

CENTRAL BANKING AND THE POLITICAL ECONOMY
OF EAST ASIAN REGIONALISM:
SOVEREIGNTY, AUTONOMY AND MONETARY POLICY

A Dissertation

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Abstract

This dissertation explores the role of central banking in the political economy of East Asian regionalism by means of empirical quantitative and institutional qualitative analyses. The first section studies the interest rate policies and balance sheet policies of East Asian central banks, demonstrating how regional monetary authorities manage to isolate domestic monetary policy from the impact of international financial flows and retain their policy autonomy even under non-floating regimes. Building upon this, the second section presents an in-depth study of Chinese monetary policy operations, including a text-based analysis of "window guidance" policies, and illustrates how quantity-based policy tools affect and distort price-based policy tools, the very instruments which Chinese monetary authorities currently aim to establish as the primary policy lever. Finally, the third section conducts an institutional political economic analysis of currency internationalisation against the background of the internationalisation of the Chinese yuan and the Japanese yen, arguing that the internationalisation of both currencies requires internal rebalancing towards greater domestic consumption and external rebalancing towards higher imports. The thesis concludes by reflecting upon these findings in the context of East Asian regionalism and by drawing comparisons to European regionalism. It is argued that current political economic conditions in East Asia neither suit nor require formal coordination of monetary policies and associated sovereignty pooling. Instead, existing integration would benefit from institution building, capacity building and the diversification of exchange rate policies.

Keywords: central banking; regional integration; international currency; East Asia;
political economy

JEL Classifications: E05, F03, F05

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1 The Politics of Central Banking

In summer 2008, the bankruptcy of US investment bank Lehman Brothers triggered a worldwide economic crisis and a sharp reversal of international financial flows. The rapid outflow of funds from East Asia¹ led to a sharp depreciation of regional currencies, and the collapse of international demand severely disrupted East Asian supply chains. It was not, however, the first crisis of its kind. Only a decade earlier, financial and monetary factors were primary drivers of the *Asian Financial Crisis*, in response to which policymakers set up the *Chiang Mai Initiative*, a multilateral system of swap agreements for emergency liquidity provision. When the *Global Financial Crisis* hit the region in 2008, however, this arrangement was not called upon (Grimes, 2015).

East Asian economies had been stabilising their exchange rates against the US dollar for several decades, creating a common monetary standard which allowed countries separated by vastly different political systems to maintain intra-regional exchange rate stability in an informal yet effective way (McKinnon & Schnabl, 2005). The *East Asian dollar standard* played a major role in the growth of regional output and the development of supply chain networks producing goods for the United States, but by the end of the 20th century, increasing dependence on external fin-

¹“East Asia” is herein defined as the People’s Republic of China (hereafter simply as “China”), Japan, South Korea, the member economies of the Association of Southeast Asian Nations (ASEAN), made up of Indonesia, Malaysia, Philippines, Singapore, Thailand, Brunei, Vietnam, Laos, Myanmar and Cambodia, and the smaller East Asian economies of Hong Kong, Macao, the Republic of China on Taiwan (hereafter as “Taiwan”) and North Korea. For most empirical matters, the study focusses on the ASEAN+3 core group of economies (i.e. ASEAN plus China, Hong Kong, Japan, South Korea), due to limitations in data availability.

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ance had led to the accumulation of *currency mismatches* and *maturity mismatches* on regional balance sheets. When the withdrawal of funds led to a region-wide crisis, East Asian policymakers, recognising their economies' real and *monetary* integration² with one another, began exploring the possibility of putting the regional exchange rate system on a more formal basis (Volz, 2010, pp. 1–46). The ensuing political initiative towards policy cooperation and policy coordination, which this thesis collectively refers to as “East Asian regionalism”, has all but disappeared from public debate two decades later, however. Meanwhile, the US dollar still occupies a central position in regional exchange rate regimes, while the *European Monetary Union*, the role model many East Asian policymakers aspired to, has been mired in an existential crisis for eight years and counting.

