed in the literature. IPE scholars refer to these factors as the 'economic determinants' of currency internationalisation to distinguish them from the 'political determinants', which is one of their main contributions to this literature. However, a major limitation of 'economic determinants' is the reliance of IPE scholars on the mainstream theory to analyse the economic factors that influence the use of a currency in the international market. This approach neglects the determinants stressed by Post Keynesian economists, who apply the Keynesian theory of money to the international market. Moreover, most of the literature does not evaluate which economic determinants influence each type of currency internationalisation.

II- 3.2 Political Determinants of Currency Internationalisation

The theoretical determinants of currency internationalisation are widely discussed in the literature, particularly because of its considerable implications for economic and financial stability. International Political Economy (IPE) scholars were the pioneers of theorising the concept of currency internationalisation. IPE researchers also have contributed to this literature by bringing to the discussion the importance of political and historical background, which are also emphasised by Post Keynesian economists (Strange, 1971c, De Conti et al., 2013b).

Helleiner and Kirshner (2012) divide different theoretical approaches to currency internationalisation into 'market-based', 'instrumental' and 'geopolitical'. The market-based approach essentially discusses the determinants from mainstream economics, namely confidence, liquidity and size. The instrumental category refers to the decisions of policymakers that have an impact on the international use of currencies, such as the anchor currency and the reserve currency. Lastly, the geopolitical perspective embraces variables such as the US hegemonic power and rise of economic and political power centres (e.g. European Union and China). Although this categorisation may shed some light on the different perspectives presented in the currency internationalisation literature, this discussion is centred on the

international use of the US dollar. Thus, it has little contribution to the internationalisation of peripheral currencies.

In terms of the 'geopolitical' approach, Strange (1971b) was the pioneer in pointing at the necessity of a political theory of currency internationalisation that takes into account historical and political factors that are taken for granted in the mainstream economics literature[31]. She does not allude to the argument of market forces stressed by mainstream economists and Cohen (1998) to explain currency internationalisation. In another IPE perspective, Strange (1971b) describes this process as a result of economic leadership, currency strength and political power. Each of these elements manifests themselves in different degrees in the four categories of currency hierarchy, as discussed in section II- 2.2.2.

In his theoretical research, Helleiner (2008) revisits the currency hierarchy categories proposed by Strange (1971b) and he argues that whilst political power plays a major role for master and negotiated currencies[32], the so-called 'economic determinants' are more important for the top and neutral currencies (Chey, 2013). Hence, different positions at the currency hierarchy have different determinants. This argument also implies that each type of currency internationalisation has different determinants, an issue which will be discussed again in Chapter IV.

The 'economic determinants' terminology, however, does not help to understand the determinants of currency internationalisation, as one cannot theoretically and empirically distinguish between which factors are purely economic or political (Norrlof, 2014). Both factors are intermixed and the attempt of distinguishing between the two groups would be fruitless and irrelevant to understand the determinants of currency internationalisation (Strange, 1971b). For this reason, Chapter IV adopts a more comprehensive approach which also takes into account economic factors that are affected by policy decisions, such as the interest rates, to explain the determinants of currency internationalisation.

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[31] Cohen (2011a), however, recognise that some mainstream economists acknowledge for the role of political power in currency internationalisation, such as Posen (2008).

[32] See more details about the categories of currency hierarchy proposed by Strange (1971a) in Chapter II- 2.2.2.

Cohen (1998) and Strange (1971b), however, do not elaborate much on the transmission of political power to currency internationalisation. Helleiner (2008) identifies two channels through which politics can affect the process of currency internationalisation. The first one is an indirect channel, where politics affect the economic determinants, such as confidence, liquidity and transactional network. The confidence in a currency, which reflects inflation and exchange rate volatility, is largely influenced by monetary policy decisions. For instance, the greater confidence of international agents in the ability of the euro to perform the store wealth function is due to the strong promotion of anti-inflationary policies by the European Central Bank (ECB) (Otero-Iglesias and Steinberg, 2013). Another question that must be asked is regarding the extent to which the monetary authorities can influence the currency internationalisation process. This is discussed in Chapter V, which takes the Brazilian real as a case study.

The second channel of transmission is a direct one. Politics can have a subtle influence on the demand for a currency in the form of aid packages, military protection or with the potential of accessing other markets[33]. On the limit, politics can influence the international status of a currency when a dominant country imposes its currency to the subordinate countries, such as colonies. A strong form of political power is the control over financial resources, a position that has been occupied by the US, particularly since the end of World War II (Cohen, 2013). During the First and Second World War, the United States provided political and financial support to several European countries for various reasons (Strange, 1971c). For instance, some aid packages in support to the pound sterling were the Lend-Lease, British loan, Marshall Plan and the North Atlantic Treaty Organization (NATO) aid.

In an IPE framework, one can understand this financial support as an indirect channel of transmission of politics to currency internationalisation. Moreover, combining this perspective with a Post Keynesian framework, these aid packages forcefully promoted the US dollar as a 'funding currency', which denominated these international debt contracts. As argued by Kaltenbrunner (2015), the country that occupies the position of an international creditor can

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[33] "For example, as the single most coveted export destination in the world, the United States can threaten market closure, or promise increased openness, to incite others to open their markets or allow American firms to invest or open subsidiaries abroad" (Norrlof, 2014: p. 1058).

demand debt contracts to be issued in its currency. Therefore, the international role of money as a funding currency, through a direct channel, has greatly contributed to the US dollar current position as the key currency of the international monetary system, i.e. the top currency.

This section has presented an extensive research on the political determinants of currency internationalisation, which is mainly discussed by IPE and Post Keynesian scholars and often neglected by mainstream economists. However, whilst Post Keynesian economists emphasise the asymmetries between central and peripheral currencies, IPE scholars focus on the political power of countries issuers of central currencies. Though some IPE scholars implicitly recognise that economic and political factors play different roles in determining each category of international money, the literature does not discuss the determinants of each type of currency internationalisation.

II- 3.3 IPE Determinants of Currency Hierarchy

The literature on currency internationalisation does not clearly define its relationship with currency hierarchy, which is rather puzzling. Strange (1971b), who originally proposed different categories to describe currencies, does not conceptualise an explicit hierarchical order between them. She stresses that it is crucial to analyse more than their 'economic functions', such as vehicle and reserve currency, to understand each of the four types of currency. In her view, one must also analyse the political actions and economic objectives of each country.

Also from an IPE standpoint, Cohen (1998) argues that the position of a currency in the pyramid is determined by the authoritative domain of a currency, which is a new concept that stresses the role of government authorities and market forces. The authoritative domain combines the influence of the territoriality imposed by the state with the transactional network generated by the market. Territoriality refers to the region where the issuing government have political jurisdiction to impose the use of their currency for transactions. The transactional network corresponds to the extent that a currency is used by private or public actors, who choose to make use of a currency across the three functions of international money. Whilst territoriality reveals the political power of the issuing country, the transactional network is a result of market forces.

In this perspective, the wider use of a currency as a medium of exchange, unit of account and store of value in both the private and the public sector affects the transactional network. Additionally, the greater political power influences the regional use of a currency, such as the Eurozone, which enhances currency territoriality. Thus, the better performance of a currency in terms of the functions of international money and the greater political power enhances the currency authoritative domain and, consequently, its position in the pyramid. In this perspective, currency internationalisation has an implicit linear and positive relationship with currency hierarchy, where the former is a market-driven process that affects the latter.

Although extensive research has been carried out on the determinants of currency internationalisation, the IPE literature does not provide a deep study on currency hierarchy that adequately analyses the determinants of the position of a currency in each of the categories. The IPE literature assumes an implicit relationship between currency internationalisation and currency hierarchy. Such an exposition is incomplete because they do not take into account the factors that determine the different types of internationalisation, such as vehicle or invoice currencies, which, in turn, affect the position of a currency in the hierarchy.

II- 3.4 Post Keynesian Determinants of Currency Hierarchy

There is a consensus in the literature, regardless of academic fields, that the United States dollar is the key currency of the international monetary system (IMS). In an IPE and Post Keynesian interpretation, this means that the US dollar is positioned at the top of the currency hierarchy. For Post Keynesian economists, in parallel to a closed economy where money is the most liquid asset, the US dollar is the most liquid currency asset in an open economy. By definition, and in comparison to the remaining currencies, the US dollar has the highest liquidity premium. Conversely, peripheral currencies, which have lower liquidity premia, are placed at the bottom of the currency hierarchy, which does not need to be represented in a 'currency pyramid'. Figure 3 illustrates the hierarchy between currencies, where the main currencies of the IMS are located in the centre and the remaining currencies are located in the periphery. The factors that might shape currency hierarchy are those that determine the liquidity premium, which is defined by the non-monetary return of holding an asset denominated in a currency that provides security against

uncertainty. Within the Post Keynesian literature, researchers emphasise different factors that determine this international liquidity premium.

Figure 3: The Current Hierarchy of the International Monetary System

- US dollar
- Euro
- Other Central Currencies (yen, pound sterling, Swiss franc, etc.)
- Peripheral Currencies
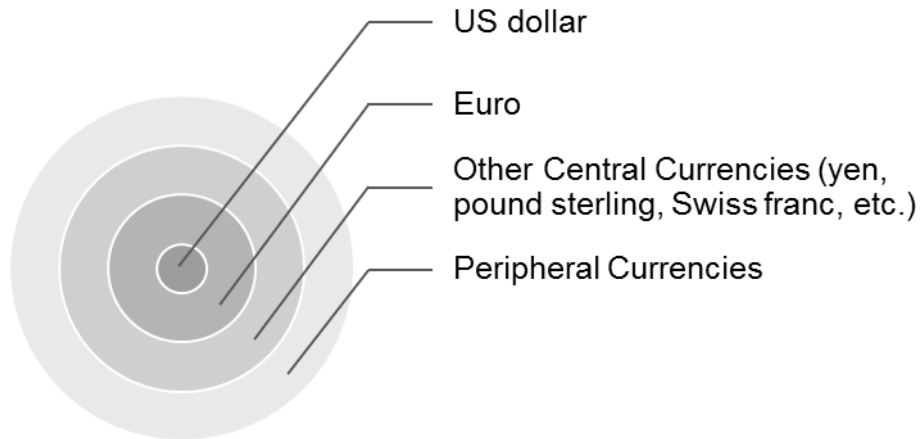
Source: De Conti et al. (2013b)

Andrade and Prates (2013) argue that the degree of liquidity is related to the ability of currencies to perform the three functions of international money: medium of exchange, unit of account and store of value. Thus, in agreement with Cohen (1998), currency hierarchy is determined by how well currencies fulfil these functions in the international market. Hence, there is an implicit linear and positive relationship between currency internationalisation and currency hierarchy: the more a currency is internationalised across the different functions, the higher its position in the hierarchy. A question that still needs to that needs to be asked is regarding the factors that determine a currency to fulfil more or fewer functions in the international market.

Though mainstream economists and some IPE scholars understand currency internationalisation as a market-driven process, some Post Keynesian scholars, such as De Conti et al. (2013b), stress that the demand for a currency is rather determined by the economic and political characteristics of the issuing countries. Essentially, the demand of private agents for a currency is influenced by the established currency hierarchy, which is determined by economic and geopolitical factors. In a similar vein, Bénassy-Quéré and Deusy-Fournier (1994)[34] argue that currency internationalisation is also a

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[34] As cited in De Conti et al. (2013b).

result of historical and institutional factors[35]. The focus on the decisions of the public sector as the main driver of currency internationalisation is referred by IPE scholars as the 'institutionalist approach' (Helleiner and Kirshner, 2012)[36].

As explained in section II- 2.3, from a Post Keynesian perspective analysing the 'own rate of interest', policymakers can compensate for low the liquidity premium (l) of peripheral currencies by setting higher interest rates (r). In periods of international liquidity, when investors are 'searching for yield', the demand for assets denominated in peripheral currencies increase, which may lead to currency appreciation (a) (De Conti et al., 2013a). Conversely, in periods of economic distress, when there are subtle changes in international liquidity preference, capital flows move towards countries issuers of central currencies, normally to the key currency of the IMS. In turn, countries issuers of peripheral currencies, particularly those internationalised as a short-term investment currency[37], experience capital outflows, which may be completely unrelated to the domestic conditions of the issuing country, and the exchange rate becomes more volatile.

Thus, the demand for short-term investment currencies is driven by returns, which might temporarily increase the internationalisation of these currencies in this dimension, but it does not structurally change its position in the currency hierarchy. In parallel with the argument presented by Carvalho (2015) in the context of a closed economy, the international liquidity preference is a theory on the determinants of the exchange rate rather than a theory on the demand for international currencies. Though the 'own rate of interest' does not describe the determinants of the liquidity premium, it provides insights that explain the exchange rate volatility of short-term investment currencies, which reinforces their lower position in the currency hierarchy.

Another group of Post Keynesians, referred in the literature as German Monetary Keynesians (GMK), argue that demand for an international currency is not only determined by expectations of individuals, but also by the liquidity

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[35] Institutions are understood in this thesis as government organization, e.g. Central Bank, or an established law or practice, e.g. regulation of capital flows.

[36] As cited in Ly (2012).

[37] More details in section II- 2.4.

premium[38] (Kaltenbrunner, 2015). For GMK scholars, the 'currency premium' is a result of the currency's ability to perform the store of wealth function, which is fundamentally driven by monetary policy credibility. The commitment of policymakers to deliver currency stability is, therefore, the key factor to achieve a higher position in the currency hierarchy or at least remain in the same position (Fritz et al., 2014).

Thus, a factor that influences the types of currency internationalisation and, in turn, currency hierarchy is the interest rate, which is often the policy instrument used by the monetary authority to control inflation. This variable is, however, mostly neglected in the mainstream and IPE analysis on the determinants of the international use of currencies. Although monetary policy credibility may be a necessary condition for a currency to be liquid, it is not sufficient. Central banks from some emerging countries are committed to currency stability, and yet they do not enhance currency liquidity or changes its position in the hierarchy (Kaltenbrunner, 2015).

Dow (1999) also stresses the importance of the store of value function as a determinant of the international demand for currencies. From a wide range of currencies available in the international market, exchange rate stability influences private decisions about which currency to hold. In other words, when the domestic currency is unstable in the international markets, due to inflation or exchange rate volatility, other currencies will more successfully satisfy the international liquidity preference, conditional to market expectations.

Kaltenbrunner (2015), in contrast, focuses on the ability of a currency to work as an international means of contractual settlement, the 'funding currency'. Similar to a closed economy where agents demand money as the most liquid asset to meet their obligations, in an open economy context, international agents will demand the most liquid currencies to meet their external liabilities. Creditor countries can induce other economies to accept debt denominated in their currencies. However, countries issuers of currencies at the bottom of the hierarchy face difficulties to issue debt denominated in domestic currencies, the 'original sin'[39]. In times of economic distress, investors will seek for the

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[38] GMK scholars refer instead to the 'currency premium', which is essentially the liquidity premium of international assets denominated in foreign currencies.

[39] See more in Eichengreen et al. (2003).

currencies that denominate international debt contracts to meet their outstanding obligations, which have a high liquidity premium. As a result, the exchange rate in peripheral countries depreciates and the economy is constantly subjected to currency volatility, regardless of fundamentals or monetary policy credibility. Thus, Kaltenbrunner (2015) understands that the liabilities denominated in foreign currency, the funding currency, is the main determinant of the liquidity premium. The relationship between these two variables is negative, as the higher the stock of debt denominated in foreign currency, the lower the liquidity premium.

In a similar approach, Bonizzi (2017) argues that the liquidity premium is determined by any factor regarded as 'Keynesian fundamentals'. For instance, the foreign exchange reserves are a good indicator of the capacity of a country to meet their obligations or to intervene in the exchange rate to curb volatility. The fact the emerging countries are distinct for their negative reputation in terms of exchange rate volatility or inability to meet their obligations reduces their liquidity premium and, thus, reinforces their lower and subordinate positions in the currency hierarchy.

As discussed in the previous sections, whilst mainstream economists focus on the economic determinants of currency internationalisation, IPE scholars stress the importance of political power to this process, which is neglected in the mainstream literature. De Conti et al. (2013b) acknowledge the importance of these economic and political determinants for currency hierarchy. They, however, in a similar vein to the 'institutionalist approach', suggest another factor not discussed in the literature that plays a crucial role in this process: the political will to promote currency internationalisation. It is clear that countries issuers of central currencies can promote their use in the international market.

A question that remains unanswered is with regards to whether and how countries issuers of peripheral currencies can influence their internationalisation and position in the hierarchy. Maziad et al. (2011) argue that EME has the potential to increase the use of their currencies in the international market. They suggest that these countries could adopt policies that support financial depth and openness, though these countries should consider the possibility of negative consequences of the transition to a multipolar IMS, such as currency instability. Another question is as to whether they are willing to promote currency internationalisation as a policy objective.

However, there is not a single solution or policy recommendation to reverse the condition of peripheral currencies in the currency hierarchy. Additionally, the lack of consensus may arise from the fact that Post Keynesians focus on different variables to explain the determinants of the liquidity premium. To 'climb the ladder' of currency hierarchy and increase the liquidity premium of a currency, Fritz et al. (2018) stress that it is crucial to smooth exchange rate volatility. To achieve this policy objective, they argue that capital account controls become an important macroprudential instrument to prevent short-term capital inflows and outflows that are a result of the liquidity cycle and a source exchange rate volatility. Another benefit of controlling capital flows emphasised in their research is the autonomy of policymakers to set the interest rate according to the domestic conditions instead of international liquidity cycles.

In addition to capital controls, De Paula et al. (2015) also argue that monetary authorities of countries issuers of peripheral currencies can intervene in the foreign exchange market to reduce the exposure of their currencies to changes in the international liquidity preference. Capital inflows in the form of external debt denominated in the foreign currency can add to the boom-bust cycles of capital flows, which create instability in the currency value. The Forex intervention strategy could reduce the volume of speculative capital flows to these countries, i.e. limit the internationalisation as a short-term investment currency, and smooth exchange rate volatility. They stress that exchange rate stability is a precondition for current account surpluses, which, when combined with low levels of external debt, may lead to a market expectation of currency appreciation in the medium term (Fritz et al., 2014). Though the liquidity premium (l) is rigid in the short term, the greater stability or appreciation (a) of a peripheral currency increase the international demand for assets denominated in this currency. In the long term, the result of this policy may increase the confidence of international agents in the peripheral currency, i.e. its liquidity premium, and its position in the hierarchy.

In short, the Post Keynesian literature on the determinants of currency hierarchy generally stresses the key role of interest rate in this process. Some other researchers also contribute to this discussion by bringing the attention to other variables that influence the currency stability, such as the current account surplus and the level of external debt, which are preconditions to increase a currency liquidity premium. Furthermore, in a similar vein to the contributions of IPE scholars, some Post Keynesian economists also

emphasise the importance of the political will to promote currency internationalisation. Policy instruments, such as exchange rate interventions, and capital controls, as well as policy strategies and regulation, may shape the demand of international agents for the local currency. However, this debate is limited to the theoretical Post Keynesian literature on currency hierarchy. Therefore, the literature lacks an in-depth study as to whether currency internationalisation can be managed as a policy strategy or whether this process is a result of market forces, particularly in EME.

II- 4   Conclusion

Chapter II presented a comprehensive literature review on the concept and theoretical determinants of currency internationalisation and currency hierarchy. The functions of international money proposed by Cohen (1971), i.e. medium of exchange, unit of account and store of value, are widely used in the currency internationalisation literature. However, different schools of thought focus on different types of currency internationalisation to analyse the use of currencies in the international market. Most of the mainstream theoretical literature on currency internationalisation overstresses the supremacy of the medium of exchange function, such as in Matsuyama et al. (1993) and Rey (2001), which overlooks other types of currency internationalisation. In their view, an international currency arises as a solution to the issue of 'double coincident of wants' in international trade.

IPE scholars originally proposed to categorise currencies in terms of their economic and political power in the international monetary system (IMS). Their main point was to stress the role of political power in promoting the international use of currencies rather than the cause or implications of the asymmetries between currencies. For this reason, the IPE literature focuses their studies on those categories of currencies with political power and mostly neglect the position of peripheral currencies in the currency hierarchy.

Post Keynesians contribute to the literature currency internationalisation by stressing the concept of liquidity premium to explain the asymmetries between currencies in the international market (Andrade and Prates, 2013, De Conti et al., 2013a, Fritz et al., 2014, De Paula et al., 2015, Kaltenbrunner, 2015). These asymmetries are represented in a currency hierarchy, where the US dollar is at the top, other central currencies in the following position, and the peripheral currencies stand at the bottom. Whilst IPE and mainstream economists generally neglect the internationalisation of peripheral currencies, Post Keynesian economists study their subordinate position in the IMS.

Both IPE and Post Keynesian scholars often understand that an increase in the position of a currency in the hierarchy reflects their greater degree of internationalisation. Chapter II argued instead that one should pay attention not only to the extent to which a currency is used in the international market but also the type of internationalisation. In a Post Keynesian framework, it was argued that the liquidity premium manifests itself in different ways in each type of currency internationalisation, which shapes the currency hierarchy. Though

currency internationalisation and currency hierarchy are correlated to each other, they do not hold a linear and positive relationship, as generally assumed in the literature.

Given that peripheral currencies issued by some emerging market economies have become more internationalised in the broad sense of this term, the literature lacks a theoretical definition of their type of internationalisation. To address this issue, Chapter II suggested an additional type of currency internationalisation: the short-term investment currency. This theoretical contribution to the literature on currency internationalisation and currency hierarchy brought together a Post Keynesian framework with the types of currency internationalisation, originally developed by IPE scholars, to shed some light on the position of peripheral currencies in the hierarchy.

The Post Keynesian theory on currency hierarchy stresses that countries which issue peripheral currencies typically offer higher interest rates to compensate for their lower liquidity premium. As a consequence of changes in the international preference for liquidity, the capital flows that once migrated to these countries with the prospect of higher returns eventually 'flight to quality', i.e. they migrate back to the countries issuers of central currencies. As a result of these capital movements, the exchange rate of peripheral currencies becomes more volatile, which reduces again the confidence of international investors in these currencies, i.e. the liquidity premium. Thus, internationalisation as a short-term investment currency does not enhance the position of a currency in the hierarchy.

A question that needs to be asked concerns the determinants of the currency hierarchy, which is influenced by the different types of currency internationalisation. The literature widely discusses the 'economic determinants' of currency internationalisation, namely currency stability, financial market development, economic size and inertia. This terminology was proposed by IPE scholars to distinguish it from political determinants, which are neglected by the mainstream theory. However, when analysing these 'economic determinants', the IPE literature bases itself on the mainstream theory and it neglects the contribution of Post Keynesian economists to this debate.

In the Post Keynesian theory, currency hierarchy is shaped by the different liquidity premium of each currency. Though the hierarchy between currencies is clear, the determinants of the liquidity premium are rather mixed in the

literature. Many Post Keynesian researchers stress the importance of currency stability to improve its position in the hierarchy. In particular, Fritz et al. (2018) argue that this is a precondition to current account surpluses, which combined with low levels of external debt, can lead to a market expectation of currency appreciation in the long term. As a result, the confidence of international agents in the currency, as well as its position in the hierarchy, would improve. The next chapter empirically investigates the different types of currency internationalisation, in particular the role of short-term investment currency proposed in Chapter II.

CHAPTER III
CURRENCY HIERARCHY AND THE ROLE OF PERIPHERAL CURRENCIES IN THE INTERNATIONAL MARKET

III- 1   Introduction

The literature on currency internationalisation, both theoretical and empirical, widely discusses the functions of international money proposed by Cohen (1971), namely medium of exchange, unit of account and store of value. Similar to the theoretical literature on currency internationalisation, most of the mainstream and IPE empirical literature focus on the study of central currencies for two main reasons. First, the incipient internationalisation of peripheral currencies has not represented a significant shift in the market demand for these currencies. Though the emergence of a multi-polar system where peripheral currencies play an important role is unlikely, the analysis of their recent internationalisation is crucial to understand their subordinate position in the hierarchy, which clearly has negative consequences over the issuing countries. Second, precisely due to their limited use in the international market, data on peripheral currencies is very limited across the functions of international money.

Post Keynesian economists, on the other hand, emphasise in their studies the asymmetries of the international monetary system (IMS). For this reason, their research is generally concerned about the causes and implications of the subordinate position of peripheral currencies in the hierarchy. In a more in-depth analysis than the dichotomy centre-periphery, Post Keynesian economists have proposed a currency hierarchy, where the key currency of the system is located at the top, currently the US dollar, which is followed by other central currencies. Finally, at the lowest positions are located the peripheral currencies, which do not fulfil the functions of international money. This approach reveals a positive and linear relationship between currency internationalisation and currency hierarchy.

As discussed in Chapter II- 2, both Post Keynesian and IPE scholars often understand that the more functions of international money a currency fulfil, the higher its position in the currency hierarchy. In this definition, the growing internationalisation of peripheral currencies in recent times would suggest a higher position in the currency hierarchy. Yet, peripheral currencies have arguably remained at the bottom of the hierarchy. One of the main arguments

of the thesis is that analysing not only the degree but mainly the types of currency internationalisation is crucial to understand the subordinate position of peripheral currencies in the hierarchy. Some other authors in the literature on currency internationalisation have proposed an aggregate measure that accounts for all types of currency internationalisation combined in an index. However, a general degree of currency internationalisation, such as an aggregate measure, is not helpful to explain the low position of peripheral currencies in the hierarchy. This thesis proposes instead to shift the focus from the empirical analysis on the degree of currency internationalisation to the types of currency internationalisation.

Chapter III contributes to the literature from three main perspectives. First, this chapter aims to understand the role of central and peripheral currencies in the IMS through a comprehensive empirical investigation of the different types of currency internationalisation, as opposed to the emphasis given by the literature on central currencies. To achieve this objective of a comprehensive analysis of the IMS, Chapter III contributes to the literature by providing one of the most extensive mappings of the process of currency internationalisation of central and peripheral currencies, particularly those issued by emerging market economies (EME). Data was collected for both central and peripheral currencies for all types of currency internationalisation suggested by the literature as well as the funding currency and the short-term investment currency.

Second, this chapter contributes to the literature by implementing a more sophisticated methodology to analyse the different types of currency internationalisation: cluster analysis. Given the data limitation, most of their empirical literature on currency internationalisation uses basic statistic tools, such as graphs and tables, to study the functions of international money. Thus, the results of this chapter should be regarded as one building block in this debate. Third, though a rigorous measure of currency hierarchy is hard to formulate, cluster analysis has been carried out to shed some light on the relationship between the types of internationalisation and the positions of central and peripheral currencies in the hierarchy. The extensive database and the results from the cluster analysis may be combined with the theoretical literature presented in Chapter II to illustrate a hierarchical order between the clusters as an approximation of the currency hierarchy.

The remainder of this chapter is organized as follows. Section III- 2 gives a review of the empirical literature on currency internationalisation. Section III-

3 discusses the empirical methodology carried out in this chapter, cluster analysis, and section III- 4 presents the results and the main research findings. Finally, section III- 5 concludes.

III- 2 Empirical Literature on the Types of Currency Internationalisation

Most empirical studies of currency internationalisation analyse proxies for the functions of international money in tables and graphs to draw conclusions about the extent to which currencies are used in the international market, i.e. a general degree of currency internationalisation. Particularly in the literature on the determinants of currency internationalisation, most empirical studies focus on one single type of internationalisation as a general proxy of this process, which is discussed in detail in Chapter IV- 2. In contrast with this one-dimensional approach, Cohen and Benney (2013), from an International Political Economy (IPE) perspective, stress the differences in the use of currencies for various purposes. They argue that the fallacy of composition is an issue that often arises in this literature, in which the conclusions found for a type of currency internationalisation are assumed to be valid for all international money roles in the IMS.

Whitman (1974), Krugman (1984) and Tavlas (1997) were some of the pioneer researchers in this literature to analyse data on different types of currency internationalisation, which were originally proposed by Cohen (1971), as discussed in Chapter II- 2.2.1. Their findings support the outstanding role of the US dollar as the key currency of the IMS, as it is internationalised across all functions. Krugman (1984) also suggests for the future that a multipolar system is more likely to take place, where other central currencies would play a more important role as international currencies.

Whilst these authors mostly focused their research on the role of the US dollar, Cohen (1998) extended this empirical analysis to other central currencies, though he recognised that the data available was not enough to account for each type of currency internationalisation. The statistics revealed the large extent of the use of international currencies, which is a phenomenon growing sharply. However, data also shows that only a few currencies perform the private and the official functions of money in the international market, which empirically suggests a hierarchical relationship between currencies in the IMS. Contrary to the arguments about the emergence of a multipolar currency system, Cohen and Benney (2013) found that currency competition has not increased, pointing in the direction of a stronger pole in the IMS.

Other authors in this literature focus on the growing role of the euro in the international market in comparison to the US dollar. Papaioannou and Portes

(2008a, 2008b) analyse proxies for the different types of currency internationalisation for the major currencies in the IMS, i.e. the central currencies. Their empirical study suggests that while the euro has maintained its share of the market fairly stable, the participation of the US dollar has declined, though they are still the dominant currency of the system. Papaioannou and Portes (2008a) recognise the increase of the share of currencies from emerging market economies, which they justify by the growing investment activities in high-yielding currencies. This result is consistent with the theoretical contribution of the short-term investment currency discussed in Chapter II- 2.4.2.

Most of the literature on currency internationalisation analyse the use of central currencies in the IMS, and the peripheral currencies are generally overlooked, apart from the Chinese renminbi. Given their less significant participation in the international market, the analysis of peripheral currencies by Cohen (1998) is more about currency substitution than their position in the currency hierarchy or their type of internationalisation. An exception to this limited analysis of the IMS is the research conducted by Maziad et al. (2011), who study proxies for the functions of international money for emerging market currencies. As these economies have increasing importance in trade and financial flows, they suggest that the globe moves towards a multi-currency system. For instance, currencies from EME that are commodity exporters can play a greater role in their region and possibly work a reserve currency such as the Canadian or the Australian dollar.

Another exception for the lack of study on the internationalisation of peripheral currencies is the Post Keynesian literature on currency hierarchy. As discussed in Chapter II- 2.3, Post Keynesian economists precisely focus on analysing the asymmetries of the IMS. These studies mainly consist of the determining factors and the implications of the subordinate position of those currencies placed at the bottom of the hierarchy, the peripheral currencies. In their most recent work, De Conti and Prates (2018) analyse data on the types of currency internationalisation in the private and the public sector for a large sample of central and peripheral currencies. The statistics have shown that whilst some currencies are widely used in the international market, others are not. For this reason, they suggested a subdivision of these currencies into two groups, the central and the peripheral currencies.

Within these two categories, their results also revealed that the current IMS can be ordered in four different hierarchical categories. The US dollar at the

top, as the key currency of the IMS, the euro on a second stage, which is followed by other central currencies, and finally a group with the remaining currencies that do not fulfil the functions of international money at the bottom. De Conti and Prates (2018) stress, however, that these categories are not rigid, and the Chinese yuan, which is still located at the bottom of the hierarchy, might change its position in the near future.

A question that remains unanswered is with regards as to why the recent internationalisation of peripheral currencies that are issued by emerging countries does not change their position in the currency hierarchy. Moreover, in agreement with the definition of currency hierarchy proposed in this thesis, this process is not understood in terms of a binary variable, in which a currency is or not internationalised. Instead, currencies in the IMS have several different degrees of use across the different types of internationalisation. This perspective raises another question about the type of internationalisation of these peripheral currencies. Though the theoretical analysis in terms of centre-periphery emphasises the subordinate position of the peripheral currencies the IMS, this dichotomy overlooks the differences within the different types of internationalisation of peripheral currencies.

In addition to the empirical literature that analyses proxies for the functions of international money using tables and graphs, some researchers attempt to aggregate these functions to analyse currency internationalisation. Krugman (1984) believes that it is possible to create an index of the use of the US dollar, though he also recognised that the different types of currency internationalisation are separable; i.e. a currency may be internationalised in one or just a few functions. Recent studies proposed an index based on the functions of international money to analyse the process of internationalisation of the Chinese renminbi (Renmin University of China, 2016). However, an aggregate indicator for currency internationalisation gives the same weight for each function of international money. This measure allows one to understand the overall relevance of currencies in the IMS, but they do not identify the different types of internationalisation for each currency.

In an innovative approach in the literature on currency internationalisation, Cohen and Benney (2013) make use of two techniques to measure market competition, the called Herfindahl–Hirschman Index (HHI) and concentration ratios. Their objective was to measure the structure of competition between currencies in the IMS. This methodology is applied to data on vehicle currency, investment currency and reserve currency, which are the functions

of international money that they found data available. Contrary to the argument presented by Krugman (1984), Maziad et al. (2011) and others, they conclude that the competition of currencies in the IMS has not increased. Instead, their results suggest that the IMS moves towards a polarised system, where the role US dollar remains as the key currency of the system.

In a nutshell, the empirical literature on the different types of currency internationalisation is not very extensive. A major drawback of the empirical literature is the emphasis given on currencies issued by developed countries, as these are the most important ones in the international monetary system. However, analysing peripheral currencies issued by emerging countries is also important, not because their currencies have a significant impact on the rest of the world, but because their economies have been affected by decisions made by countries that issue central currencies.

Additionally, the empirical literature on currency internationalisation is mostly limited to basic statistical tools to analyse data for the functions of international money. The main reason for the scarcity of other methodologies in the empirical literature, such as econometric models, must lie on the fact that data is very restricted. This is particularly the case of peripheral currencies due to their small share of currency denomination in international transactions. However, the growing importance of these currencies in international transactions allows one to extract more information about the different types of currency internationalisation.

III- 3   Methodology and Data

III- 3.1   Cluster Analysis

Chapter III introduces cluster analysis as an innovative empirical technique to contribute to the study of the functions of international money and to understand the role of peripheral currencies in the IMS. The main benefit of this methodology is to analyse how currencies are internationalised across all the types of currency internationalisation but not using an aggregate measure. Cluster analysis is a type of data mining technique that groups a sample of objects with similar characteristics at a single point in time. Each of these groups of similar objects is called clusters, which are formed based on the information provided by a dataset of variables. In econometrics, data is applied to models that express the relationship between the dependent and the independent variables, whereas in data mining technique there is no assumption about the underlying model. Instead, the data is analysed in an algorithm to build a model that bests describe the relationship among variables. Essentially, cluster analysis is a procedure that detects different patterns between the variables, e.g. the types of currency internationalisation, using a dataset.

Although cluster analysis has been widely used in the field of natural science[40], such as biology and ecology, its use in social sciences is still infrequent (Yim and Ramdeen, 2015). In economics, a few researchers have employed this technique to evaluate optimal currency areas (OCA) (Artis and Zhang, 1998, Bénassy- Quéré and Coupet, 2005, Tsangarides and Qureshi, 2008). In the field of physics, Kwapień et al. (2009) and Keskin et al. (2011) applied cluster analysis to study daily data on the exchange rates of the major currencies in the IMS. Both studies found evidence that found that clusters of currencies are mainly formed based on economic and geographical aspects, with an increasing role of the euro in the international market. However, they do not refer to the currency hierarchy literature, nor do they analyse data on the types of currency internationalisation. To the best of our knowledge, cluster analysis has not been applied to study the different types of currency

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[40] Some researchers from physics have applied cluster analysis and other mathematical methods to analyse

internationalisation and their relation with currency hierarchy. Thus, our results should be regarded as one building block in this debate.

III- 3.1.1 Hierarchical Cluster Analysis

There are two main approaches to cluster analysis: hierarchical and non-hierarchical. From the results of the hierarchical cluster analysis, it is possible to establish an optimal number of clusters while a non-hierarchical cluster analysis requires the prior specification of the number of clusters

Our objective here is to find the optimal number of clusters that would group currencies with similar characteristics in order to understand the role of peripheral currencies in the international market. Although the literature on currency internationalisation identifies a dichotomy between central and peripheral currencies, which one can understand as two separate clusters, it does not discuss the differences between peripheral currencies. Thus, the literature does not suggest an optimal number of clusters, and for this, this empirical study has applied a hierarchical cluster analysis.

The hierarchical cluster analysis can be carried out using two different methods. The first is the agglomerative method, which starts with a cluster for each object until a single cluster is formed including all objects. The second is the divisive method, which starts with a single cluster that involves all objects, which are then broken down into smaller clusters until each cluster is composed of a single object. We adopt in this chapter the agglomerative hierarchical cluster analysis because it requires a much lower computational load than the divisive method (Yim and Ramdeen, 2015).

Figure 4 illustrates the stages of the agglomerative hierarchical cluster analysis. The letters A-E represent each object, which in this research are the currencies. The first stage consists of clusters of single objects (currencies). During the second stage, the most similar currencies are grouped to form a new cluster (D and E). At the third stage, the most similar clusters are merged again to form other new clusters (A and B). This procedure repeats itself until there is only one single cluster comprising all currencies (A, B, C, D and E). In short, the hierarchical clustering produces several clusters ranked in a hierarchical order of similarity[41]. At the bottom of this hierarchy are several

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[41] One must notice, however, that the term 'hierarchical cluster analysis' has nothing to do with 'currency hierarchy'. This methodology is used to find similarities among

clusters of individual currencies, and, at the top, there is one single cluster with all currencies, which are not similar to one another (Shalizi, 2009).

Figure 4: Hierarchical Cluster Analysis
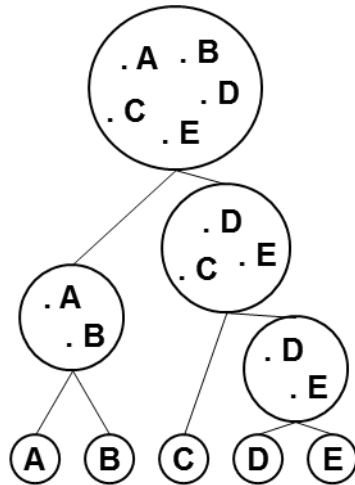
Source: Author's elaboration.

The objective of this method is neither to analyse currencies as individual clusters nor to analyse all of them in one single cluster. The idea behind the cluster analysis is to find an optimal number of clusters that groups together currencies with similar functions in the international monetary system. The currencies must share similar characteristics within the cluster and must differ from the other clusters. In other words, currencies must be homogeneous within the cluster and heterogeneous across the clusters. Although the optimal number of clusters is at the discretion of the researcher, there are a few outcomes that suggest a suitable stage to stop the clustering process.

One of the primary outcomes of the cluster analysis is the dendrogram, as illustrated in Figure 5. The dendrogram is a tree graph that displays the clustering process, which starts with clusters of single objects at the bottom of the graph. This outcome is a measure of similarity represented by the vertical distance between the clusters[42], where the closer the objects are, the more similar they are (Tan et al., 2006). The clusters of objects that are the most similar are grouped at the earliest stage of the analysis, in this case, the

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currencies and not to build a currency hierarchy using the data regarding the types of currency internationalisation.

[42] The SPSS dendrogram is instead displayed horizontally, where the objects (currencies) are organized vertically and the distance between clusters is measured in horizontal lines.

clusters D and E. Likewise, clusters that are the most dissimilar are grouped at the latest stage of the analysis, in this case, the cluster C, D and E with the cluster A and B. The optimal number of clusters will be at the point where the clusters are far from each other (represented by the vertical line) and, thus, they are too heterogeneous.

Figure 5: Dendrogram
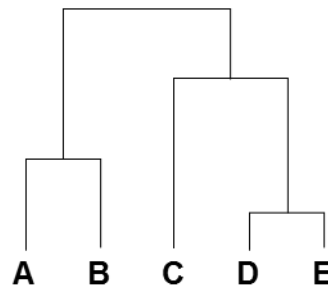
Source: Author's elaboration.

Another outcome[43] of the cluster analysis that facilitates the decision as to the optimal number of clusters is the agglomeration schedule table. This table displays the different stages at which clusters are combined and the respective coefficients that represent the distance (dissimilarity) between two clusters. Thus, this coefficient increases as it groups more heterogeneous clusters. To define the stage at which the hierarchical cluster analysis should stop merging the clusters, one can plot these coefficients in a line graph to find the inflection point where the clusters are too heterogeneous to be grouped. Therefore, in the hierarchical cluster solution, there is no rule regarding the choice of an optimal number of clusters. This is a subjective decision to be taken from the analysis of the agglomeration schedule or the dendrogram.

The use of hierarchical cluster analysis has three main benefits for this research. The first advantage is that it clusters currencies with the same type and degree of internationalisation. The second benefit is that it allows a comparison of the different types of internationalisation across the clusters. As a result, one can analyse not only the differences between central and peripheral currencies but also those between peripheral currencies. Thirdly,

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[43] The hierarchical cluster analysis also produces other outcomes that are not specified in this chapter because they are less relevant or harder to extract information from, such as the icicle plot and case processing summary table.

cluster analysis allows all the types of currency internationalisation to be analysed simultaneously, which is a major limitation of graphs, tables and other basic analytical tools. Even though the sample size is relatively small, cluster analysis still provides a more detailed and sophisticated examination of the data than descriptive quantitative analysis.

Nevertheless, cluster analysis can be limiting in that it only analyses cross-sectional data. It is, therefore, not possible to observe how the types of internationalisation change for each currency over time. A few cluster analysis techniques have been developed to explore time series data in the context of social sciences, such as the Dynamic Pattern Synthesis (DPS) (Haynes, 2017). While it would be pertinent to carry out a cluster analysis on both previous and current periods, due to the limited availability of data on peripheral currencies and other periods, it was not feasible for the present research project.

III- 3.1.2   Methods and Distance Measures

The hierarchical cluster analysis identifies clusters of currencies with similar types of currency internationalisation, which is calculated based on the distance between observations in the dataset. The more different two cases are, the greater the distance between them. There are a variety of possible measures to define the distance between two cases (currencies), which are chosen according to the type of data analysed, such as continuous, categorical or binary, among others. Although it is easy to observe distance in a two or even three-dimensional graph, it is far from ideal when there are more than two or three variables. The simultaneous analysis of several variables that represent each of the types of currency internationalisation is one of the main benefits of the cluster analysis.

This chapter analyses continuous data categorised in numerical scales and the measure chosen to quantify the similarities between currencies was the squared Euclidean distance, which is the shortest length between two points. The Euclidean distance (d) between two points (p and q) in a Cartesian coordinate system, with an n-dimensional space $p = p_1, p_2, \ldots, p_n$ and

$q = q_1, q_2, \dots, q_n$, is derived from the Pythagoras' theorem[44], represented in the following formula in Equation 3:

Equation 3: Euclidean Distance

$$d(p,q) = \sqrt{(q_1 - p_1)^2 + (q_2 - p_2)^2 + \cdots + (q_n - p_n)^2}$$

It is important to notice that the distance chosen is measured by the square of the standard Euclidean distance (d^2), which gives more weight to observations that are further apart, such as outliers. Objects that are not close to each other become even more distant whilst objects that are closer do not move away from each other and, for this reason, objects are clustered faster. This measure is affected by differences in scale (e.g. meters and centimetres), however, as our sample is all measured in percentage format[45], our analysis is not affected by this problem. The formula for the square of the standard Euclidean distance is displayed in Equation 4:

Equation 4: Squared Euclidean Distance

$$d^2(p,q) = (q_1 - p_1)^2 + (q_2 - p_2)^2 + \cdots + (q_n - p_n)^2$$

There are a number of methods of distance measurement between cases of clusters or objects when carrying out a cluster analysis. The city-block is one method of measuring distance[46]. It calculates the absolute value of the distance between two points, which prevents positive numbers cancelling out negative ones. The Minkowski distance, a general method of calculating the Euclidean distance, raises the distance between two points to the power *R*. The Chebyshev distance calculates the maximum distance between two points, which is a measure of dissimilarity. For the present cluster analysis, a squared Euclidean distance has been applied not only because it gives greater weight for extreme values but also because it is the most common distance measure for continuous variables used in cluster analysis literature (Yim and Ramdeen, 2015). The proximity matrix displays the distances calculated between each pair of objects. The elements in the principal

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[44] Pythagoras' theorem states that for all right-angled triangles, the square of the hypotenuse (d) is equal to the sum of the squares of the other two sides (p and q).

[45] Since the observations were in percentage format, we did not standardize the observations into Z-scores or any other transformed values.

[46] Also known as Manhattan distance.

diagonal are always marked as zero because it represents the distance between an object and itself.

In addition to the squared Euclidean distance method, one must define a measure to calculate the centre of the cluster. One possibility is the nearest neighbour method, which measures the distance between the two closest objects that belong to each cluster. The downside of this method is that it may produce a cluster chain where clusters are merged because of the close proximity of certain objects to the next cluster. As peripheral currencies have low degrees of internationalisation and are, therefore, likely to be closer to each other, this method can produce misleading results. By contrast, the furthest neighbour method calculates the distance between the two most distant objects in each cluster. Although this method resolves the chaining problem, it creates another one. If an object in a cluster is further away from the rest, this may prevent two similar clusters from being merged because of an outlier (Yim and Ramdeen, 2015).

In this cluster analysis, Ward's method was chosen to calculate the distance between clusters. This method uses squared Euclidean distances and it analyses the proximity between two clusters in terms of changes in the error sum of the squares (ESS)[47]. A higher ESS represents a greater distance between clusters. The choice of method was based on the fact that although it is prone to create small clusters, this method attempts to minimise the variance of clusters and it is less vulnerable to outliers. This feature of this method is important for our analysis because some currencies are far more internationalised than others. Thus, the distance between clusters should not be significantly affected by the presence of those outliers.

III- 3.1.3 Limitations of the Cluster Analysis Results

Chapter III contributes to the literature by analysing the different types of currency internationalisation in a methodology that does not aggregate the data. However, the data and methodology used have a few limitations. First, though the choice methods and distances measures were justified according to the characteristics of the data, other measures could have led to different clusters. Second, the data collected on the different types of currency

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[47] The error sum of the squares is the sum of the difference between each observation and the sample mean.

internationalisation are proxies suggested in the literature, which may not be a rigorous measure for each function of international money. Cohen (1998) also recognises that the available data is not enough to fully account for each type of cross-border use of currencies. Third, the data available is very limited, particularly for currencies issued by emerging countries. For instance, the survey from BIS is based on the average for a month and it is only published every three years. The lack of data for other periods can be a source of bias in the analysis, as the year analysed could have been atypical, although it is almost a decade after the financial crisis and the data available on previous surveys seem to be fairly similar. Finally, the data missing for a few currencies, which was estimated through OLS to avoid removing another currency from the sample, can also be a source of bias. However, as the share of these currencies with missing data are very small, one should not expect much of a difference from the actual data.

III- 3.2   Data Sources

The sample used in this empirical work is composed of 24 currencies from both developed and emerging economies, as follows: Australian dollar (AUD), Brazilian real (BRL), Canadian dollar (CAD), Chinese yuan (CNY), Danish krone (DKK), Euro (EUR)[48], Hong Kong dollar (HKD), Hungarian forint (HUF), Indian rupee (INR), Japanese yen (JPY), Mexican peso (MXN), New Taiwan dollar (TWD), New Zealand dollar (NZD), Norwegian krone (NOK), Polish zloty (PLZ), Pound sterling (GBP), Russian ruble (RUB), Singapore dollar (SGD), South African rand (ZAR), South Korean won (KRW), Swedish krona (SEK), Swiss franc (CHF), Turkish lira (TRY) and United States dollar (USD)[49].

The selection criterion for the data was based on data availability. The Bank for International Settlements (BIS), the primary data source of this chapter, publishes data for the 24 most traded currencies. For this reason, these currencies were selected for this empirical work. Though the sample size is relatively small, considering that there are 162 currencies in the ISO currency

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[48] The Euro area currently consists of the following 19 countries: Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain.

[49] The three-letter currency codes are used in accordance with the ISO 4217 currency code list.

code list, these currencies account for 195.5% of the total over-the-counter (OTC) foreign exchange turnover[50]. This chapter analyses the most recent cross-sectional data from 2016 on the types of currency internationalisation[51]. Due to the lack of data for the public sector for all the types of currency internationalisation, this empirical study only analyses data for the private sector. Table 3 summarises the proxies used for the types of currency internationalisation in the private sector.

Table 3: Data Source - Types of Currency Internationalisation

Function	Source
Means of Payment	_Vehicle_: Share of currency in global total turnover (BIS)
	Trade Settlement: Share of Currencies on Global Customer Initiated and Institutional Payments (SWIFT)
Unit of Account	_Invoice_: Share of currency denomination on imports (various sources)
	Funding: Share of cross-border liabilities denominated in the counterparty country's currency (BIS)
Store of Wealth	_Long-term_: Share of Institutional Investors in currency turnover (BIS)
	Short-term: Share of Hedge funds and Proprietary Trading Firms in currency turnover (BIS)

Note: all data is in a percentage format.

The means of payment function in the international market refers to the ability of a currency to serve as a vehicle to trade a currency against another and as an instrument for trade settlement. The vehicle function is captured by the volume of transactions in the foreign exchange market. Based on existing literature, this chapter have chosen the currency share of global foreign exchange market turnover as an indicator of the vehicle currency (Cohen and Benney, 2013, Papaioannou and Portes, 2008b). This data is published by

[50] There are always two currencies involved in a Forex transaction. Therefore, the sum of the share of each currency amounts to a total turnover of 200%.

[51] The data used in the cluster analysis is available in the Appendix Table 2.

the Triennial Central Bank Survey[52] of the Bank for International Settlements (BIS).

The foreign exchange (Forex) turnover is defined by the volume of currency transactions, regardless of whether it is a sale or purchase operation. Cross-currency transactions using a vehicle currency to purchase another currency are recorded as two separate transactions against the vehicle currency. For instance, if a currency is used as a vehicle to exchange euros into dollars and thereafter the trader uses this amount of dollars to purchase Japanese yen, the total turnover of US dollar would be double-counted. Thus, the more a currency is used as a vehicle, the higher its turnover will be. The Forex turnover captures the volume of transactions for the following instruments: spot, outright forward, Forex swaps, currency swaps[53] and options (King and Mallo, 2010).

The trade settlement currency can be measured by the Customer Initiated and Institutional Payments, which are international payments via the SWIFT global bank payment messaging network. This data is available on the Renminbi Tracker study by the Society for Worldwide Interbank Financial Telecommunication (SWIFT). Although this data is published monthly, it only displays the top 20 most traded currencies in SWIFT, which account for roughly 98% of international payments via this network. For this reason, there was no data available for currencies with a trade settlement share under 0.29%, i.e. the share of the 20th most traded currency in this network[54]. There is no data available for Brazilian real, Hungarian forint, Indian rupee, New Taiwan dollar, South Korean won and Russian Rouble.

The Hungarian forint was among the 20 most traded currencies in March 2016 and data was used for that month on the assumption that this share would not

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[52] Triennial Central Bank Survey - Global foreign exchange market turnover.

[53] A foreign exchange swap (also known as Forex or FX swap) consists of exchanging a spot contract and a forward contract, or exchanging two forward contracts, each with a different completion date. Conversely, a currency swap contract is one in which counterparties exchange interest payments in different currencies.

[54] Although the Thai baht and the Chilean peso are among the 20 most traded the currencies in SWIFT, these currencies are not among the 24 most traded currencies in terms of global turnover. Therefore, they have not been incorporated into this empirical study. Data has been analysed for the other 18 currencies in the SWIFT database.

display any significant changes in the following month. We conducted some sensitivity tests on the other five currencies using the maximum value (0.29%), the middle value (0.145%) and minimum value (0.0%). The results of the cluster analysis remained the same in these three scenarios, suggesting that these shares are too low to affect the analysis. Thus, this thesis has assigned each trade settlement currency without data a value of zero.

The unit of account function, which denotes the relative prices of commercial and financial contracts at the international level, can be analysed through surveys, although this data is still very limited (Cohen and Benney, 2013). This chapter separates the unit of account function into a trade and a financial sector. We analyse the share of each currency in total imports within the trade sector. Evidence from the literature suggests a preference for invoicing the trade of goods in the currency issued by the exporter or the larger country (Krugman, 1984). Thus, data on imports was collected to avoid overestimating the share of domestic currencies.

The data used for the euro, Danish krone, Hungarian forint, Norwegian krone, Polish zloty, Swedish krona and Swiss franc (CHF) were extracted from the currency denomination of Extra-European Union (EU) imports[55], retrieved from Eurostat. The data for the Brazilian real, British pound, Australian dollar, Canadian dollar, Chinese yen, Indian rupee, Turkish lira, South African rand and Japanese yuan were obtained from surveys or statistics websites of the respective government authorities[56]. For the remaining six currencies, namely Hong Kong dollar, Mexican peso, New Zealand dollar, Russian ruble, Singapore dollar and New Taiwan dollar, data was estimated through an Ordinary Least Squares (OLS) regression, using the GDP of each country and their currency shares in global turnover as the explanatory variables. Data for the US dollar and South Korean won were extracted from the ECB publication on invoice currencies (Kamps, 2006, Gopinath, 2015)[57].

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[55] Extra-EU refers to countries that do not belong to the European Union. Whilst some EU countries are not part of the Eurozone, the euro still plays an important role in EU trading. Intra-EU trading data by currency is not available and it would overestimate the share of euro in international trade.

[56] It was not possible to find currency trading data for the same periods in each country. Some of the data was only available for exports or total trade and not for imports.

[57] More details on data source and estimation are available in the Appendix Table 1.

This unit of account function was analysed in regards to trade and to the financial market. In the financial sector, a currency becomes more internationalised as it is used to denominate financial operations such as debt contracts. Data on the share of cross-border liabilities was collected as a proxy for the funding currency. This data refers to BIS reporting banks cross-border liabilities denominated in the counterparty country's currency. The cross-border liabilities of the reporting banks represent a claim for the counterparty countries. Thus, this data published by BIS reflects the willingness of international banks to denominate their liabilities in the currency of the recipient (counterparty) country.

Lastly, it was analysed the store of wealth function in a long and short-term perspective. Long-term currency internationalisation reflects the ability of a currency to store their wealth in the long term. This variable can be measured by the share of institutional investors in each currency's total turnover (Bonizzi, 2017). Institutional investors are those companies whose primary motive to participate in the market is to trade Forex instruments for investment and risk management purposes. Institutional investors are also known as 'real money investors', and include investment in pension funds, mutual funds and insurance companies.

In contrast, data on shares of hedge funds and proprietary trading firms in each currency turnover is analysed as a proxy to the short-term investment currency. Hedge funds are investment companies that often have both short and long-term positions in different markets, asset classes and instruments. Proprietary trading firms are well known for high-volume and high-frequency investments, hedge and speculative operations over short periods. Hedge funds and proprietary trading firms have a different regulatory framework from institutional investors and are generally related to speculative activities, such as carry trade operations (McGuire and Upper, 2007, Galati et al., 2007). Data for both hedge funds and institutional investors is available on the Triennial Central Bank Survey published by BIS[58].

Some authors have analysed currency denomination of international debt securities (published by BIS) as a proxy for investment currency (Cohen and Benney, 2013, Papaioannou and Portes, 2008b). Private agents tend to invest

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[58] A description of this data was retrieved from the Reporting Guidelines for Turnover, April 2016 - Triennial Central Bank Survey of Foreign Exchange and OTC Derivatives Market Activity.

their resources in debt securities denominated in a currency in which they expect to store their wealth. For this reason, this variable is understood as a long-term investment currency. However, the choice of analysis of institutional investors is due to its easy comparability with the hedge funds shares in each currency turnover[59].

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[59] Data on the total turnover for each currency was adjusted to incorporate data on options bought and sold, previously recorded on a gross basis.

III- 4   Results

III- 4.1   Summary of the Cluster Analysis

The objective of Chapter III is to analyse data on each type of currency internationalisation to understand the role of central and peripheral currencies in the IMS. As discussed in detail in the previous section, the cluster analysis methodology arranged the sample of 24 currencies into groups of currencies that have similar types of internationalisation. The first result of the cluster analysis is the proximity matrix, which presents the pairwise dissimilarities among currencies, as in Appendix Table 3.

The greater the coefficient, which is measured by the squared Euclidean distance, the more dissimilar the currencies are. For instance, the distance between the Brazilian real (BRL) and the Mexican peso (MXN) is much smaller (88.7) than the distance between the BRL and the US dollar (USD) (23,192.5). In fact the distance between the USD and all the other currencies in the sample is significantly large and, curiously, the most dissimilar currencies in the sample are the USD and the BRL. This suggests that their type and degree of internationalisation are significantly different. Conversely, the closest currency to the USD is the euro (EUR) (6,012.9). Thus, the BRL is much similar to the MXN than the USD is to the EUR. Each cluster of single currencies is represented by a number, which is shown in the first column of the proximity matrix or on the left-hand side of the dendrogram.

A second result of the cluster analysis is the agglomeration schedule, which is displayed in Table 4. This table shows the different stages where the program combines the clusters of currencies and their respective coefficient, which represents the distance of the combined clusters. At the beginning of this analysis, each cluster is formed by a single currency. As shown in Table 4, at the first stage, the two most similar currencies are grouped in one cluster. In the result below, the cluster 18 (RUB) and the cluster 21 (TRY) are clustered on the first stage because they are the most similar currencies in the sample. According to the proximity matrix, their dissimilarity measured in Euclidian distance is 12.9. After the first stage in the agglomeration schedule, cluster 18 is no longer composed only by the RUB but also by the TRY. At the following stages (from 1 to 23) the most similar clusters of currencies are grouped to form another cluster.

The procedure of grouping the clusters stage by stage is repeated until all the currencies are grouped in one single cluster. However, the objective of the cluster analysis is not to have a single cluster that embraces all the currencies (stage 23) or to have several clusters of single currencies (stage 1). Instead, the researcher must find the optimal number of clusters based on the coefficients provided by the agglomeration schedule. These coefficients represent the dissimilarities between two clusters, which is measured by the Ward's method, as discussed in III- 3.1.2.

Table 4: Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	18	21	6.474	0	0	8
2	14	17	18.371	0	0	3
3	14	24	34.101	2	0	11
4	15	20	51.779	0	0	10
5	2	10	71.327	0	0	8
6	6	19	99.575	0	0	10
7	9	13	133.235	0	0	14
8	2	18	170.122	5	1	11
9	1	3	221.713	0	0	16
10	6	15	273.822	6	4	17
11	2	14	329.505	8	3	15
12	4	11	385.958	0	0	15
13	16	22	443.315	0	0	18
14	5	9	525.473	0	7	17
15	2	4	627.876	11	12	21
16	1	8	735.380	9	0	19
17	5	6	864.441	14	10	18
18	5	16	1146.380	17	13	20
19	1	12	1631.611	16	0	20
20	1	5	2567.950	19	18	21
21	1	2	4472.829	20	15	23
22	7	23	7479.299	0	0	23
23	1	7	26588.943	21	22	0

To guide the decision on the optimal number of clusters, it is beneficial to plot the coefficients from the agglomeration schedule table into a line graph, as presented in Figure 6. At the point where there is a large increase in the coefficients, the clusters merged can be considered too heterogeneous and, thus, should remain as a separate grouping. It is visually clear in the line graph

that at stage 20 the clusters become more dissimilar and at stage 22 the clusters must not be merged anymore.

Figure 6: Agglomeration Schedule Coefficient
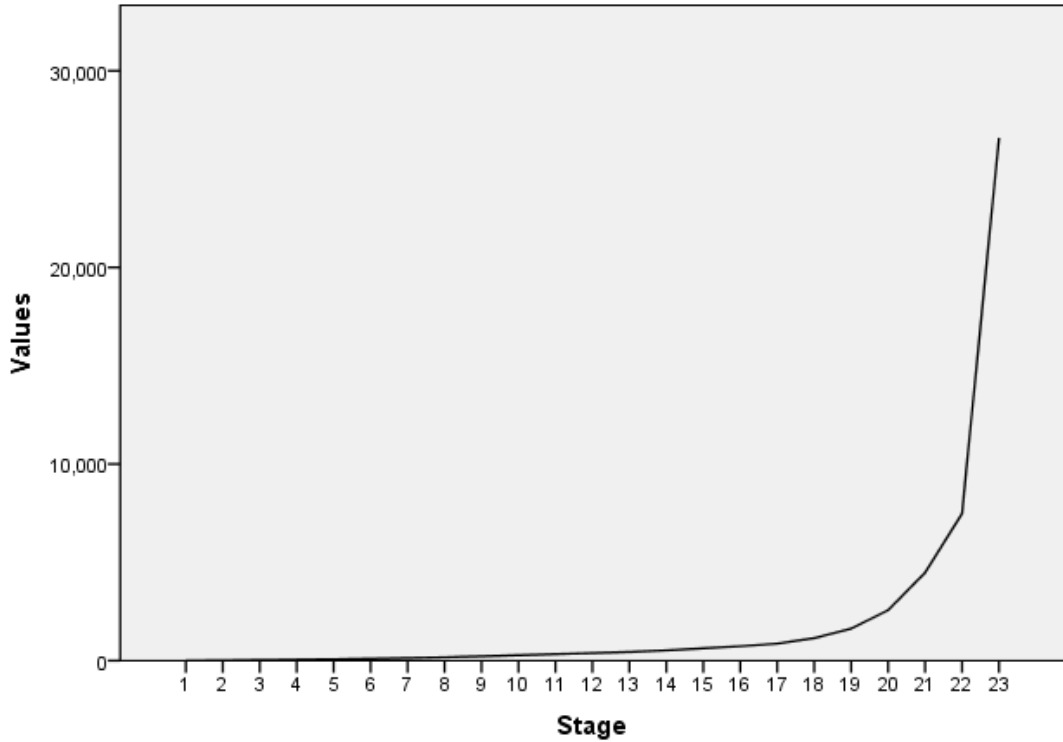
Another way to analyse the same coefficients to choose the optimal number of clusters is by analysing the dendrogram in Figure 7. The horizontal axis shows the objects (24 currencies) and the clusters (numbers). The vertical axis represents the dissimilarities between the clusters measured by the Ward's method, which are specified in detail in the agglomeration schedule. The result presented in the agglomeration schedule and the dendrogram suggests that the optimal number of clusters could be wither four (stop clustering at stage 20) or three (stop clustering at stage 21). As discussed in section III- 3.1.1, the results of the cluster analysis suggest a range of optimal numbers of clusters. However, this optimal number is at the discretion of the researcher, whose choice may be supported by theory.

Figure 7: Dendrogram
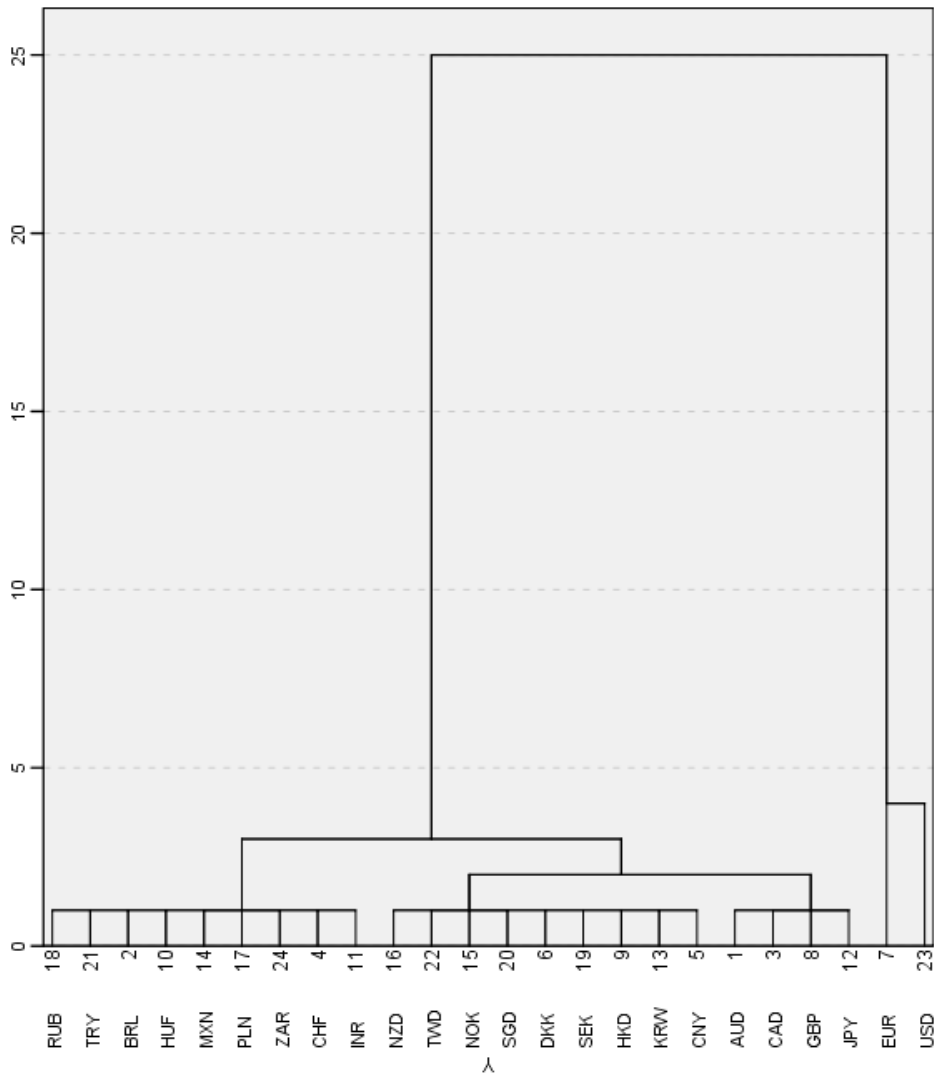
As described in Table 5, when four is selected as the optimal number of clusters, the following groups are formed: (4) the USD in a single cluster; (3) the EUR in another single cluster; (1) other central currencies, such as JPY, GBP, NOK, NZD and the CNY; (2) the remaining currencies from the sample, mostly from emerging market economies. If three clusters are chosen instead, the latter two groups (1 and 2) are merged. These clusters in Figure 7 (horizontal axis) and Table 5 are also ranked by degree of similarities in terms of the types of currency internationalisation. Cluster 4 (USD) is more similar to cluster 3 (EUR), which, in turn, is more similar to cluster 1 (other central currencies). The most dissimilar group of currencies, when compared to cluster 4 (USD), is Cluster 2 (peripheral currencies). Though the Russian ruble (RUB) appears to be the most distant currency from the USD, the most dissimilar currency is, in fact, the BRL, as previously shown in the proximity

matrix. These four clusters of currencies are analogous to the categories of currency hierarchy proposed by De Conti and Prates (2018). In a similar vein to their results, which suggest that the Chinese renminbi may change its position in the hierarchy in the near future, the CNY was clustered with other central currencies instead (cluster 1) of other peripheral currencies (cluster 2).

Table 5: Cluster Membership

Case	4 Clusters	3 Clusters
18:RUB	2	1
21:TRY	2	1
2:BRL	2	1
10:HUF	2	1
14:MXN	2	1
17:PLN	2	1
24:ZAR	2	1
4:CHF	2	1
11:INR	2	1
16:NZD	1	1
22:TWD	1	1
15:NOK	1	1
20:SGD	1	1
6:DKK	1	1
19:SEK	1	1
9:HKD	1	1
13:KRW	1	1
5:CNY	1	1
1:AUD	1	1
3:CAD	1	1
8:GBP	1	1
12:JPY	1	1
7:EUR	3	2
23:USD	4	3

The results also show that the types and degree of internationalisation of the euro and, particularly, of the US dollar are significantly larger than the remaining currencies. For this reason, the differences within other central currencies and within peripheral currencies appears to be smaller. This finding is in agreement with the fact that the US dollar is the key currency of the international monetary system as it is internationalised across all functions of international money. The literature also describes the Euro to be a currency that fulfils all the functions of international money, though in a lower degree than the US dollar. Therefore, one can infer that the roles of the US dollar and

the euro are so dominant that they skew the results and make the results of the types of internationalisation of emerging market currencies more difficult to analyse. Thus, to analyse and understand the differences between the types of currency internationalisation of the other currencies, the US dollar and the euro were excluded from the sample. On the second part of the study, the hierarchical cluster analysis with the same measure for distance and method was replicated for the adjusted database. Figure 8 presents the agglomeration schedule coefficient for the sample that excludes the US dollar and the euro[60].

Figure 8: Agglomeration Schedule Coefficient (Excluding USD and EUR)
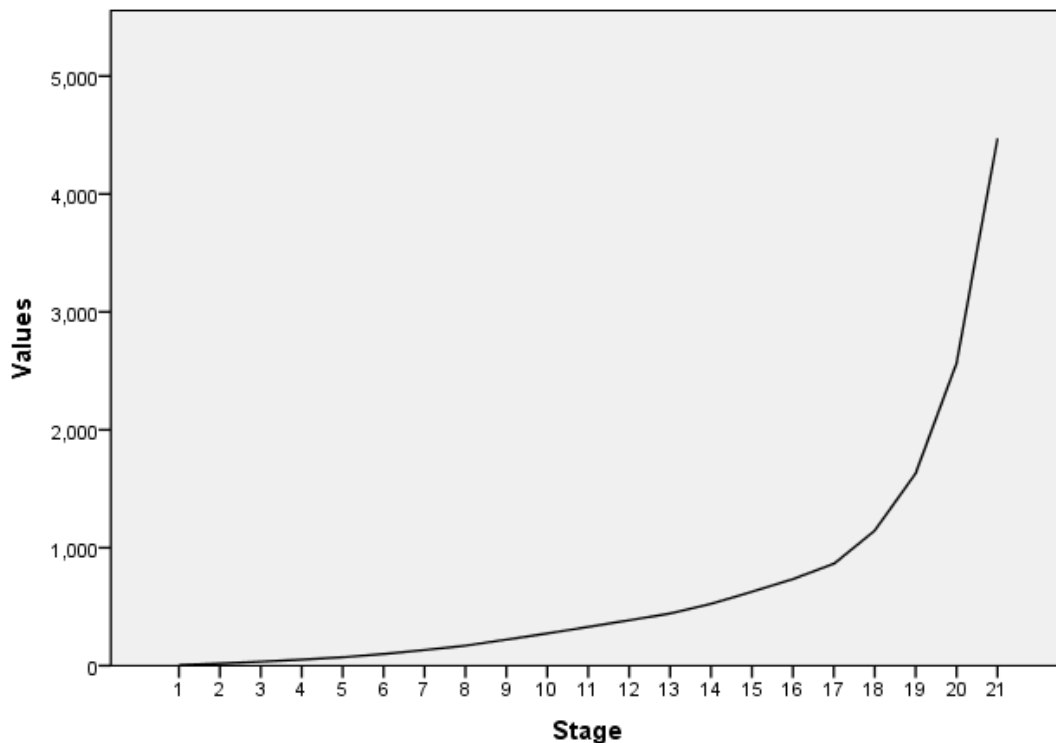
The results of the agglomeration schedule as well as the dendrogram presented in Figure 9 suggest that the optimal number of clusters is between eight (stop clustering at stage 15) and five (stop clustering at stage 18). As one can observe in the dendrogram in Figure 9, when the USD and the EUR are excluded from the sample, the Japanese yen (JPY) becomes the most internationalised currency across the different functions and it remains in a

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[60] The agglomeration schedule table and the proximity matrix for the sample without the USD and EUR is available in the Appendix Table 5 and Appendix Table 4, respectively.

single cluster. The vertical axis, which represents the dissimilarities between the clusters, shows that the JPY is significantly more similar to other central currencies than to peripheral currencies. The currencies on the horizontal axis are ordered in terms of similarities. According to the proximity matrix, the BRL is once again the most dissimilar currency to the JPY. However, the type and degree of internationalisation of the BRL are similar to other currencies that are not so different from the JPY, such as the MXN. For this reason, in the order of the clusters of currencies, the BRL is nor the furthest currency to other central currencies.

Figure 9: Dendrogram (Excluding USD and EUR)
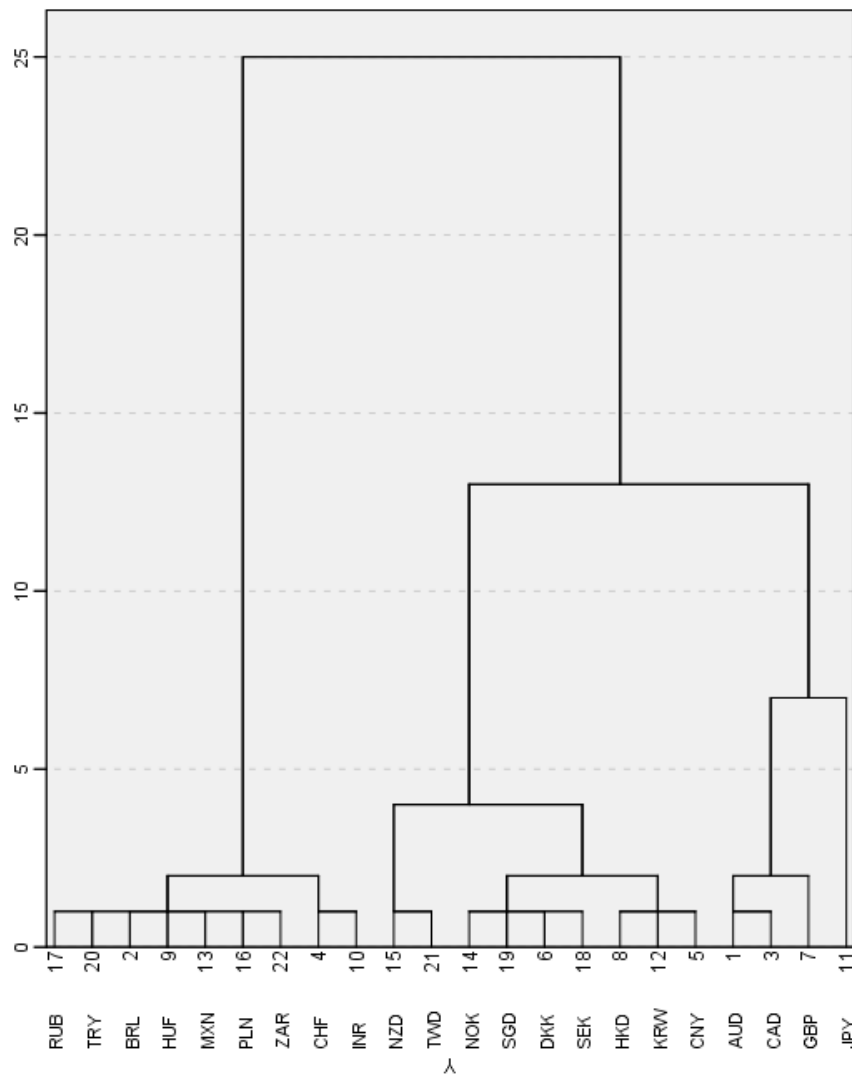
As demonstrated in the cluster membership in Table 6, when the number of optimal clusters is five, the groups formed are the following: (4) the JPY in a single cluster; (1) other central currencies, namely the British pound (GBP),

the Australian (AUD) and the Canadian dollar (CAD); (3) currencies from Scandinavia and from other advanced economies in Asia[61], such as the Singapore dollar, in addition to the Chinese yuan (CNY), which is still considered an emerging country; (5) New Zealand dollar (NZD) and the Taiwan new dollar (TWD); and (2) cluster with the remaining peripheral currencies.

Table 6: Cluster Membership (Excluding USD and EUR)

Case	8 Clusters	7 Clusters	6 Clusters	5 Clusters
17:RUB	2	2	2	2
20:TRY	2	2	2	2
2:BRL	2	2	2	2
9:HUF	2	2	2	2
13:MXN	2	2	2	2
16:PLN	2	2	2	2
22:ZAR	2	2	2	2
4:CHF	3	2	2	2
10:INR	3	2	2	2
15:NZD	8	7	6	5
21:TWD	8	7	6	5
14:NOK	5	4	4	3
19:SGD	5	4	4	3
6:DKK	5	4	4	3
18:SEK	5	4	4	3
8:HKD	4	3	3	3
12:KRW	4	3	3	3
5:CNY	4	3	3	3
1:AUD	1	1	1	1
3:CAD	1	1	1	1
7:GBP	6	5	1	1
11:JPY	7	6	5	4

The main difference between the choice of five and six clusters is that the CNY is grouped with the Hong Kong dollar (HKD) and the South Korean won (KRW) in another cluster. This result suggests that these three currencies from Asia are more similar to other central currencies, e.g. the GBP and the AUD, than currencies from Scandinavia, e.g. the Swedish (SEK) and Danish Krone (DKK). If the optimal number of clusters is 7, the GBP is isolated from the CAD and AUD in another cluster. Lastly, when the number of clusters is

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[61] Classification of advanced and emerging countries in accordance with The World Economic Outlook from the International Monetary Fund (IMF).

equal to 8, it allows one to see the differences within currencies from emerging countries. The Swiss franc (CHF), which surprisingly had been grouped with other peripheral currencies, has now been grouped with the Indian rupee (INR). Thus, to analyse the differences between central and peripheral currencies as well as within these two groups, this research adopts eight as the optimal number of clusters.

Though an aggregate index does not serve the purpose of this chapter, which is to analyse the different types of currency internationalisation, factor analysis may provide an illustration of the hierarchical relationship between currencies. This method combines the six types of currency internationalisation in a smaller number of factors. When the number of factors chosen is two, one can express the results found in the cluster analysis in a two-dimensional graph, as displayed in Figure 10. The eight clusters analysed above are represented in different colours and symbols, though it is almost not possible to distinguish the currencies within the cluster.

Figure 10: Cluster Analysis in a Two-Dimensional Space
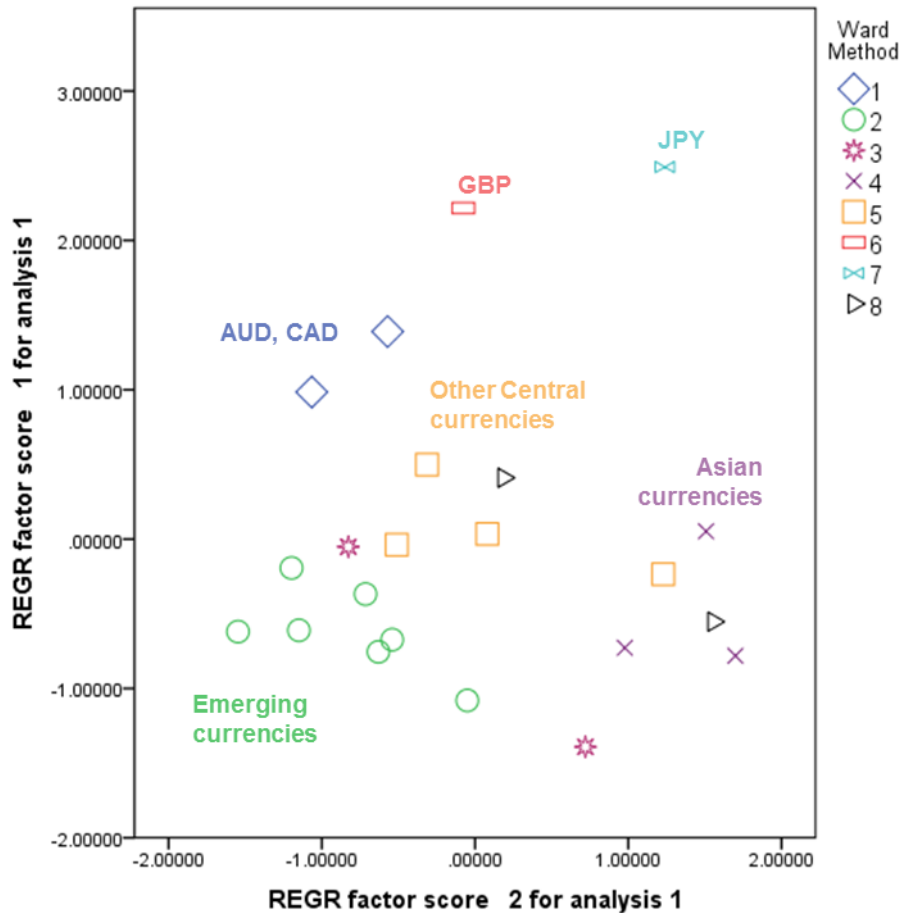
III- 4.2   Research Findings

The different clusters presented in the previous sections are formed from the data on the types of currency internationalisation. To understand the criteria that grouped certain currencies in a cluster, it is crucial to analyse the statistics for each type of currency internationalisation that lead to the resulting clusters. Table 7 presents the mean for each type of currency internationalisation of each cluster membership.

Table 7: Types of Currency Internationalisation - Cluster Mean

Cluster	Vehicle	Trade Set.	Invoice	Funding	LT Invest.	ST Invest.
2	1.1%	0.27%	7.2%	2.72%	12.4%	7.9%
3	3.0%	0.75%	1.6%	7.58%	12.5%	5.1%
8	1.3%	0.18%	10.3%	30.15%	15.7%	6.2%
5	1.6%	0.81%	13.7%	18.14%	15.4%	7.2%
4	2.4%	0.96%	16.6%	18.01%	7.9%	3.9%
1	6.0%	1.70%	27.9%	6.23%	18.0%	9.7%
6	12.8%	8.40%	20.2%	8.73%	16.2%	8.3%
7	21.6%	3.24%	26.1%	28.68%	17.9%	7.8%

To begin with the most distinct clusters from the rest of the sample, **clusters 7** and **6** are formed by the Japanese yen (JPY) and the British pound (GBP), respectively. These clusters presented a high degree of currency internationalisation in all dimensions, though these percentages are much lower than the degree of internationalisation of the US dollar and euro. In **cluster 1**, composed of the Australian (AUD) and Canadian dollar (CAD), the shares on invoice currency, as well as both short and long-term investment currency, were considerably high.

Cluster 4 is formed by two currencies from advanced countries in Asia, the South Korean won (KRW) and the Hong Kong dollar (HKD), in addition to a currency from an emerging economy, the Chinese yen (CNY). Interestingly, the currencies in this cluster presented a high degree of internationalisation as funding and invoice currency. Yet, this cluster also had the lowest degree of internationalisation as short and long-term investment currency, which are measured by the participation of hedge funds and institutional investors in the foreign exchange market, respectively. The fact that China, for instance, is

known for restrictions on the capital account may be a reason why the proxy for speculation is so low in the country. On the other hand, these constraints may also inhibit long-term investments.

An interesting result from the cluster analysis is that cluster 4 is more similar to other central currencies (clusters 7, 6 and 1), such as the GBP and JPY, than other currencies from developed countries (cluster 5). Though cluster 4 differ from clusters 7, 6 and 1 across the means of payment and store of value functions, they are similar in terms of the unit of account function. This is an evidence of the growing internationalisation of the CNY, even though China is still considered an emerging market economy. Therefore, the dichotomy centre-periphery seems to be too vague to express the different types of currency internationalisation of peripheral currencies. Though most of these currencies have a limited role in the international market, they are internationalised on different dimensions and these differences cannot be accounted for in this terminology.