This dissertation sets out to revisit the role of central banking in the political economy of East Asian regionalism to shed light on these developments. On the basis of recent theoretical advances within economic and political economic theory, empirical quantitative and institutional qualitative analysis is provided to highlight several facets of central banking and its relationship with autonomy and sovereignty that have thus far been overlooked. A central contention will be that the re-evaluation of monetary policymaking since the Global Financial Crisis and the outbreak of the Euro Crisis have profound consequences for the theoretical understanding of the relationship between monetary policy and political autonomy and sovereignty, which need to be taken into consideration to gain an understanding of the forces driving the evolution of East Asian regionalism.

The analysis is presented in three chapters. Chapter 2 looks at the monetary policy constraints facing open economies and demonstrates how modern central bank practices warrant a reconsideration of traditional open economy theory, particularly with regard to the tension between exchange rate stability and domestic

²Monetary integration is here understood as “all forms of coordinated currency stabilisation” (Schelkle, 2001, p. 1). Following Volz (2010), this includes pegging to the same anchor currency or currency basket in addition to monetary union.

monetary policy autonomy. In its illustration of the way in which interest rates mediate public and private sector balance sheets, the chapter demonstrates that such tension is present only under conditions of a sustained loss of foreign exchange reserves. Building upon this, chapter 3 examines the process of monetary policy transmission in China in order to gain an understanding of the role of the interbank overnight interest rate in a policy framework strongly characterised by quantitative policy measures. The analysis shows that the interbank rate plays an important and consistent role in monetary policy even within such a system, and presents suggestions for how the role of the interbank rate could be strengthened. Chapter 4 presents a political economic analysis of the institutional conditions of currency internationalisation based on a study of the policy constraints facing economies at different stages of their economic development. This chapter elucidates the relationship between the international use of currency and the institutional structure of the international monetary system, how this structure affects countries' policy choices and patterns of economic development. In doing so, the analysis highlights important real economic factors that affect a currency's potential to achieve greater international use. Chapter 5 draws together all of the above factors, reflects upon their policy implications and formulates conclusions.

Methodologically, this thesis will conduct quantitative econometric analysis in combination with qualitative institutional analysis in a political economic framework. This approach differs from other economic, political economic or political treatments of the topic in two central respects: First, the analysis is strongly empirically driven so as to minimise theoretical assumptions. Inferences are drawn from large amounts of data and the statistical analysis of balance sheets. The results of the analysis are examined extensively for robustness across different model specifications. The empirical data provides the basis for an eclectic treatment of the research topic that draws on different guiding theories. Second, the analysis treats economics and politics in an integrated, non-dichotomic way so as to account for

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the political nature of the economic systems and institutions under study. This is achieved through a detailed observation of how institutions are structured and how monetary claims are issued, where they are held and how they are denominated. The results allow for a unified treatment of traditional economic topics, such as central bank operating procedures, and traditional political economic topics, such as agency and interest groups. The argument here is that economics and politics are inextricably intertwined. Political economy needs to account for this in revisiting the political element of basic economic models.

In some cases, this approach yields the same conclusions as those afforded by established analyses, such as the claim presented in chapter 4, which addresses the interrelation of currency internationalisation and economic rebalancing (mirroring a point made by Germain & Schwartz, 2014), despite arriving at different conclusions about associated policy aspects, such as the relevance of the modern-day interpretation of the Triffin dilemma (which is closer to Bordo & McCauley, 2016). In other cases, the conclusions of this study differ from those of previous analyses. For example, it is argued here that decentralised policies are likely to benefit existing integration in East Asia more than formal approaches, although a general desirability of greater regional political orientation and cooperation also underlies the analytical framework chosen here (similar to Kawai, 2009). The purpose is to highlight neglected aspects of the topic, in order to complement previous studies and motivate further inquiry, all the while acknowledging that this topic, being extremely complex and subject to much uncertainty, warrants careful analysis.