Cluster 5 is composed of currencies from Scandinavian countries, namely the Swedish krone (SEK), the Danish krone (DKK) and the Norwegian (NKK) krone, and the Singapore dollar (SGD). These currencies are not particularly internationalised as means of payments, but they appear to fulfil the unit of account function, as both invoice and funding currency. Additionally, the currencies in this cluster are also internationalised as short and long-term investment currencies. **Cluster 8**, with the New Zealand dollar (NZD) and the New Taiwan dollar (TWD), has the highest share of funding currency after the US dollar and euro. Curiously, these two currencies are clustered together even if the optimal number of clusters is five.

An unexpected result was **cluster 3**, which grouped the Swiss franc (CHF) with the Indian rupee (INR), which are currencies with a very different degree and type of internationalisation. Although they significantly contrast each other in terms of the means of payment function and the store of value, they share similar degrees of internationalisation as a unit of account. In terms of the funding currency, both of them have a smaller degree of internationalisation than other central currencies, but greater than other peripheral currencies. However, in terms of the internationalisation as trade invoice, the CHF is the least internationalised currency in this dimension, which is similar to the INR. It is their similar degree of internationalisation as a funding currency that prevents both of them to be clustered with other central, in the case of CHF, and peripheral currencies, in the case of INR.

Lastly, **cluster 2** embraces most of peripheral currencies in the sample, which are issued by emerging countries. The results show that these currencies are generally not used across all types of currency internationalisation, except for the short-term investment. In this cluster, the Mexican peso (MXN) and the Brazilian real (BRL) have the higher shares of hedge funds in their Forex market. This suggests that these currencies are often traded for speculative purposes, as the literature often associates hedge funds with short-term and speculative operations (McGuire and Upper, 2007, Galati et al., 2007, Kaltenbrunner, 2010)[62].

This result is analogous to the literature on currency hierarchy, in which peripheral currencies are often analysed as a single group. However, this approach does not account for the differences in the type and degree of internationalisation within these currencies. Though the results of the cluster analysis also suggest a cluster with almost all peripheral currencies in the sample, it does not mean that other currencies not included in the sample have a similar type or degree of internationalisation.

Whilst peripheral currencies in the sample, which are issued by EME, appear to be internationalised as short-term investment currency, data on other peripheral currencies was not available due to their insignificant participation in the international market. According to the triennial survey from BIS, 'other currencies' accounted for only 2.1% of the foreign exchange turnover in 2016, which is the same share of the Mexican peso in the total turnover[63]. Certainly, most currencies from emerging countries also have a small share of the international market when compared to central currencies, i.e. a low degree of internationalisation. However, it is crucial to analyse their types of currency internationalisation to understand the subordinate position of these currencies that are located at the bottom of the hierarchy.

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[62] One may notice, however, that the shares of institutional investors in total turnover is also relatively high for peripheral currencies, which suggests that this data may not ideally represent the long-term investment currency. As argued in section III-3.2, this data was chosen for this analysis as a matter of comparability with the share of hedge funds in total turnover.

[63] The sum of the percentage shares of each currency in the foreign exchange turnover is 200% instead of 100% because two currencies are involved in each transaction.

III- 5   Conclusion

This chapter aimed at identifying and analysing the types of currency internationalisation that are predominant in developed and, particularly, in emerging countries to understand their role in the international monetary system. Another central point of this chapter was to shift the focus of the analysis from the degree of internationalisation to the different types of currency internationalisation. The theoretical argument of this chapter was that differential liquidity premia of currencies manifest themselves in the different types of currency internationalisation, which gives an indication of the position of a currency in the currency hierarchy, as discussed in Chapter II.

The methodology chosen to address this research question was the hierarchical cluster analysis, which allows one to evaluate each type of currency internationalisation in a more sophisticated technique that does not aggregate the data. The hierarchical cluster analysis quantified the dissimilarities between groups of currencies. Although the results of this analysis did not rank the clusters in a hierarchical order, it organised the currencies according to their similarities regarding degree and type of currency internationalisation. The analysis of the data on each type of currency internationalisation along with the results of the cluster analysis allows one to rank these clusters of currencies, which can be understood as a measure of currency hierarchy.

The results obtained from the cluster analysis showed the increasing importance of the Chinese yuan in the international markets, particularly as a means of payments. This finding is consistent with recent research on the internationalisation of the renminbi, which is the only currency from an EME that has been widely discussed in the literature (Chen and Peng, 2010, Li and Liu, 2010, McCauley, 2011, He et al., 2016). Another important result from the cluster analysis is that most currencies from emerging countries are mainly internationalised as short-term investments, particularly the Brazilian real and the Mexican peso.

As discussed in Chapter II, the theoretical argument behind this result is that countries which issue currencies only internationalised as a short-term investment are vulnerable to large volumes of speculative capital flows, which depends on the international preference for liquidity. The instability of these capital flows increases exchange rate volatility and, in the long term, it reduces the liquidity premium of the currency in these countries. Therefore, currencies

internationalised as a short-term investment do not improve their position in the currency hierarchy. In other words, the relationship between currency internationalisation and currency hierarchy is non-linear.

The results also suggested that some central currencies, which have a higher liquidity premium, are internationalised as a short-term investment currency. However, because these currencies are also internationalised on other dimensions, their position in the hierarchy is higher. For instance, the Canadian dollar (CAD) has one of the highest shares of hedge funds in the total turnover, which indicates that it is internationalised as a short-term investment currency. However, the Canadian dollar is also highly internationalised as a long-term investment currency and it reasonably fulfils the means of payment function.

Therefore, currencies internationalised solely as a short-term investment do not cluster with other currencies that are internationalised on other dimensions. The internationalisation as a short-term investment currency does not enhance the position of a currency in the hierarchy, which corroborates the argument in Chapter II of a non-linear relationship between currency internationalisation and currency hierarchy. This conclusion stresses that the type of currency internationalisation plays a crucial role in this relationship. A question that still needs to be asked is with regards to the determinants of each type of currency internationalisation, i.e. the factors that shape currency hierarchy, which will be explored in the next chapter.

CHAPTER IV
THE DETERMINANTS OF THE DIFFERENT TYPES OF CURRENCY INTERNATIONALISATION

IV- 1   Introduction

The theoretical literature on the determinants of currency internationalisation is widely discussed by different academic fields, as presented in Chapter II. Mainstream economists often use econometric tools to analyse the 'economic determinants' of the status of a currency in the international market. Most of these economists assume that the choice of an international currency is a market-driven process, a result of the 'invisible hand' (Krugman, 1984, Matsuyama et al., 1993, Rey, 2001).

International Political Economy (IPE) scholars contribute to this debate by stressing the importance of political factors, which are usually neglected by the mainstream economics literature[64]. As discussed in Chapter II, Post Keynesian economists also engage with this literature, but focusing instead on the determinants of currency hierarchy. Though they acknowledge the importance of the 'economic determinants', in agreement with IPE scholars, Post Keynesian scholars also emphasise the influence of historical and institutional factors on the choice of international currencies (De Conti et al., 2013b).

However, most of the empirical literature on the determinants of currency internationalisation is developed in the mainstream economics field. These analyses typically focus on either the invoice currency or the reserve currency, which is understood as a proxy for a general degree of currency internationalisation. A major drawback of this approach is that it ignores the determinants of other types of currency internationalisation. As discussed in Chapters II and III, not only the degree but particularly the type of currency internationalisation plays an important role in determining the position of a currency in the hierarchy. Another drawback of this empirical literature is that it focuses on the determinants of the internationalisation of central currencies

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[64] Although Whitman (1974), Papaiannou and Portes (2008a, 2008b) and Posen (2008) acknowledge the importance of historical and political factors for currency internationalisation.

and it neglects the factors that may influence the use of peripheral currencies in the international market.

Given the limitations of the empirical literature on the determinants of currency internationalisation, Chapter IV attempts to contribute to this literature in three different aspects. First, this chapter consists of an empirical study using a panel data for both central and peripheral currencies, paying particular attention to the potential differences between these currencies. Second, this chapter proposes to analyse the determinants of all the types of currency internationalisation in the private sector for which data was available. Chapter III stresses not only the importance of studying currencies from developed and emerging countries but also the different types of currency internationalisation these currencies might assume. Thus, analysing the determinants of each type of currency internationalisation shed some lights on the determinants of currency hierarchy.

Third, this chapter presents a comprehensive analysis of the determinants of currency internationalisation because it combines the 'economic' factors suggested by the mainstream theory with two other factors stressed by the Post Keynesian theory in the same model. One variable is the interest rate[65], which, in accordance with the 'own rate of interest', is a policy instrument used to attract capital flows and compensate for lower liquidity premium. The other variable is the current account surplus, which is a precondition to increase the liquidity premium of a currency. The theoretical rationale for adding these variables is discussed in detail in Chapter II- 3.4 (Fritz et al., 2014, De Paula et al., 2015).

A limitation of this empirical analysis of the determinants of currency internationalisation is the lack of data that represents political power. De Conti and Prates (2018) analyse data on proxies for political power, such as the voting power of countries in the International Monetary Fund (IMF) and the participation of countries on multilateral institutions (G-20, NATO and others). However, this data is often qualitative or not available for countries issuers of peripheral currencies. However, this thesis attempt to analyse the influence of

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[65] Though mainstream economists generally analyse the interest rate in their studies, their interpretation of this variable is rather vague, while this variable plays a key role in the Post Keynesian theory.

political power and policy decisions in Chapter V, which applies a qualitative approach to address this issue.

Chapter IV is organized as follows. Section IV- 2 builds on the theoretical literature review presented in Chapter III to discuss the existing empirical literature on the determinants of currency internationalisation. Section IV- 3 explains in detail the methodology adopted in this research and the data sources used in the estimation of the determinants of each type of currency internationalisation. Section IV- 4 presents the main results from the OLS and fixed-effect estimators for each of the four models proposed in this chapter, i.e. one model for each type of currency internationalisation. Finally, section IV- 5 concludes.

IV- 2   Determinants of Currency Internationalisation: an Empirical Literature Review

IV- 2.1   Determinants of Currency Internationalisation

IV- 2.1.1   The Economic Determinants of Currency Internationalisation

The theoretical literature on the determinants of currency internationalisation is widely discussed in the fields of economics and International Political Economy (IPE), as presented in Chapter II. The empirical literature on these determinants remains, however, more limited. This section presents an extensive empirical literature review of the main determinants of currency internationalisation. The main limitation of this literature is that currency internationalisation is often studied in a single dimension. Most studies focus on only one variable to represent how much a currency is internationalised, which does not account for the different types of currency internationalisation.

As discussed in Chapter II- 3.1, the mainstream economics literature on currency internationalisation identifies four main factors that influence the use of a currency in the international market. These determinants stressed by the mainstream economics literature on currency internationalisation are referred by IPE scholars as the 'economic determinants' (Cohen, 1998, Cohen, 2003, Helleiner, 2008, Cohen, 2011a). Though this terminology refers to the determinants of currency internationalisation stressed by mainstream economists, both IPE and Post Keynesian scholars acknowledge the importance of these factors. Despite the fact that most of the mainstream

literature neglect political factors, the 'economic determinants', such as currency stability, are also influenced by policy decisions.

The first 'economic determinant' of currency internationalisation is what this research denominates as financial market robustness. A sound financial market encompasses a set of interrelated characteristics, specifically a high degree of liquidity, development, depth and openness. Liquid foreign exchange markets reduce the transactions costs, which is an incentive for further agents to do operations with that currency. Other factors such as the development, depth and openness of forex markets play an important role in attracting capital flows and, thus, enhance currency internationalisation.

Forex turnover is usually seen as a proxy for the vehicle currency, as it measures the amount traded in a certain currency regardless whether it is a sale or purchase operation. Yet, some authors use this data as a proxy for a sound financial market because currencies with a high turnover generally have a liquid, open, deep and developed financial market (Chinn and Frankel, 2008). Other authors use data on indices for capital openness, such as the Chinn-Ito index, or data on bid-ask prices of exchange rates to measure market liquidity and depth (Chinn and Ito, 2006, Goldberg and Tille, 2008, Norrlof, 2014, Ito and Chinn, 2014).

A large economic size and a broad trade network[66] are the second indispensable factors that contribute to currency internationalisation. Krugman (1984), followed by many other authors in this literature, analyses data on the shares of the world output and shares of the world trade as proxies for economic size and transactional network, respectively (Subramanian, 2011, Chinn and Frankel, 2008). Large economies are consistently associated with a broad transactional network and, thus, these factors are considerably intertwined. The more relevant an economy is in the international market, the more likely it will be that agents trust to use its currency for international transactions.

The third economic factor that influences currency internationalisation is inertia. Krugman (1984) referred to this self-reinforcement power of

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[66] We adopt in this thesis the term 'trade network' to distinguish from the term 'transactional network' often used in the literature. Whilst the former refers to trade, the latter is more general and it can refer to both financial and economic markets.

international currencies as a 'circular causation'. Krugman (1984) argues that although the US dollar overcame the economic power of the British pound after the World War I, the sterling remained the key-currency of the system for another half a century. The inertia factor, which is also called 'network externalities', is normally used in the empirical literature as the lagged value of the currency internationalisation variable (Chinn and Frankel, 2008).

Finally, the last economic determinant is currency stability. An important feature of an international currency is its ability to maintain not only external stability, i.e. its exchange rate to other currencies, but also internal stability, granted by low levels of domestic inflation. The empirical literature uses data on the standard deviation of the exchange rate, often against the Special Drawing Rights (SDR)[67], to capture currencies' volatility against a basket of the most important currencies in the world's trading and financial markets (Chinn and Frankel, 2008). Regarding the domestic stability component, researchers mostly analyse data on the consumer price index (CPI), although they use different measures such as period average or rate of change (Chinn and Frankel, 2008).

IV- 2.1.2 Other Determinants of Currency Internationalisation

International Political Economy (IPE) authors criticise this purely economic perspective on the determinants of currency internationalisation by arguing that one must also contemplate political and historical determinants, which are "inextricably intermixed" with the economic attributes of international relations (Strange, 1971ap. 217, Cohen, 2011a). One of the main limitations of mainstream economists' research lies in the fact that they often rely too much on empirical studies to evaluate a complex process such as currency internationalisation. These econometric methods tend to overlook political determinants that are crucial to explaining the processes of currency internationalisation. Though proxies on political power are not used in this research given the difficulty of finding data for countries issuers of peripheral

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[67] SDR is a supplementary international reserve asset created by the International Monetary Fund (IMF). It is not defined as a currency nor a claim on IMF, but it is an asset that can be exchanged by currencies from IMF member countries. This basket of currencies is currently composed of US Dollar, Euro, Chinese Yuan, Japanese Yen and Pound Sterling. Source: information retrieved from IMF website in May 2018.

currencies, these variables are analysed in depth through a qualitative approach in Chapter V.

From an IPE perspective, Norrlof (2014) analyses data on a scatterplot about monetary capabilities and currency influence to assess the hegemony of the US dollar. She quantifies monetary capabilities in two dimensions. One is an economic dimension, which is a composite measure of GDP, trade and capital markets[68]. In a similar vein to the mainstream perspective on currency internationalisation, the "primary purpose of an international currency is to facilitate trade in goods and assets through a common medium of exchange" (Norrlof, 2014p. 1046). Thus, this measure essentially accounts for the determinants of one dimension of currency internationalisation, the medium of exchange function, which is overemphasised by the mainstream theory. The other is a political dimension, approximated with a variable of defence expenditure, though she recognises that other political variables are hard to quantify.

Analysing data on a scatterplot is a quite limiting approach to evaluate currency internationalisation, as it allows one to use two variables at the time. To circumvent this limitation, Norrlof (2014) composes some indices that include both economic and political variables. However, similar to the argument in Chapter III- 2, building an aggregate index is not helpful to understand which determinants influence each of the types of currency internationalisation.

IPE scholars have a significant contribution to the literature on the determinants of currency internationalisation by bringing political factors to the discussion. Still, accounting for such qualitative and often discretionary data in empirical exercises seems to be often impractical. This may be one of the reasons why most IPE researchers do not attempt to quantify and empirically estimate the determinants of currency internationalisation.

As discussed in Chapter II- 2, most of the IPE and Post Keynesian literature understand that currency internationalisation and currency hierarchy hold a linear and positive relationship. In this perspective, the determinants of currency internationalisation also affect the position of a currency in the hierarchy. De Conti and Prates (2014, 2018) also analyse data on both economic and political determinants of currency internationalisation. Although

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[68] This variable includes the Chinn-Ito index for capital openness.

they recognise that there is no ideal variable to express geopolitical power, it is unquestionable which countries are the most powerful ones. One indicator of geopolitical power is the country's participation in multilateral institutional groups, such as G7, G20, NATO and OECD. Another indicator is the percentage of voting power in IMF Board of Governors, which is the highest decision-making office of this institution. They have also analysed data on the ranking of military power, which is closely interrelated to political power.

Besides the traditional so-called 'economic determinants' and the political factors that determine currency internationalisation, De Conti et al. (2013b) also analyse three other variables: the political will to promote the use of the domestic currency abroad, responsible economic policy and sound institutions, which are defined by the rules and inherent mechanisms that enforce these rules. Whilst there is no data to quantify political will, they analyse data on the Worldwide Governance Indicators (WGI) to measure how sound the institutions on each country are. Kaufmann et al. (2011) composed aggregate indicators in the WGI project to assess six dimensions of governance: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption.

Other Post Keynesian economists stress the importance of economic policy responsibility to determine currency hierarchy, i.e. macroeconomic stability, fiscal discipline, monetary policy credibility and balance of payments equilibrium (Angeloni et al., 2011, De Conti et al., 2013b). De Conti et al. (2013b) analyse data on inflation, public debt and current account balance. Although inflation is a variable already mentioned by mainstream economists to measure currency stability, public debt and current account balances are variables that are not so prominent in this literature. As discussed in detail in Chapter II, De Paula et al. (2015) and Fritz et al. (2014) argue that current account surpluses are a necessary attribute to improve currency liquidity and, thus, the position of a currency in the international monetary system.

The Post Keynesian literature is the most complete and integrated account of currency internationalisation produced so far, where they incorporate other economic and political factors in their analysis besides the economic determinants. Nevertheless, this topic has been little explored in empirical terms, which leaves some room for the introduction of more sophisticated methodologies.

From this extensive empirical literature on the determinants of currency internationalisation, one can draw a few conclusions. Firstly, in the words of Strange (1971c), the mainstream literature often takes for granted the importance of political and historical to determine currency internationalisation. Although some authors have started recognising the importance of these factors (Posen, 2008, Papaioannou and Portes, 2008b), they mostly focus their research on the results provided by sophisticated econometric models. One of the reasons for neglecting these variables may lie on the fact that consistent data regarding politics is not easy to collect and they are mostly qualitative.

Secondly, if on the one hand, IPE researchers stress the importance of politics in the process of currency internationalisation, on the other hand, they only mention the economic factors posed by mainstream economists. For instance, Cohen (2015) argues that currency internationalisation is a market-driven process determined by Darwinian process of natural selection, without any reference to concepts such as liquidity premium and interest rate that scholars such as De Conti et al. (2013b), Kaltenbrunner (2015) and Fritz et al. (2018) have introduced in analysing this process.

Thirdly, Post Keynesian economists present a broader perspective, in which they argue that the demand for currency is determined by geo-political and geo-economic issues. They take into account the economic determinants stressed by mainstream economics as well as the political factors stressed by IPE scholars. Additionally, Post Keynesian scholars also stress the role of variables such as political will, interest rates, current account surpluses and economic policy responsibility, in determining the demand for a currency. Though they also analyse data on the different types of currency internationalisation, there was no attempt to find out which determinants are more important for each of those types.

Lastly, IPE and mainstream economists researchers mostly focus on studying central currencies and neglect the internationalisation of peripheral currencies[69]. Some non-heterodox researchers have attempted to analyse data on peripheral currencies in tables and graphs, but political and other economic determinants of currency internationalisation are not studied in

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[69] There are however, a few researchers in IPE literature that studies peripheral currencies, such as Helleiner (2013).

detail or left aside (Ma and Villar, 2014). Although the US dollar and euro are far more internationalised than the other currencies, both type and degree of currency internationalisation of some central currencies are not so different from the peripheral currencies, as shown in Chapter III. Thus, the IPE literature seems to be an extension of mainstream research on currency internationalisation. The difference is that in the former it is included political and historical factors to discuss the hegemony of US dollar or whether other currencies, such as the euro, will eventually surpass the greenback.

IV- 2.2   Determinants of the Different Types of Currency Internationalisation

As stated in the previous section, IPE and Post Keynesian researchers have not extensively contributed to the empirical literature on the determinants of currency internationalisation. Although they have stressed the importance of political factors and, particularly Post Keynesians, have introduced and analysed data on additional determinants, this literature remains quite small. One of the reasons for it, may lie in the fact that is hard to quantify political factors. Another reason could be that they are not interested in following the positivist approach presented by mainstream economists, where mathematical models only are used to scientifically verify economic phenomena. This section presents an extensive empirical literature review of the determinants of the different types of currency internationalisation, which is generally studied by mainstream economists. Most of this empirical literature consistently analyse only one variable, i.e. one type of currency internationalisation, as a general proxy for a general degree of currency internationalisation. As discussed above, this is partly due to data limitations but also due to the fact that most scholars neglect the qualitative implications of different types of currency internationalisation.

In the public sector, the most prevalent type of currency internationalisation is the reserve currency, which is represented by the share of currencies on the world official reserves and published by IMF[70]. This data is available for a large time period, which allows researchers to use this data for econometric estimation. The major drawback of this data is that it is available only for central currencies. However, this is not a problem for mainstream economists

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[70] Data published on the Currency composition of Official Foreign Exchange Reserves (COFER).

because they often neglect the internationalisation process of peripheral currencies.

Chinn and Frankel (2008)[71] developed a well-known research using a panel data model estimated by a pooled OLS to explain which 'economic determinants' stressed in the mainstream literature determine the reserve currency status for central currencies. They found evidence that country size, inflation differential and exchange rate volatility are significant to explain the share of currencies in the reserves of central banks. Moreover, the lagged value of the dependent variable, which represents the inertia factor of currency internationalisation was also statistically significant. However, they do recognise that their study is limited to only one role of currency internationalisation, although they expect that similar determinants to explain other types of currency internationalisation. Cohen (2011a) and Posen (2008p. 79) criticised Chinn and Frankel (2008) for their "pure economic explanation" of currency internationalisation, in which politics play no role.

Several researchers in the literature built on this study from Chinn and Frankel (2008) to estimate a panel data model on the determinants of reserve currency status, using mostly 'economic determinants' as the explanatory variables. The results generally endorse the conclusion that country size is one of the most important factors determining currency internationalisation (Chen and Peng, 2010, Li and Liu, 2010, Subramanian, 2011, Eichengreen et al., 2016). However, the conclusion regarding other factors is rather mixed, often because they use different variables.

Li and Liu (2010) extended the period studied and improved the model by using a fixed effect model including variables stressed in the Post Keynesian literature, such as interest rate and current account balance, though they do not refer to this literature. Variables such as inflation, exchange rate stability and interest rate were statistically significant, which suggests that monetary policy plays an important role in the process of currency internationalisation. By contrast, Chen and Peng (2010) also using a fixed effect model found no evidence that exchange rate volatility and inflation were significant. Subramanian (2011) also included the current account balance as a measure of economic power from debtor-creditor relations in his model on the reserve currency. Using a pooled OLS estimator, he found a positive though not so

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[71] An updated work from Chinn and Frankel (2007).

strong relationship between the net status of a country and the ability of its currency to serve as a reserve currency.

Following the extensive research conducted by IPE researchers and mainstream economists on whether the euro will surpass the dollar, Eichengreen (1998) also analyses theoretical and empirical determinants of reserve currency. In one of his empirical studies, he analyses time-series data on the determinants of the shares of some reserve currencies. Although he recognizes the importance of historical factors in theory, those were not applied to the econometric exercise. The independent variables used to explain this type of currency internationalisation were output, trade and the lagged reserve shares.

In another empirical study on the determinants of reserve currency, Eichengreen et al. (2016) use a random effect model to analyse inertia, country size and policy credibility, measured by exchange rate appreciation against SDR. Whilst inertia is significant in this model, they found some counterintuitive results regarding policy credibility, which was negatively related to currency internationalisation for a certain period. A possible reason for this unexpected result may lie on the bias that can be caused by the inclusion of a lagged variable in the random-effect model.

The literature that uses data for reserve currency seems to understand it as a general measure for currency internationalisation. Although reserve currency data by IMF is widely used in the literature for being an old established dataset with many time periods, it has two major drawbacks. The first one is that this data is available only for the eight major currencies[72] that are part of most central banks reserves. The second weakness of those studies is that the reserve currency is a function of international money of the public sector, which leaves aside other types of currency internationalisation, particularly those regarding the private sector, as discussed in Chapter II.

In the private sector, a type of currency internationalisation that is widely discussed in the literature is the invoice currency, which relates to the unit of account function. Although there is evidence that invoice currency is normally

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[72] Currently US dollar, euros, Chinese yuan, Japanese yen, pound sterling, Australian dollars, Canadian dollars Swiss franc and an "other currencies" category, which embraces all the remaining currencies. Source: COFER, IMF. Information retrieved in May 2018.

the same currency used as vehicle currency, these are different types of currency internationalisation. One of the most recognized empirical studies on invoice currency is from Goldberg and Tille (2008). Based on data from twenty-four countries from Europe and Asia, mostly developed countries, they build a pooled OLS estimator to evaluate the determinants of invoice currency. In agreement with the suggestion of studies on the determinants of reserve currency, country size was significant to determine invoice currency. Moreover, they conclude that transaction costs measured by bid-ask spread were also a key determinant for this type of currency internationalisation.

Following the paper developed by Goldberg and Tille (2008), another acknowledged empirical study is the one from Kamps (2006). In this ECB working paper, she estimates a random-effects GLS panel on the determinants of invoice currency to compare the use of the US dollar and the euro. This paper represents a substantial contribution to the literature, as it presents a dataset on invoice currency for 42 countries, which is also used in the analysis in Chapter III- 3.2. Similar to the 'economic determinants' presented in the previous section, the model incorporates variables for inflation and exchange rate volatility, besides the shares of imports and exports to the US and the share of differentiated goods in exports and imports[73]. She found evidence that, as expected by theory, country membership in the European Union has a large influence on choosing the euro for invoice. Exchange rate volatility, however, led to ambiguous results.

Using the same database from Kamps (2006), Li and Liu (2010) analysed a panel data under fixed effects and found evidence that the coefficients related to the currency stability determinants, such as interest rate, trade to GDP ratio, current account balance, exchange rate volatility and appreciation were significant and coherent with the literature.

Ito and Chinn (2014) expand the database collected by Kamps (2006), Goldberg and Tille (2008) and analyse a random effect model to investigate the determinants of invoice currency. As a matter of robustness, they also

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[73] A differentiated good is the one that is more attractive to a certain market and, thus, the producer can set the market price. For this reason, differentiated goods are likely to be invoiced in the currency of the exporter whist homogeneous good are likely to be invoiced in US dollars or in another central currency. See MCKINNON, R. I. 1979. *Money in international exchange: the convertible currency system*, Oxford University Press on Demand.

analyse a fixed effect for the possibility of intrinsic characteristics of each country, such as the presence of strong institutions and regulation. Besides the traditional determinants of invoice currency used in the literature[74], they also include data on capital account openness, represented by the Chinn-Ito index. Although there is a consensus in the literature that the renminbi internationalisation depends on capital account liberalisation, Ito and Chinn (2014) found that capital account openness reinforces not only the use of the domestic currency but also the use of euro. Thus, financial openness is argued to be the main threat for the US dollar dominance and an important determinant of the internationalisation of other central currencies.

Another type of currency internationalisation that is not widely discussed in the literature is the funding currency. Although some authors understand that currency denomination of debt securities fulfil a store of value function, it may also be understood as a unit of account function, as discussed in Chapters II and III. If one takes the perspective from the party issuing the debt security, the currency is invoicing a financial contract with a funding purpose. From the perspective of the party who is buying the debt security, this operation is understood as an investment.

Bobba et al. (2007) analyse both a pooled OLS and a GMM estimator of the currency denomination of international debt securities as a proxy for the unit of account function for financial contracts. An important feature of this paper is that they consider data on international debt securities by residency, which an important aspect to define the concept of currency internationalisation[75]. Another important feature is that they include both developed and developing countries in the sample. They basically include in the model the same determinants mentioned in the literature with the addition of a time constant variable that accounts for currency liquidity, which may be interpreted as a proxy for the liquidity premium discussed in the Post Keynesian literature. As a result, they found that variables such as trade and currency regime play an important role in developing countries. Whilst the liquidity effect, particularly for the euro, appears to be significant for developed countries, this variable has declining relevance for developing countries over time.

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[74] Such as share of exports, share of commodities/differentiated goods, country membership in a monetary union, exchange rate volatility and inflation.

[75] More details in Chapter II- 2.4.1.

Li and Liu (2010) also use similar data on currency denomination of international bond and notes[76]. They conduct a fixed effects estimation to analyse the store of wealth function of international currencies. Once again, the results from this model were very similar to the ones obtained in the international reserves estimation, which gives further evidence about the importance of economic size in determining the different types of currency internationalisation. Cohen (2005)[77] also estimates a time-series regression for eight major currencies on the determinants of currency denomination of international bond securities. He argues that the preference of investors is just as important as the ones of the borrower. Thus, he does not distinguish whether this research emphasises investment or funding currency. Using determinants such as exchange rate, bond yield and share of a country's nationals in total debt issuance, he finds that inertia given by a historical use of the currency and higher interest rates play a key role in the currency choice by investors and borrowers.

However, all the empirical studies reviewed so far focus mainly on two types of currency internationalisation: reserve currency and invoice currency. The main reason for that is the lack of data for other functions. Another reason for it is that most of the empirical studies on currency internationalisation do not acknowledge the implications of the different types of currency internationalisation. One of the main arguments stressed in this thesis is that the types of currency internationalisation, in which the liquidity premium manifests itself, shape the position of a currency in the hierarchy, as discussed in Chapters II and III. Thus, understanding the determinants of each type of currency internationalisation is crucial to analyse the subordinate position of peripheral currencies in the IMS.

Different studies on different types of currency internationalisation reach fairly similar conclusions, which emphasise the importance of economic size as a major determinant of currency internationalisation. Although there is a consensus in the theoretical literature among the economic determinants of currency internationalisation, which is mostly regarded as a market-driven

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[76] Both papers use data from BIS debt security international statistics. See Li and Liu (2010) and Bobba et al. (2007).

[77] Benjamin H. Cohen is the Head of Financial Markets in the Monetary and Economic Department of BIS.

process, there seems to be a divergence on the relevance of other determinants of currency internationalisation (Helleiner, 2013). The reason for this divergence may rely on the fact that they focus on the determinants of different types of currency internationalisation, in both the private and the public sector.

Li and Liu (2010) were the only authors in the current literature who attempted to build an econometric model for more than one type of currency internationalisation in the private sector. Driven by a theoretical and empirical analysis of the determinants of the Chinese renminbi and other central currencies, they analyse data on reserve, trade settlement and invoice currencies. However, they focused only on the major currencies of the international monetary system. This research proposes a wider study about international currencies by analysing central and peripheral currencies across the different types of currency internationalisation.

Most of the empirical research focuses on the discussion of the determinants of currency internationalisation to make inferences on whether one international currency will surpass another, which also disregards the different types of currency internationalisation. The general literature seems to focus on one type of currency internationalisation because they are interested in measuring the degree of currency internationalisation. The objective of this chapter, however, is to have a broader perspective of currency internationalisation, which encompasses the determinants of different types of currency internationalisation, which influence the position of currencies in the hierarchy.

In short, two questions remain unanswered. The first question is about the determinants of other types of currency internationalisation, particularly regarding the functions of international money in the private sector. The second question that remains unanswered is regarding the determinants of the types of currency internationalisation of peripheral currencies. According to the research developed in Chapter III of this thesis, peripheral currencies from EME are mostly internationalised as short-term investment currencies, but the factors which influence this type of internationalisation are not empirically discussed in the literature.

IV- 3   Methodology and Data

IV- 3.1   Data Sources

IV- 3.1.1   Dependent Variables: Measuring Currency Internationalisation

Currency internationalisation is measured in different ways in the literature, which is not only influenced by the theoretical background of each research, but also by data availability. As discussed in section IV- 2, the empirical literature generally discusses the determinants of the invoice currency, in the private sector, and the reserve currency, in the public sector. Whilst the latter is mostly understood in the literature as a general measure of currency internationalisation, this research analyses the determinants of each type of currency internationalisation that we could find data for. This chapter focuses on the private sector because of its importance in the process of currency internationalisation. Also, data on the public sector is very limited and often qualitative.

A major challenge was to find consistent data for the different types of currency internationalisation with a reasonably large time period. Based on these criteria, this chapter found data for the following types of currency internationalisation[78]: vehicle currency, funding currency, long and short-term investment currency. Thus, we did not include two types of currency internationalisation in the private sector, the invoice currency and the trade settlement currency, which were taken into account in our sample in Chapter III. The data source for the four types of currency internationalisation that we included in our study, which is also used in Chapter III, is detailed in Table 8[79].

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[78] For more details on the different types of currency internationalisation, see Chapter II- 2.2.1.

[79] The currencies included for each model are available in Appendix Table 8.

Table 8: Data Source - Types of Currency Internationalisation

Function	Private Sector	Source
Means of Payment	*Vehicle*: Share of currency in global total turnover	Triennial Central Bank Survey (BIS)
Unit of Account	*Funding*: Share of cross-border liabilities denominated in the counterparty country's currency	Locational Banking Statistics (BIS)
Store of Wealth	*Long-term*: Share of institutional investors in currency turnover	Triennial Central Bank Survey (BIS)
	Short-term: Share of hedge funds and PTFs[80] in currency turnover	

Note: all data is in a percentage format.

For the means of payment function, represented by the vehicle currency, we analysed data on the share of currency in global foreign exchange turnover, which is published by the Triennial Central Bank Survey from the Bank for International Settlement (BIS). For this variable, data was available for 35 currencies and 6 time periods, which is a triennial data from 2001 to 2016. We only use this data for 31 currencies because there was no data available on the determinants of currency internationalisation (independent variables) for the following countries: Singapore, Taiwan Province of China, Romania and Peru.

Regarding the unit of account function, the proxy used for the funding currency is the share of cross-border liabilities denominated in the counterparty country's currency published by the Locational Banking Statistics from BIS. As explained in detail in Chapter III- 3.2, this data refers to the willingness of international banks to denominate their debt (liabilities) in the currency of the creditor (counterparty) country. This variable encompasses data for all countries since 1977[81]. However, the currency denomination that is available is restricted to a small group of central currencies: Swiss franc, euro, pound sterling, Japanese yen and US dollar. In addition to these central currencies, they also publish data on all currencies. Thus, by taking the difference between all currencies, unallocated currencies and central currencies, we obtain data on 'other currencies', which refer to positions where the currency

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[80] Proprietary Trading Firms.

[81] Some countries have data since 1977 and others have data for different years.

was reported but are not shown separately. These currencies are likely to be denominated in the domestic currency of the counterparty country and, thus, we use this data as a proxy for the 'other currencies' that are not published by BIS. Therefore, we have data on 24 currencies from the last quarter of 1993, when they start publishing data for Russia, to the last quarter of 2017, which is the most recent data available.

Finally, the store of wealth function is divided into two types of currency internationalisation. The first one is the long-term investment currency, which is represented by the share of institutional investors in currency turnover from the BIS. The second one is the short-term investment currency and a proxy for this data is the share of hedge funds and PTFs in currency turnover, as explained in detail in Chapter III. Both of these data were only reported for 2013 and 2016, which represents two cross-sections for 24 currencies. As a matter of consistency, we applied the same panel data methodology for this type of currency internationalisation even though we acknowledge the limitation of these results.

One of the variables excluded from our analysis was the trade settlement currency (means of payment function). A proxy for this variable is data on the share of currencies on customer initiated and institutional payments from SWIFT. Unfortunately, this data is only published for the 20th most traded currencies in a month. Therefore, although there is data available for a few years, some data is lost due to changes in the composition of the 20th most-traded currencies. The second excluded variable is the invoice currency (unit of account function). To the best of our knowledge, we have the most updated and comprehensive database on invoice currency, following the data collection of Kamps (2006), Goldberg and Tille (2008) and Gopinath (2015) in Chapter III. However, time periods and type of transaction (export or import) varies a great deal, preventing us from consistently analysing at least similar data for different currencies over the same time period.

Since the independent variables are all in percentage format, bounded between 0 and 1, we applied a logit transformation. This transformation limits the prediction interval of the dependent variable, which avoids predicting results above 100% or below 0%. The logit transformation is widely used in the empirical literature on currency internationalisation, following the study proposed by Chinn and Frankel (2008). In this chapter, the logit transformation was applied to all types of currency internationalisation using the following formula:

$$Y_{it} = log \left(\frac{CI_{it}}{1 - CI_{it}} \right)$$

Where Y_{it} is the logit transformation of each type of currency internationalisation (CI_{it}) in Table 8.

IV- 3.1.2 Independent Variables: The Determinants of Currency Internationalisation

As discussed in Chapter II, this research does not include proxies for political power due to the difficulty of measuring this variable. Instead, Chapter IV presents a comprehensive perspective on the determinants of currency internationalisation as it includes economic determinants stressed by both mainstream and Post Keynesian economists. Table 9 presents the variables and data source of each determinant of currency internationalisation.

Table 9: Data Source - Determinants of Currency Internationalisation

Determinant	Variable	Source
Market Size	Gross Domestic Product (GDP)	World Economic Outlook (IMF)
Inflation	Consumer Price Index, all items	International Financial Statistics (IMF)
Exchange Rate Volatility	Standard deviation of exchange rate against SDR, period average	International Financial Statistics (IMF)
Interest Rate	Central Bank Policy Rates	BIS Statistics and International Financial Statistics (IMF)
Current Account Balance	Net Current Account (surplus or deficit)	International Financial Statistics (IMF)
Capital Openness	Chinn-Ito index	Chinn and Ito (2006)

Note: all data is in percentage format.

The first determinant that we included in our model refers to the market size, which is generally considered by the literature as the most important determinant of reserve and invoice currency. The literature often uses data on Gross Domestic Product (GDP) as a proxy for the market size. GDP can be measured at the market exchange rate, i.e. converting the GDP denominated in domestic currency into US dollars, or using the Purchasing Power Parity (PPP). The latter measure provides an exchange rate in terms of consumption

power in two given countries. However, the GDP measured in US dollars may better represent wealth in terms of international consumption because the US dollar is the key currency of the system. For this reason, this research adopts the GDP in US dollars current prices. Some authors also analyse other variables, such as the growth rates or trading volume to measure the economic strength, but we understand that these variables are accounted for in the GDP. Yearly data on GDP was available in World Economic Outlook from the International Monetary Fund (IMF) for all countries in our analysis since 1995.

The second and third determinants of currency internationalisation that we have incorporated in our model refer to currency stability. As discussed in the theoretical and empirical literature review, this determinant can be understood in two components: an internal and an external one. The former refers to monetary stability, i.e. inflation. The inflation is represented by the Consumer Price Index (CPI) for all items, available at International Financial Statistics (IFS) from IMF. This data is a good indicator of the degree of monetary policy credibility because it includes historical records of inflation stability. Some authors adopted the moving average inflation differential between a country and the average inflation of a group of advanced economies, such as the G7 countries[82] (Chinn and Frankel, 2008, Chen and Peng, 2010). CPI data was available for all countries in our analysis since 1996.

Regarding the external component, currency stability is measured by exchange rate volatility. The literature often analyses data on average annual variation of exchange rate against Special Drawing Right (SDR). The idea of measuring the currency volatility against a basket of currencies such as the SDR has the advantage of having a general notion about currency volatility. International agents are mainly concerned about the US dollar volatility because it is the key currency of the system. Yet, if volatility is measured only against the dollar, it would not incorporate periods of volatility from other major currencies, which can also have a significant impact on the demand for international currencies. Also, it allows us to measure the volatility of the dollar, which would be zero in case we used only the dollar instead of the

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[82] The Group of Seven countries encompasses United States of America, Japan, Germany, Italy, United Kingdom, France and Canada, which are the issuers of the most traded currencies in the world (Germany, Italy and France as part of the Eurozone).

basket of currencies. For this reasons, we calculate the standard deviation of the percentage change of currency units per SDR, which is published by IMF for all countries in our analysis since 1999.

Another variable related to currency stability that is occasionally studied by mainstream economists to explain currency internationalisation is the interest rate. Mainstream economists and IPE researchers mostly neglect this variable in the theoretical discussion on the determinants of currency internationalisation. From a Post Keynesian perspective, potential investors have to take into account the trade-off between return and risk to compose their currency portfolio. The lack of liquidity premium of peripheral currencies can, therefore, be outweighed by higher returns to make assets denominated in those currencies more attractive, as discussed in Chapter II- 2.3 (Andrade and Prates, 2013, De Conti et al., 2013a, Fritz et al., 2014, De Paula et al., 2015, Kaltenbrunner, 2015). For the interest rate, we adopt data on Central Bank Policy Rates published by BIS, which is complemented by the same database in IMF but with more information for some of the countries in our analysis. This data is available since 1998 for most countries. Still, there is no information for Singapore, Taiwan Province of China, and for Romania and Peru before 2003. Thus, these four currencies were excluded from the analysis.

Post Keynesian economists also emphasise the importance of current account balances for currency hierarchy. The rationale for using this variable lies in the fact that current account surpluses are a necessary condition to influence the expectations of agents about currency appreciation in the long term. Similar to the interest rates, expected appreciation also helps to compensate for a lower liquidity premium and might affect the degree and type of currency internationalisation. Data on current account balance published by IMF is available for 34 countries since 2000, except for Taiwan Province of China.

Among the several determinants of currency internationalisation emphasised in the literature is the market liquidity[83]. This attribute can be measured by the bid-ask spread, which is the difference between the exchange rate agents would like to sell a currency and the exchange rate they would be willing to

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[83] As we discussed in Chapter II- 3.1, this market liquidity is not a synonym of currency liquidity.

buy. The larger the difference, the less liquid the currency is. Yet, data on bid-ask spread is published in a high-frequency and, therefore, it is difficult to operationalise. This variable is not often used in the literature, so we have decided to not include this variable in our model.

Additionally, market liquidity also presupposes a broad, deep and efficient financial markets. The literature adopts different measures to represent these variables, such as Forex turnover in different financial centres such as London and New York (Chinn and Frankel, 2008). However, not only this variables are often not available for peripheral currencies, but we also use forex turnover as a proxy for the vehicle currency, which is a dependent variable in one of our models. Therefore, given the difficulty to measure market liquidity, this chapter adopted the Chinn-Ito index on capital account openness, which is available for all countries except for Taiwan Province of China since 1999[84]. For the case of Euro, we calculated the average of this index for the Euro area member states.

Lastly, inertia is also considered an important determinant of currency internationalisation. To represent this variable, following the approach taken by many researchers in this literature, we added the lagged value of the dependent variable in the model for each type of currency internationalisation. The coefficient of this variable displays the influence of currency internationalisation in the past and the current one.

In a nutshell, the dataset on the dependent and independent variables have some limitations. Regarding the dependent variables, there is not much data available for peripheral currencies, which are issued by emerging and developing countries. For this reason, our study ranges from 22 to 31 currencies, as shown in the appendix section. Moreover, we are also limited by the fact that the earliest time period we can include in our analysis is 2000, because the euro was officially introduced in the international market in 1999 and there is some data missing on that year for some other currencies. Data on independent variables refer to the countries that issue the currencies in our sample. There is almost no data for the Taiwan Province of China and, thus, the New Taiwan dollar was excluded from our analysis. Therefore, the panel data model for vehicle currency analyses information on 31 currencies from

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[84] The latest data available at the time of this econometric study was 2015. Thus this data was used as a proxy for 2016, as one should not expect a strong change in the openness of a country from one year to another.

2001 to 2016. The model on funding currency encompasses data on 31 currencies and for a longer time period, from 2000 to 2016. The last panel data model, on the investment currency, we analyse data on 22 currencies only for the two time periods available, which are 2013 and 2016. All of the panel data studied in this chapter are strongly balanced.

IV- 3.2   Econometric Estimation of the Determinants of the Different Types of Currency Internationalisation

IV- 3.2.1   Panel Data Model

This chapter adopts a panel data model, which consists of a combination of a cross-section with time-series, to evaluate the determinants of the different types of internationalisation for central and peripheral currencies and their respective countries across time. Thus, the model has two dimensions, one referring to countries that issue the currencies in the sample (i) and another dimension that refers to time (t). The choice of panel data is justified by two main arguments. First, the empirical literature on currency internationalisation consistently analyses panel data model to evaluate the determinants of currency internationalisation for several currencies across time. Whilst cross-sectional data would estimate the determinants of the use of several currencies in one point at the time, panel data allow us to study the cross-section dynamics of change. Also, the choice of panel data instead of time-series minimises the aggregation bias effect from estimating the same parameter to represent all currencies.

Second, panel data allows us to control for time-invariant individual effect, which measures particular behaviour of each currency. This individual heterogeneity[85] is any country or currency specific characteristics that cannot be measured or are difficult to obtain (Gujarati, 2004, Baltagi, 2005). As discussed in the previous section, some authors in the literature argue that governments can induce the use of their currency abroad, although they recognise that this power is limited. A variable that could represent unobserved heterogeneity is the political power of the countries that issue the currencies analysed in this study.

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[85] Also called unobserved heterogeneity.

Another variable that also represents unobserved heterogeneity is the liquidity premium. This variable is defined in Chapter II by the opportunity cost investors are willing to take in order to hold an asset that can be easily sold without significant losses. Thus, liquidity premium reflects the level of confidence of investors, which is a particular characteristic of each currency and it is hard to measure. Post Keynesian economists suggest that the demand for an international currency is shaped by the currency's liquidity premium, which is rigid in the short-term (Fritz et al., 2014). Thus, the assumption that the unobserved heterogeneity is time-invariant may hold in the period analysed in our sample.

Based on the determinants discussed in the literature review section, the model on the determinants of currency internationalisation is represented in Equation 5:

Equation 5: Static Model on the Determinants of Currency Internationalisation

$$Y_{it} = \beta_0 + \beta_1 \, logGDP_{it} + \beta_2 CPI_{it} + \beta_3 ER_{it} + \beta_4 IR_{it} + \beta_5 \left(\frac{CA}{GDP}\right)_{it} + \beta_6 \, KO_{it}$$
$$+ D_t + \eta_i + u_{it}$$

Where Y_{it} are the dependent variables that represent the four types of currency internationalisation adopted in this chapter: vehicle, funding, long and short-term investment currencies. Thus, we have four models using the same independent variables for each individual (i) and time (t) to explain each of these dependent variables that represent currency internationalisation. Regarding the independent variables, $logGDP_{it}$ is the logarithm transformation of the gross domestic product; CPI_{it} is the inflation, ER_{it} is the exchange rate volatility; IR_{it} is the policy rate; CA/GDP_{it} is the share of the net current account in terms of GDP and KO_{it} is the capital openness index. Finally, D_t are the time dummies for each (t), η_i is the unobserved heterogeneity for each currency (i) and u_{it} is the error term.

It is important to notice that some of the variables are analysed in level and others in logarithm or as a share of GDP due to the differences in terms of magnitude. We applied a non-linear transformation using the logarithm form of GDP to simplify the coefficient interpretation. In a log-log regression, where both the independent and dependent variable are in logarithm form, if we increase GDP in one percentage, this will have an impact of ($\beta_1/100$) units on the variable for currency internationalisation (Y_{it}). We have also applied a

similar transformation to the current account variable, which cannot take a logarithm transformation due to negative values. Because we are not interested in getting a coefficient that express the impact of a dollar unit change of current account on the dependent variable, we analyse this variable as a share of current prices of GDP in US dollars.

After these transformations, the coefficients are easier to understand and the skewness is reduced. Additionally, the intercept β_0 is a time effect variable that is constant across individuals (currencies), whilst the unobserved heterogeneity (η_i) is a cross-section effect that is constant across time. The dummy variables included in the model D_t allows the intercept β_0 to change in each time period. Thus, one can see how much each year contribute to explain the variation of the dependent variable.

IV- 3.2.2   Panel Data Estimators

Econometrics textbooks mostly mention a few main standard estimators used in panel data linear models. These estimators rely on some key assumptions to produce consistent and efficient parameters. The first assumption is about the exogeneity of the independent variables, i.e. they are not correlated with the error term. The second and third assumptions are spherical disturbances, where the error term is homoscedastic and serially uncorrelated. It is important to distinguish between these assumptions. Whereas the first assumption is necessary in order to obtain a consistent and unbiased estimator, the second and third are ideal assumptions that only affect inference and efficiency. Thus, the latter assumptions are at best second-order importance, even because the robust option in Stata corrects for cross-sectional heteroscedasticity and within-panel (serial) correlation[86]. A response to the problem of endogeneity can be the panel data model estimation, which addresses endogeneity as an individual effect.

Among the main linear model estimators used in econometrics, there are three static model estimators and two dynamic model estimators. The first static model estimator, which is the most simple one, is the pooled Ordinary Least Square (OLS). If the abovementioned assumptions hold, the OLS will produce a consistent estimator. This method applies an OLS to pool the observations

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[86] The robust option changes the standard error and t-test, but not the coefficient estimated (Stata, 2015).

across i and t, leaving the unobserved heterogeneity in the error term. By assuming that the explanatory variables are not correlated with the error term, it also assumes that the explanatory variables are not correlated with the unobserved heterogeneity. Thus, models with the lagged dependent variable ($Y_{i,t-1}$) violates the latter assumption, because this variable is correlated with the unobserved heterogeneity in the composite error term (Wooldridge, 2010).

The second estimator is the random effects (RE), which treats the individual heterogeneity as a random variable. As with the pooled OLS, the RE does not control for individual effects and leaves the unobserved heterogeneity in the error term. The RE analysis also relies on the strong assumption of strict exogeneity between the independent variables and the unobserved heterogeneity, which, in practice, is very rare. This approach is appropriate when the study draws individuals from a large population and it uses a Generalised Least Squares (GLS) estimator (Baltagi, 2008). However, country individual heterogeneity, such as liquidity premium and political power, cannot be considered a random variable that is uncorrelated with other explanatory variables. For this reason, this chapter does not estimate a random effects model.

The third static estimator is the fixed effects, which treats unobserved heterogeneity as a parameter estimated for each cross-section. In this estimator, the unobserved heterogeneity is allowed to be correlated to the independent variable. This approach transforms the model equation to eliminate the unobserved heterogeneity. This transformation is called within transformation and it is obtained by calculating the equation averages and subtracting it from the original equation. As the unobserved heterogeneity is a time-invariant variable, it is eliminated from the transformed equation. Thus, FE estimator allows the correlation between the unobserved heterogeneity and independent variable because it does not affect the assumption of strict exogeneity.

In contrast to the static model, a dynamic model is defined by the presence of a lagged dependent variable. If the model is considered dynamic in literature, not including this component in the model results in a problem of omitted variable that is a source of endogeneity bias. However, using static model estimators when a lagged dependent variable is included as an explanatory variable, it also becomes an obvious source of endogeneity, which biases the results. As the literature in currency internationalisation stresses the importance of inertia, which is represented by a lagged dependent variable,

we analysed both static and dynamic models to compare the coefficients. The dynamic model is represented in Equation 6, which is basically the same model as Equation 5 but with the addition of the lagged dependent variable ($logGDP_{i,t-1}$). When the lagged dependent variable is added to the model, one more observation is lost because there are t-1 observations.

Equation 6: Dynamic Model on the Determinants of Currency Internationalisation

$$Y_{it} = \beta_0 + \beta_1\,Y_{i,t-1} + \beta_2 logGDP_{it} + \beta_3 CPI_{it} + \beta_4 ER_{it} + \beta_5 IR_{it} + \beta_6\left(\frac{CA}{GDP}\right)_{it}$$
$$+ \beta_7\,KO_{it} + D_t + \eta_i\ + u_{it}$$

The panel data methods described so far do not address the problems caused by endogeneity, such as omitting a time-variant variable. The assumption of strictly exogeneity[87] in the linear static model is unrealistic, as there are no variables that are strictly exogenous. The endogeneity problem can be solved by using the method of instrumental variables (IV), which are highly related to the independent variable but uncorrelated to the error term and with no partial effects on the dependent variable (Wooldridge, 2012). However, in practice, natural instrumental variables are very difficult to find. A solution to this problem could be to include in the model lagged values of the dependent variable as an instrument, which transforms the model into a dynamic panel data. Arellano and Bond (1991) developed this idea to propose a different set of instruments in a Generalised Methods of Moments (GMM). Blundell and Bond (1998) also proposed additional linear moment restrictions to the equations in level, which contributed to improve the efficiency of the GMM estimators. The former estimator is referred to as first-difference GMM and the latter estimator is the system GMM.

However, the sample size is too small to derive strong instruments for IV estimation. For this reason, this chapter proposes a comparative analysis of pooled OLS and FE estimators with and without a dynamic component, as each of them have different limitations. Whilst the pooled OLS estimator presents an upward bias because it neglects the unobserved country-specific factor, the FE estimator presents a downward bias caused by the correlation of the lagged dependent variable with unobserved time-invariant effect. As the

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[87] Strict exogeneity assumes that the independent variable is not correlated with the error term. However, if there is a variable omitted that is correlated to any of the independent variables, the strict exogeneity assumption does not hold.

sample size increases, the bias associated with FE estimators reduces. Given that the sample size is not considered very large, both estimators are analysed to choose which one better fits the different models on the types of currency internationalisation.

IV- 3.2.3   Caveats of the Panel Data Study

Panel data studies are normally applied to microeconomic data, which has a large sample size in terms of individuals and a small time period. The present research analyses macroeconomic data instead, which has a limited number of individuals (currencies) but a longer time range[88]. Although panel data may be not ideal, it still has more advantages than exploiting time-series and cross-sectional data. As discussed in section IV- 2, several authors in the literature on the determinants of currency internationalisation have used panel data estimators, although the database and time periods varied across the papers.

Macroeconomic data, on the one hand, does not suffer from the random sampling assumption, since data is collected for the same currencies on the same period. On the other hand, it is necessary to address problems that are normally raised in time-series, due to the macroeconomic feature of the data, such as endogeneity. A relevant limitation of the panel data model is the cross-section dependence. Not accounting for error independence from the currency-specific variables can lead to biased estimates and spurious correlations (Chudik et al., 2011). Moreover, it is necessary to run panel unit root tests for cross-section dependence particularly for long panel data, i.e. large time period and a small number of individuals (Baltagi, 2005).

Besides these general limitations of panel data, the study proposed in this chapter has four other major limitations. First, similar to the issues raised in Chapter III, data on the types of currency internationalisation is very restricted, particularly for peripheral currencies. Second, the panel data model proposed in this chapter may potentially have an endogeneity problem, in which the explanatory variable is correlated to the error term. Possible sources of this bias are measurement error, e.g. a proxies that do not well represent currency internationalisation, omitted variable, e.g. political power, and simultaneous causality. These endogeneity problems could be solved with instrumental

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[88] The time range varies for each type of currency internationalisation. Thus, although we use the same model for each type of currency internationalisation, the tests analysed are not the same.

variables estimation, such as GMM. However, going back to the first limitation, the lack of data does not allow one to derive good instruments.

Third, as discussed in the previous section, while pooled OLS estimators may present an upward bias, FE estimators may present a downward bias. For this reason, both estimators are taken into account. Fourth, this study does not account for the influence of political power or policy decisions of currency internationalisation. This limitation is mainly caused by the lack of data on political variables, which are often qualitative. Though these variables are often stressed by IPE and Post Keynesian scholars, they are often neglected by mainstream economists. Chapter V complements Chapter IV by analysing political variables in a qualitative methodology.

IV- 4 Estimation Results

IV- 4.1   Panel Data 1: Vehicle Currency

The data on the dependent variable, the vehicle currency, is obtained from a triennial survey from BIS. For this reason, our sample ranges from 2001 to 2016, which comprises of six time periods for 31 currencies. Table 10 presents the summary statistics of the vehicle currency, which is measured as the share of a currency in the total turnover.

Table 10: Summary of Statistics – Vehicle Currency

Variable	Obs.	Mean	Std. Dev.	Min	Max
Year	186	-	-	2001	2016
FXT	186	0.062	0.166	0.000	0.899
GDP	186	1722.064	3376.735	53.106	18624.450
CPI	186	95.811	19.386	31.798	162.197
IR	186	4.796	5.671	-0.750	59.000
CA	186	5249.649	119716.700	-705372.000	459502.500
KO	186	1.034	1.391	-1.904	2.374
ER	186	0.026	0.020	0.003	0.155

The Kernel density function estimates the probability distribution of a random variable based on the sample analysed. The Kernel density function for the dependent variable, the vehicle currency (FXT), is displayed in Figure 11 and Figure 12. The former figure shows the distribution of the vehicle currency, which is right-skewed. After the logit transformation, in the latter figure, this data becomes more similar to a normal distribution, which is not an assumption of OLS or FE estimators, but it helps to clarify its relationship with the independent variables and changes the p-values of the estimation. Thus, the Kernel density function corroborates the decision of adopting a logit transformation of the dependent variable.

Figure 11: Kernel density – Vehicle Currency

Kernel density estimate

kernel = epanechnikov, bandwidth = 0.0054
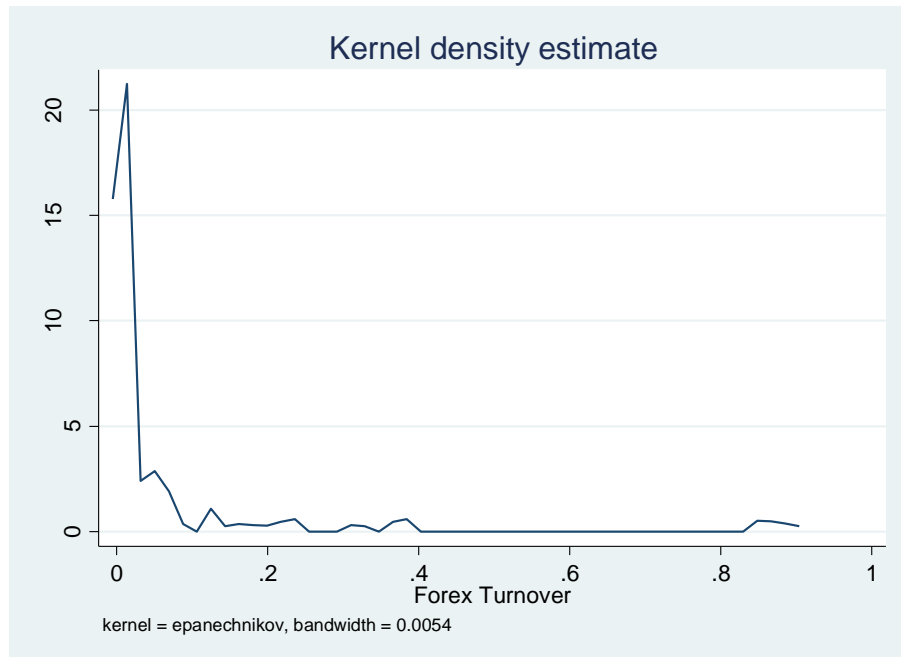
Figure 12: Kernel density – Logit Vehicle Currency

Kernel density estimate

kernel = epanechnikov, bandwidth = 0.6033
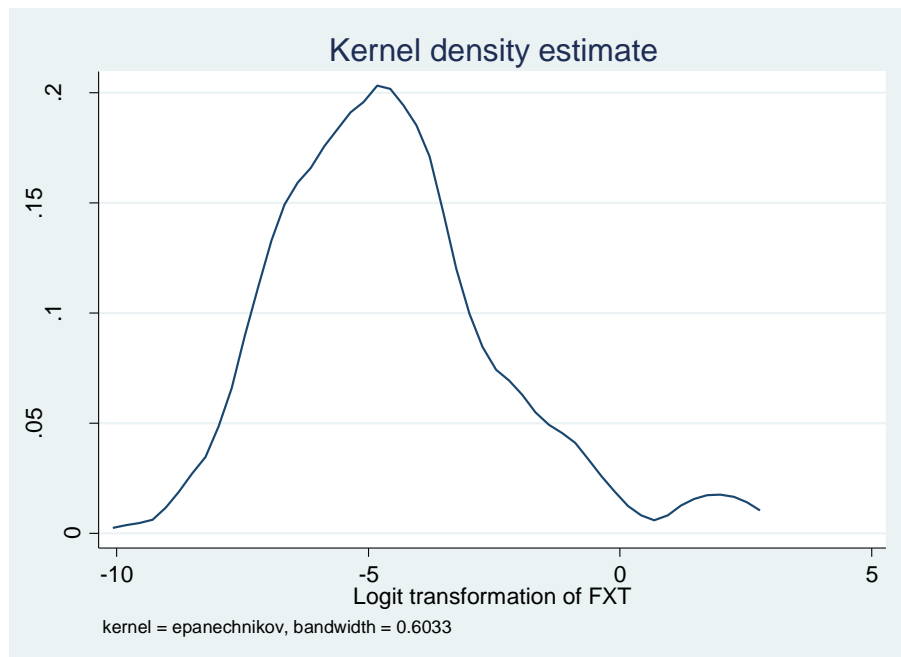
The results of the panel data on the vehicle currency is displayed in Table 11. The dynamic model, which are estimated in the two right-hand side columns, suggest the lagged dependent variable was significant at the 1% level. This result demonstrates the relevance of the inertia for the internationalisation as a vehicle currency. Therefore, due to the importance of the lag of the dependent variable, one may argue that the static model suffers from omitted

variable bias, which breaks with the assumption of exogeneity of the independent variables. For the vehicle currency, the dynamic model should be less biased and, thus, report more precise coefficients.

Table 11: Panel Data Estimators on Vehicle Currency

Regressors	OLS Static	FE Static	OLS Dynamic	FE Dynamic
log_GDP	1.152 ***	1.437 **	0.224 ***	0.702 ***
CPI	0.003	0.004	-0.004	0.001
IR	-0.043 *	-0.029 **	0.000	-0.022
CA/GDP	-0.004 **	0.000	-0.002 **	-0.002 **
KO	0.619 ***	-0.046	0.045	-0.005
ER	5.763	3.981	-1.84	0.934
log_FX t-1	-	-	0.801 ***	0.399 ***
Year Dummy	Yes	Yes	Yes	Yes
Constant	-12.14 ***	-13.472 ***	-1.812 ***	-7.201 ***

Note: *, ** and *** indicate the 10%, 5%, and 1% level of significance, respectively.

Similar to the results obtained in the literature, where most researchers agree that GDP plays an important role in currency internationalisation, our empirical exercise corroborates with this conclusion for the vehicle currency. The GDP was significant at 1% level in all the estimators analysed with a positive relationship with the dependent variable. Given that the vehicle currency is interrelated with the invoice currency and trade settlement currency, the empirical literature suggests larger countries have more economic power to encourage the use of its currency for as vehicle currency (Chinn and Frankel, 2008, Subramanian, 2011). For example, data on Forex turnover suggests that the Chinese renminbi has sharply increased as a vehicle currency over the past decade.

However, inflation and exchange rate volatility, which are expected to have a negative coefficient, were not significant in any of the estimators analysed. The interest rate was only significant in the static models. The coefficient for interest rate was negative, which shows that positive changes in the interest rates causes a reduction of the internationalisation as a vehicle in the Forex

market. The capital openness variable yielded mixed results, but it was only significant for the OLS estimator of the static model.

In short, the GDP appears to be the most important variable to explain changes in the share of currencies as a vehicle currency, particularly in the fixed-effect model. The current account variable was also relevant, although negative related to the dependent variable across all estimators that it was significant at 5%. This result goes against the theoretical intuition, which expects that surpluses in the current account lead to currency appreciation in the long-term which, in turn, increases the confidence of agents in that currency and its internationalisation.

IV- 4.2   Panel Data 2: Funding Currency

As described in section IV- 3, a proxy for the funding currency is the share of cross-border liabilities denominated in the currency of the counterparty country. A sign of internationalisation of the domestic currency is when a domestic agent, institution or government borrow funds in the international market, a cross-border claim for the international agent, denominated in domestic currency. The inability of countries to borrow in the international market in their domestic currency is known in the literature as the 'original sin' (Eichengreen et al., 2003). However, a greater sign of currency internationalisation comes from the liability side, when international agents are willing to borrow funds denominated in the currency of the counterparty country. At the end of this financial contract, the liability holder will have to demand the counterparty currency to offset their obligations, which indicates a certain degree of confidence in the currency of the counterparty country (Kaltenbrunner, 2015).

Since the euro was officially used after 1999, our sample for the model on funding currency starts on that same year. The latest data available is 2017, however, some of the dependent variables are available only until 2016. Thus, the dataset consists of 31 currencies from 2000 to 2016, i.e. 527 country-year observations, as shown in Table 12.

Table 12: Summary of Statistics – Funding Currency

Variable	Obs.	Mean	Std. Dev.	Min	Max
Year	527	-	-	2000	2016
FundCur	527	0.105	0.186	0.000	0.867
GDP	527	1693.776	3322.979	47.311	18624.450
CPI	527	94.417	18.341	20.595	162.197
IR	527	5.225	9.330	-0.750	183.200
CA	527	3569.681	120296.500	-761715.000	468246.100
KO	527	1.040	1.366	-1.904	2.374
ER	527	0.031	0.026	0.002	0.186

To understand the variability of the dataset, we analyse the Kernel density function of the dependent variable before and after the logit transformation, as illustrated in Figure 13 and Figure 14. In addition to the fact that this transformation is necessary to ensure that predicted values of the dependent variable will not surpass the lower and upper boundaries of 0% and 100%, respectively, it also helps to reduce the data skewness.

Figure 13: Kernel density – Funding Currency

Kernel density estimate

kernel = epanechnikov, bandwidth = 0.0192
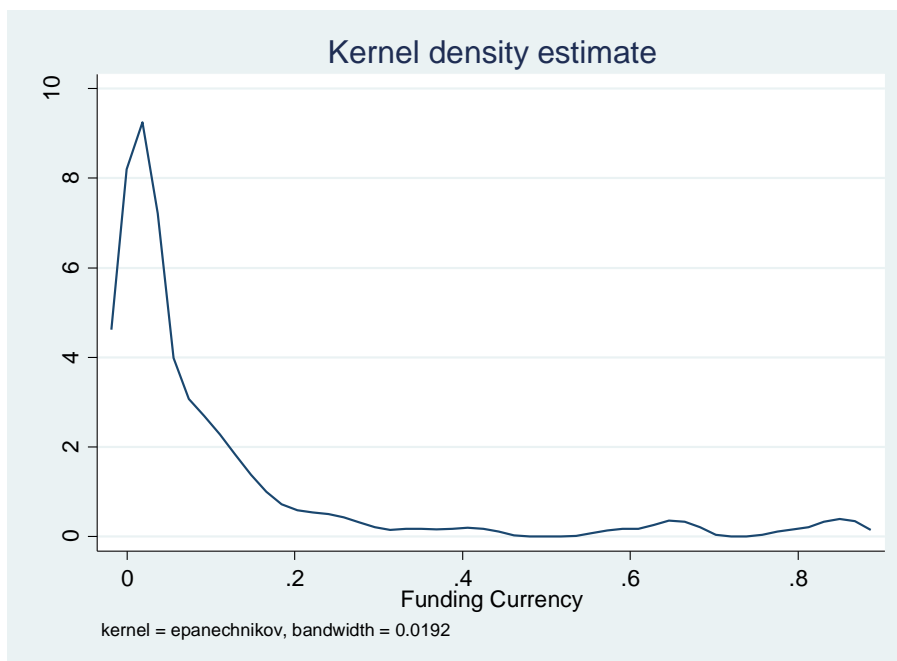
Figure 14: Kernel density – Logit Funding Currency

Kernel density estimate

kernel = epanechnikov, bandwidth = 0.5286
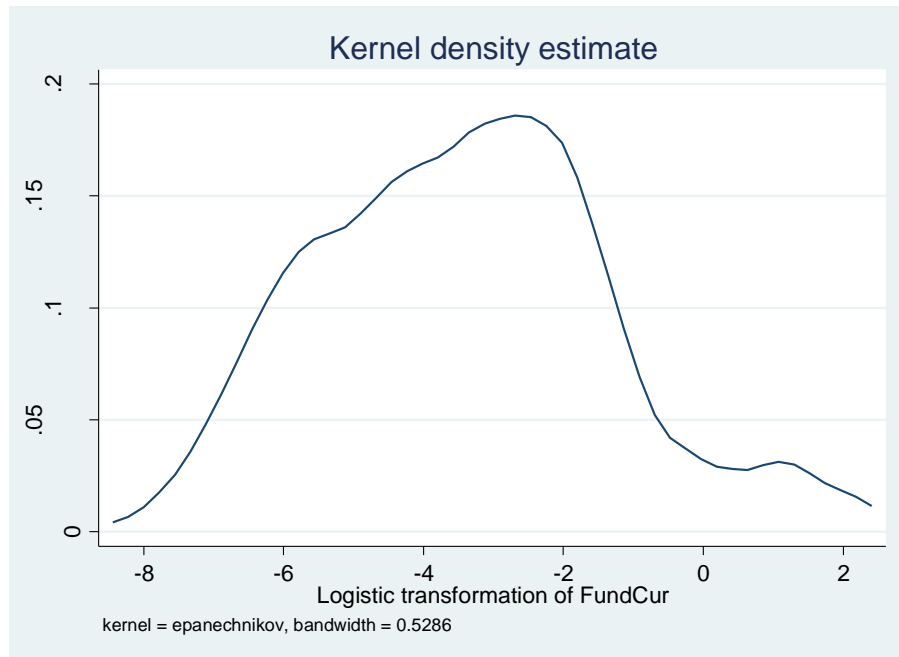
The database for the funding currency has 16 years, which is considered a large time period for panel data. For this reason, one should be concerned with potential problems that normally arise in the context of time-series data. In order to test for the stationarity of the variables, we have applied a unit root test. Among the several unit root test available for panel data, we chose the Fisher-type test using an Augmented Dickey-Fuller (ADF) unit-root test[89]. The Fisher-type test is appropriate for balanced or unbalanced panel data that have a large time dimension (t) and a moderate number of individuals (i) (Stata, 2015). As the ADF test is sensitive to non-linear transformations, we have applied this test after using logit and log transformations of funding currency and GDP, respectively.

The ADF test in panel data is performed on each panel series separately using the drift option. The p-values obtained are then combined to assess whether the panel has or not a unit root. The null hypothesis is that all panels contain a unit root against the alternative hypothesis that at least one panel has a unit root. This test uses four different methods to evaluate the null hypothesis, which yields four different p-values: inverse chi-squared, inverse normal, inverse logit t and modified inverse chi-squared. The last method is suitable

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[89] Unit root results are displayed in the Appendix Table 9.

for when the number of individuals tends to infinity, which is not the case here. For this reason, we only take into account the three other methods.

As a rule of thumb for yearly data, one should analyse the unit root test using one or two lags, given the restriction in terms of the number of years available for the analysis. As a result, the null hypothesis is rejected for all the variables at a 10% level of significance. Using one lag, only the CPI variable presented a p-value of 8% at most, whilst with two lags, the independent variable funding currency and CPI presented a p-value of 4% and 6% at most, respectively. Thus, one can reject the hypothesis that all the variables in this model have a unit root.

Table 13 presents the coefficients of the regressors analysed in the panel data model for the funding currency and their respective levels of significance. The lagged dependent variable and most of the time dummies were not significant at 10% level across all estimators. This result suggests the funding currency is better represented by the static model, which are probably less biased.

Table 13: Panel Data Estimators on Funding Currency

Regressors	OLS Static	FE Static	OLS Dynamic	FE Dynamic
log_GDP	0.733 ***	0.095	0.01	0.085
CPI	0.012 *	0.016 **	0.001	0.004 *
IR	-0.021	0.006 **	-0.01 *	-0.001
share_CA/GDP	0.001	0.002	0.000	0.000
KO	0.421 ***	0.1	-0.003	0.075 *
ER	-15.664 ***	0.12	-0.212	-0.031
logit_FundCur_1	-	-	0.012	0.051
Year Dummy	Yes	Yes	Yes	Yes
_cons	-8.917 ***	-6.134 ***	-0.15	-1.598 **

Note: *, ** and *** indicate the 10%, 5%, and 1% level of significance, respectively.

In the OLS estimator that did not include the lagged dependent variable (OLS static), the GDP, inflation, capital openness and exchange rate volatility were significant at the 10% level to explain the funding currency. As expected by theory, the greater the GDP and the capital openness, the more a currency is internationalised. Also, the greater exchange rate volatility, the less a currency is internationalised as a funding currency. The curious result was regarding

the inflation, which has positive coefficients for all estimators. The theoretical intuition was that the greater the inflation, the less internationalised a currency becomes. However, inflation was not statistically significant for any of the estimators at the 1% level. Moreover, the GDP is also not significant at 10% in the FE estimator.

In short, the results obtained from each estimator were mixed. The OLS estimator suggests that GDP, capital openness and exchange rate volatility were relevant to explain variations in the dependent variable. For the FE estimator, only inflation and interest rate were significant but counterintuitive. The results suggest that inflation and interest rate affect the funding currency positively, which goes against the theory on the determinants of currency internationalisation.

IV- 4.3   Panel Data 3: Short and Long-Term Investment Currency

The last two models in our empirical study are regarding data on short and long-term investment currency, which are represented by the share of hedge funds and the share of institutional investors in each currency turnover, respectively. This data, collected from the triennial survey from BIS, shows how much of each currency turnover is used for short and long-term investments. However, for both dependent variables data was published only after 2013, which leaves only two time periods for this analysis. Data on hedge funds and institutional investors were available for 24 currencies, but there was no data on the independent variables for countries that issue the Singapore dollar and the Taiwan new dollar. For this reason, these two currencies were not included in the analysis. The panel data model on both short and long-term currencies consists of 22 currencies for each year, which sums to 44 country-year observations, as in Table 14.

Table 14: Summary of Statistics – Short and Long-Term Currency

Variable	Obs	Mean	Std. Dev.	Min	Max
Year	44	-	-	2013	2016
InstInv	44	0.089	0.188	0.002	0.845
HedgeF	44	0.088	0.190	0.002	0.884
GDP	44	0.117	0.039	0.046	0.188
CPI	44	0.087	0.036	0.018	0.166
IR	44	2925.359	4564.332	129.144	18624.450
CA	44	115.575	15.410	97.745	162.197
KO	44	2.790	3.362	-0.750	13.750
ER	44	11576.680	154509.900	-504794.000	459502.500

Similar to the other models on vehicle and funding currency, this chapter also analysed the Kernel density function for the short and long-term investment currency before and after applying logit transformation. Whilst vehicle and funding currency were skewed before this non-linear transformation, short and long-term investment currency seem to approach a normal distribution without the transformation, as shown in Figure 15. The reason for this may rely on the fact that this data analyses the share of institutional investors and hedge fund on the total turnover for each currency, which has fewer extreme values. When we analyse the same data as a share of the world total turnover, the graph is highly skewed. Nevertheless, as explained in the previous section, this transformation was necessary in order to maintain the predicted values of the dependent variables in the boundaries between 0% and 100%. The Kernel density estimate for the logit transformation of both variables is displayed in Figure 16.

Figure 15: Kernel density – Short and Long-Term Currency
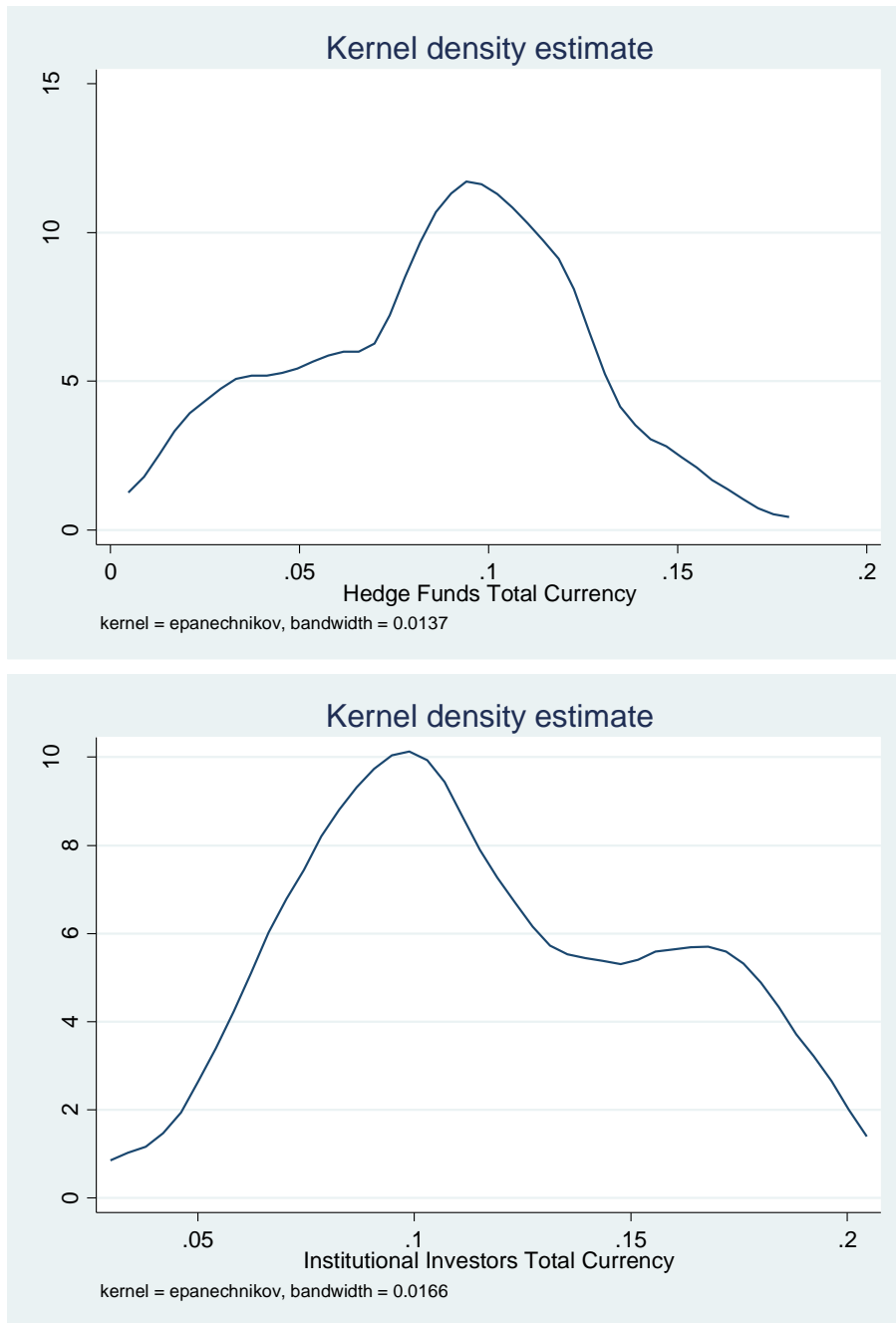
Figure 16: Kernel density – Logit Short and Long-Term Currency

Kernel density estimate

Logit transformation of Hedge Funds Total Currency
kernel = epanechnikov, bandwidth = 0.1779

Kernel density estimate

Logit transformation of Institutional Investors Total Currency
kernel = epanechnikov, bandwidth = 0.1672
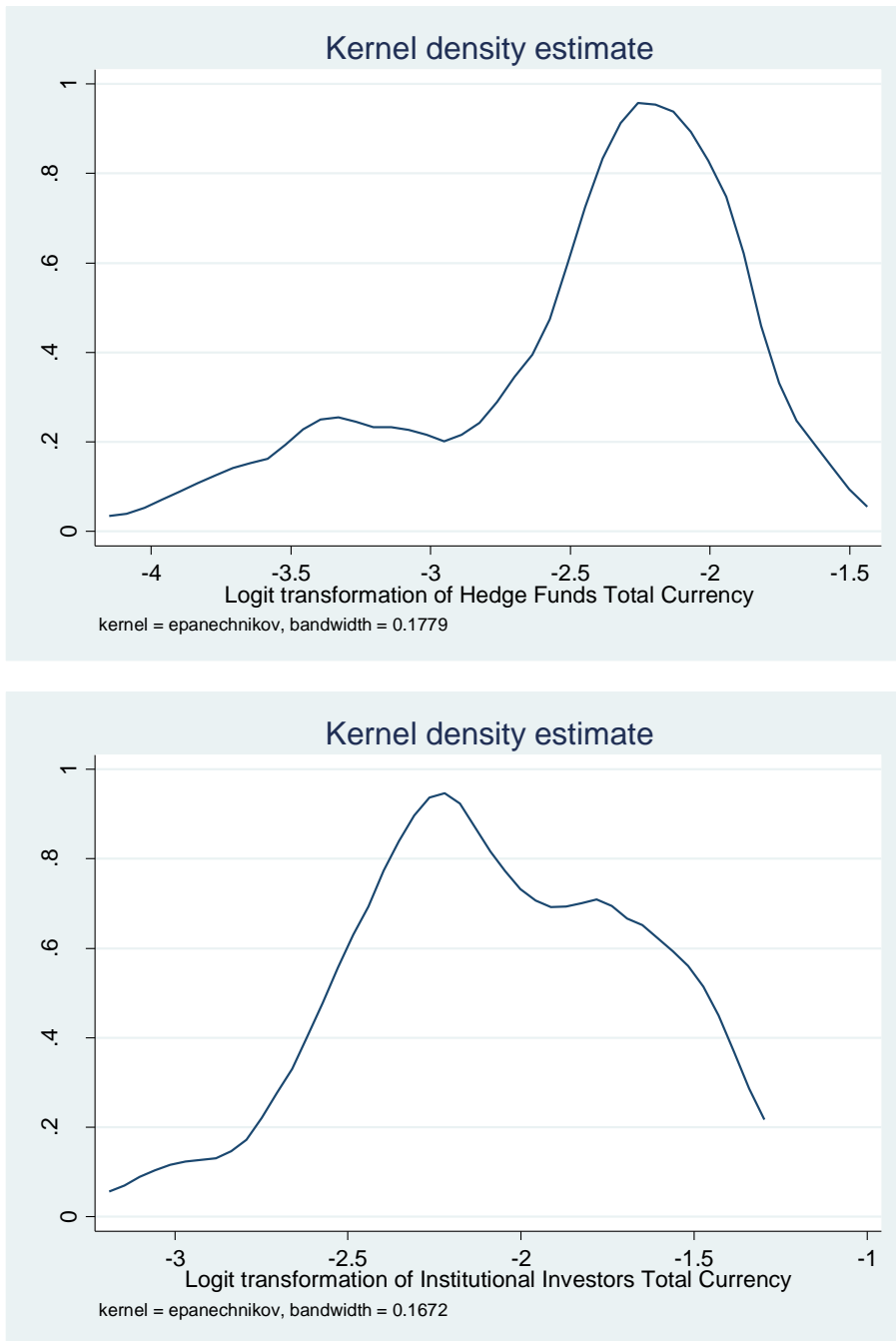
Although we recognise the limitation of this small database that possibly biases the results, this chapter has applied an OLS and FE estimators for short and long-term investment currency models as a means of comparability with the models on other types of currency internationalisation. For this reason, panel data with T=2 was chosen as opposed to two cross-sections. Despite the limitations of such a small panel data model, this study represents a contribution to the literature because it empirically analyses a novel type of

currency internationalisation that is not discussed in the literature, the short-term investment currency.