The overarching argument of this thesis is that, together, the findings presented warrant a reconsideration of the political economic dimension of central banking and its role in economic policy. It is demonstrated that central banks, and thereby economies, retain their interest rate autonomy so long as they maintain positive net inflow of foreign exchange reserves, the effectiveness of which depends on the domestic monetary policy set-up and the transmission from interest rates to mac-

roeconomic outcomes. Thus, East Asian economies do not necessarily “suffer” from pegs to external currencies as long as they maintain external surplus positions, and do not necessarily “gain” autonomy by moving to floating exchange rates or entering a monetary union. The adoption of a different exchange rate regime is therefore not in itself indicative of a change in the “power” relationship between countries. Rather, to the extent that monetary power relates to the ability of states to use their currency in the settlement of international transactions and in the financing of their external commitments, monetary power is determined by institutional factors which operate on domestic, regional and international levels. Given that the Euro Crisis has served as a forceful reminder of the political dimension of monetary matters, the thesis concludes that existing East Asian integration neither suits *nor warrants* greater formality and associated sovereignty pooling, but rather would benefit from efforts towards institution building, capacity building and the diversification of exchange rate policies.

2 Global Liquidity and Monetary Policy Autonomy

This chapter examines the monetary policy constraints facing economies on a fixed peg or managed float regime, contrasting the Mundell-Fleming Trilemma view against the Compensation view commonly found at central banks. While the former holds that foreign exchange inflows and outflows affect the domestic money base and constrain monetary policy under non-floating regimes unless capital controls are adopted, the latter purports that endogenous sterilisation of foreign exchange flows invalidates this trade-off. The predictions of both theories are empirically evaluated for five East Asian economies using central bank balance sheets, vector error correction models and impulse response functions. The findings indicate that the dynamics for the economies studied correspond more closely to the Compensation view than the Trilemma view, suggesting that it is a sustained loss of foreign exchange reserves, not the adoption of a non-floating exchange rate regime, that imposes a relevant constraint on autonomy.

2.1 Introduction

Thought about the international monetary system and its working mechanisms has traditionally been guided by various notions of an “impossible trinity”, according to which it is impossible for an economy to simultaneously achieve stable exchange rates, free financial flows and monetary policy independence. The theory goes that policymakers are forced to choose a combination of any two of these goals, but cannot realise all three of them at the same time.

The most popular and arguably most influential representation of this *Trilemma view* is the Mundell-Fleming model, which holds that foreign exchange inflows and outflows associated with balance of payments disequilibria directly affect the domestic money base under a fixed peg or managed float regime, making it impossible for an economy to pursue an independent monetary policy unless capital controls are adopted. This view has been questioned from a variety of perspectives, with several studies pointing to the fact that modern central banks consistently sterilise and thereby offset foreign exchange inflows. Nevertheless, the idea that an economy loses its autonomy when adopting a peg is still widely held on to in the literature, irrespective of theoretical orientation.

This study demonstrates that the operational principles underlying modern central bank systems largely invalidate the Trilemma trade-off. As central banks operate by setting a policy interest rate and accommodating the demand for central bank liquidity at that rate, balance sheet quantities adjust endogenously. Therefore, an economy’s degree of autonomy ultimately depends on its ability to accumulate foreign exchange rather than its choice of exchange rate regime.

This conclusion is based on the analysis presented in the following three sections. First, the Mundell-Fleming Trilemma is theoretically contrasted against the so-called *Compensation view*, a perspective commonly found in the writings of central bank practitioners (Le Bourva, 1959, 1962; Berger, 1972; Goodhart, 1984, pp.