The empirical exercise for the short and long-term investment currencies are the simplest kind of panel data that one can analyse, as only two years of data are available. In this panel data, which is formed by two cross-sections, fixed-effect estimators and first-difference estimators give the same result[90]. The strict exogeneity assumption holds if the error term is not correlated to the explanatory variables in both time periods (Wooldridge, 2012). For that reason, one cannot use the lagged dependent variable as an explanatory variable in FE models with two time periods. We would need to collect more data in order to analyse a dynamic model, which is not currently available. Additionally, when the lagged dependent variable is added to the model, it loses one observation. Thus, the OLS estimator for a dynamic model is essentially estimating the parameters in a cross-section. Table 15 display the coefficients and level of significance for the panel data on the long-term investment currency as a share of each currency total turnover.

Table 15: Panel Data Estimators on Long-Term Investment Currency

Regressors	OLS Static	FE Static	OLS Dynamic
log_GDP	0.008	-0.674 **	0.008
CPI	-0.015 **	-0.01 *	-0.014 ***
IR	0.044	0.089 ***	0.106 ***
share_CA	-0.002 **	0.000	-0.001
KO	0.155 ***	0.085	0.165 ***
ERVol	2.57	-3.55 *	-1.449
Dummy Variable	Yes	Yes	-
logit_InstInv T-1	-	-	0.593 ***
_cons	-1.109 **	3.343	0.658

Note: *, ** and *** indicate the 10%, 5%, and 1% level of significance, respectively.

Results suggest that the inertia, represented by the lagged of the dependent variable, was significant at the 1% level and positively related to the dependent variable. Thus, the dynamic OLS appears to be a better fit for the

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[90] The fixed-effect estimator use within transformation and leads to the same result as first difference, which takes the difference between the two time periods.

data and it yields some interesting results. Inflation was significant at the 1% level and its estimated coefficient is negative, as expected in the literature. Capital openness, which is an essential attribute for investors, has a positive coefficient that is also significant at the 1% level. Lastly, interest rates were positively related to the dependent variable at the 1% level of significance. Though an increase in the interest rates should increase the demand for long-term investment currencies, which are essentially central currencies, countries issuers of these currencies have very low interest rates.

Exchange rate volatility explained negative variations of the dependent variable, but it was not significant at the 10% level. GDP, which was positively related to the long-term investment currency, was also not significant at the 10% level. A result that goes against literature-based expectations was the current account, which was estimated to have a negative impact on the long-term investment currency, though it was not significant at the 10% level.

The other dependent variable, the short-term investment currency, was measured by the share of hedge funds on each currency total turnover. As explained in section IV- 3.1 and further detailed in Chapter II- 2.4.2, this data represents for the volume of operations that are associated to short-term investments, such as speculative operations. The results from the model on short-term investment currency are shown in Table 16.

Table 16: Panel Data Estimators on Short-Term Investment Currency

Regressors	OLS Static	FE Static	OLS Dynamic
log_GDP	-0.048	0.987 *	-0.056 *
CPI	-0.037 ***	0.002	-0.021 ***
IR	0.166 ***	-0.06	0.06 **
share_CA	-0.005 ***	-0.006 ***	-0.003 **
KO	0.176 **	-0.092	-0.022
ERVol	1.421	4.581 **	0.42
Dummy	Yes	Yes	-
logit_Hedge T-1	-	-	0.581 ***
_cons	1.475 *	-9.279 **	1.615 ***

Note: *, ** and *** indicate the 10%, 5%, and 1% level of significance, respectively.

The dynamic OLS estimator suggests that the lagged dependent variable is significant to the model at the 1% level. Indeed, as argued in Chapter II, the short-term investment currency has a strong inertial component, which maintains these currencies at the bottom of the hierarchy. As the liquidity premium of short-term investment currencies is very low, the capital movements from changes in the international liquidity cycles cause exchange rate volatility. Therefore, these currencies remain unable to fulfil other functions of international money and their position also remains at the bottom of the hierarchy. This result corroborates with the theoretical and empirical conclusions from Chapters II and III, which argues that peripheral currencies that are internationalised as a short-term investment currency tend to maintain this role in the international market because the confidence of international agents in this currency is not enhanced.

The results suggest that inflation explains negative variations in the short-term investment currency, which is in accordance with the literature. Though the GDP and current account surplus were significant at the 10% level, both coefficients were negative. The negative coefficient of GDP indicates that smaller economies tend to issue currencies with short-term internationalisation. Exchange rate volatility and capital openness, on the other hand, were not significant at the 1% level. Their coefficients reveal that whilst exchange rate explains positive variations in the proxy for the short-term investment, the capital openness explains negative variations.

Lastly, the panel data model above shows evidence that the interest rate positively influences internationalisation as a short-term investment. As discussed in Chapter II, from a Post Keynesian point of view, agents who are willing to invest in volatile currencies for a short-period certainly require higher returns to offset uncertainty and low liquidity premium.

IV- 5   Conclusion

Although the shape of a currency hierarchy is clear, the determinants of currency internationalisation and, thus, the position of these currencies in the hierarchy is not so obvious (De Conti and Prates, 2014). Whilst mainstream economics focused on elaborating a model on the economic determinants of only a few types of currency internationalisation, IPE and Post Keynesian economics provided valuable theoretical insights to explain the factors that contribute to currency internationalisation. The empirical study proposed in this chapter is a general approach that tries to combine econometric formalisation to assess the 'economic determinants' of currency internationalisation in addition to other factors proposed by the Post Keynesian literature.

Chapter IV aimed to investigate the determinants of the different types of currency internationalisation, which are reflected on the different positions in the currency hierarchy. This empirical study contributed to the literature by analysing the determinants of the internationalisation of central and peripheral currencies. However, due to lack of data for currencies across time, only models in four types of currency internationalisation were evaluated: the vehicle currency, the funding currency, the short and long-term investment currencies.

In the first model, the vehicle currency, which is defined as the one used for foreign exchange operations, is widely discussed by the mainstream theory, which overemphasises the medium of exchange function of international money. In their approach, money arises as a solution to 'lubricate the wheels of trade'. Similar to the conclusions of their empirical work on this type of currency internationalisation, the results from the panel data suggested that the market size, represented by the GDP, is particular relevant for the vehicle currency. Thus, growing economies are more prone to internationalise their currencies as vehicle for trade, which is the case of the Chinese renminbi.

The second model analysed in this chapter was the funding currency. This type of internationalisation, which is proposed by Kaltenbrunner (2015), is defined by the currency used to denominate financial contract, such as debt securities. She argues that the funding currency has a strong inertial component, as the borrowing agents will have to demand this currency to pay for their obligations. The data analysed in this panel data model indicated that capital openness and exchange rate volatility are important determinants of

the funding currencies. A more open capital account and a less volatile currency increase internationalisation in this dimension.

Chapter II contributed to the literature by suggesting an additional type of currency internationalisation, which accounts for the use of peripheral currencies in the international market – the short-term investment currency. A currency is internationalised in this dimension when it fulfils the store of wealth function in the short time, as opposed to the long-term investment currency. The model on the long-term investment currency demonstrated that an increase in capital openness, as well as a decrease of inflation, lead to positive changes in this type of currency internationalisation. By contrast to these findings, the model on the short-term investment currency suggested that the interest rate plays an important role. An increase in interest rate promotes the internationalisation of currencies as a short-term investment. This conclusion corroborates the Post Keynesian international liquidity theory, where countries that issue peripheral currencies must increase the interest rates to compensate for the low liquidity premium.

Though the interest rate was found to be significant, the other variable also stressed by Post Keynesians, the net current account was not significant in any of the models and the coefficients were counterintuitive. According to Fritz et al. (2014), low levels of external debt and surpluses in the current account would lead to exchange rate appreciation in the medium term, which, in turn, increases the demand for that currency. Although one should then expect a positive relationship between current account and each of the types of currency internationalisation, the coefficients, that were significant only for vehicle and investment currency, were all negative. A possible explanation for this unexpected result is that the current account surpluses only influences the different types of currency internationalisation in the long run.

Similar to the empirical literature, which has mixed results regarding the importance of each determinant of currency internationalisation, this empirical exercise also found different conclusions across and within the models on the different types of currency internationalisation. The first explanation for some of the inconclusive results lies in the estimator chosen for the analysis, which is also very mixed in the literature. Many papers use a pooled OLS or RE estimators to evaluate the determinants of currency internationalisation. The main drawback of these estimators is that they do not account for individual

heterogeneity, which may be a source of bias. Therefore, this chapter compared the pooled OLS estimator with the FE estimator, which accounts for individual heterogeneity. The second motive for the different results is caused by the dynamic component, i.e. the lagged dependent variable, which changes the coefficients of the static model. In short, this chapter stressed that each determinant has different implications for the types of currency internationalisation, which may explain the asymmetries in the use of currencies in the international market. However, a major limitation of this empirical work is the lack of a variable that accounts for the influence on political power on currency internationalisation, which is an issue addressed in the next chapter.

CHAPTER V
THE IMPLICATIONS OF POLICY DECISIONS FOR CURRENCY INTERNATIONALISATION: A CASE STUDY OF THE BRAZILIAN REAL

V- 1 Introduction

As discussed in detail in Chapters II and IV, International Political Economy (IPE) researchers draw attention to the importance of political power in the determination of currency internationalisation, a factor mostly neglected by mainstream economists. It is undeniable the argument put forward by IPE scholars that economic and politically powerful states can influence the process of currency internationalisation. In a similar vein, Post Keynesian scholars stress another critical determinant of the international use of currencies: the 'political will', i.e. the inclination of policymakers to promote currency internationalisation (De Conti et al., 2013b). Although it is certainly a necessary condition to promote currency internationalisation, it may not be sufficient. Even if they have the political will, countries that have a limited political power may also have limitations in their capacity to influence the use of the national currency in the international market.

Little is known in the literature about which policy instruments may influence both degree and type of currency internationalisation. This topic is particularly unexplored for those currencies issued by emerging economies, which have less political power, but have a growing economic role in the international market. Therefore, a question that remains unanswered is regarding the extent to which policymakers from emerging market economies (EME)[91] can have a direct or indirect influence on the currency internationalisation process.

The mainstream economics research on currency internationalisation is marked by the strong presence of mathematical formalisation to explain the determinants of this process. Chapter IV also adopted a quantitative method to analyse the determinants of currency internationalisation, though including some factors emphasised by Post Keynesian economists. In contrast with this approach, Chapter V adopts semi-structured interviews to analyse the

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[91] This research question can also be extended to developing countries, however it is outside the scope of this thesis given the minor participation of currencies issued by these countries in the international market.

influence of political will and policy instruments in the degree and type of currency internationalisation. A general objective of this qualitative method is to complement with the results presented in Chapters II and III, which suggest that currencies issued by EME are typically internationalised as a short-term investment. Also, this method is also used with the purpose of completeness, as it further contributes to Chapter IV by analysing politics as a determinant of currency internationalisation, which is difficult to quantify.

In order to address this research question, semi-structured interviews were conducted with representatives from the Brazilian Central Bank (BCB) to provide a comprehensive understanding of the main regulations and policy initiatives that influence the internationalisation of the Brazilian real. The rationale for a case study of the Brazilian real lies in the fact that it is an example of a promising currency from an EME that has become more internationalised and yet, its position in the currency hierarchy remained the same.

As discussed in Chapter II, Post Keynesian economists argue that currency hierarchy is shaped by the liquidity premium, i.e. the confidence of international investors in the ability of a currency to fulfil the functions of international money. They also argue that policymakers from countries that issue peripheral currencies tend to set interest rates in a higher level than those issuers of central currencies to compensate for the lower liquidity premium. The empirical results from Chapter IV corroborate with this argument as interest rates are suggested to be an essential determinant for the short-term investment currency.

Though one can infer that there is a strong relationship between currency internationalisation and monetary policy, the interviewees in the BCB were unanimous to stress that the internationalisation of the Brazilian real is not a policy goal. They argue that the BCB focuses on the stability of the monetary and financial markets, and the policy instrument, the interest rates, are defined in accordance with domestic conditions. Though there is clear the impact of currency internationalisation on monetary policy, and perhaps vice versa, it is not in the scope of this thesis to assess this relationship. Thus, this chapter does not focus on monetary policy but rather on regulation and institutional mechanisms. While the existing literature, particularly the Post Keynesian, has discussed the role of monetary policy and interest rates in determining currency internationalisation, little attention has been given to regulation.

Even though it is not a policy objective, participants recognise that other measures that were taken by the BCB indeed affect currency internationalisation. This chapter is shaped by the following general research question: how have the regulation in the foreign exchange market in Brazil and other policy measures affected the nature of internationalisation of the Brazilian real?

In the semi-structured interviews conducted with representatives from the BCB as well as with some other participants from the financial market, it was identified two main sources of political influence of the BCB on currency internationalisation. The first one is with regards to the impact of (Forex) market regulation on the use of the Brazilian real by non-residents. This chapter analyses in-depth historical factors that affect this process as well as two main means of international transactions that are essential for currency internationalisation, the Forex operations and the International Transfer in Brazilian real (TIR). The second influence of policy measures on currency internationalisation is through the Local Currency Payment System (SML), which encourages the regionalisation of the BRL as an invoice currency. Though some may argue that SML accounts for a small share of the market, it is still an important step into a wider use of the Brazilian currency.

Chapter V is organised as follows. After this introduction, section V- 2 presents in detail the methodology applied in this chapter, which is the 24 semi-structured interviews with policymakers in the BCB and also with some financial market participants. Section V- 3 discusses the historical factors that affect regulation in the Forex market and currency internationalisation. This section also explains the complex mechanism behind the Forex operations and the TIR. These two types of Forex market transactions are then critically assessed regarding their impact on the internationalisation of the BRL. Section V- 4 analyses the influence of the SML on the use of the BRL in the international market. It also analyses the main risks and limitations of this system. Section V- 5 concludes with the implications of historical factors, Forex regulation and the SML for the internationalisation of the Brazilian real.

V- 2 Methodology

V- 2.1 Objective

In contrast with quantitative methodologies used in Chapters III and IV, Chapter V adopts semi-structured interviews mainly with participants in the Brazilian Central Bank (BCB) and with a few others from the private sector. In this type of interview, the researcher formulates an interview sheet for guidance, and follow up questions that were not included in it may also be asked (Bryman, 2008). One benefit of this methodology is to allow the conversation to flow more naturally and the researcher can focus on the expertise of each interviewee. Another advantage is flexibility because it also allows participants to emphasise the factors that they believe to be more relevant. Thus, the results of the interviews can provide great insights into how the participants understand the influence of politics on currency internationalisation.

There are two main objectives that motivate the adoption of semi-structured interviews to address the research questions presented in Chapter V. First, Chapters III and IV rely on quantitative methods to assess the types and the determinants of currency internationalisation, respectively. Although this research is exploratory rather than conclusive, the outcomes from the interviews complemented the results from previous chapters, which allowed this Chapter to draw a few conclusions on the limiting factors and the type of internationalisation of the BRL.

Second, the insights provided by experienced participants in the BCB and the private sector complement the results obtained in Chapters II, III and IV. The knowledge obtained from the interviews represents valuable insights to the literature, as it is difficult to make contact with central bankers, particularly those who are occupying key positions at the BCB. In addition, the semi-structured interviews were designed to present a practical perspective of how currency internationalisation works, which cannot be found in the literature and textbooks. These interviews provided a rich and complex explanation of the foreign exchange (Forex) regulation and the Local Currency Payment System (SML). As a result, this information shed some light on how Forex regulation and the SML, which are both under the control of the BCB, influence the process of internationalisation of the Brazilian real.

However, semi-structured interviews is not a novel methodology to the literature on currency internationalisation. Other researchers, such as Kaltenbrunner (2011) and Otero-Iglesias and Steinberg (2013), have also applied semi-structured interviews to analyse the internationalisation of emerging market economies. Though this chapter uses the same methodology, it addresses an unanswered research question regarding the impact of politics in the internationalisation of the BRL.

V- 2.2   Data Collection

The interviews were conducted in two stages. At the first stage, in August 2017, an interview sheet was used to conduct the semi-structured interviews with 8 participants, where only one was from the private sector. These exploratory interviews were an efficient strategy to spot questions that were missing out from the first round of interviews and to contact other potential participants at the Brazilian Central Bank. At the second stage, in August 2018, when more connections were established, 15 central bankers and one other participant from the private sector participated in the interviews. Five participants from the first stage were interviewed again in the second stage with further in-depth questions resulting from the first interview sheet.

In summary, there were 24 in-depth interviews with an average duration of 1 hour and 45 minutes, ranging from 30 minutes to three hours and 25 minutes[92]. Some researchers suggest that 10-15 interviews should be enough because answers normally start repeating after this threshold (Bruine de Bruin and Bostrom, 2013). However, this research studies not only the way they understand currency internationalisation but particularly how policy decisions from some strategic departments in the BCB affect currency internationalisation. Participants belong to different departments, and they contribute to this study from different perspectives. Thus, it was necessary a greater number of interviews to obtain a more comprehensive answer to the research questions, which was also limited by the number of policymakers who could contribute to the topic of currency internationalisation. The participants from the private work with financial strategies to operate with the BRL in the United Kingdom and in South America. Their interviews contributed to a greater understanding of the restrictions of using this currency by non-

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[92] More details in Appendix Table 13.

residents, which validated and complemented the arguments from central bankers.

All interviews were conducted in Portuguese, and most of them were conducted in person, only two on videoconference and other three were contacted by telephone. There is no consensus in the literature regarding which interview procedure is better (Bruine de Bruin and Bostrom, 2013). 23 out of 24 interviews were taped in order to gather more information with greater precision[93]. Recording and transcribing the interviews corrects for the notes inaccuracy, and the transcripts can be coded by themes, which helps to analyse the data. Another advantage is that it allows a thorough and repeated examination of the material, which in turn can also lead to more insights and to reuse the data for different purposes (Bryman, 2008). It also has the benefit of sharing information with other people, who can then evaluate the findings of this thesis.

V- 2.2.1   Participants and Sampling

In the selection process of the participants for the interviews conducted at the Brazilian Central Bank, this research adopted a non-probability, purposive and homogeneous sampling (Bryman, 2008). Non-probability sampling is a form of sampling where the respondents were not randomly selected. Participants were chosen through a snowball sampling approach, where the researcher contacts a small group of relevant participants and use this network to contact other potential participants. The selected participants were neither typical nor atypical to this research. They were chosen based on their knowledge about the relevant topic, which is subjective to the judgment of the researcher. Individuals were purposely selected to this experiment because of their potential of providing information that explains the results obtained from the other theoretical and empirical chapters.

The sample is homogenous because all participants currently work or are retired from the Brazilian Central Bank (BCB), apart from 2 interviewees who work in the private sector. Most participants were policymakers in the BCB who directly or indirectly work with policies that affect the internationalisation of the Brazilian real. For this reason, they were strategically chosen to provide insights into how the BCB can influence the process of currency

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[93] More details about the ethics of this research in Appendix Chapter V.

internationalisation. Many participants hold key-positions in the BCB, which includes a former director and a former president of this institution.

Regarding the private sector participants, one of them was pointed out by an interviewee from the BCB, and the other is an expert on international operations using the Brazilian real, which was contacted through a platform of Brazilian researchers in the United Kingdom.

V- 2.2.2   Data Analysis

All the recorded interviews were transcribed to a word document. The transcription of the general section of the interview sheet was analysed through coding. It was first selected key-words for the analysis that were then grouped into themes. As the interviews were conducted with a few participants from key departments from the BCB, each of them was manually coded. This strategy facilitates the researcher to read and analyse quotes from different participants on the same theme or code. In this part of the interview sheet, coding is far superior to analyse the transcripts because there is plenty of information from the in-depth interviews with 24 participants. The results contrast and compare the opinion of different participants as well as linking the main conclusions with the results from previous chapters.

For the specific content of the interview sheet, each interview was individually analysed. The main reason for this extensive work is because participants often explained and illustrated how certain mechanisms work. For that part of the interviews, coding is not as beneficial. The objective of the specific interview sheet is to provide rich, complex and uneven information, which is much better analysed through reading and identifying themes. This chapter developed a narrative centred on the two main topics discussed by the participants: regulation of the Forex market and the Local Currency Payment System (SML).

V- 2.2.3   Potential Weakness of Qualitative Research

A few potential sources of weakness were identified in the semi-structured interviews conducted to analyse the influence of policy decisions on the internationalisation of the BRL. As a general criticism to qualitative research, quantitative researchers often emphasise the subjective component of qualitative methodologies, which rely too much on the discretion of the researcher regarding what is important or significant (Bryman, 2008). Indeed, the choice of relevant information may be biased by the expectation of the

interviewer. However, most of the results presented in this chapter have been corroborated by many participants.

In a similar vein, a specific problem that arises with semi-structured interviews is the bias of the interviewer, which may deliberately or unintentionally shape the answers of the participants. Follow up questions can focus on areas of interest of the interviewer, which bias the results in the sense of what the interviewee believes to be more relevant information. The interview sheet was formulated considering the avoidance of potential bias from the interviewer. Additionally, participants may feel more or less comfortable to answer accordingly to the background of the interviewer or their behaviour during the meeting. Counselling interview methods recommend that researchers should be active listeners, using a nonjudgmental but encouraging tone (Bruine de Bruin and Bostrom, 2013). Thus, the interviewer did not demonstrate any preference for particular schools of economic thought during the interviews.

Participants may also be suspicious of the real intentions of the interviewer. In the case of the interviews in the BCB, this is particularly an issue because central bankers shared sensitive information during the interviews. To manage this problem, an information sheet with the terms of confidentiality and anonymity was provided to participants, who could refuse to record the interviews or draw their data at any point. As a matter of preserving their confidentiality, no quotes from the interviews were used in this research.

Another source of bias is with regards to the choice of the participants for the interview. The choice of snowball sampling in specific areas in the BCB may cause a selection bias, in which participants from the interviews may recommend other potential colleagues that share a similar opinion. However, there are not many specialists from BCB who can provide the specific information needed for this study. For this reason, it is unlikely that the sample chosen is biased. Moreover, the participants that contributed to the interviews come from different backgrounds, such as engineering, managers and economists, which allows the analysis of the same process from different specialists. For instances, among the economists interviewed, many are from different schools of economic thought, which evidences plurality in the answers provided.

A final general weakness of qualitative studies is the generalisation of results. This problem arises when the observation of one participant or the information

provided by only a few participants is used to draw general conclusions about other settings. The interviewees from BCB work in key sectors that are responsible for policy decisions related to the use the BRL by non-residents. Instead of providing general information, these participants discussed the particularities of the Brazilian foreign exchange market and other policy initiatives, such as the SML. Thus, this information cannot be generalised for other countries or currencies.

V- 3   Foreign Exchange Market Regulation in Brazil

V- 3.1   Historical Overview of the Forex Market Regulation in Brazil

The foreign exchange (Forex) market is where agents purchase and sell currencies for different purposes, such as trade, hedge or speculation. Foreign exchange operations, International Transfer in Brazilian Real (TIR), international credit card and Post Office payment orders are types of international transactions that compose the Forex market in Brazil. The main objective of Chapter V is to assess the influence of policies from the Brazilian Central Bank (BCB) on the internationalisation of the Brazilian real (BRL). To contextualise the Forex market regulation in Brazil, it is crucial to understand the historical factors that gave rise to the regulatory measures that affect the internationalisation of the Brazilian real.

There is a consensus between the participants of the interviews that the regulation of the Forex market has major implications for the internationalisation of the Brazilian real. However, they also emphasised that currency internationalisation is not a policy objective of the BCB. Among other factors, this process is rather understood as a consequence of the measures taken by policymakers to accomplish the mission of the central bank, which is to seek inflation stability and a sound financial system (Brazilian Central Bank, 2019). Three main implications of regulation for the internationalisation of the Brazilian real that are explained by historical factors of the Brazilian economy were identified in the interviews.

One of the first regulatory measures of the BCB that has had an impact on currency internationalisation is the **Circular number 24** from 1966, as illustrated in the timeline of Forex market regulation in Figure 17. This circular, which is still valid, forbids financial institutions in Brazil to apply resources abroad. In that period, the main concern of the BCB was to preserve the national savings and promote domestic investment. One of the main implications of this regulation is that it prevents foreign agents to borrow money from financial institutions in Brazil. Essentially, it rules out the possibility of internationalisation of the BRL as a funding currency.

As discussed in Chapter II, this type of currency internationalisation is crucial to improve the position of a currency in the hierarchy. Kaltenbrunner (2015) argues that to enhance the liquidity premium of a currency and, thus, its

position in the currency hierarchy, countries should ideally become a net creditor and use their currency for funding purposes. Central bankers argue that abolishing this regulation is a necessary condition to allow agents in the international market to use the BRL, which at the moment is not a policy objective of the BCB. They also observed, however, that there is not a suppressed demand from foreign agents to operate with Brazilian real in the long term.

Figure 17: Timeline Forex Regulation in Brazil
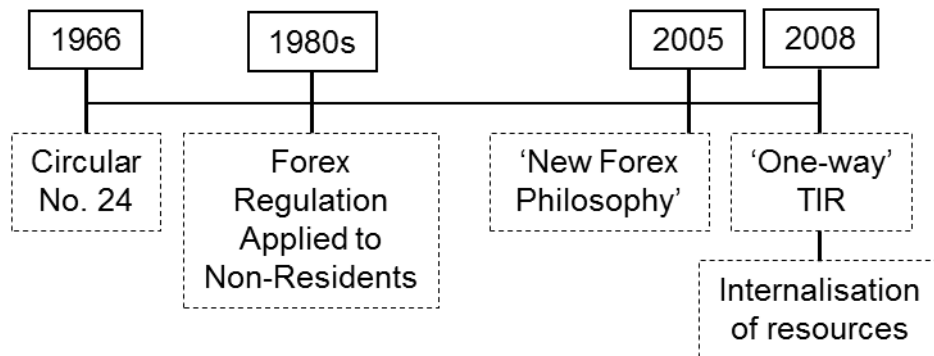
Source: Author's elaboration.

Many interviewees, particularly those who have been working at the central bank for a long time, explained that the BCB had a strict regulation on the foreign exchange market until the end of the 1980s. The justification for this tight control was because Brazil had international debt and deficient levels of foreign exchange reserves, as shown in Figure 18. At that time, the volume of reserves was not sufficient for the BCB to honour its obligations and, thus, there was also no foreign currency available for transactions in the private sector. Participants explained that in this period of reserve scarcity, the regulatory department would only allow private agents to purchase foreign currency in extreme situations, such as for imported medication or health treatments abroad.

Figure 18: International Reserves- Total - US$ (million)
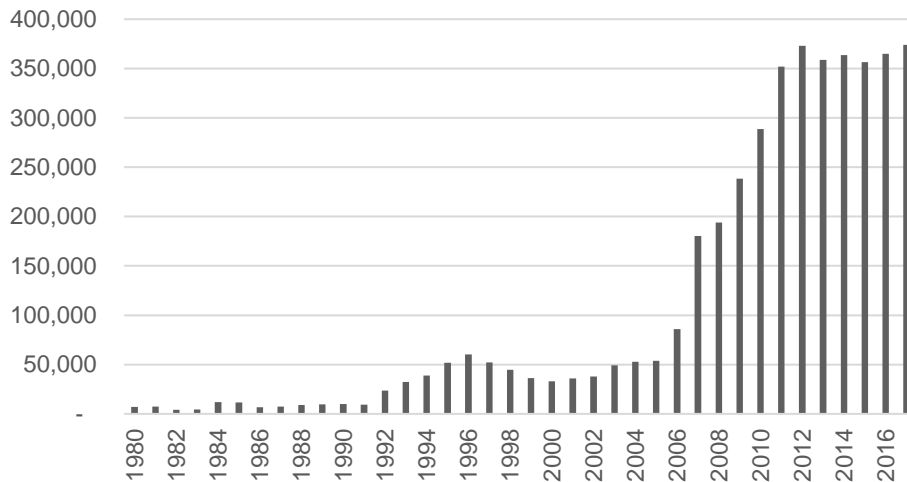
Source: Time Series Management System – Brazilian Central Bank

To increase the volume of international reserves, the BCB restricted capital outflows and purchased foreign currency from capital inflows. During the 1980s, the non-resident accounts were freely convertible, which allowed non-residents to remove their resources from Brazil at any time. Non-residents could receive and send funds through International Transfer of Brazilian real (TIR)[94], which constantly placed the volume of Forex reserves in jeopardy. To preserve these reserves, the restrictions applied to Forex operations to send resources abroad were also applied to non-resident accounts operating with TIR, as shown in Figure 17. Until the beginning of the 1990s, non-residents operating with TIR were only allowed to send resources abroad in the same amount that were once sent to Brazil. Any additional capital outflow, such as investment returns, could only be sent abroad through a traditional Forex operation[95], which was also subjected to restrictive regulation. The uncertainty regarding these restrictions on capital outflows was certainly a factor that prevented the Brazilian currency[96] to be used in the international market, though the currency at that time was also suffering problems of hyperinflation.

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[94] More details in section V- 3.3.

[95] More details in section V- 3.2.

[96] The Brazilian real was only created in 1994 with the economic strategy called 'Real Plan' (or *Plano Real*, in Portuguese)

Additionally, to increase the reserves, the BCB regulation forced exporters to 'internalise' their revenues denominated in foreign currencies. Brazilian exporters, who were the primary source of international reserves, were compelled by regulation to exchange 100% of their revenues in foreign currencies to the domestic currency. The financial institution that received this operation would then sell the foreign currency to the BCB. For this reason, not only was it forbidden to denominate exports in the domestic currency but also exporters could not keep their revenue abroad.

According to the Brazilian regulation, the BRL cannot be declined as means of payment and foreign currencies are not allowed to circulate in the domestic market[97], i.e. two residents that are not authorised to operate in the spot market cannot make payment orders in foreign currency. In other countries, such as the United Kingdom or Mexico, agents may have bank accounts denominated in foreign currencies, such as the US dollar. This regulation has two main implications. First, given that inflation in Brazil is relatively contained[98], the Brazilian Central Bank ensures by virtue of the law that the Brazilian real will fulfil the three functions of money in the domestic market. Second, this regulation forces agents who receive payments in foreign currencies to 'internalise' their resources if they have obligations in Brazil.

The growing level of reserves during the 1990s and particularly at the beginning of the 2000s, allowed the BCB to implement policies to simplify Forex operations gradually. Since 2005, the BCB has been adopting a "new foreign exchange philosophy", which comprises a range of measures to eliminate barriers to trade in the foreign exchange market (Brazilian Central Bank, 2013: p. 2). The National Monetary Council (CMN, in Portuguese) started to progressively moderate the regulation on **'internalisation' of resources** with the Law number 11,371 (2006). In the beginning, only 30% of export income was allowed to be retained abroad[99]. In 2008, the CMN finally allowed Brazilian exporters to keep 100% of their revenues abroad[100], given

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[97] Apart from a few exceptions, such as banks authorised to operate in the foreign exchange market, embassies and others.

[98] Since the implementation of the Brazilian real in 1994, the inflation has always been below two digits, except in 1995, 2002 and 2015.

[99] Resolution 3,389 (2006).

[100] Resolution 3,548 (2008).

the large volume of international reserves. Moreover, until 2008, export revenues were not allowed to be denominated in BRL[101]. The second impact of regulation was that the BRL was prevented to function as an invoice and trade settlement currency until 2008 as a consequence of the need to accumulate foreign exchange reserves.

Whilst the regulation in the Forex market has become more flexible, the operations with the non-resident accounts remained restricted. Although there is no longer the need to accumulate reserves, the bureaucracy required by the BCB in the forex market and non-resident accounts is currently supported by the Prevention of Money Laundering and Terrorist Financing program, in Portuguese *Prevenção à Lavagem de Dinheiro e Financiamento ao Terrorismo* (PLDFT). In the second half of the 1990s, the Brazilian Federal Police identified illegal remittance operations to abroad using the non-resident account, previously known as the CC5 accounts (*Carta Circular Nr. 5*, in Portuguese). The recent 'Car Wash' operation in Brazil also identified a large money laundering scheme involving foreign exchange operations. These corruption scandals increased the pressure of Brazilian institutions, such as the Federal Police, on the BCB to adopt more strict regulation, which limits and conflicts with the elimination of barriers to trade in the Forex market. As these institutions are focused on the single objective of preventing money laundering, they do not account for the consequences of this strict regulation on the Brazilian economy.

The BCB demands financial institutions to supervise and classify the nature of every operation in the non-resident accounts. It is also under the responsibility of the bank to provide all that information to the BCB. Collecting and scrutinising this documentation is not only costly for the bank, but also for foreign agents to provide evidence of legal activity for every transaction. In addition to the costs from supervising these accounts, bankers are also hesitant to operate with non-residents because of the risk of the penalties from the BCB in case banks overlook illegal operations in these accounts. A few participants argue that this regulation is hardly efficient, as money laundering is still a significant problem in Brazil.

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[101] Resolution 3,657 (2008), which was later substituted by the Resolution 3,719 (2009).

Given the costs with the excessive bureaucracy to maintain non-resident accounts in Brazil and the risk of the BCB closing down financial institutions if found illegal operations in these accounts, these financial institutions charge high administrative fees for these accounts. Consequently, non-residents are also discouraged to maintain a bank account in Brazil. The asymmetry of the operating costs between residents and non-residents is a peculiarity of the Brazilian market. This difference is usually much smaller or inexistent in other countries, particularly in those issuers of internationalised currencies, such as the United States and the United Kingdom. Thus, the third impact of regulation on currency internationalisation arises from the aim of BCB to **prevent money laundering**, which operationally limits non-residents to use the BRL.

The first and second regulations presented in this section have a direct impact on the internationalisation of the Brazilian real as a funding, trade settlement and invoice currency. Although the BCB does not prohibit non-resident accounts in Brazil, the third regulation presented in this section economically prevents non-residents to have bank accounts in Brazil. This regulation has a rather indirect impact on currency internationalisation as it economically limits the use of the BRL by non-residents. To understand the limited use of this currency, specialists in Forex regulation from the BCB provided a complex and comprehensive explanation of how Forex operations and international transfers from and to Brazil work in practice. This rich and unique information shed light on nebulous concepts and mechanisms that are rarely discussed in academia[102].

An agent or institution can send and receive international payments to and from Brazil in several different operations in the foreign exchange market. To analyse the practical implications of the lack of non-resident accounts in Brazil for the internationalisation of the BRL, it is crucial to understand the mechanism behind foreign exchange (Forex) operations and in the International Transfers in Brazilian real (TIR). The following sections V- 3.2 and V- 3.3 complement the argument presented here by focusing on the mechanisms and implications of these two international payment operations, the forex operation and the TIR.

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[102] Apart from the exceptional works of Rossi (2016) and Siqueira (2016).

V- 3.2 Foreign Exchange Operations in Brazil

V- 3.2.1 Introduction & Mechanism of Forex Operations

First, as one of the participants stressed, it is important to understand and acknowledge that international transfers do not refer to physical movements of currencies from one country to another. Apart from a few exceptions[103], international transfers do not transport cash, but instead, they change the currency ownership, from residents to non-residents and vice versa. Naturally, this statement is in line with the concept of currency internationalisation, which is the process of non-residents operating with a currency that is issued outside of their home country, as explained in detail in Chapter II.

Second, one of the specialists in regulation also emphasised that financial relations are given by residency, not nationality. The example below explains an international transfer from a company in Japan, which can be Japanese or not, to a company in Brazil, which can also be Brazilian or not. The nationality does not matter in the analysis of a foreign exchange operation because all residents of a country, regardless of their nationality, must embrace the national regulation. An example of currency internationalisation is not when the BRL is held by foreign companies that are residents in Brazil. Instead, it becomes more internationalised when this foreign company sends their resources denominated in BRL abroad, i.e. from a resident to a non-resident account in Brazil.

Third, the operational details of international transfers are imperative to understand the limited use of the Brazilian real in the international market. To illustrate an international transfer between two countries, suppose that a company in Japan (C1), which has an account in a bank in Japan (B1), would like to pay for a product imported from a company in Brazil (C2), which has an account in a bank in Brazil (B2). Figure 19 illustrates an example of a traditional Forex operation between two currencies. This operation relies on the services provided by correspondent banks, which conduct financial transactions in a foreign country on behalf of domestic banks. Some of the services provided by the correspondent banks include sending and receiving

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[103] For example, foreign cash needed in other countries for tourism purposes. During the recent World Cup and Olympic games in Brazil, the Brazilian real (cash) was circulating outside Brazil because of a tourist demand from other countries.

wire transfers[104], facilitating international trade, issuing and honouring letters of credit, accepting deposit and processing documentation (Mullineux and Murinde, 2003).

The correspondent bank can either be a subsidiary of the domestic bank abroad or a foreign bank where the domestic bank has a bank account. The domestic bank controls the subsidiary bank, which is considered a resident in the foreign country and must comply with the regulation and legislation of the foreign country. This is the reason why financial relations are given by the concept of residency, not nationality. In the example below, the correspondent bank of the bank in Japan (F1) could either be a subsidiary of the bank in Japan in the United States or a bank account of the bank in Japan in another bank located in the United States. In the former option, the subsidiary bank of the bank in Japan in the US (F1) would be considered a non-resident in Japan and a resident in the US. Thus, it must comply with the regulation and legislation of the US. For the purpose of this section, it is irrelevant on whether the correspondent bank is a subsidiary of the domestic bank or a bank account in a foreign bank. Either way, the bank in Japan (B1) will have a non-resident bank account with the US correspondent bank (F1).

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[104] Wire transfer is an electronic transfer of money from one party to another, which can be domestic or international.

Figure 19: Foreign Exchange Operation
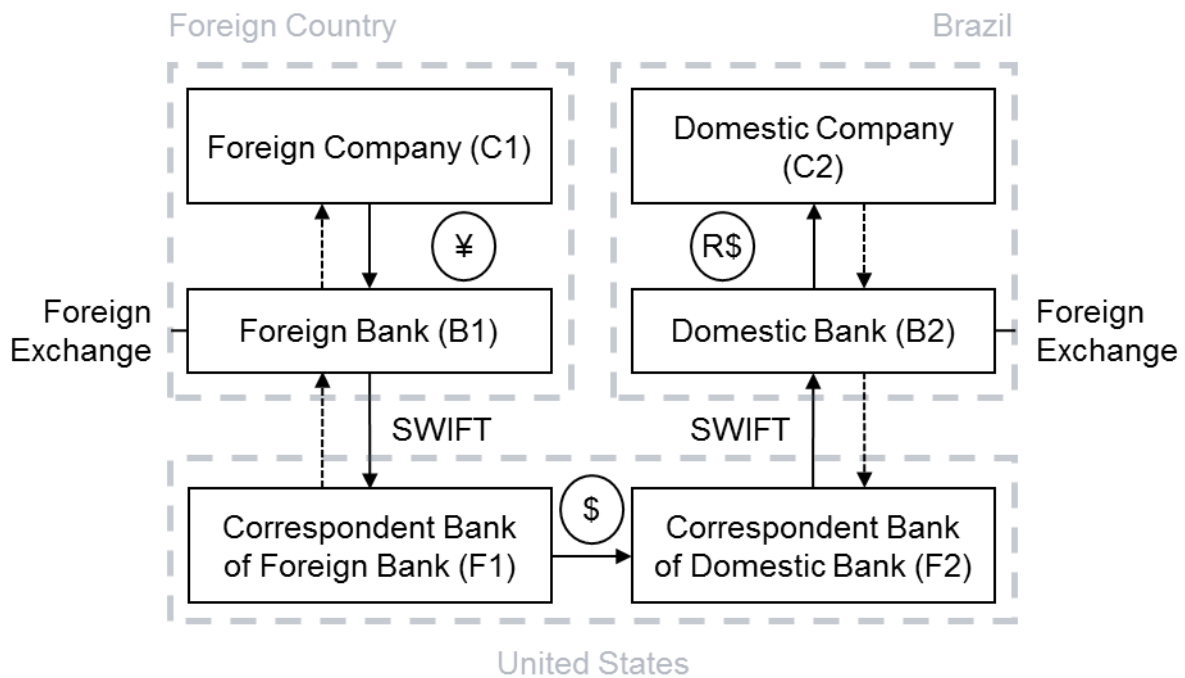
Source: Author's elaboration.