291–292) which holds that *endogenous* sterilization of foreign exchange flows offsets possible effects on domestic monetary policy. Second, the predictions of both theories are examined on the basis of central bank balance sheet data and evidence is provided showing that empirical dynamics correspond more closely to the Compensation view than the Trilemma view. Third, several important consequences of these findings pertaining to an economy’s political autonomy and sovereignty are identified and analysed. The main implication is that currency pegs may be less costly in autonomy terms than has been traditionally assumed, whereas the gains from floating or monetary union may not be as high as generally expected. In the current era of buoyant global liquidity, this conclusion is highly relevant for economies seeking to stabilise their exchange rate.

2.1.1 Literature review

While the conclusions presented here warrant a reconsideration of the established tenets underpinning much of economics and political economic literature (see, e.g., Rogoff, 1984; Obstfeld & Rogoff, 1995), there exist several strands of research that have yielded results similar to those presented here. The works of central bank practitioners in particular generally maintain a similar methodological and theoretical perspective, which is best reflected in the studies published by the originators of the Compensation view (Le Bourva, 1959, 1962; Berger, 1972; Goodhart, 1984, pp. 291–292). More fundamentally, the results here also echo insights presented in analyses of unconventional monetary policy measures, specifically regarding the distinction between balance sheet policies and interest rate policies (Goodfriend, 2000; Borio & Disyatat, 2010), which is also reflected in the Compensation principle.

Empirically, this study is similar to the paper by Lavoie & Wang (2011), who analyse the balance sheet of the People’s Bank of China for the period from 1999 to 2007 and test restrictions on the long-run relations in the VECM, and to a more

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recent examination of the case of Macedonia in Bozhinovska (2015). Both studies find evidence for the existence of long-run relationships between foreign exchange accumulation and non-money base liabilities, specifically central bank securities, which the authors interpret as support for the Compensation view. The analysis presented here is similar in that it accounts for the presence of cointegration, yet also seeks to disentangle the average quantitative response of balance sheet items.

Finally, the conclusions presented here are conceptually close to those of authors who argue that sterilised foreign exchange market intervention is empirically effective (e.g. Löffler et al., 2012; Ito, 2003), as well as to those of studies which find that global financial cycles dominate domestic financial cycles and thereby render the choice of exchange rate regime irrelevant (e.g. Rey, 2015). There are also parallels to analyses based on macroeconomic accounting models such as Taylor (2008), who argues that in a well-defined stock-flow consistent system, there is no independent equation for the balance of payments (Taylor, 2008).

2.2 Theory

Consider an economy with a fixed exchange rate regime and an open capital account, where the central bank stands ready to convert foreign currency to local currency at some pre-announced parity. The Trilemma view holds that the central bank in such an economy increases the domestic money base whenever there is an inflow of foreign exchange associated with a balance of payments surplus (and decreases it in the case of outflows). This one-to-one link between the items “net foreign exchange reserves” and “money base” on the central bank’s balance sheet ($ALFR \uparrow LMB \uparrow$, where $\Delta ALFR = \Delta LMB$ in Figure 2-1) is said to deprive the central bank of its ability to set domestic interest rates by manipulating the money base, causing the central bank to lose its policy autonomy (Ethier, 1995, p. 442; Obstfeld & Rogoff, 1995, p. 75). Hence, the Trilemma view regards the choice of exchange rate regime as the determinant of policy autonomy, given free financial flows.

[Figure 2-1 “Stylised central bank balance sheet”]

The Compensation view, on the other hand, holds that a deviation of the money base in response to foreign exchange inflows would be prevented by movement in other balance sheet items, as such inflows would be offset by a decrease of other central bank assets (e.g. $ALFR \uparrow AGS \downarrow$) or an increase of other central bank liabilities (e.g. $ALFR \uparrow LCS \uparrow$). Such a *compensating* response could, contingent upon institutional factors and banks’ liquidity preference, instantaneously absorb up to the full amount of the foreign exchange inflow (e.g. $\Delta ALFR = \Delta LCS$, where $\Delta LMB = 0$) and thereby prevent movement of the interest rate. Transitory or minor residual effects on the money base would then merely reflect changes in the demand for precautionary reserve holdings or national variations in reserve requirements and their associated maintenance periods, with no bearing on the domestic interest rate.