Figure 19 illustrates an international payment order from a company in Japan (C1) to a company in Brazil (C2) through a foreign exchange (Forex) operation. In this example, the operation is denominated in US dollars[105]. At the beginning of this international transaction, the company in Japan (C1) negotiates a foreign exchange operation with the bank in Japan (B1), who is selling US dollars to the company in Japan (C1) at a certain exchange rate. The negotiation in the spot market does not occur simultaneously with the financial flow, and the currency must be delivered in two business days. The financial flow unfolds as follows. On the first step, the company in Japan (C1) sends to the bank in Japan (B1) the amount of yen (¥) equivalent to the price of the import negotiated in US dollars ($).

On a second step, the bank in Japan (B1), which has an account in a correspondent bank in the United States (F1), wires funds in US dollars to the bank in Brazil (B2), which also has an account in a correspondent bank in the US (F2). At this point, the bank in Japan (B1) is exchanging yens per dollars, i.e. it is purchasing yens from and selling dollars to the company in Japan

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[105] As explained in Chapters II and III, the US dollar, as the key currency of the system, is mostly used as a vehicle currency. Thus, companies generally use US dollars for foreign exchange operations.

(C1), so this company can honour its obligation with the company in Brazil (C2). The foreign exchange operations are normally executed through SWIFT[106], which provides a platform where both the bank in Japan (B1) and the bank in Brazil (B2) manage and communicate the transaction with each other.

Although the bank in Japan (B1) has done a foreign exchange operation from yen to dollar, its correspondent bank in the US (F1) has simply transferred dollars domestically to the correspondent bank of Brazil (F2). In short, the dollars that were owned by the bank in Japan (B1) were sold to the company in Japan (C1) and transferred to the bank in Brazil (B2), with which the company in Brazil (C2) has a bank account[107]. On the third step, the bank in Brazil (B2) negotiates the exchange of the US dollars per Brazilian real with the company in Brazil (C2), who is the owner of these dollars. Finally, when an exchange rate is agreed, the bank in Brazil (B2) transfers the BRL to the company in Brazil (C2) through the Brazilian Payment System (SPB, *Sistema de Pagamentos Brasileiro*, in Portuguese). It is important to notice that these dollars remained in the United States throughout the transaction and the important aspect of this operation is not the geographical location of the money, but the location of its owner: resident or non-resident.

The inverse foreign exchange operation represented by the dashed arrows is also feasible. If a company in Brazil (C2) wishes to send a payment to a company in Japan (C1), the process is analogous: the company in Brazil (C2) negotiates an exchange rate with a bank in Brazil (B2). On the next step, the company (C2) delivers the Brazilian real (R$) in exchange for US dollars, which are held by a correspondent bank of the bank in Brazil in the US (F2). In turn, this correspondent bank (F2) sends the US dollars of the company in Brazil to the correspondent bank of the bank in Japan in the US (F1). Then,

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[106] Society for Worldwide Interbank Financial Telecommunication (SWIFT) is a network that provides message services about financial transactions between financial institutions.

[107] Actually, the company in Brazil (C2) does not necessarily need to have a bank account in the domestic bank (B2) that operates the international transaction through the correspondent bank (F2). The company in Brazil can either keep its resources in a bank account abroad or it can exchange the US dollars with the bank in Brazil (B2) for BRL. However, this level of detail is rather irrelevant to the argument and it is left aside to avoid further complication, given the complexity involved in international transfers.

the bank in Japan (B1), chosen by the company in Japan (C1), keep the dollars and delivers the yen (¥) using the exchange rate negotiated with the company in Japan (C1).

V- 3.2.2   Regulation of Forex Operations

It is important to stress two legal requirements from the BCB that affect foreign exchange operations in Brazil: the authorisation to operate in the spot market and the 'foreign exchange contract' form.

According to the Resolution 3,568 (2008) , the BCB requires that all operations of purchase and sale of foreign currency in the spot market must be performed by an **authorised institution**. Agents operating in the spot market negotiate transactions that exchange one currency for another at a rate agreed on the day of the contract for delivery in two business days (BIS, 2015). In the example in the previous section, the company in Brazil (C2) can only exchange the US dollars with an institution previously authorised by the BCB to operate in the spot market, such as the bank in Brazil (B2). Currently, the BCB granted access to 188 institutions to operate in the spot market[108]. To operate in the spot market, financial institutions must comply with the BCB regulation, which includes the responsibility for monitoring illegal Forex operations.

Whilst in the spot market agents must exchange the full amount negotiated in the contract[109], in the futures market trading parts are required to deposit only a margin, which results in higher leverage. In the Brazilian Forex market, the volume of operations in the spot market is considerably smaller than the futures market. Some researchers argue that this difference can be explained by the restrictions on the financial institutions that can operate in the spot market (Ventura and Garcia, 2012, Rossi, 2016).

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[108] Circular 3,691 (2013): "Article 33. BCB may grant authorizations to perform operations in the foreign Exchange market to multiple banks, commercial banks, saving banks, investment banks, development banks, foreign exchange banks, development agencies, credit, financing and investment societies, securities and stocks brokerage societies, securities and stocks dealers societies and foreign exchange brokerage societies."

[109] B3 is the Brazilian stock exchange that provides the infrastructure to negotiate standardised futures contacts, which are settled in Brazilian real.

However, central bankers argue that the restriction on the financial institutions that can operate in the spot market does not have an impact on the volume of transactions. Based on their experience, some participants believe that the major financial institutions that operate on the spot market are most likely to be those operating in the futures market. Additionally, regulatory specialists from the BCB also stressed that any person, company or institution could operate in the spot market provided that they operate through an authorised institution. Thus, for participants of the BCB, capital flows migrate from spot market to futures market because of leverage strategies, and not as a consequence of the regulation on the spot market.

Thus, there is less consensus on the factors that determine the migration of operations from the spot to the futures market, which is a discussion left for further research. It is clear from this discussion two intrinsic characteristics of the futures market in Brazil – its liquidity and depth. Interviewees from the private sector also explained that the participation of non-residents in this market is not forbidden by regulation. The lack of capital controls on the derivatives market in Brazil allows international investors to use futures contracts in this market as a proxy for derivative contracts in other emerging market economies (Prates, 2010).

In addition to this restriction on the spot market, all foreign exchange operations must be registered in the BCB system in a comprehensive document named the '**foreign exchange contract**' form[110], in Portuguese *contrato de câmbio*. In the example in Figure 19, the foreign exchange operation between the bank in Brazil (B2) and the company in Brazil (C2) must be registered in a foreign exchange contract. This is a comprehensive document that informs all Forex operation details: counterparties involved in the transaction (customers), amount, invoice currency, exchange rate and classification of the operation. This classification is composed of a seven-digit code, which provides information such as the trading sector for the balance of payments and the nature of the transaction (trade, finance or tourism). The foreign exchange contract must be stored by the financial institutions and it is

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[110] The Law number 11,371 states that the BCB no longer requires a foreign exchange contract for operations below US$ 3,000. Also, after the Resolution 3,568 (2008), financial institutions are no longer required to present the detail of operations lower than US$ 3,0000.

not forwarded to the central bank, though the details of all operations must be registered and categorised in the Electronic Declaration Register (RDE)[111].

On the one hand, participants argue that the level of detail registered in the BCB allows them to produce precise statistics, which is particularly convenient to support the monetary authorities in their decision-making process. On the other hand, they recognise that the costs for companies to allocate staff to manage Forex contracts and to provide detailed information to the BCB are significantly high. As a consequence of the excessive bureaucracy involved in spot market operations, agents often migrate their operations to the derivatives market.

In a nutshell, there is no consensus that restrictions on the financial institutions that can operate in the spot market increase the liquidity in the futures market. However, the interviews suggest that the bureaucracy associated with the Forex contracts in Brazil may encourage agents to operate in the derivatives market instead[112]. One of the main benefits for short-term financial investors of trading derivatives is the significantly higher leverage, which does not exist in the spot market, because the initial margins required by the exchange are only a small share of the cash value of the contract. Kaltenbrunner (2010) stresses that, as a result, market participants are able to trade risk and expand their balance sheets, which goes along not only with hedge, but also with speculative operations. A participant from the private sector believes that the volatility of the Brazilian real encourages more residents and non-residents to operate with derivatives for hedge purposes, which increases the volume of transactions in this market. The substantial liquidity of this market, the leverage opportunity, and the lack of capital controls in the futures market may, in turn, also attract speculative capital flows, in a vicious circle. Thus, given these conditions, international investors may become more attracted to short-term investments with the BRL

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[111] The RDE (*Registro Declaratório Eletrônico*, in Portuguese) is part of the Central Bank Information System (SISBACEN, *Sistema de Informações do Banco Central* in Portuguese).

[112] The derivatives market is composed of futures contract, forward contracts and options. However, the futures market in Brazil is significantly larger than the forward market (Rossi, 2016).

V- 3.3 International Transfers in Brazilian Real (TIR)

V- 3.3.1   Introduction & Mechanism of TIR

Another way that allows one to send international funds to Brazil is through the International Transfers in Brazilian Real, also known by the acronym TIR (*Transferência Internacional em Reais*, in Portuguese). There are essentially two mechanisms to transfer resources through a TIR.

In the first TIR mechanism, the foreign company must have an account with a correspondent bank in Brazil. Figure 20, which builds on the example above, explains how a company in Japan (C1) can send a payment for a product or service imported from a company in Brazil (C2). The company in Japan (C1) simply sends a payment order via SBP from its bank account in Brazil (B2) to the company in Brazil (C2) in Brazilian real (R$). This is considered an international transfer because the funds in Brazilian real changed its ownership from a non-resident, the company in Japan (C1), to a resident, the company in Brazil (C2). No foreign banks were involved in this operation and there was no Forex operation, this is essentially a 'plain vanilla' international transfer in Brazilian real. In this example, the company in Japan (C1) does not rely on the services of a financial institution in Japan. Instead, it operates directly with the domestic company (C2) using resources denominated in BRL from its account in the bank in Brazil (B2).

Figure 20: 'Plain Vanilla' TIR
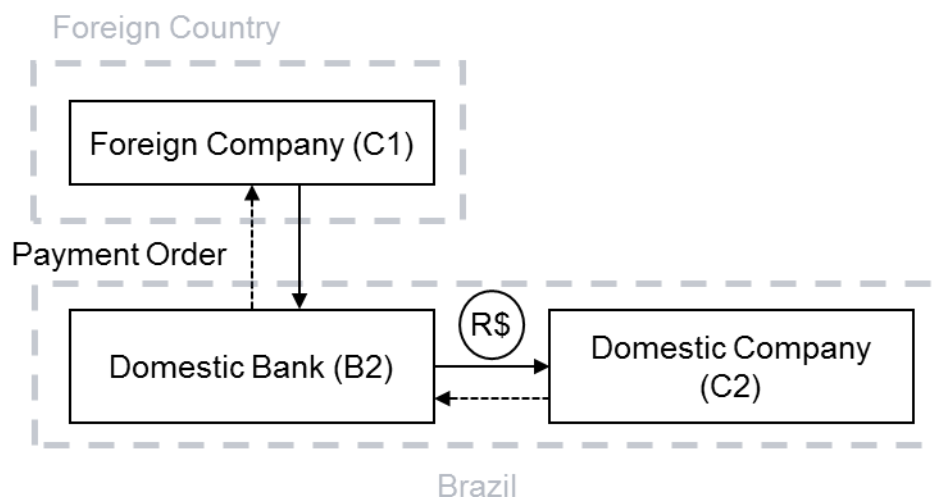
Source: Author's elaboration.

The inverse operation is represented by the dashed arrows. A company in Brazil (C2) can also send payments in Brazilian real to the company in Japan

(C1), which has a bank account in Brazil (B2). In the inverse operation, the Brazilian real 'leaves the country', i.e. its ownership is now foreign. Not only foreign companies, but any foreign financial institution that has a bank account in Brazil can send and receive payments in local currency. The reverse operation is allowed by the BCB provided that the company or financial institution operates with their funds and not on behalf of a third party.

In the second mechanism of TIR, represented in Figure 21, the foreign company (C1) does not have a bank account in Brazil. Thus, this transaction will have to go through a bank in Japan that has an account in a correspondent bank in Brazil (B2). Similar to the previous example, a company in Japan (C1) sends yen (¥) to a bank in Japan (B1), which has a bank account in Brazil (B2). The bank in Japan (B1) exchanges the yens (¥) paid by the company in Japan (C1) for the Brazilian real (R$) held in its bank account in Brazil and sends a payment order to the company in Brazil (C2). It is important to notice that the foreign exchange operation was between two non-residents abroad and no financial institutions in Brazil were involved. Therefore, this is the only part of the operation that is outside the jurisdiction of the BCB and the Brazilian regulation for foreign exchange operations does not apply[113]. Though TIR does not involve a Forex operation in Brazil, the transfer of Brazilian real involving non-residents must be operated through a financial institution authorised by the BCB to operate in the spot market.

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[113] The BCB regulation is applied to TIR as a whole, but not to the part of the operation that is negotiated outside Brazil.

Figure 21: TIR with Forex Operation Abroad
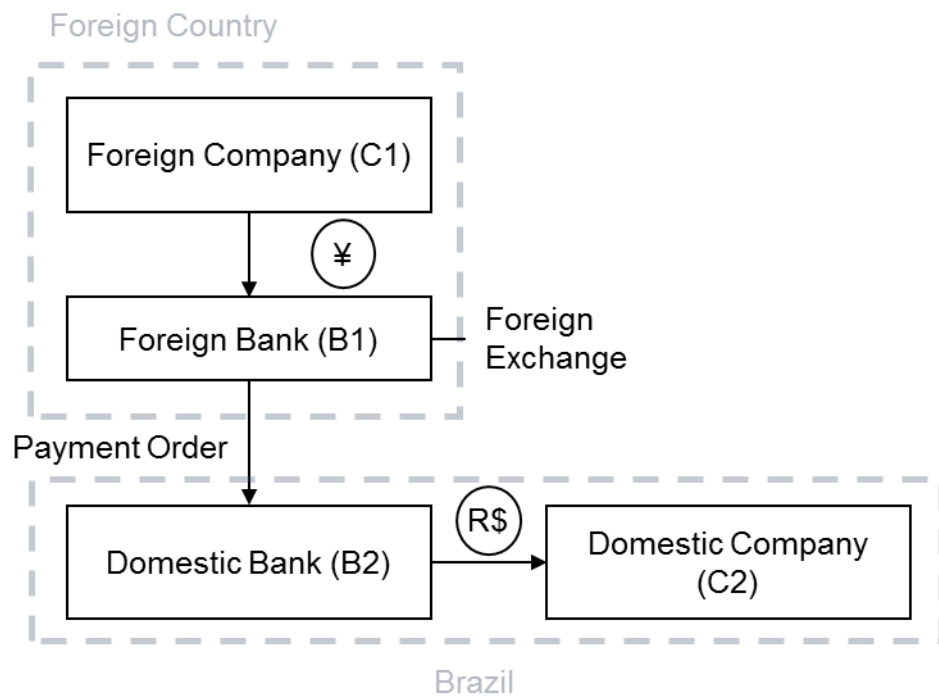
The bank in Japan (B1) has credited the company in Brazil (C2) on behalf of a third party (C1) through its account in the bank in Brazil (B2). This is an international transfer of Brazilian real from a non-resident to a resident and a foreign exchange operation in Brazil was not necessary. Neither the bank in Brazil (B2) nor the company in Brazil (C2) exchanged Brazilian real for another currency and, thus, there was no Forex operation in Brazil. The Forex operation took place abroad, between the company in Japan (C1) and the bank in Japan (B1). In comparison to the Forex operation example in Figure 19, from the standpoint of regulators in the United States, there was no foreign exchange operation in the United States. Instead, there was an international transfer of US dollars from a non-resident, the correspondent bank of the bank in Japan (F1), to another non-resident, the correspondent bank of the bank in Brazil (F2).

The reverse operation, however, is not feasible. When the operation is set on behalf of a third party, the Brazilian real is only allowed to enter the country, i.e. it can change from a non-resident to a resident agent but not vice versa. For instance, suppose instead that a company in Brazil (C2) is sending a payment to a company in Japan (C1) through the account of the bank in Japan

(B1) in the bank in Brazil (B2). The bank in Japan is not operating its funds, but the funds of a third party, the company in Japan (C1).

V- 3.3.1   The 'One-Way' TIR

The current regulation on international transfers in Brazilian real (TIR) establishes that, when a foreign bank operates in Brazil on behalf of a third party, resources may only enter the country. The Law number 11,803 (2008) and the Resolution 3,568 (2008) allows non-residents to transfer Brazilian real to residents, regardless whether the operation is on behalf of a third party. However, residents and non-residents are not allowed to transfer Brazilian real to non-residents, unless they operate with their resources. As illustrated in Figure 20, the resident company in Brazil (C2) may send payments in BRL to the non-resident company (C1) and vice versa. Figure 21 shows that when a non-resident company (C1) is operating through a non-resident financial institution (B1), it can only send payments to the resident company (C2).

Therefore, this is a 'one-way' international transfer in BRL: capital flows may enter the country (from non-resident to resident) through TIR, but it cannot leave the country (from resident to non-resident). In practice, not many foreign companies have a non-resident account in other countries. In Brazil, this is particularly infrequent because of the high costs charged by financial institutions on non-resident accounts, as discussed in section V- 3.1. To send resources from a third party abroad, non-residents must operate in the spot market with an authorised institution, which is also costly and bureaucratic[114].

Some participants from the BCB mentioned that though the Law number 11,803 (2008) may appear to be restrictive, it was a measure from BCB to allow at least 'one-way' of the TIR. This law is one of the regulatory measures that the BCB has been adopting since 2005 to eliminate barriers in the Forex market. In fact, before this regulation, foreign agents could only send resources to and from Brazil on behalf of third parties through Forex operations. However, the fact that capital flows cannot leave the country through international transfers[115] limits the use of the BRL in the international market. Consequently, the offshore market of Brazilian real, which consists of non-residents trading this currency with each other, does not exist.

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[114] More details in sections V- 3.2.

[115] Unless the agents are not operating on behalf of a third party.

The 'one-way' TIR regulation is one of the regulatory measures adopted at the time when the BCB started to implement the Local Currency Payment System (SML). Many participants mentioned that such regulatory measures were implemented under the greater political strategy to enhance economic integration between South American countries, which was supported by the former Brazilian president Luiz Inácio Lula da Silva. In this context of simplifying and eliminating barriers to Forex operations, the BCB had the opportunity to introduce a few laws, resolutions and circulars. Though the regulation that allows the 'one-way' TIR does not represent a substantial change in the internationalisation of the BRL, it is the first step towards a greater use of this currency by non-residents. Therefore, political will and the policy instruments adopted by the BCB seem to have, at least, a general impact on the internationalisation of the Brazilian real.

V- 3.4   Considerations on Forex Market Regulation & Non-Residents Trading the BRL

The focus on residency, as opposed to nationality, is crucial to understand in-depth the process of currency internationalisation. The use of a currency between non-residents is essentially operated through international transfers, as explained in sections V- 3.2 and V- 3.3. International transfers are defined by the changes in ownership of money between a resident and a non-resident or between non-residents, but there is no actual physical circulation of this money. From a regulatory and financial perspective, the BRL 'exits' Brazil when the ownership of this currency changes from a resident to a non-resident or from a non-resident to another.

Though the regulation from the BCB presented in previous sections does not forbid the use of the BRL by non-residents, it prevents these agents to use the BRL with one another. Particularly two outcomes of regulation have a rather indirect influence on currency internationalisation: the lack of non-resident operating through correspondent banks and the 'one-way' TIR. Whilst the costs of non-residents accounts economically discourage these agents to operate with correspondent banks in Brazil, the 'one-way' TIR operationally limits non-residents to trade the BRL with other non-residents through correspondent banks. When a currency cannot be traded between non-residents, it cannot fulfil most functions of international money and, thus, it is considered not convertible in the offshore market.

Though the concept of convertibility has multiple definitions[116] in the literature and this discussion is not in the scope of this thesis, a participant from the financial market explained that the BRL is often considered convertible only in onshore banks (Credit Suisse, 2013). As the offshore market does not exist and non-residents cannot send resources abroad through TIR, i.e. non-residents cannot trade BRL with each other, the only way to convert the BRL into a foreign currency is through financial institutions authorised to operate in the spot market in Brazil.

To circumvent the economic and operational obstacles to use the BRL in the international market, non-residents negotiate the BRL in the offshore market via other financial instruments, such as the Non-Deliverable Forwards (NDF). The NDF is a short-term forward contract between two parties that is settled in foreign currency, mostly the US dollar, and hence the 'non-deliverable' term. NDFs are normally traded with those currencies that experience restrictions on their international use, such as many peripheral currencies from emerging market economies (Mihaljek and Packer, 2010). When regulatory restrictions are removed and the currency becomes fully convertible in the offshore market, as it happened with the Mexican peso, the NDF becomes a redundant instrument (London School of Economics, 2012).

Whilst the derivatives traded onshore are settled in local currency, the derivatives traded in the offshore market are settled in foreign currency. Not only participants from the BCB but also from the private sector stress that the financial institutions that operate with NDF adjust their positions in the onshore market for hedging purposes, which transfers exchange rate downward or upward pressures to the onshore market (Rossi, 2016). Major international banks also offset their positions with onshore banks or with other market players (Lipscomb, 2005). Thus, the volatility of the NDF rate is transmitted to the exchange rate negotiated in the onshore market.

Although there is no consensus on this figure, major financial market participants estimate that the share of speculative operations in the NDF traded volume varies between 60% and 80%, with a growing participation of hedge funds (Lipscomb, 2005). As argued in Chapter III, this group of financial investors are often associated with short-term speculative operations (McGuire and Upper, 2007, Galati et al., 2007, Kaltenbrunner, 2010). In 2013

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[116] See more details in Arraes (1994).

the offshore market of the BRL accounted for more than 60% of the daily volume traded in the Forex market in Brazil (Rossi, 2016). Moreover, Kaltenbrunner (2010) found evidence that the majority of forward contracts negotiated offshore with the BRL are NDFs. Thus, the use of NDF may be a potential source of instability of the BRL, though the composition of the BRL offshore market is unknown.

Though there seems to be evidence that regulation on the use of the BRL between non-residents encourages the use of BRL derivatives in the offshore market, one cannot infer from the interviews that this restriction has increased the use of the BRL for speculative purposes. Whilst restrictions on foreign capital and exchange rate volatility are certainly important factors for the investment decisions, speculative capital flows are mainly attracted by the prospects of higher returns, particularly in periods of lower preference for liquidity. Thus, other variables, particularly the interest rates, play an important role in determining the use of a currency as a short-term investment.

In summary, section V- 3 discussed the internationalisation of the BRL and how this has been shaped by the regulation from the BCB. The results suggest that the main regulatory measures that economically and operationally prevent the BRL to circulate between non-residents. Consequently, the internationalisation of the BRL across the roles of international money proposed by Cohen (1971) is very limited. By contrast with the restrictive regulations presented in this section, the next section discusses an active policy from the BCB that have positively influenced the regional importance of the BRL: the Local Currency Payment System (SML).

V- 4   The Local Currency Payment System (SML)

V- 4.1   Introduction and Mechanism of the SML

The Local Currency Payment System, in Portuguese *Sistema de Pagamentos em Moeda Local* or in Spanish *Sistema de Pagos en Moneda Local*, is also known by the acronym SML. This payment system was an initiative of the Brazilian Central Bank (BCB) with the primary purpose of providing exporters and importers with the use of local currencies through quicker, cheaper and non-bureaucratic operations. The SML allows both parts in a contract to operate in their respective local currencies whilst the foreign exchange operation is done by central banks from both countries using the US dollar.

According to some interviewees who were involved since its creation, SML was inspired by the payment system observed in the European Union. SML also has some similarities to the *Directo a México*, which is a payment system for remittances from the US to Mexico. The most similar payment system at the time of the creation of SML was the Reciprocal Payment and Credit Agreement (CCR), in Portuguese *Convênio de Pagamentos e Créditos Recíprocos*. CCR was a multilateral cooperation between central banks from the Latin America Integration Association (ALADI)[117], which operates with US dollar. The BCB interviewees believe that so far there is no other similar mechanism that integrates payment systems using multi local currencies[118].

Whilst the payment systems mentioned above operate with foreign currencies, such as the US dollar, the SML operate in local currencies. The Department of International Affairs from the BCB developed this payment system that reduces the dependence on central currencies as invoice currency, vehicle currency, to access other currency markets and trade settlement[119]. Currently, the SML only has legislative authorisation to operate with countries in the Mercosur: Argentina, Paraguay and Uruguay. This payment system, however, works differently for each country. For instance, the regulation with Argentina states that the trade operation must be

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[117] ALADI has 13 member countries: Argentina, Bolivia, Brazil, Chile, Colombia, Cuba, Equator, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela.

[118] SML integrates, for instance, the Brazilian *Sistema de Pagamentos Brasileiro* (SBP) with the Argentinian *Medio Electrónico de Pagos.*

[119] The types of currency internationalisation are explained in detail in Chapter II.

denominated in the currency of the exporting country. In Uruguay and Paraguay, the invoice currency can be either the currency of the importer or exporter. Additionally, whilst the SML with Argentina only allow users to send and receive trade-related transactions[120], with Uruguay and Paraguay users can also send and receive unilateral transfers, i.e. remittances.

Figure 22: Operation Using SML
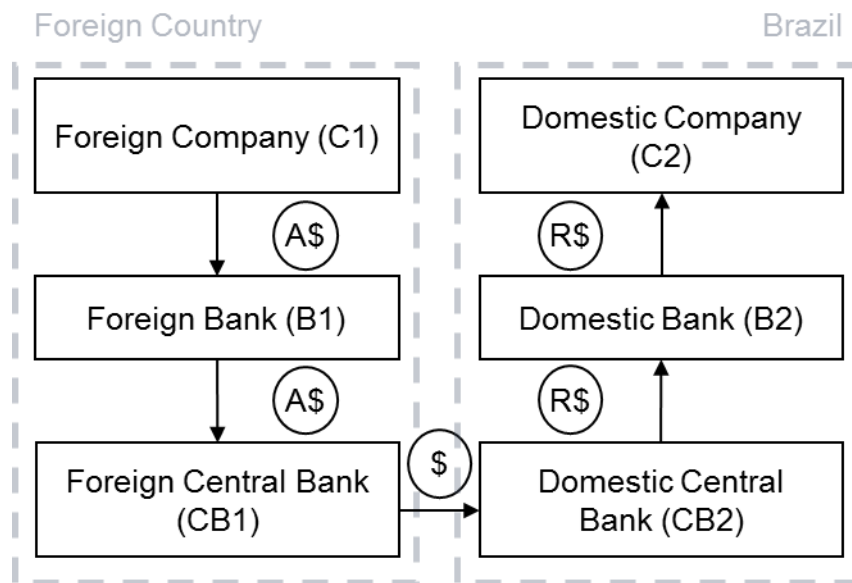
Figure 22 illustrates a company in Argentina (C1) using SML to pay for an imported product from a company in Brazil (C2). Both of companies in Argentina (C1) and Brazil (C2) need to have a bank account in a financial institution in Argentina (B1) and Brazil (B2) that are authorised by their respective central banks (CB1 and CB2) to operate with the SML. These two companies (C1 and C2) agree on an import contract denominated in Brazilian real (R$), where the company from Argentina (C1) owes the company in Brazil (C2) for the goods or services provided.

The company in Argentina (C1) will send the equivalent amount of the imported product in Argentinean pesos (A$) to its bank in Argentina (B1). This financial institution sends the money in Argentinean pesos (A$) to the central bank in Argentina (CB1), which communicates with the central bank in Brazil (CB2) through SML. At this point, it is important to draw attention to two facts. First, neither central bank is willing to hold the currency of the other in their Forex reserves. For this reason, the transaction between the two central

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[120] It is also allowed agents to send retirement pensions.

banks is settled in a foreign currency, normally the US dollar[121]. Thus, SML is an innovative system that promotes internationalisation as an invoice currency, but not trade settlement or vehicle currency, as transactions are settled in dollars. Second, the objective of the central banks is not to replace a financial institution that could do the foreign exchange operation from Argentinean pesos to Brazilian real. The central banks are involved in this operation to transfer only the net exports, i.e. exports minus imports[122]. However, since there is no direct convertibility from Argentinian pesos to Brazilian real, the central bank in Argentina uses a foreign currency from its reserves (CB1) to send payments to the central bank in Brazil (CB2).

When the central bank in Brazil (CB2) receives the payment in their reserves, it sends the equivalent amount in Brazilian real to the bank in Brazil (B2), which credits it in the account of the company in Brazil (C2). Even though in this example the company in Argentina (C1) is sending money to the company in Brazil (C2), the central bank in Brazil will not necessarily be credited from the central bank in Argentina. If Brazilian imports are larger than exports, the central bank in Brazil would have to transfer dollars to the central bank in Argentina.

V- 4.1.1   Objectives of SML

There is a consensus among interviewees that SML was created with the aim of facilitating payments in local currency. However, there was less consensus regarding the reasons as to why the Brazilian Central Bank promotes this initiative. Particularly three long-term objectives were stressed in most interviews: to allow small and medium-sized enterprises (SMEs) to participate in international trade, to foster regional integration in the Mercosur and to provide conditions that permit the use of the Brazilian real (BRL) in trade operations. Participants mostly see SML as a positive initiative for Brazil. A question that arises with this statement is regarding the extent to which SML has reached its objectives.

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[121] Central banks normally settle net exports using the US dollar because it denominates most foreign reserves, but the transaction may also be settled in another central currency, such as the euro.

[122] The original proposal of the SML project was that a private financial institution would settle the net transactions between the counterparty countries, but private institutions from Brazil and Argentina did not reach an agreement.

To begin with, smaller and medium enterprises mostly engage in local trade because of their difficulty to deal with risks and costs of operating in the Brazilian foreign exchange (Forex) market. By contrast, large enterprises have a financial sector responsible for managing exchange rate risks and hedge operations. Additionally, larger companies normally have larger volumes of operations, which gives them better exchange rates[123] when they negotiate with financial institutions. Many interviewees emphasised that the exchange rates and fees charged by financial institutions (FI)[124] to SMEs are prohibitive, given their low volume of operations. As discussed in the previous section, it is not only the exchange rate but also the high costs associated with the bureaucracy to operate in the Brazilian spot market. Consequently, there is an economic barrier for small and medium-sized companies to expand their business abroad. The first foremost objective of the SML mentioned in the interviews is to **promote trade** for SMEs.

In order to achieve this objective, the Brazilian Central Bank establishes an exchange rate that must be used in all SML operations – the SML rate. The conversion rate is calculated using triangulation of currencies with data on the official Brazilian real to US dollar exchange rate[125] and the official exchange rate of a foreign currency (Argentinean peso, Uruguayan peso or Paraguayan *guarani*) to US dollar, which is informed by the respective Central Bank[126]. Thus, the SML rate is a more competitive exchange rate in comparison to the rates offered by private FI, which profit from the exchange rates spread, particularly for SMEs. Many participants emphasised that even though the SML rate is more competitive, the objective of SML is not to substitute foreign

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[123] Financial Institutions often profit from exchange rate spread, which is the price difference between the purchase and the sale of a currency. This spread is normally lower for larger companies, as they trade larger volumes. Thus, they can negotiate better exchange rates in the Forex market.

[124] In this thesis we define Financial Institutions (FI) for being those who can operate in the Forex market, such as commercial banks, foreign exchange brokerage societies and others. See more details in section V- 3.2.2.

[125] PTAX is the Brazilian real to the US dollar exchange rate, which is calculated and published by the BCB.

[126] During the implementation of SML, policymakers had to emphasise that the SML rate was the spot market rate, and not a fixed exchange rate regime, to prevent market speculation against it.

exchange operations or to make all transactions to go through SML, but to provide another possibility for international payments.

However, participants believe that the BCB has not accomplished the objective of promoting international trade for SMEs. Though one should expect a large share of SMEs in the SML operations, according to the data from the BCB[127], nearly all SML operations are traded by large companies. A possible explanation for this unexpected difference may be the fact that the volume of operations of SMEs is significantly smaller than the volume of operations of large companies. Data on the number of users of SML by size is not available.

Some central bankers explained that SMEs would not necessarily engage in international trade only because they can operate with local currency. Many other factors influence the decision of companies to expand their business to foreign markets, such as international demand for their products and logistics. The users of SML are mostly those companies that do not have their liabilities denominated in dollars, but in local currency, such as wages and other production costs. Particularly for those companies located in the frontier with countries in the Mercosur, SML is a payment system that encourages and facilitate international trade, as shown in Figure 23. Data reveal that SML is mostly used by inter-industry trade, particularly in the automotive sector. Companies that have subsidiaries in different Mercosur countries use SML to facilitate their supply chain trade.

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[127] This data is no published by the BCB. More details in Appendix Figure 1.

Figure 23: Operations of SML with Argentina by Geographic Location
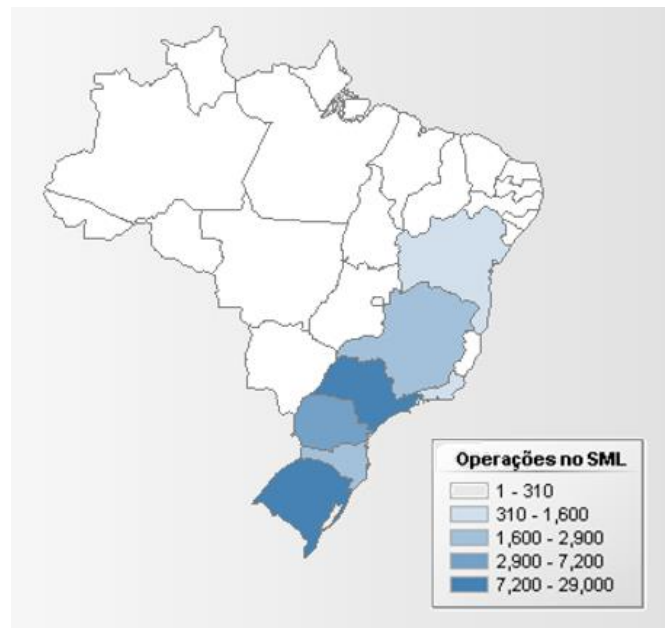
Source: Brazilian Central Bank (BCB) in 2018. On the left-hand side: number of total operations of the SML

The second objective identified in the interviews was the promotion of a **regional integration**, which was mentioned by many participants. A few interviewees, who were involved in policy decisions, believe that the objective of SML was to promote an integration particularly between countries in the Mercosur. Although SML was an initiative of analysts and technicians from the BCB, its implementation had great support from the former presidents of Brazil and Argentina, Luiz Inácio Lula da Silva and Cristina Fernandéz Kirchner, respectively. Thus, behind all these rationales for the SML creation was a greater political objective of promoting Brazil as the protagonist of this regional integration.

At that time, not only the SML but also the Forex regulation in Brazil benefited from the political support to increase economic integration between countries in the Mercosur. Although the SML does not have an objective of currency internationalisation, this system was crucial to remove some regulatory barriers that prevent the BRL to become more internationalised. The most important one was to allow exporters to invoice their contracts in BRL and the 'one-way' TIR, as discussed in detail the previous section.

Though Brazil already plays an important role in the Mercosur, the greater use of the Brazilian real in trade stresses the economic and political power of Brazil. To provide a payment system in local currency at a reasonable price

that could be afforded by SMEs, the central banks in the Mercosur had to simplify the operations to reduce costs and transaction time. Consequently, the payment system between countries in the Mercosur became more integrated to allow the use of local currencies, which clearly has consequences on currency internationalisation.

The third objective of SML is with regards to the creation of conditions to support a greater participation of **Brazilian real in trade operations**. All participants were keen to stress that the primary objective of the BCB is "to ensure the stability of the currency's purchasing power and a solid and efficient financial system" (Brazilian Central Bank, 2019). Some of them acknowledged that the SML is currently the best channel for the international use of the Brazilian real. The internationalisation of the BRL is understood as a by-product of the objective to allow, but not necessarily promote, the use of the BRL in international trade. Although the share of Brazilian real denominating trade invoice is rather small, data from the BCB shows that most SML operations are denominated in BRL because of the large share of operations with Argentina. Thus, this payment system in local currency has increased the use of the BRL to denominate trade contracts, i.e. it promotes the internationalisation as invoice currency.

An interviewee also mentioned that a rather indirect objective of SML was to create a market for an exchange rate between currencies in the Mercosur and reduce the use of the US dollar as a vehicle currency. The idea was not to create two different exchange rates, which would encourage arbitrage opportunities. Instead, it would allow direct conversion between two peripheral currencies. However, it was also mentioned that this indirect objective has not been successful. SML still uses the US dollar for currency triangulation because currencies from the Mercosur are not traded against one another. Thus, the SML has not diminished the regional role of the US dollar as a vehicle currency.

V- 4.1.2 Participation of Countries in the SML

The Local Currency Payment System, which was an initiative of the Brazilian Central Bank (BCB), is mostly used by Brazilian exporters. Although the share of the BRL denomination through SML is small relative to the trade volume in Brazil, according to participants from BCB, after the SML was introduced, the BRL also became more used as an invoice currency outside SML. Before SML, the international trade in BRL was inexistent, particularly because of the

BCB regulation. Although there was an increase of real as an invoice currency, this does not mean that the Brazilian real will be used to settle trade.

The operations between Brazil and Argentina are particularly asymmetric to the figures on trade operations outside this system. Although Brazil has a history of trade balance surpluses with Argentina, according to data retrieved from the BCB website, nearly 100% of the SML operations are exports from Brazil to Argentina, as shown in Table 17. Hence, the Brazilian real predominates in the SML, since the operations with Uruguay and Paraguay are substantially smaller than the operations with Argentina. Essentially, most of the exchange rate risk is taken by Argentinean importers whilst Brazilian exporters are certain about the amount to be received. Hence, the SML appears to promote more the use of the Brazilian real than the Argentinean peso in the regional trade.

Table 17: Imports and Exports in the SML with Argentina

Argentina	Exports		Imports*		Total
Date	No.	Amount (R$)	No.	Amount (R$)	Share of BRL
2008	31	9,882,612.65	10	1,313,842.06	88.3%
2009	1163	451,061,104.78	72	4,296,941.53	99.1%
2010	3353	1,252,700,553.25	40	8,998,129.07	99.3%
2011	487	1,623,201,038.91	50	8,736,895.69	99.5%
2012	7431	2,277,897,217.86	83	17,245,299.73	99.2%
2013	9041	2,581,447,704.82	47	10,525,643.55	99.6%
2014	919	2,313,261,335.97	38	5,033,622.97	99.8%
2015	10788	2,504,490,534.16	38	37,573,226.80	98.5%
2016	8264	2,469,907,531.59	34	21,772,789.50	99.1%
2017	7619	2,341,900,041.18	22	4,092,223.25	99.8%
Jan-18	604	219,329,949.07	2	159,736.83	99.9%
Feb-18	506	145,520,158.20	1	81,349.58	99.9%
Mar-18	606	203,435,833.44	3	407,605.52	99.8%
Apr-18	710	206,645,957.87	2	28,032.12	100.0%
May-18	713	259,213,365.22	5	437,423.17	99.8%
Jun-18	665	202,630,919.42	3	326,246.31	99.8%
Jul-18	683	207,246,686.38	5	599,697.37	99.7%
Aug-18	758	232,355,981.27	6	247,654.62	99.9%
Sep-18	616	248,656,126.62	3	885,407.08	99.6%
Oct-18	673	201,150,007.17	1	25,062.41	100.0%
Nov-18	463	201,609,689.33	1	44,382.37	100.0%

Source: Brazilian Central Bank – SML; (*) The value of imports is the sum of SML transactions, which is set in Argentinean pesos, was converted to BRL using the SML rate. This is the amount charged from the financial institutions.

This asymmetry in the operations with Argentina raises the following questions: why are the Brazilian exports to Argentina on SML significantly larger than the imports? And, given this discrepancy, why would the central bank of Argentina be interested in this payment system? The answers to these questions were explained by the participants with two main factors. One is a political factor, as the presidents Kirchner and Lula were interested in a greater integration between Brazil and Argentina at the time of the creation of the SML.

The second factor refers to the preference of Argentinians exporters to receive their payments in US dollars. One of the participants explained, the reason why we do not have many remittances from Brazil to Argentina is because the Argentineans prefer to receive payments denominated in the US dollar, a 'strong currency'. As discussed in Chapter II, this may be explained by the fact that the US dollar is the major funding currency of the system, and it most likely denominates the liabilities of Argentinean exporters. For this reason, they prefer to denominate in US dollars to avoid currency mismatch. Another reason is that Argentineans do not have confidence in the ability of the peso to function as a reserve currency. Thus, the inability of the Argentinean peso to fully fulfil the functions of money domestically further prevents its use in the international market. In contrast with Brazil, where the current regulation does not allow any foreign currency to circulate in the economy[128], the US dollar fulfils the store of value function in Argentina.

The SML started operating with Uruguay in 2015, but the volume of operations in 2018 is still roughly 5% of the volume of operations with Argentina. The interviewees argue that this discrepancy is explained by three main facts. First, the trade operations between Brazil and Uruguay outside SML, which is normally denominated in US dollars, is much smaller than the trade between Brazil and Argentina. Second, the operations started more recently, it takes some time until the system is disseminated for agents interested in trade and financial transactions between Uruguay and Brazil. Third, Uruguay is economically smaller than Argentina and Brazil, so the BCB already expected that its participation on SML would not be as large as Argentina.

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[128] Apart from a few exceptions, such as embassies and financial institutions, that are allowed to operate with foreign currency in Brazil.