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Known as *sterilisation*, the Trilemma view sees neutralising transactions of this kind as a secondary and discretionary measure that is largely ineffective (e.g. McCallum, 1996, p. 138) or even detrimental to the integrity of a fixed exchange rate system (Mundell, 1963, p. 485). In the Compensation view, by contrast, sterilisation is the logical consequence of the operation of an interest rate targeting central bank system and is non-discretionary, as described by the former governor of the Bank of Japan, Shirakawa (2008, pp. 291–292):

“It does not make [theoretical] sense to distinguish between ‘sterilised intervention’ and ‘unsterilised intervention’. Moreover, based upon our understanding of the modern practices for monetary policy operations and foreign exchange market intervention, it is difficult to imagine an operation which would end up being an ‘unsterilised intervention’. Consider the case of intervening by buying foreign currency, for example. In such a case, domestic currency [...] is paid to the market, so that the balance of central bank reserves increases. ‘Unsterilised intervention’ means that the central bank then leaves things as they are, but in this case the short-term interest rate would fall. Since the central bank has a target level for the short-term interest rate, however, [...] it will be necessary to conduct a funds absorption operation equal in size to the foreign exchange market intervention in order to realise the decided interest rate level. In other words, as long as a target level for the short-term interest rate has been set, foreign exchange market intervention will always be ‘sterilised’. [...]” (Translation, annotation and emphases by the author of this study)¹

¹The author thanks Tomohiro Kinoshita for helpful comments on the translation of this paragraph.

Shirakawa goes on to outline how the purchase of foreign currency by Japanese authorities involves the simultaneous issuance of “Short-Term Financing Bills”, which automatically sterilise the transaction. Even when this is not the case, offsetting transactions may occur automatically at the initiative of the private sector, as argued by Goodhart (1984, pp. 191–192), former member of the Bank of England’s Monetary Policy Committee:

“In order to achieve the desired level of [high-powered money], [...] the authorities have to try to offset movements, which may on occasions be very large, in all these other flows by inducing people to purchase, or if needs be to sell, marketable government debt. [Continued in footnote] *There is, however, some tendency towards negative covariation in these flows, i.e. they seem to interact in a way that produces some partial compensation, which alleviates certain of the difficulties facing the authorities.* A large foreign exchange inflow usually encourages sales of gilts [i.e. government bonds] and also reduces company demand for bank credit.” (Annotations and emphasis by the author of this study)

In a situation where commercial banks find themselves holding excess reserves that pay little or no interest, and without recourse to interbank lending in a situation where the system-wide demand for reserves is satisfied at the prevailing interest rate level, they will attempt to substitute the corresponding reserves for interest-earning assets and purchase government securities or central bank securities from the central bank. Such transactions would be most common in economies where monetary policy primarily assumes the form of open market operations, as in Anglo-American systems (Mehrling, 2011). In economies where monetary policy typically relies on standing facilities and loans, as has historically been the case in the bank-dominated financial systems of Europe and East Asia (Yoshino, 2012), banks may wish to repay part of their debt to the central bank and thereby reduce their debt servicing costs.

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Both purchase of government securities as well as repayment of central bank debt would cause the money base to fall back to its original level without any explicit action on the part of the authorities, whereas in the Trilemma view it would remain at its new higher level, since an increase of commercial bank reserves is assumed to set into motion a multiplier process leading to a manifold expansion of the total money supply. Again, while sterilisation is recognised within the Trilemma view, it is seen as a fundamentally ineffective operation which should remain the exception, since frequent application is assumed to lead to a breakdown of the peg.