A point stressed by many interviewees is that trade with Uruguay is, however, more balanced regarding the volume of imports and exports, whereas Argentina mostly imports from Brazil. Table 18 shows the volume and number of export and import operations with Uruguay. Though the total amount of exports is set in Brazilian real and the imports are converted from Uruguayan pesos to BRL, it does not mean that these were the invoice currencies for imports and exports. Thus, one cannot draw conclusions about the participation of BRL in the SML with Uruguay based on the data published by the BCB. One can infer that the US dollar remittance of net exports between the central banks is more balanced, even though Brazil also has a trade surplus with this country.

Table 18: Imports and Exports in the SML with Uruguay

Uruguay	Exports		Imports*	
Date	Number of Operations	Amount (R$)	Number of Operations	Amount (R$)
2015	115	12,144,617.55	22	15,355,759.34
2016	278	40,705,346.15	105	31,088,250.92
2017	424	65,689,341.03	247	34,448,782.49
Jan-18	33	8,167,660.14	25	6,576,667.67
Feb-18	42	11,224,201.44	27	6,967,979.17
Mar-18	47	8,088,069.43	27	3,258,179.92
Apr-18	57	10,219,088.92	22	1,999,313.54
May-18	62	12,885,229.54	7	1,114,966.46
Jun-18	58	8,361,495.08	4	889,129.51
Jul-18	77	16,811,713.42	14	7,552,930.74
Aug-18	74	11,252,261.75	13	960,663.92

Source: Brazilian Central Bank – SML; (*) The value of imports is the sum of SML transactions, which is set in Uruguayan pesos, was converted to BRL using the SML rate. This is the amount charged from the financial institutions.

Finally, Paraguay was recently incorporated in the SML and policymakers from the BCB believe that it is still too early to draw any inferences regarding the participation of the Brazilian real in the operations. The data available is presented in Table 19. Similar to Uruguay, participants do not expect that operations using the BRL will turn out to be as asymmetric as they are with Argentina. Although they expect the BRL to account for a larger share of the operations than the *guaraní*, given the size of their economy and their trade relations with Brazil, the fact that agents can freely choose which local currency denominates the contracts gives more space for other currencies in

the Mercosur. Participants also mentioned that the Paraguayan central bank was very interested in launching SML.

Table 19: Imports and Exports in the SML with Paraguay

Paraguay	Exports		Imports*	
Date	Number of Operations	Amount (R$)	Number of Operations	Amount (R$)
Jul-18	0	-	0	-
Aug-18	5	281,672.06	1	4,182.70

Source: Brazilian Central Bank – SML; (*) The value of imports is the sum of SML transactions, which is set in guaraní, was converted to BRL using the SML rate. This is the amount charged from the financial institutions

The BCB needs a legislative authorisation to operate with each country in SML. At the moment, the BCB is only allowed to operate the SML with countries in the scope of the Mercosur, namely Argentina, Paraguay and Uruguay[129]. Some interviewees believe that this was a precautionary measure in the sense of testing the outcomes of the SML in the Mercosur before expanding this system to other countries. They also mentioned that the extension of SML to other countries is a long and slow process, which may be an obstacle to diffuse this system.

One of the interviewees explained that, at the time of the introduction of the SML, the group of countries that composes the acronym BRICS[130] did not seem very keep in participating on a system with local currencies. For instance, India, which exports commodities, would not benefit much from such a system because they mainly operate with US dollars. It was expected that China would be interested in operating with SML given their volume of trade operations with Brazil. However, the Chinese central bank seemed to have a more ambitious strategy in terms of investing in their payment system. This strategy facilitates to achieve the policy objective of internationalisation of the Chinese renminbi as well as promoting its leading role in Asia.

Other potential partners in Latin America that could increase the importance of SML in the region, such as Mexico, also did not demonstrate much interest. As explained in the previous section, Mexico uses the system called *Directo*

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[129] Venezuela is also a full member of the Mercosur, but is has been suspended indefinitely since August 2017.

[130] BRICS stands for Brazil, Russia, India, China and South Africa.

a Mexico. This is a payment system sponsored by the Federal Reserve and the Bank of Mexico to send remittances mainly from the US to Mexico denominated in US dollars. There has also been some negotiation with the Community of Portuguese Language Countries (CPLP), but the main obstacle is that they would have to set up a whole new system to operate with the SML, and they do not seem to believe it would be beneficial.

Some other interviewees mentioned that other central banks outside Latin America had contacted the BCB with interest in the SML. Also, SML users have occasionally suggested the expansion of this system to other countries. Thus far the SML is limited to operate with countries in the Mercosur, and participants did not seem to expect changes in the near feature. In order to understand the limited influence of SML on currency internationalisation, it is crucial to investigate the risks of operating with this system and the factors limiting the expansion of this system within and beyond the Mercosur.

V- 4.2   Considerations on the SML

V- 4.2.1   Risks of Operating with SML

The Brazilian Central Bank needed two legislative authorisations to start operating with SML. One of them refers to the countries that are allowed to operate with Brazil through SML, as mentioned in section V- 4.1.2. The other authorisation refers to the countries that the BCB can offer a 'contingency margin', which is a credit that the BCB is allowed to lend to another central bank in the scope of the SML. The Reciprocal Payment and Credit Agreement (CCR) is a multilateral payment system where central bank works as a payment guarantor for the counterparty countries. In this system, the Brazilian Central Bank bears a credit risk in case of insolvency of domestic banks (Franco, 2000). In contrast with the CCR, the SML was designed to avoid this risk. However, most participants recognised that the BCB still bears some **credit risk** because of the contingency margin. This credit can be offered to Argentina and Uruguay, but not to Paraguay, which has recently started operating with SML.

The SML with Argentina started operating in 2008, simultaneously with the recent financial crisis, and the SML with Uruguay started operating seven years later. The delay between the start dates of Argentina and Uruguay is explained by long period to approve the contingency margin in the Congress. For this reason, the BCB decided not to incorporate the contingency margin

with Paraguay, which eliminates the possibility of credit risk with this country. One of the participants mentioned that after operating with Paraguay without the contingency margin, central bankers recognised that this credit was not crucial for operations in SML. In practice, the contingency margin can only be used by Argentina or Uruguay, as Brazil receives net flows from both countries.

Under normal circumstances, the BCB only pays the financial institution in Brazil or the foreign central bank[131] when it receives the money from the foreign central bank or the financial institution in Brazil, respectively. The contingency margin is only given to other central banks when specific problems arise during the operation through SML. For example, central banks use the contingency margin when it is a bank holiday in New York, which prevents central banks from sending payments denominated in US dollars from their respective correspondent bank in the United States.

The contingency margin may also be used when the total value of the net exports is so small that the costs associated with the international transfer are almost equivalent to the amount to be transferred. In this case, the foreign central bank uses the contingency margin and the amount owed to the BCB is accumulated with the net exports of the next working day. Thus, when foreign central banks use the contingency margin, the BCB transfers the money to the Brazilian financial institution, even though it has not yet received the money from the other central bank. However, the interviewees stress that this credit risk is insignificant given the low probability of default from another central bank, particularly because it has already received the payment from the foreign financial institution. Moreover, the credit is borrowed in a very short period, typically overnight or only for a few days.

Another precautionary measure taken by the BCB to reduce credit risk was to limit the operations via SML to 365 days. Essentially, the contract between the Brazilian and the foreign agent cannot exceed one year, which inhibits large transactions of long-term investments, such as the construction of

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[131] The BCB pays the Brazilian financial institution when the Brazilian exports exceed Brazilian imports (positive net exports) and the BCB pays the foreign central bank when the Brazilian imports exceed the Brazilian exports (negative net exports).

hydroelectric power plants. Nevertheless, by the time of the interviews[132], roughly ten years after the operations with SML started, the BCB has not been requested to increase this maximum length for each transaction via SML. This suggests that foreign agents are only willing to issue contracts in denominated in Brazilian real in the short-term, i.e. fewer than 365 days.

This conclusion further corroborates the hypothesis in Chapters II and III, where theoretical and empirical evidence shows that the Brazilian real fulfils store of value function only in the short-term. Thus, one may infer that the Brazilian real is also becoming more internationalised across the unit of account function, as a regional invoice currency through SML operations. Nevertheless, the amount traded in BRL is still marginal and this does not represent a significant change in terms of the confidence of international investors in this currency – the Brazilian real remains at the bottom of the currency hierarchy.

The interviewees also identified **other risks** that are always involved in any transaction with a central bank, such as the image risk, legal risk and operational risk. Though BCB has no credit risk with Paraguay as there is no contingency margin for this country, the BCB still bears these secondary risks with every country. Central bankers also explained that SML causes no risk to foreign exchange reserves or to inflation. In the scope of SML, the BCB receives US dollars when the exports are greater than the imports. However, the BCB does not operate in the forex market to exchange the US dollars for Brazilian real (BRL). Instead, it keeps the dollars in the reserves and credits BRL in the account of the Brazilian financial institution, i.e. it expands the money supply. Policymakers argued that the amount traded with SML is too small to have any impact on the monetary base. Moreover, the additional supply of BRL is backed by an increase of US dollars in the Forex reserves, which also explains why the BCB does not exchange the foreign currency for BRL in the Forex market. Although Brazil is mostly a net exporter in SML, the increase of US dollars in the reserves is still insignificant when compared to the total volume of Forex reserves.

In addition to the risks identified for the BCB, which are rather small, the interviewees also mentioned another unavoidable risk taken by the private sector: the **foreign exchange risk**. This risk does not apply to the central

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[132] Interviews were conducted in September 2018. See more details in section V- 2.

bank, as the SML rate fixed by the BCB is actually the market rate on the day of the transaction. Thus, the private agents involved in these transactions have to bear the Forex risk that arises from three different sources.

The first one is with regards to the SML rate, which is published by the BCB once a day. For this reason, financial institutions that need to operate with the SML before the official exchange is available in the BCB website must use a proxy for the SML rate, which is normally the exchange rate of the previous day. Thus, the amount transferred from the agent to the financial institution is probably not accurate. Once the SML rate is published, the financial institutions must negotiate the difference with the customer, which can be a source of exchange rate risk. In the unlikely event of a strong currency devaluation from one day to another, this could potentially create problems for the client to pay its obligations to the FI. Participants explain that the financial institutions often collect a deposit from their clients in order to do these adjustments, but depending on the exchange rate depreciation and the transaction volume, it could potentially be not enough.

The second Forex risk refers to the currency mismatch that arises when the currency that denominates the assets differs from the currency that denominates the liabilities. In the case of SML, the Forex risk would arise if the exporter that receives payments in local currency (asset) has its costs, such as operational costs or credit, denominated in a foreign currency (liability). However, this risk is rather irrelevant for SML, as the users of this system are those companies that mostly operate with local currency.

The third and last source of Forex risk comes from the choice of invoice currency. The SML regulation on the currency denomination of trade or financial contracts varies according to the counterparty country. In the SML operations with Argentina, the invoice currency must be the domestic currency of the exporting country. However, the SML regulation has become more flexible with time and it was adapted for Uruguay and Paraguay to allow users to choose the invoice currency regardless whether they are importers or exporters. Data on the SML operations within countries in the Mercosur shows that Brazil is predominantly a net exporter. Although only the exports to Argentina are issued in Brazilian real, the operations with Paraguay are Uruguay are considerably smaller. Moreover, the literature suggests that the invoice currency is normally the currency issued by the exporter (Krugman, 1984).

At this point, two main conclusions must be emphasised. One is that the forex risk is normally taken by the importer, and the appreciation of the BRL increases the costs of the transaction for the foreign party. This is an evidence that countries in the Mercosur, particularly Argentina, are willing to take the exchange risk against of invoicing the contract in BRL. Some contracts are issued months before the agents use the SML to settle a payment, limited by one year difference between the negotiation and the payment. However, the foremost conclusion is that the Brazilian real is playing a more important role as an invoice currency through the SML, which promotes its use in the South America region. Though the Brazilian currency is not used as means of payment, it denominates trade and financial contracts in SML, i.e. it works as an invoice currency.

V- 4.2.2   Operational Factors Limiting the Use of SML

The Local Currency Payment System (SML) has increased the share of Brazilian real (BRL) in trade denomination over the last decade, according to participants from BCB. Nevertheless, this system remains quite limited, as only an insignificant share of trade with Brazil is denominated in BRL. As discussed in section V- 4.1, the SML is an international payment system that aims to provide cheap, non-bureaucratic and quick operations in local currency. The majority of the participants identified the same problems in the system with regards to the factors that prevent SML from achieving a greater share of the market, though their opinion diverges in terms of causes and solutions.

In order to achieve the objectives discussed in section V- 4.1.1, particularly to become attractive to small and medium enterprises, the BCB established that those financial institutions operating with the SML on behalf of other companies must comply with the exchange rate disclosed by the BCB, the SML rate, in addition to a transaction fee. In Forex market financial institutions normally charge an exchange rate spread and a transaction fee. The clients often do not fully understand the costs involved in a Forex operation because of the bureaucracy and complexity of the Forex market regulation.

As the volume of transactions of SMEs is significantly smaller, they have no bargaining power to negotiate the transaction fee, which is not an issue for larger companies. Participants indicated that the costs with the transaction fees could be up to 50% cheaper in SML in comparison to the fees charged by financial institutions in a normal Forex operation. Though the BCB offers

competitive exchange rates and requires costs associated with transaction fees to be transparent for the users of the system, participants have identified that transaction fees for small companies are often too **expensive**.

The second factor limiting the use of SML, according to BCB representatives, is the **operational bureaucracy**. As explained in section V- 3.1, financial institutions are responsible for identifying illegal operations carried out by their clients in the Forex market. Though financial institutions operating with SML are not involved in a Forex operation, their precautionary measures remain the same. The BCB has been pursuing the disassociation of the SML operations from Forex operations, but it has not been successful. Financial institutions still ask their clients extensive documentation for each operation, which results in excessive bureaucracy in the SML. The regulation in the Forex market does not apply to the SML, which operates with local currency, but it still has an indirect effect on it. Central bankers suggest that financial institutions should follow the 'know your customer' strategy, in which they collect information on how much their clients normally transfer, their type of business and with whom they negotiate. Thus, rather than requiring extensive documentation for every single operation, they could just identify operations which are out of the ordinary without excessive bureaucracy.

The SML circular requires more documents when the operation exceeds US$3,000, in which case it has some similarities to the regulation applied in the Forex market. This could potentially be the reason why financial institutions associate SML operations with Forex operations. Therefore, the strict regulation of the BCB justified by the Anti-Money Laundering (AML) program limits the use of SML. One of the interviewees argues that the bureaucracy in the SML does not prevent from reaching more users, but it is instead a barrier to let the operations flow faster.

The third limiting factor of SML is the **delays in operations** via this payment system. The BCB expected that SML could quickly transfer money as if it was a traditional bank transfer between residents. However, the SML payment operation normally takes three days to complete. This transfer is slightly longer than operations in the spot market, which takes up to two business days from the trade date. The major cause of this delay is the bureaucracy from financial institutions due to the regulation of the BCB, as explained above. Although central bankers clarify to these institutions that SML operations are not considered foreign exchange operations, they are excessively concerned about penalties for overlooking illegal operations.

Some participants believe that the apprehension of financial institutions towards the BCB is rooted in the banking culture in Brazil and it will remain a challenge to reduce the bureaucracy in SML.

V- 4.2.3   Economic and Institutional Factors Limiting the Use of SML

In addition to the operational factors that prevent SML to work efficiently, i.e. with cheaper, less bureaucratic and quicker transactions than the Forex market, the interviews identified four other institutional factors that also limit the use of SML. The first limiting factor recognised by almost all interviewees is the **lack of low-cost credit**. The basic interest rate in Brazil, the Selic rate[133], is one of the highest real interest rates in the world[134], though it has been recently decreasing. Hence, export companies in Brazil have difficulty to finance the production of good or services. In contrast, the lack of low-cost credit is not an issue for importing companies that use SML, as the volume of importing operations is significantly smaller than exporting operations in SML. The rationale for this asymmetry lies in the fact that most exporters in Argentina, which is the larger trading partner of Brazil in SML, are not interested in receiving payments in local currency.

To circumvent this limitation, exporting companies in Brazil normally access subsidised credit programs or credit denominated in dollar through instruments such as Advances on Export Exchange Contracts (ACC) or Advance on Export Shipment Documents (ACE) [135]. The ACC and ACE offer lower interest rates that are obtained by Brazilian banks in the international market. A currency mismatch problem arises when agents that have their claims denominated in local currency create liabilities denominated in a

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[133] Selic is the Special System for Settlement and Custody (*Sistema Especial de Liquidação e de Custódia*, in Portuguese), where the BCB executes open market operations for monetary policy purposes. The Selic rate is the overnight interest rate in the interbank lending market.

[134] According to data from BIS on central bank policy rates in 2018, Selic is amongst the top five highest interest rates in the world.

[135] *Adiantamento sobre Contrato de Câmbio* (ACC): "Pre-shipment financing that provides exporters of goods and services with the working capital required to produce the goods to be exported". *Adiantamento sobre Cambiais Entregues* (ACE): "Post-shipment financing that enables the exporter of goods and services to offer better terms to customers abroad". Source: China Construction Bank (CBB).

foreign currency, e.g. US dollar. Thus, the fact that many Brazilian exporters have their liabilities denominated in US dollar using such credit instruments is a factor that limits the use of SML. In contrast, exporting companies that use the US dollar as invoice and trade settlement currencies may instead access credit in the international market at lower interest rates and without exchange rate risk. As a result, the users of SML in Brazil are mostly companies that have their liabilities denominated in Brazilian real.

Therefore, the high interest rates in Brazil have two major consequences for currency internationalisation. First, as suggested by a participant of the interview, as long as the interest rate differential between the US dollar and the Brazilian real remains high, there is no solution for the credit issue in SML. As argued in Chapter II[136], interest rates are an instrument used by policymakers to compensate for low liquidity premium. Thus, the fact that the Brazilian real is positioned at the bottom of the currency hierarchy prevents its internationalisation as invoice currency through SML, as the lack of low-cost credit induces exporters not to use the BRL in international trade. Second, in line with the argument of Kaltenbrunner (2015) presented in Chapter II[137], this is a clear example that the currency that denominates credit, the funding currency, is determining the invoice and trade settlement currency.

Some interviewees stressed that without a credit line associated with SML, the local currency payment system is limited to a small number of users since its implementation. A few other interviewees believe that the greater access to credit would not increase the number of SML users, as the costs structure of the companies plays a more important role in determining whether they use the SML. They argue that the decision on to whether use SML depends on whether production costs, such as wages and other inputs, are denominated in the domestic or foreign currency. Participants also argue that there is a significant amount of subsidised credit in Brazil directed to micro and small enterprises from government institutions, such as BNDES. Indeed, these programs offer much lower interest rates, but there is no information regarding the funding structure of the firms to support this hypothesis, which is left for future research.

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[136] More details in section II- 2.3.

[137] More details in section II- 2.4.

The second limitation mentioned in the interviews is the **lack of information**, which was identified in a survey made by the BCB. Particularly smaller companies are unaware of the possibility of trading with other countries in the Mercosur using local currencies. The results from the survey suggest that these companies have less access to information because they generally trade locally and, thus, lack a Forex department that manages international payments. Large companies have a department with qualified personnel that can identify the financial products available in the market, such as the SML. This also explains the concentration of larger companies operating with SML.

One of the reasons for the lack of advertisement for SML is the restricted financial resources of the BCB to promote this payment system. Another reason that was revealed by the survey is that the SML users rarely knew about this system through the financial institutions operating with SML, as they have no incentives to advertise it. Operating in the Forex market is more profitable than operating with SML, because financial institutions gain from exchange rate spread and higher transaction fees. SML is a system that mostly benefits the users, particularly smaller and medium-sized enterprises, and financial institutions are not interested to offer this product to their clients.

The survey also identified that often there is a lack of information regarding the SML even within the financial institution. Particularly in smaller branches, where many SMEs have their bank accounts, the employees of the financial institutions are not familiar with payment systems of international trade. For this reason, staff in these institutions do not offer services for operating with SML, which may be the reason for the low participation of smaller companies in this payment system. Moreover, there is no benefit in training personnel to operate via SML, as those employees who work with international trade are rather skilled to operate in the Forex market, not with payments in local currency.

Interviewees also mentioned a third factor that limits the SML that is related to the productive structure of Brazilian exports. Brazil is a large exporter of commodities in international trade, which are essentially denominated in US dollars. Thus, participants argue that there is a natural cap for the SML, as there is little opportunity to promote the Brazilian real in the commodities sector. They also stressed that it would be unrealistic to expect SML to substitute Forex operations or that most of the trade and the financial transactions would be through this system. Some interviewees argued that to expand SML as well as internationalise the BRL, Brazil would have to export

more technology-intensive products instead of primary products. Interestingly, data from the Ministry of Development, Industry and Foreign Trade (MDIC) suggests tobacco and sugar were the leading products on the BRL-invoiced trade in 2011, which accounted together for 33% of the exports denominated in BRL (Reiss, 2015).

A final obstacle that prevents the expansion of the SML comes from an institutional perspective, as the SML needs authorisation from the Brazilian Congress to operate with every country. Due to the credit risk involved in operating with SML as discussed in section V- 4.2.1, the BCB depends on the consent of the Congress to expand the system to other countries. However, given the different political interests and the bureaucracy in the parliament, the process of expansion of SML is slow and long. Hence, the SML is also restricted by legislative issues, even though the operation, management and negotiations are entirely under the control of the BCB.

In sum, section 170V- 4 has presented the objectives and mechanism of the SML. Though currency internationalisation is not a policy objective of the BCB, this payment system in local currency represents a pioneer policy measure that promotes the regional use of the BRL as an invoice currency, which one can understand as 'regionalisation'. Despite the fact that this system is still very limited and it faces many obstacles, this initiative may promote a greater integration between Brazil and other countries in South America. Moreover the internationalisation of the BRL among other dimensions may and its promising role in the region may, in the future, allow this currency to enhance its position in the currency hierarchy.

V- 5 Conclusion

Chapter V attempted to complement the analysis on the determinants of currency internationalisation from Chapter IV by evaluating whether policy decisions have an impact on currency internationalisation. Whilst central countries clearly have the political power to promote currency internationalisation, it is unclear whether peripheral countries can influence this process. This chapter has presented a case study of the Brazilian real (BRL), which is a peripheral currency that has become more internationalised in recent years. The methodology adopted to address the abovementioned research question was semi-structured interviews with 24 participants, most from the Brazilian Central Bank (BCB) and a few from the private sector.

These semi-structured interviews provided a comprehensive understanding of how currency internationalisation operates in practice and the main influences of policy decisions of the BCB on this process. As a result, two policies were identified to have a major impact on the internationalisation of the BRL: the foreign market (Forex) regulation and the Local Currency Payment System (SML). Another finding of the interviews suggested that the regulation of the BCB, directly and indirectly, affects the use of the BRL by non-residents across all types of currency internationalisation, i.e. it also influences the shape of currency hierarchy.

Some participants from the BCB believe that, if the BRL becomes more internationalised in the future, it is more prone to fulfil the means of payment and, particularly, unit of account function. Regarding the means of payment function, the responsibility of financial institutions in Brazil to analyse the transactions in non-resident accounts to search for illegal operations increase the costs of maintaining these accounts. Also, the regulation only allows capital outflows, i.e. remittances to a non-resident account, when the resources are not operated on behalf of a third party, which this thesis refers to as the 'one-way' TIR. Whilst the former regulation from the BCB economically discourages correspondent accounts of non-residents in Brazil, the latter operationally prevent non-residents to operate BRL with one another. As explained in section V- 3, non-resident accounts in correspondent banks are operationally crucial for international transfers of any currency. Thus, both regulatory measures limit the use of the BRL as vehicle and trade settlement currency.

As discussed in Chapter II, the unit of account function comprises two types of currency internationalisation, the funding and invoice currency. On the one hand, the chapter has shown that Circular 24 forbids financial institutions in Brazil to lend money to non-residents, which essentially limits the role of the BRL as a funding currency. As discussed in Chapter II, this type of currency internationalisation is crucial to improve the position of a currency in the hierarchy. On the other hand, the SML, which is an initiative of the BCB, promotes the use of BRL as a regional invoice currency. Though all participants emphasised that the objective of the SML is not to promote the internationalisation of the BRL, they recognise that it has important implications for its international use. Even though the SML represents a small share of the Brazilian trade, central bankers emphasised that it accounts for almost all trade denominated in BRL.

Thus, SML is an important step into the regionalisation of the BRL with trade partners in the Mercosur, which can be understood as 'currency regionalisation'. Additionally, at the time of the creation of SML, the political support to a greater integration between Brazil and other countries in the Mercosur allowed the BCB to simplify and eliminate barriers in the Forex market. For instance, until 2008, exporters were not allowed to keep their resources abroad and the regulation forbids these exports to be denominated in local currency. Consequently, the BRL could not serve as invoice currency. The bureaucracy in Forex operations also reduced in 2008, as operations lower than US$ 3,000 were no longer required the Forex contract or the presentation of the respective documentation to the BCB.

Chapter II put forward a novel approach to the store of value function, which was analysed in two types of currency internationalisation, the short and long-term investment currency. The latter type of internationalisation refers to those currencies that are liquid and able to preserve their value through time, i.e. low inflation and exchange rate volatility. Conversely, a currency is used for short-term investments when non-residents do not expect it to hold its value for a long period. For this reason, countries that issue these currencies generally offer higher returns to attract capital flows from international investors.

As discussed in section V- 3.2.2, regulations that lead to bureaucracy and restrictions in the spot market may encourage capital flows to migrate to the derivatives market onshore. The futures market in Brazil is highly liquid, particularly when compared to other emerging countries, and there are no

capital controls on the operations of non-residents. For these reasons, many international investors use these derivatives as a proxy of derivatives in other emerging economies (Prates, 2010). The liquidity and high leverage opportunity in this market may also attract more speculative investments.

Additionally, the regulations that prevent the trade of BRL between non-residents also shifts the trade of this currency to the derivatives market offshore, where these agents use instruments such as the NDF. Lipscomb (2005) also found evidence of a large participation of hedge funds in these markets, which are associated with short-term operations, generally for speculative purposes. Therefore, the regulatory measures that do not allow non-residents to trade BRL in the offshore market reduce the liquidity of this currency, which does not appear to be used as a long-term investment currency. Instead, these restrictions on the trade of BRL between non-residents does not prevent its internationalisation as a short-term investment currency.

In short, the results of the semi-structured interviews complement the theoretical contributions of Chapter II and the empirical findings of Chapter III, in which the BRL is suggested to be mostly internationalised as a short-term investment currency. As discussed in Chapter IV, the liquidity and depth of financial markets, as well as high interest rates, are suitable features for a currency internationalised for short-term investment purposes. Though Forex regulation is neither the cause nor does it control for this type of internationalisation of the BRL, restrictions on the use of the BRL between non-residents may encourage the use of derivatives in the offshore market, which can reinforce a speculative use of this currency.

If the choice of internationalisation is left to be a market-driven process, the BRL is used as a short-term investment currency. However, policymakers have an influence on the type of internationalisation through active policies. The SML is an initiative from the BCB that is promoting a gradual increase of the use of the BRL in the region as an invoice currency. Though this system still faces many limitations, it was also an important initiative to reduce restrictions on the Forex market and to support the leading role of Brazil in the Mercosur. Therefore, despite the lower political power of emerging countries, policy decisions from BCB may influence the type of internationalisation of the BRL through small changes in the use of BRL in the region, which can potentially enhance its position in the currency hierarchy.

CHAPTER VI
CONCLUSION

VI- 1 Summary of the Research Findings

This thesis presented an in-depth study of the nature and determinants of currency internationalisation and currency hierarchy in peripheral economies.

Chapter II presented a theoretical contribution to the literature on currency internationalisation and currency hierarchy. This chapter also critically reviewed the literature on the determinants of this process, which served as a theoretical foundation for the Chapters III, IV and V. Most researchers analyse currency internationalisation through the functions of international money proposed by Cohen (1971), i.e. medium of exchange, unit of account and store of value. This pioneering approach to international currencies defines their roles in the international market, which this thesis refers to as 'types of currency internationalisation'.

Chapter II also presented the definition of currency internationalisation used throughout this thesis as the process in which local currencies are used by non-residents. A stronger evidence of this process is when non-residents use the local currency for transactions with one another. In this viewpoint, the growing use of currencies issued by emerging market economies (EME) suggests a greater internationalisation of these peripheral currencies. Post Keynesian researchers argue that in periods of international liquidity, capital flows migrate towards countries with higher returns but lower currency premium, such as in EME. During times of rising liquidity preference, these resources are withdrawn again, often very quickly. The functions of international money proposed in the IPE literature, however, do not comprise the nature of the internationalisation experienced by the peripheral currencies from EME. Thus, Chapter II suggested an additional type of currency internationalisation that describes the use of peripheral currencies in the International Monetary System (IMS): the short-term investment currency.

The second contribution of this chapter was to bring together the literature on currency internationalisation and currency hierarchy and to suggest that different types of currency internationalisation represent different positions in the currency hierarchy. There seems to be an apparent consensus between Post Keynesian and IPE scholars that the more functions of international money a currency fulfils, the greater its position in the currency hierarchy.

Chapter II diverged from this generic assumption that currency internationalisation and currency hierarchy hold a linear and positive relationship. Instead, it argued that the internationalisation as a short-term investment currency does not increase the confidence of non-residents in these currencies, i.e. their liquidity premium. Essentially, this type of currency internationalisation reinforces the position of these peripheral currencies at the lowest end of the currency hierarchy. This chapter concluded that a higher degree of internationalisation cannot be understood into a higher position in the currency hierarchy, and the type of currency internationalisation plays a crucial role in this relationship.

Chapter III then presented an in-depth empirical investigation into the different types of internationalisation assumed by different currencies. The specific objective of this chapter was to understand the type of the internationalisation of central and peripheral currencies as well as to analyse their relationship with currency hierarchy. To address this research question, this chapter adopted a cluster analysis technique, which groups currencies that have similar degree and type of currency internationalisation. Data was collected for all currencies that information was available, which sums 24 central and peripheral currencies.

As expected by theory, the US dollar, which is the key currency of the system, was organised in a cluster alone, given that no other currency has a comparable degree of internationalisation across all functions of international money. The euro, which is the closest currency to the US dollar, was also clustered by itself. Interestingly, results have also revealed that some currencies, particularly those issued by emerging countries, are not internationalised across most types of currency internationalisation, but as a short-term investment currency[138]. A few central currencies are also internationalised on this dimension, and, nevertheless, their position in the hierarchy is higher than the peripheral currencies. Statistics revealed that these central currencies are also internationalised in terms of other functions, which might be a factor that explains their position in the currency hierarchy.

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[138] Data was not available for many peripheral currencies, which have an insignificant participation in the international market. Thus, there is no empirical evidence to infer that other peripheral currencies are also internationalised as a short-term investment currency.

This finding suggested that currencies that are solely used for short-term investments, which are essentially speculative, do not improve their position in the currency hierarchy. Therefore, the relationship between currency internationalisation and currency hierarchy is rather non-linear, and also negative when a currency is internationalised only as a short-term investment. In agreement with the Post Keynesian theory, currency hierarchy is shaped by liquidity premium, and this thesis also argued that the liquidity premium manifests itself differently in each type of currency internationalisation. This outcome raised the question of which factors determine the asymmetries in the IMS, i.e. the reason why some currencies are more used than others in the international market.

Chapter IV attempted to answer this research question by empirically analysing data on the determinants of currency internationalisation suggested in the literature. The theoretical literature on the determinants of this process is widely discussed by IPE scholars, mainstream and Post Keynesian economists. However, each academic fields focuses on different determinants of currency internationalisation. One of the reasons for the lack of consensus between these academic fields may lie on the fact that many empirical studies focus on only one of the functions of international money as a general proxy of currency internationalisation.

To address this issue, this chapter estimated a panel data model to investigate the determinants of each type of currency internationalisation. Although the mainstream and IPE literature on currency internationalisation generally discuss the determinants of this process for central currencies, Chapter IV included those peripheral currencies for which data is available. Additionally, this analysis also included two variables stressed in the Post Keynesian theory, the interest rates and the current account surplus. The results showed that the determinants of currency internationalisation suggested in the literature have a different influence on each type of currency internationalisation. For instance, while economic size is significant for the internationalisation as a vehicle currency, other determinants stressed in the Post Keynesian literature, such as interest rates, are more important for the internationalisation as a short-term investment currency.

Another determinant of currency internationalisation emphasised by the IPE literature is the political power to promote the use of the domestic currency in the international market. Developed countries that issue central currencies certainly have political influence to encourage non-residents to use their

currencies in the international market. A question that remained unanswered was with regards to whether emerging countries that issue peripheral currencies can support and, more importantly, shape the internationalisation process of their peripheral currencies. In addition to the IPE focus on political power, some Post Keynesian economists suggest an additional determinant that is not discussed in the literature: the political will to promote currency internationalisation as a policy objective (De Conti et al., 2013b). This raised another question as to whether and how policymakers from emerging market economies can influence currency internationalisation.

Chapter V addressed these questions by conducting 24 semi-structured interviews with participants in the Brazilian Central Bank (BCB) and the private sector. The rationale for adopting this methodology lied in the benefit of gathering specific information about policy decisions of the monetary authority in Brazil that affects the internationalisation of the Brazilian real (BRL). Moreover, the interviews might offer a more comprehensive understanding of the operational side of currency internationalisation, which substantiates the theoretical and empirical analysis of this process. The results of these interviews also complemented the analysis of the empirical determinants of currency internationalisation discussed in Chapter IV. The variables related to political power and the will to promote this process can hardly be quantified and, for this reason, were not included in the panel data models.

To reach an in-depth understanding of the influence of policy decisions on currency internationalisation, this chapter focused on the experience of the BRL. The case study of the BRL was motivated by the fact that it is a peripheral currency from an EME that is becoming more internationalised, though its position in the currency hierarchy has remained the same, as discussed in Chapters II and III. The results of the interviews suggested that though the internationalisation of the BRL is not a policy objective of the BCB, some regulations and the creation of the Local Currency Payment System (SML) have a direct or indirect impact on the international and regional use of the BRL.

The main conclusions of this chapter were that whilst some regulations prevent the internationalisation of the BRL as a funding currency and trade settlement currency, the SML promotes its use as a regional invoice currency. Additionally, to circumvent the restrictions to operate with the BRL onshore and offshore, non-residents migrate their operations to the derivatives market, which is significantly more liquid. The literature suggests that derivative

instruments offshore, such as the NDF, are known for the large participation of hedge funds, which are often associated with short-term operations. The high leverage opportunities in the derivatives market are interesting for speculators, which may be consistent with the internationalisation of the BRL as a short-term investment currency, as suggested in Chapters II and III. Thus, though the regulation is not the cause of the short-term investments, it does not inhibit this type of internationalisation.

Therefore, regulatory measures and policy initiatives such as the SML have an impact on the type of internationalisation of the BRL. Although this is not currently a policy objective of BCB, whilst the SML and some changes in regulation promote the use of BRL as an invoice currency, other regulation prevents other types of currency internationalisation and allows encourages the speculative use of BRL, which in turn, reinforces its lower position at the bottom of the currency hierarchy. In a Post Keynesian perspective, currency internationalisation is not only driven by market demand. In that sense, policy decisions from the BCB have an impact on the type of currency internationalisation and, thus, it also influences the shape of the currency hierarchy.

VI- 2 Limitations

The present thesis represents a substantive empirical work in the literature on currency internationalisation and currency hierarchy. Perhaps no other research in the literature has presented an in-depth and comprehensive analysis of each type of currency internationalisation and their determinants. However, the main limitations of this thesis regards data availability on currency internationalisation, particularly because data on peripheral currencies issued by EME are recent and often incomplete.

To circumvent this problem, Chapter III analysed cross-sectional data, which was almost entirely available for the currencies in the sample. One may argue that the data used for 2016 could potentially be atypical and non-representative of the IMS. The only few missing data were either estimated or used another proxy, such as the last data available. However, the data analysed is considerably after the financial crisis in 2008 and statistics available for previous years in the triennial survey from the Bank of International Settlements (BIS) seem to be fairly similar.

In Chapter IV, the lack of statistics was a point of weakness, as panel data analysis require a large database. For this reason, two types of currency internationalisation, the proxy for trade settlement and invoice currency, that were empirically evaluated in Chapter III were left aside in Chapter IV. Moreover, data on short and long-term investment currency published by the BIS were only available for two periods, which is a potential source of bias in the results.

Lastly, the qualitative research applied in Chapter V can potentially be biased by the interviewer or the participants. The semi-structured interviews with participants from the BCB and the private sector suggested that policy decisions from the monetary authority in Brazil have significant implications for the internationalisation of the BRL. However, this study did not imply that the BCB can actually control the internationalisation of their currency. Instead, they can influence this process by limiting non-residents using the domestic currency, which could reinforce the internationalisation as a short-term investment currency, and through active policies, such as the SML. Additionally, the findings of this study should not be read as evidence that all or most emerging countries have control or influence of their currencies. The lack of in-depth information about the historical factors and intrinsic characteristics of the foreign exchange markets in other countries does not allow one to draw conclusions about the internationalisation of other currencies.

VI- 3 Policy Implications

The general aim of this thesis was to analyse the types of internationalisation of central and peripheral currencies, particularly those issued by EME, to understand their position in the currency hierarchy. This thesis adopted a theoretical and an empirical approach to understand the role of currencies in the IMS, i.e. their degree and type of internationalisation. A specific objective of this thesis was to focus on the internationalisation of the BRL as a case study. The outcomes from each chapter of this thesis provided three main policy implications about the internationalisation of peripheral currencies.

The Post Keynesian analysis of currency internationalisation argues that in periods of lower international liquidity, capital flows move towards those countries that issue peripheral currencies, which offer higher yields. In times of higher international liquidity preference, capital flows move back towards

countries that issue central currencies, which is called the flight for liquidity. Consequently, peripheral currencies become more volatile, which reinforces the lack of confidence in these currencies, i.e. their low liquidity premium. This type of currency internationalisation, which is not embraced by the functions of international money proposed in the IPE literature, was referred to in this thesis as the short-term investment currency.

The first policy implication discussed in this thesis is that currencies internationalised as short-term investments cannot improve their positions in the currency hierarchy. To prevent this type of currency internationalisation and the consequences of issuing a currency located at the bottom of the hierarchy, policymakers must reduce exchange rate volatility and increase liquidity premium. In the Post Keynesian literature, a few researchers suggest that current account surpluses are crucial to appreciate the currency and avoid volatility (Fritz et al., 2014, De Paula et al., 2015, Fritz et al., 2018). Others suggest that countries should first reach a creditor position in the international market (Kaltenbrunner, 2015, Bonizzi, 2017).

To understand in depth the policy decisions that influence the type of currency internationalisation, i.e. the position of a currency in the hierarchy, semi-structured interviews were conducted in the BCB as a case study of the BRL. The results suggested that the regulation of the BCB does not allow non-residents to trade BRL with one another. Given this restriction and the lack of capital controls in the derivatives market, there is a significant share of non-residents trading the BRL in the futures market onshore or offshore, with instruments such as the NDF. The leverage opportunity in both derivatives market may attract speculative investments, which can increase the volatility of the exchange rate, as speculative capital flows move according to the liquidity cycle. Thus, the second policy implication of this study is that speculative operations with the BRL may increase exchange rate volatility and prevent other types of currency internationalisation.

Many participants mentioned that to promote the use of BRL, it is crucial to remove some operational barriers, such as the Circular number 24 and the 'one-way' TIR. Also, it would be crucial to reduce the costs of non-residents operating with correspondent banks in Brazil. However, one should be careful with such policy recommendations. For instance, as a greater use of the non-resident accounts can cause problems of money laundering. In fact, fewer restrictions on the use of BRL by non-residents can also be counterproductive and increase speculative operations with this currency. Although the current

regulatory measures slow down the process of internationalisation of the BRL across other types of internationalisation, the internationalisation of the BRL is not guaranteed by a more flexible regulation in the Forex market.

Moreover, participants argued that probably there is no suppressed demand of non-residents for correspondent banks in Brazil. However, from a Post Keynesian perspective, currency internationalisation is not a process only driven by market demand. Institutional policies and historical factors play an important role to affect the decision of private agents on whether to hold a currency or another. Yet, regulation alone is not enough to promote the internationalisation of the BRL in other dimensions. It must be complemented with a stable macroeconomic environment, which is conditional on low exchange rate volatility. Thus, other policy instruments, such as capital controls, may provide greater autonomy for policymakers to set interest rates in accordance to domestic conditions (Fritz et al., 2018).

Finally, a third policy implication of this study is that the expansion of the SML may promote the use of the BRL in other types of currency internationalisation, which, in turn, helps to 'climb the ladder'[139] of the currency hierarchy.

VI- 4 Recommendations for Future Research

In the course of the development of this thesis, a few areas for further research were identified. First, the literature on currency internationalisation often discusses the concept currency convertibility, which has different definitions in academia (Arraes, 1994). Though it is not in the scope of this thesis, the investigation of the different concepts of currency convertibility would be an important contribution to the literature on the concept of currency internationalisation. For instance, Carneiro (2008) defines an inconvertible currency the one that does not fulfil the functions of international money.

Second, Chapter III applied cluster analysis to evaluate data on the different types of currency internationalisation. This methodology used cross-sectional data, i.e. data for several countries at a specific point in time. Currently, there is not enough data to explore the development of each of these types of currency internationalisation through time. The lack of data is particularly an issue for the proxy on the short-term investment currency, as data from the

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[139] In allusion to Fritz et al. (2018).

Triennial Central Bank Survey from the Bank for International Settlement (BIS) is only available for 2013 and 2016. A question that remains unanswered is whether currencies from EME will maintain a large share of hedge funds in their foreign exchange turnover, which are known for speculative operations (McGuire and Upper, 2007, Galati et al., 2007).

Another contribution to the literature on currency hierarchy would be to analyse not only each type of currency internationalisation across time but also follow the development of the use of peripheral currencies. The Dynamic Pattern Synthesis (DPS) is a methodology similar to cluster analysis that has a dynamic component, i.e. it allows one to apply a comparative analysis of how the clusters of currencies change and evolve across time as well as its degree of stability (Haynes, 2017).

Third, the growing internationalisation of currencies issued by emerging market economies also increases the data availability for a panel data study, which was an issue for the panel data in Chapter IV. The larger number of observations reduces the potential bias of the results and a replication of the panel data models used in this thesis in the future could verify the findings in this thesis. Another limitation of this chapter on the determinants of currency internationalisation was the lack of a variable that accounts for political power. The empirical literature political power is extensive and a proxy was not explored to be included in the models. This suggestion is left for future research.

Fourth, some IPE and Post Keynesian scholars focus on the importance of historical factors in determining currency internationalisation (Strange, 1971c, De Conti et al., 2013b). Chapter V- 3.1 discussed the implications of some historical factors on the policy regulation that affects the internationalisation of the BRL. One avenue for further study would be to continue the research initiated in this thesis, which should combine historical and institutional factors that shaped the regulation in the foreign exchange market in Brazil and in other emerging market economies. A comparative study could also be an important contribution to the literature on currency internationalisation and currency hierarchy.

Lastly, a question that remained unanswered and which is not much explored in the literature, apart from Ventura and Garcia (2012), is the relationship between the spot and futures market in Brazil. Though some researchers suggest that the future market is normally more liquid than the spot market in

other countries, the inverse determination of the exchange rate seems to be a peculiarity of the Brazilian market. Moreover, the lack of consensus between interviewees from the BCB and some researchers in the academia regarding whether regulation plays a role in the relationship also remains unanswered.

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LIST OF ABBREVIATIONS

ALADI – Latin America Integration Association

BCB – Brazilian Central Bank or *Banco Central do Brasil* (in Portuguese)

BRL – Brazilian *Real*

CCR – *Convênio de Pagamentos e Créditos Recíprocos* (in Portuguese)

CMN – National Monetary Council or *Conselho Monetário Nacional* (in Portuguese)

CPLP – Community of Portuguese Language Countries or *Comunidade dos Países de Língua Portuguesa* (in Portuguese)

DPS – Dynamic Pattern Synthesis

ECB – European Central Bank

EME – Emerging Market Economies

FI – Financial Institutions

Forex or FX – Foreign Exchange

GMK – German Monetary Keynesians

IMS – International Monetary System

IPE – International Political Economy

MDIC – Ministry of Development, Industry and Foreign Trade or *Ministério da Indústria, Comércio Exterior e Serviços* (in Portuguese)

PLDFT – Prevention of Money Laundering and Terrorist Financing program or *Prevenção à Lavagem de Dinheiro e Financiamento ao Terrorismo* (in Portuguese)

PK – Post Keynesian

RDE – Eletronic Declaration Register or *Registro Declaratório Eletrônico*, in Portuguese

Selic – Special System for Settlement and Custody or *Sistema Especial de Liquidação e de Custódia* (in Portuguese)

SISBACEN – Central Bank Information System or *Sistema de Informações do Banco Central* (in Portuguese)

SMEs – Small and Medium-sized Enterprises

SML – *Sistema de Pagamentos em Moeda Local* (Portuguese) or *Sistema de Pagos en Moneda Local* (Spanish) or Local Currency Payment System

SPB – Brazilian Payment System or *Sistema de Pagamentos Brasileiro* (in Portuguese)

SWIFT – Society for Worldwide Interbank Financial Telecommunication

US – United States

APPENDIX CHAPTER III

Appendix Table 1: Data Source – Invoice Currency

Currency	Variable	Date	Source
AUD	Imports	Q1 2016	Reserve Bank of Australia
BRL	Exports	S1 2015	Ministry of Development, Industry and Foreign Trade (MDIC)
CAD	Exports	2002	Survey conducted by the Bank of Canada
CHF	Imports	2016	Eurostat
CNY	Exports, Imports	Q2 2016	The People's Bank of China, author's calculations
DKK	Imports	2016	Eurostat
EUR	Imports	2016	Eurostat
GBP	Imports	2016	HM Revenue & Customs Overseas Trade Statistics
HKD	N/A	2016	Author's calculations using an OLS
HUF	Imports	2016	Eurostat
INR	Imports	Jun-14	Reserve Bank of India
JPY	Imports	2016	Japan Customs
KRW	Imports	2003	Monthly Statistics of South Korea *apud* Kamps (2006)
MXN	N/A	2016	Author's calculations using an OLS
NOK	Imports	2016	Eurostat
NZD	N/A	2016	Author's calculations using an OLS
PLN	Imports	2016	Eurostat
RUB	N/A	2016	Author's calculations using an OLS
SEK	Imports	2016	Eurostat
SGD	N/A	2016	Author's calculations using an OLS
TRY	Imports	Apr-16	Turkish Statistical Institute
TWD	N/A	2016	Author's calculations using an OLS
USD	Imports	2003	Bureau of Labour Statistics *apud* Kamps (2006)
ZAR	Exports	2004	National Treasury - Republic of South Africa

Appendix Table 2: Data on Types of Currency Internationalisation

Currency	Vehicle	TradeSet	Invoice	Funding	LTInvest	STInvest
AUD	6.9%	1.56%	32.8%	7.01%	18.3%	9.2%
BRL	1.0%	0.00%	2.0%	0.36%	14.5%	9.5%
CAD	5.1%	1.83%	23.0%	5.45%	17.8%	10.2%
CHF	4.8%	1.50%	1.1%	7.48%	16.6%	7.7%
CNY	4.0%	1.82%	22.2%	22.24%	7.5%	5.5%
DKK	0.8%	0.44%	14.8%	22.50%	15.1%	3.0%
EUR	31.3%	30.69%	42.2%	58.84%	17.3%	7.0%
GBP	12.8%	8.40%	20.2%	8.73%	16.2%	8.3%
HKD	1.7%	1.06%	12.1%	19.43%	7.4%	2.4%
HUF	0.3%	0.21%	4.8%	5.43%	12.3%	9.9%
INR	1.1%	0.00%	2.1%	7.67%	8.3%	2.5%
JPY	21.6%	3.24%	26.1%	28.68%	17.9%	7.8%
KRW	1.6%	0.00%	15.6%	12.35%	8.9%	3.8%
MXN	2.2%	0.34%	11.1%	2.38%	13.8%	9.7%
NOK	1.7%	0.73%	11.8%	15.46%	12.7%	10.3%
NZD	2.1%	0.36%	14.2%	29.84%	16.6%	9.7%
PLN	0.7%	0.57%	8.9%	5.83%	14.5%	7.6%
RUB	1.1%	0.00%	5.5%	0.77%	11.0%	3.8%
SEK	2.2%	1.09%	15.7%	19.86%	17.1%	9.5%
SGD	1.8%	0.97%	12.5%	14.73%	16.6%	6.0%
TRY	1.4%	0.29%	7.2%	1.11%	11.1%	7.0%
TWD	0.6%	0.00%	6.4%	30.47%	14.8%	2.8%
USD	87.6%	41.92%	90.3%	78.69%	14.9%	7.4%
ZAR	1.0%	0.46%	10.5%	3.15%	9.5%	8.0%

Appendix Table 3: Proximity Matrix

Case	Squared Euclidean Distance (to be continued on the next page)											
	1:AUD	2:BRL	3:CAD	4:CHF	5:CNY	6:DKK	7:EUR	8:GBP	9:HKD	10:HUF	11:INR	12:JPY
1:AUD	0.0	1043.8	103.2	1014.7	484.0	651.2	4221.1	247.7	774.0	868.8	1122.8	732.9
2:BRL	1043.8	0.0	497.5	75.7	963.5	695.8	6907.4	613.9	566.9	39.1	140.5	1829.2
3:CAD	103.2	497.5	0.0	491.5	412.0	437.6	4747.0	126.4	493.8	387.0	609.2	827.2
4:CHF	1014.7	75.7	491.5	0.0	752.5	454.6	5881.6	478.2	385.9	63.1	112.9	1360.2
5:CNY	484.0	963.5	412.0	752.5	0.0	130.5	3418.3	391.1	125.0	643.8	636.7	481.8
6:DKK	651.2	695.8	437.6	454.6	130.5	0.0	3934.4	453.9	76.3	446.6	426.8	634.3
7:EUR	4221.1	6907.4	4747.0	5881.6	3418.3	3934.4	0.0	3837.7	4328.9	6173.5	6176.3	2017.8
8:GBP	247.7	613.9	126.4	478.2	391.1	453.9	3837.7	0.0	467.1	488.2	629.6	539.8
9:HKD	774.0	566.9	493.8	385.9	125.0	76.3	4328.9	467.1	0.0	331.4	240.3	817.7
10:HUF	868.8	39.1	387.0	63.1	643.8	446.6	6173.5	488.2	331.4	0.0	83.3	1490.6
11:INR	1122.8	140.5	609.2	112.9	636.7	426.8	6176.3	629.6	240.3	83.3	0.0	1563.6
12:JPY	732.9	1829.2	827.2	1360.2	481.8	634.3	2017.8	539.8	817.7	1490.6	1563.6	0.0
13:KRW	473.3	393.3	238.7	322.0	155.1	143.2	4770.5	302.7	67.3	215.9	205.9	881.4
14:MXN	536.6	**88.7**	177.7	145.7	580.1	465.9	5940.8	307.3	385.3	54.9	191.3	1319.7
15:NOK	573.7	328.9	264.7	210.7	210.6	118.1	4612.8	314.4	105.4	152.1	235.1	814.5
16:NZD	896.9	1022.3	686.4	683.1	229.1	102.9	3408.5	663.7	249.9	705.1	757.8	537.5
17:PLN	629.4	81.2	237.5	85.6	512.5	334.0	5769.7	346.5	273.5	27.5	114.4	1271.7
18:RUB	900.8	56.8	432.8	127.1	765.3	575.3	6616.7	531.2	407.5	61.6	68.3	1692.5
19:SEK	481.5	576.6	270.9	376.4	159.5	56.5	3948.3	311.0	156.2	354.2	461.0	567.8
20:SGD	511.8	334.8	227.8	194.9	239.4	77.8	4581.4	276.6	118.6	182.6	239.7	780.2
21:TRY	778.2	45.5	338.8	121.6	695.4	546.2	6411.7	449.0	394.4	35.7	96.9	1577.9
22:TWD	1344.9	970.8	990.7	603.6	394.0	135.0	3994.3	914.5	211.1	686.5	579.8	876.1
23:USD	16595.2	**23192.5**	18321.4	21523.5	16485.9	18126.8	6012.9	16535.7	18751.3	22052.2	22120.1	12490.7
24:ZAR	627.1	107.7	253.5	173.6	521.5	447.8	5998.0	371.4	303.0	50.0	122.1	1395.3

This is a dissimilarity matrix.

Case	Squared Euclidean Distance											
	13:KRW	**14:MXN**	**15:NOK**	**16:NZD**	**17:PLN**	**18:RUB**	**19:SEK**	**20:SGD**	**21:TRY**	**22:TWD**	**23:USD**	**24:ZAR**
1:AUD	473.3	536.6	573.7	896.9	629.4	900.8	481.5	511.8	778.2	1344.9	16595.2	627.1
2:BRL	393.3	**88.7**	328.9	1022.3	81.2	56.8	576.6	334.8	45.5	970.8	**23192.5**	107.7
3:CAD	238.7	177.7	264.7	686.4	237.5	432.8	270.9	227.8	338.8	990.7	18321.4	253.5
4:CHF	322.0	145.7	210.7	683.1	85.6	127.1	376.4	194.9	121.6	603.6	21523.5	173.6
5:CNY	155.1	580.1	210.6	229.1	512.5	765.3	159.5	239.4	695.4	394.0	16485.9	521.5
6:DKK	143.2	465.9	118.1	102.9	334.0	575.3	56.5	77.8	546.2	135.0	18126.8	447.8
7:EUR	4770.5	5940.8	4612.8	3408.5	5769.7	6616.7	3948.3	4581.4	6411.7	3994.3	6012.9	5998.0
8:GBP	302.7	307.3	314.4	663.7	346.5	531.2	311.0	276.6	449.0	914.5	16535.7	371.4
9:HKD	67.3	385.3	105.4	249.9	273.5	407.5	156.2	118.6	394.4	211.1	18751.3	303.0
10:HUF	215.9	54.9	152.1	705.1	27.5	61.6	354.2	182.6	35.7	686.5	22052.2	50.0
11:INR	205.9	191.3	235.1	757.8	114.4	68.3	461.0	239.7	96.9	579.8	22120.1	122.1
12:JPY	881.4	1319.7	814.5	537.5	1271.7	1692.5	567.8	780.2	1577.9	876.1	12490.7	1395.3
13:KRW	0.0	179.3	82.1	403.3	135.3	240.2	158.1	80.7	212.2	450.3	19176.1	129.1
14:MXN	179.3	0.0	173.7	771.1	23.8	76.8	337.7	176.5	31.8	862.2	21125.7	23.9
15:NOK	82.1	173.7	0.0	228.3	112.9	300.8	54.7	35.4	240.8	317.5	19256.5	169.4
16:NZD	403.3	771.1	228.3	0.0	614.8	986.3	102.8	245.5	911.4	114.7	17237.4	780.1
17:PLN	135.3	23.8	112.9	614.8	0.0	64.1	255.8	100.6	37.6	637.2	21198.4	35.2
18:RUB	240.2	76.8	300.8	986.3	64.1	0.0	539.2	280.7	12.9	898.2	22517.9	49.9
19:SEK	158.1	337.7	54.7	102.8	255.8	539.2	0.0	49.6	466.4	254.2	17992.6	367.5
20:SGD	80.7	176.5	35.4	245.5	100.6	280.7	49.6	0.0	244.9	301.0	19188.2	193.2
21:TRY	212.2	31.8	240.8	911.4	37.6	12.9	466.4	244.9	0.0	894.0	22100.4	18.9
22:TWD	450.3	862.2	317.5	114.7	637.2	898.2	254.2	301.0	894.0	0.0	18712.8	818.2
23:USD	19176.1	21125.7	19256.5	17237.4	21198.4	22517.9	17992.6	19188.2	22100.4	18712.8	0.0	21321.6
24:ZAR	129.1	23.9	169.4	780.1	35.2	49.9	367.5	193.2	18.9	818.2	21321.6	0.0

This is a dissimilarity matrix.

Appendix Table 4: Proximity Matrix (Excluding USD and EUR)

Case	**Squared Euclidean Distance** (to be continued on the next page)										
	1:AUD	**2:BRL**	**3:CAD**	**4:CHF**	**5:CNY**	**6:DKK**	**7:GBP**	**8:HKD**	**9:HUF**	**10:INR**	**11:JPY**
1:AUD	0.0	1043.2	103.2	1014.7	484.0	651.2	247.7	774.0	868.8	1122.2	732.9
2:BRL	1043.2	0.0	496.8	75.1	962.8	695.7	610.5	566.5	39.1	140.5	**1828.0**
3:CAD	103.2	496.8	0.0	491.5	412.0	437.6	126.4	493.8	387.0	608.5	827.2
4:CHF	1014.7	75.1	491.5	0.0	752.5	454.6	478.2	385.9	63.1	112.3	1360.2
5:CNY	484.0	962.8	412.0	752.5	0.0	130.5	391.1	125.0	643.8	636.0	481.8
6:DKK	651.2	695.7	437.6	454.6	130.5	0.0	453.9	76.3	446.6	426.7	634.3
7:GBP	247.7	610.5	126.4	478.2	391.1	453.9	0.0	467.1	488.2	626.3	539.8
8:HKD	774.0	566.5	493.8	385.9	125.0	76.3	467.1	0.0	331.4	239.9	817.7
9:HUF	868.8	39.1	387.0	63.1	643.8	446.6	488.2	331.4	0.0	83.3	1490.6
10:INR	1122.2	140.5	608.5	112.3	636.0	426.7	626.3	239.9	83.3	0.0	1562.4
11:JPY	732.9	**1828.0**	827.2	1360.2	481.8	634.3	539.8	817.7	1490.6	1562.4	0.0
12:KRW	472.7	393.3	238.0	321.4	154.5	143.1	299.4	66.9	215.8	205.9	880.2
13:MXN	536.6	88.6	177.7	145.7	580.1	465.9	307.3	385.3	54.9	191.2	1319.7
14:NOK	573.7	328.6	264.7	210.7	210.6	118.1	314.4	105.4	152.1	234.8	814.5
15:NZD	896.9	1022.2	686.4	683.1	229.1	102.9	663.7	249.9	705.1	757.6	537.5
16:PLN	629.4	81.0	237.5	85.6	512.5	334.0	346.5	273.5	27.5	114.2	1271.7
17:RUB	900.2	56.8	432.1	126.6	764.6	575.2	527.9	407.1	61.5	68.3	1691.3
18:SEK	481.5	576.2	270.9	376.4	159.5	56.5	311.0	156.2	354.2	460.6	567.8
19:SGD	511.8	334.4	227.8	194.9	239.4	77.8	276.6	118.6	182.6	239.3	780.2
20:TRY	778.2	45.5	338.8	121.6	695.4	546.2	449.0	394.4	35.7	96.9	1577.9
21:TWD	1344.3	970.8	990.0	603.1	393.3	134.8	911.2	210.7	686.5	579.8	874.8
22:ZAR	627.1	107.5	253.5	173.6	521.5	447.8	371.4	303.0	50.0	121.9	1395.3

This is a dissimilarity matrix.

Case	Squared Euclidean Distance										
	12:KRW	**13:MXN**	**14:NOK**	**15:NZD**	**16:PLN**	**17:RUB**	**18:SEK**	**19:SGD**	**20:TRY**	**21:TWD**	**22:ZAR**
1:AUD	472.7	536.6	573.7	896.9	629.4	900.2	481.5	511.8	778.2	1344.3	627.1
2:BRL	393.3	88.6	328.6	1022.2	81.0	56.8	576.2	334.4	45.5	970.8	107.5
3:CAD	238.0	177.7	264.7	686.4	237.5	432.1	270.9	227.8	338.8	990.0	253.5
4:CHF	321.4	145.7	210.7	683.1	85.6	126.6	376.4	194.9	121.6	603.1	173.6
5:CNY	154.5	580.1	210.6	229.1	512.5	764.6	159.5	239.4	695.4	393.3	521.5
6:DKK	143.1	465.9	118.1	102.9	334.0	575.2	56.5	77.8	546.2	134.8	447.8
7:GBP	299.4	307.3	314.4	663.7	346.5	527.9	311.0	276.6	449.0	911.2	371.4
8:HKD	66.9	385.3	105.4	249.9	273.5	407.1	156.2	118.6	394.4	210.7	303.0
9:HUF	215.8	54.9	152.1	705.1	27.5	61.5	354.2	182.6	35.7	686.5	50.0
10:INR	205.9	191.2	234.8	757.6	114.2	68.3	460.6	239.3	96.9	579.8	121.9
11:JPY	880.2	1319.7	814.5	537.5	1271.7	1691.3	567.8	780.2	1577.9	874.8	1395.3
12:KRW	0.0	179.2	81.9	403.2	135.2	240.2	157.8	80.4	212.1	450.3	128.9
13:MXN	179.2	0.0	173.7	771.1	23.8	76.7	337.7	176.5	31.8	862.1	23.9
14:NOK	81.9	173.7	0.0	228.3	112.9	300.5	54.7	35.4	240.8	317.3	169.4
15:NZD	403.2	771.1	228.3	0.0	614.8	986.2	102.8	245.5	911.4	114.6	780.1
16:PLN	135.2	23.8	112.9	614.8	0.0	63.9	255.8	100.6	37.6	637.0	35.2
17:RUB	240.2	76.7	300.5	986.2	63.9	0.0	538.8	280.4	12.9	898.2	49.8
18:SEK	157.8	337.7	54.7	102.8	255.8	538.8	0.0	49.6	466.4	253.8	367.5
19:SGD	80.4	176.5	35.4	245.5	100.6	280.4	49.6	0.0	244.9	300.7	193.2
20:TRY	212.1	31.8	240.8	911.4	37.6	12.9	466.4	244.9	0.0	893.9	18.9
21:TWD	450.3	862.1	317.3	114.6	637.0	898.2	253.8	300.7	893.9	0.0	818.1
22:ZAR	128.9	23.9	169.4	780.1	35.2	49.8	367.5	193.2	18.9	818.1	0.0

This is a dissimilarity matrix.

Appendix Table 5: Agglomeration Schedule (Excluding USD and EUR)

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	17	20	6.436	0	0	8
2	13	16	18.333	0	0	3
3	13	22	34.063	2	0	11
4	14	19	51.741	0	0	10
5	2	9	71.267	0	0	8
6	6	18	99.515	0	0	10
7	8	12	132.983	0	0	14
8	2	17	169.870	5	1	11
9	1	3	221.461	0	0	16
10	6	14	273.570	6	4	17
11	2	13	329.156	8	3	15
12	4	10	385.329	0	0	15
13	15	21	442.634	0	0	18
14	5	8	524.627	0	7	17
15	2	4	627.098	11	12	21
16	1	7	734.601	9	0	19
17	5	6	863.705	14	10	18
18	5	15	1145.498	17	13	20
19	1	11	1630.729	16	0	20
20	1	5	2566.326	19	18	21
21	1	2	4470.723	20	15	0

APPENDIX CHAPTER IV

Appendix Table 6: Panel Data Estimators on Long-Term Investment Currency (TW)

Regressors	OLS Static	FE Static	OLS Dynamic
log_GDP	0.94 ***	0.556	0.227 ***
CPI	-0.014	-0.001	-0.011 *
IR	-0.065	0.043	0.043
share_CA	-0.01 ***	-0.005	-0.003 *
KO	0.615 ***	0.015	0.132 **
ERVol	5.806	-0.301	-1.436
yr2016c	0.325	0.154 **	-
logit_InstInvTW_1	-	-	0.788 ***
_cons	-9.445 ***	-7.623 *	-1.166

Note: *, ** and *** indicate the 10%, 5%, and 1% level of significance, respectively.

Appendix Table 7: Panel Data Estimators on Short-Term Investment Currency (TW)

Regressors	OLS Static	FE Static	OLS Dynamic
log_GDP	0.902 ***	1.804 **	0.218 ***
CPI	-0.035 **	0.01	-0.019 *
IR	0.055	-0.115	-0.021
share_CA	-0.013 ***	-0.009 ***	-0.005 **
KO	0.653 **	-0.174	-0.026
ERVol	3.935	6.644 **	1.661
yr2016c	0.541	0.197	-
logit_HedgeTW_1	-	-	0.721 ***
_cons	-7.064 ***	-17.135 **	-0.08

Note: *, ** and *** indicate the 10%, 5%, and 1% level of significance, respectively.

Appendix Table 8: Currencies Included in Each Model

Currency	Vehicle	Funding	Investment (LT and ST)
AUD	Included	Included	Included
BRL	Included	Included	Included
CAD	Included	Included	Included
CHF	Included	Included	Included
CLP	Included	Included	Not Included
CNY	Included	Included	Included
COP	Included	Included	Not Included
CZK	Included	Included	Not Included
DKK	Included	Included	Included
EUR	Included	Included	Included
GBP	Included	Included	Included
HKD	Included	Included	Included
HUF	Included	Included	Included
IDR	Included	Included	Not Included
ILS	Included	Included	Not Included
INR	Included	Included	Included
JPY	Included	Included	Included
KRW	Included	Included	Included
MXN	Included	Included	Included
MYR	Included	Included	Not Included
NOK	Included	Included	Included
NZD	Included	Included	Included
PEN	Not Included	Not Included	Not Included
PHP	Included	Included	Not Included
PLN	Included	Included	Included
RON	Not Included	Not Included	Not Included
RUB	Included	Included	Included
SAR	Included	Included	Not Included
SEK	Included	Included	Included
SGD	Not Included	Not Included	Not Included
THB	Included	Included	Not Included
TRY	Included	Included	Included
TWD	Not Included	Not Included	Not Included
USD	Included	Included	Included
ZAR	Included	Included	Included

Appendix Table 9: Fisher-type Unit-root Test

Fisher-type unit-root test for **log_GDP**, dfuller drift lags(1)
Based on augmented Dickey-Fuller tests

Ho: All panels contain
unit roots   Number of panels   31
Ha: At least one panel
is stationary   Number of periods   17

AR parameter: Panel-specific   Asymptotics: T -> Infinity
Panel means: Included
Time trend: Not included
Drift term: Included   ADF regressions: 1 lag

		Statistic	p-value
Inverse chi-squared(62)	P	235.7765	0.00
Inverse normal	Z	-10.7036	0.00
Inverse logit t(159)	L*	-11.4847	0.00
Modified inv. chi-squared	Pm	15.6056	0.00

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for **CPI**, dfuller drift lags(1)
Based on augmented Dickey-Fuller tests

Ho: All panels contain   Number of
unit roots   panels   31
Ha: At least one panel   Number of
is stationary   periods   17
AR parameter: Panel-specific   Asymptotics: T -> Infinity
Panel means: Included
Time trend: Not
included
Drift term: Included   ADF regressions: 1 lag

		Statistic	p-value
Inverse chi-squared(62)	P	82.821	0.04
Inverse normal	Z	-1.502	0.07
Inverse logit t(159)	L*	-1.4152	0.08
Modified inv. chi-squared	Pm	1.8698	0.03

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for **IR**, dfuller drift lags(1)
Based on augmented Dickey-Fuller tests

Ho: All panels contain
unit roots   Number of panels

Ha: At least one panel
is stationary   Number of periods

AR parameter: Panel-specific

                                                  Asymptotics: T ->
Panel means: Included   Infinity
Time trend: Not   ADF regressions: 1
included   lag
Drift term: Included
                                  Statistic   p-value
Inverse chi-squared(62)   P   212.2534   0.00
Inverse normal   Z   -9.5393   0.00
Inverse logit t(159)   L*   -10.234   0.00
Modified inv. chi-squared Pm   13.4932   0.00

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for **share_CA**, dfuller drift lags(1)
Based on augmented Dickey-Fuller tests

Ho: All panels contain unit   Number of
roots   panels   31
Ha: At least one panel is   Number of
stationary   periods   17

AR parameter: Panel-specific   Asymptotics: T -> Infinity
Panel means: Included
Time trend: Not included
Drift term: Included   ADF regressions: 1 lag
                                        Statistic   p-value
Inverse chi-squared(62)   P   166.3647   0.00
Inverse normal   Z   -7.4807   0.00
Inverse logit t(159)   L*   -7.6382   0.00
Modified inv. chi-squared Pm   9.3722   0.00

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of
panels.

Fisher-type unit-root test for **KO**, dfuller drift lags(1)
Based on augmented Dickey-Fuller tests

Ho: All panels contain unit roots — Number of panels 31

Ha: At least one panel is stationary — Number of periods 17

AR parameter: Panel-specific — Asymptotics: T -> Infinity
Panel means: Included
Time trend: Not included
Drift term: Included — ADF regressions: 1 lag

		Statistic	p-value
Inverse chi-squared(62)	P	142.7106	0.00
Inverse normal	Z	-8.1791	0.00
Inverse logit t(159)	L*	-9.3869	0.00
Modified inv. chi-squared	Pm	13.1831	0.00

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for **ER**, dfuller drift lags(1)
Based on augmented Dickey-Fuller tests

Ho: All panels contain unit roots — Number of panels 31

Ha: At least one panel is stationary — Number of periods 17

AR parameter: Panel-specific — Asymptotics: T -> Infinity
Panel means: Included
Time trend: Not included
Drift term: Included — ADF regressions: 1 lag

		Statistic	p-value
Inverse chi-squared(62)	P	299.5055	0.00
Inverse normal	Z	-13.2379	0.00
Inverse logit t(159)	L*	-14.8247	0.00
Modified inv. chi-squared	Pm	21.3286	0.00

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for **logit_FundCur**, dfuller drift lags(1)
Based on augmented Dickey-Fuller tests

Ho: All panels contain
unit roots   Number of panels   31
Ha: At least one panel
is stationary   Number of periods   17

                                                        Asymptotics: T ->
AR parameter: Panel-specific   Infinity
Panel means: Included
Time trend: Not
included
Drift term: Included   ADF regressions: 1 lag

                                    Statistic   p-value
Inverse chi-squared(62)   P   135.7725   0.00
Inverse normal   Z   -5.2243   0.00
Inverse logit t(159)   L*   -5.4945   0.00
Modified inv. chi-squared Pm   6.625   0.00

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

APPENDIX CHAPTER V

Interview Sheet

As presented in the Appendix Table 10, Appendix Table 11 and Appendix Table 12 below, the first interview sheet is divided into two main parts: general and specific questions. The former part aims to capture definitions and how the participants understand the process of currency internationalisation. The main goal of this part is to characterize their beliefs, avoiding any sort of bias by introducing in these questions terminologies form literature or other specific ideas (Bruine de Bruin and Bostrom, 2013). At this stage, it was expected that all participants would have at least some practical experience with currency internationalisation, although most of them demonstrated to be familiar with the literature on this topic.

The latter part of the first interview sheet was formed by more specific questions, so participants answered according to their experience. Particularly in the second part of the interview sheet, the follow-up questions are more directive to cover relevant issues. Thus, whilst the general questions allow respondents to express their genuine thoughts on the topic, their beliefs may be influenced by the more directive specific questions (Bruine de Bruin and Bostrom, 2013).

The second interview sheet was designed with very specific questions that were identified in the first stage of interviews. One of them was formed by in-depth questions on the first interview sheet, specifically about regulation and monetary policy. The other one was focused on the Local Currency Payment System (SML). The interviewees that already participated in the first stage of interviews would answer the second interview sheet whilst new interviewees would answer both the first and the second interview sheet. Only 4 participants, who were specialists in SML, did not answer to the first interview sheet.

Appendix Table 10: General Questions of the Interview Sheet

Aspectos Gerais

1. Como você define e/ou entende o processo de internacionalização de moedas?
2. Qual é a sua percepção sobre processo de internacionalização do real?
   2.1. Em que âmbito se dá o processo de internacionalização da moeda brasileira?
      2.1.1. Quais funções internacionais da moeda são identificadas no processo de internacionalização do real?
   2.2. Qual é o nível de internacionalização do real em relação a outras moedas periféricas?
      2.2.1. Como o processo de internacionalização de moedas é diferido entre os países emissores de moedas centrais e os emissores de moedas periféricas?
      2.2.2. Como o processo de internacionalização de moedas é diferido entre os países emissores de moedas periféricas?
   2.3. Quais agentes são particularmente importantes no processo de internacionalização do real?
3. Como é enxergado processo de internacionalização do real (positivo/negativo)?
   3.1. O que se revelou como principais custos e benefícios da maior utilização do real no mercado internacional?
   3.2. Quais seriam outros potenciais aspectos positivos e negativos deste processo?
4. Quais são os principais fatores que restringem ou ampliam a utilização do real no mercado internacional?
   4.1. Qual é o papel do Banco Central no processo de internacionalização do real?
   4.2. O Banco Central tem potencial para influenciar no processo de internacionalização do real?
      4.2.1. Até que ponto o Banco Central tem capacidade de influenciar no processo de internacionalização do real (nível e tipo de internacionalização)?
      4.2.2. Se o Banco Central pudesse influenciar no processo de internacionalização do real, que tipo de internacionalização de moeda deveria ser buscada?
      4.2.3. Qual é a importância do setor privado e das expectativas de mercado neste processo?
      4.2.4. Como o Banco Central assegura a confiança dos investidores internacionais em relação ao real?

4.2.5. Caso existam, quais instrumentos são (ou poderiam ser) utilizados para ampliar o uso do real no mercado internacional?

5. Qual é a posição do Banco Central em relação à internacionalização regional da moeda brasileira?

   5.1. Por que a utilização do Sistema de Pagamentos em Moeda Local (SML) ainda é limitada?

Appendix Table 11: Specific Questions of the Interview Sheet

Aspectos Específicos

6. Como que o processo de internacionalização de moeda afeta a política monetária?

   6.1. Qual é a diferença, em termos de tomada de decisões de política monetária, entre a moeda ser internacionalizada onshore e offshore ?

7. Como que as decisões de política monetária influenciam no processo de internacionalização do real?

   7.1. Em que medida a taxa de juros da economia brasileira influencia no processo de internacionalização do real?

      7.1.1. Como o Banco Central se posiciona em relação a operações especulativas?

      7.1.2. Quais indicadores são utilizados pelo Banco Central para detectar a presença de agentes especuladores no mercado de câmbio brasileiro?

8. Quais são os riscos e as incertezas enfrentadas pelo Banco Central no processo de internacionalização do real?

   8.1. Como que a política monetária lida com os custos do processo de internacionalização do real?

      8.1.1. Caso não haja nenhuma política para atenuar os aspectos negativos da internacionalização do real, quais instrumentos poderiam ser utilizados? Por que estes não são utilizados no momento?

9. Qual é a estrutura regulatória vigente que afeta ou orienta o processo de internacionalização do real?

   9.1. Como que a internacionalização do real afeta a estratégia de abertura financeira praticada pelo Banco Central?

   9.2. Qual é a relação entre a abertura financeira e o mercado de câmbio no Brasil?

   9.3. Por que o aprimoramento da regulação no mercado de câmbio é um dos objetivos da agenda BC+?

   9.4. Como é entendida a relação entre a inconversibilidade do real e o processo de internacionalização do mesmo?

9.5. Qual é o objetivo do Banco Central em restringir as operações no mercado a vista de câmbio apenas às instituições financeiras autorizadas pelo Banco Central?

Appendix Table 12: Local Currency Payment System (SML) Interview Sheet

1. Qual é o objetivo do SML?

    1.1. Qual é o objetivo deste sistema para a Argentina?

        1.1.1. Quais são as vantagens para a Argentina em participar do SML, dado que a maioria das operações são denominadas em real e efetuadas por exportadores brasileiros?

        1.1.2. Já era esperado uma maior denominação das transações em reais em relação ao peso? Por que?

    1.2. Qual é o papel do SML na promoção de uma integração regional entre os países do Mercosul?

        1.2.1. Há outras iniciativas relacionadas com ou complementares ao SML?

    1.3. Como está o uso do SML no Uruguai e a e a implementação do SML no Paraguai?

    1.4. Quais são os agentes envolvidos nos processos de tomada de decisão?

        1.4.1. O SML possui algum conselho formal?

        1.4.2. Quem seriam os agentes envolvidos no caso de uma decisão de expansão deste mecanismo?

    1.5. Quais são as empresas que utilizam o SML?

        1.5.1. Por que o SML atende principalmente à pequenas e médias empresas?

2. Como foi o surgimento do SML?

    2.1. Quem foram os autores desse sistema? Quais países e atores tomaram as primeiras iniciativas?

    2.2. Quais eram os interesses a favor e contra à criação do SML?

        2.2.1. Que grupos de interesse estavam apoiando ou desencorajando esta medida?

        2.2.2. Qual foi o posicionamento do BC em relação à criação do SML?

            2.2.2.1. Quais foram os atores do BC envolvidos na criação desse sistema?

            2.2.2.2. Qual foi o posicionamento dos diferentes atores no BCB em relação à criação do SML? Havia alguma divergência de opiniões?

2.2.3. Qual é o papel de outros órgãos do governo (MDIC, câmaras de comércio e etc.) na criação, implementação e promoção do uso do SML?

2.2.4. Como os bancos comerciais reagiram à implementação do SML?

2.2.5. Como as empresas reagiram à implementação do SML?

2.3. Que medidas foram tomadas para incentivar o uso do SML?

2.4. Quais outros fatores ou sistemas similares com os mesmos objetivos do SML estavam ocorrendo no mercado internacional na época em que o SML foi criado?

3. Poderia me dar uma explicação detalhada do funcionamento do SML?

3.1. Quais são os potenciais riscos na operação do SML? Quem assume estes riscos?

3.1.1. Quem assume o risco de crédito na operação de SML?

3.2. Como é escolhida a moeda de denominação dos contratos?

3.2.1. Qual é o percentual de utilização do real? Este dado está disponível?

3.2.2. Por que os exportadores brasileiros usuários do SML preferem utilizar o real em vez do dólar como meio de pagamento?

3.3. Qual é o papel dos bancos centrais no SML?

3.3.1. Os bancos centrais assumem algum risco?

3.3.2. Por que os bancos centrais liquidam as operações em dólar?

3.4. Como o comércio via SML é financiado?

3.4.1. Na sua opinião, a falta de financiamento ao comércio previne o uso do SML?

4. O SML cumpre o papel esperado pelo BC?

4.1. O BC possui alguma forma de avaliar o empenho do uso do SML?

4.1.1. Quais métodos são utilizados? Há alguma pesquisa, questionário, enquete?

4.2. Há algum diálogo com os participantes do sistema?

5. Quais são os fatores que limitam a utilização do SML?

   5.1. Que medidas poderiam expandir o uso do SML?

      5.1.1. Qual seria o papel de novas tecnologias nesse processo (Fintech)? [Por exemplo, as tecnologias de blockchain]

   5.2. Qual é o papel de mecanismos de governança neste sistema?

   5.3. Qual seria o papel de instituições e medidas complementares? Por exemplo, como discutido anteriormente, financiamento ao comércio em moeda doméstica?

   5.4. O SML seria mais utilizado se as empresas fossem estivessem mais preparadas para administrar os riscos?

6. Há alguma intenção ou expectativa de expandir ou modificar o uso deste sistema na América Latina?

   6.1. Por que o Brasil cortou as negociações bilaterais de swap com a Argentina?

Ethics

This research has been approved by the ethical committee from the University of Leeds. All participants agreed and signed a consent form that explains in detail how all given information will be used and stored. It has been assured to participants their anonymity, confidentiality and data protection. They were also informed about the purpose of my research and how I would conduct the interviews. There was no manipulation and no coercion. Participants were told that they were free to leave the interview at any point and that they could refuse to answer any questions. Only one participant at the first stage of interviews asked not to use the recorder. This participant, however, on the second stage of interviews, felt comfortable enough to allow the interview to be recorded.

Participants were directly contacted through email informing my research purpose and the university where I come from. Their contacts were given to me mostly through the network of my supervisor and, with the snowball sampling, through other central bankers. I also have a colleague in the BCB who introduced me to other participants. As most of the interviews were conducted in the BCB headquarters in Brasília, participants were interviewed in a comfortable environment and they seemed very comfortable with the interview sheet. The interviewees from the private sector and those who were retired from the BCB were interviewed in their current working place.

It is apparently unusual that researchers in Brazil give them an information sheet and a consent form to sign. They appeared to be more comfortable with the concern of my research for ethics. Sometimes they would ask to turn off the recorder for a moment, particularly when the information was related to politics. Regarding the specific content of the interview sheet, they seemed comfortable and confident to say when they were unsure about the answer because it was out of their expertise. I was also given data that is not available, which shows trust. Therefore, participants did not appear to be reluctant to give their opinion and, thus, they are more likely to tell me the truth.

Appendix Figure 1

Gráfico-13: Transações por faturamento das empresas em janeiro de 2018

Microempresa (0.76%)
Empresa de Pequeno Porte (0.76%)
Médias e Grandes (98.48%)
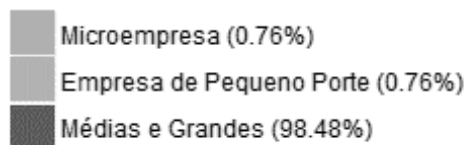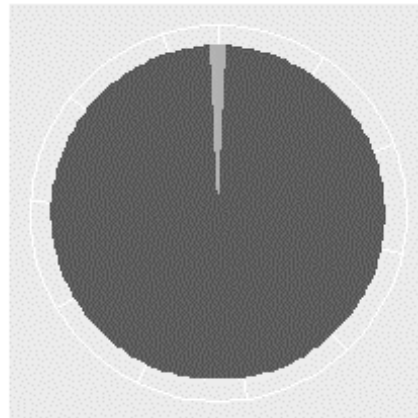
Appendix Table 13: Interview Duration

Round 1	
Participant	**Duration**
Interviewee 1	01:37:01
Interviewee 2	03:03:45
Interviewee 3	01:24:04
Interviewee 4	-
Interviewee 5	01:01:04
Interviewee 6	03:25:47
Interviewee 7	01:49:51
Interviewee 8	01:16:10

Round 2	
Participant	**Duration**
Interviewee 1	01:38:48
Interviewee 2	01:48:03
Interviewee 3	01:51:21
Interviewee 4	01:56:55
Interviewee 5	02:46:41
Interviewee 6	01:06:46
Interviewee 7	02:06:04
Interviewee 8	02:01:01
Interviewee 9	01:47:24
Interviewee 10	01:05:05
Interviewee 11	01:34:44
Interviewee 12	01:32:16
Interviewee 13	00:59:56
Interviewee 14	02:03:05
Interviewee 15	01:58:33
Interviewee 16	00:30:57