Under the Compensation view, on the other hand, sterilisation is an *endogenous* operation: In order to prevent interest rate movement away from the target, a central bank must either accommodate private demand for reserves through credit facilities or open market operations, or find other ways to induce commercial banks to hold on to excess reserve balances. These compensating measures can take place either via the asset side or the liability side of the central bank's balance sheet. Whereas the sale of securities involves a "dual decision" by the central bank and the private sector, sterilising transactions may also be initiated autonomously by the private sector alone through drawings on central bank credit lines,² which extend equivalent arrangements between commercial banks and firms (Kaldor & Trevithick, 1981; Robinson, 1956, pp. 225–244). It is the latter demand-driven sterilisation in particular that Le Bourva (1959; 1962) and Berger (1972) of the Banque de France, the originators of the theory, stress within an open economy setting as the "compensation principle" (Lavoie, 1992).³

Within this framework, an economy remains autonomous so long as it maintains a net inflow of foreign exchange, since its central bank faces no balance sheet constraint with respect to assets and liabilities denominated in its own currency. Consequently, it also faces no technical limitations to its ability to sterilise foreign exchange inflows

²The author thanks Marc Lavoie for pointing out this distinction.

³Ehnts & Barbaroux (2015) give an account of the historical development of the Compensation thesis.

(Buiters, 2008) and achieve its interest rate target. In contrast, an economy experiencing a sustained outflow is limited by its remaining stock of foreign exchange reserves. Only the latter would find its autonomy, understood here as the ability to achieve its interest rate target, constrained (Lavoie, 2001).

2.3 Empirical analysis

2.3.1 Methodology

To determine which of the two theories under discussion provides a better description of the workings of modern central bank systems, their predictions are compared on the basis of central bank balance sheets for five East Asian economies. If foreign reserve accumulation in these economies is primarily associated with a dominating, positive, significant and lasting increase of the money base, the Trilemma view would apply. If dominating, significant and lasting offsetting movement in other balance sheet items (negative in the case of assets and positive in the case of liabilities) is the observed response, the Compensation view would apply. To determine which is the case, vector error correction models (VECM), a multivariate time-series framework which accounts for the presence of long-run stationary relationships among a group of variables (cointegration), are estimated and impulse response functions are calculated.

In order to retrieve that part of the movement in balance sheet items that is due to an inflow of foreign exchange reserves, a standard Cholesky ordering is used here to identify the orthogonalised impulse responses. Effects are assumed to run successively from net foreign exchange reserves to the money base before affecting other balance sheet items, arranged in order of decreasing importance as suggested by their outstanding positions. While this approach primarily embodies the causality predicted by the Trilemma view, it also allows for the possibility of transitory or

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minor liquidity effects on the money base, e.g. rising private reserve positions in anticipation of increased payment commitments during an economic expansion or precautionary reserve holdings during periods of stress in the financial system.

The economies of South Korea, Taiwan, Malaysia, China and Hong Kong (in order of decreasing exchange rate flexibility) were selected for study here on the grounds that they are geographically close, institutionally well developed, and rather heterogeneous in their central bank set-ups and use of capital controls. Less developed economies typically are not good candidates for analysis of this kind since necessary structures such as interbank markets or domestic bond markets are often absent or insufficient (Yoshino et al., 2006). In more advanced economies, on the other hand, unconventional monetary policies involving interest payments on excess commercial bank reserves turn said reserves into near-perfect substitutes for treasury paper, causing their opportunity cost to disappear or even become negative (Bindseil, 2014, pp. 93–95), which invalidates the negative relationship with the interbank interest rate that is central to both the Trilemma and the Compensation view.

While Taiwan and Malaysia both stabilise exchange rates to a greater degree than Korea, albeit at lower frequencies than China or Hong Kong, this is inconsequential for the assumed working mechanisms. As soon as monetary authorities acquire foreign exchange, they cease to “float freely” (in the stylised model sense) and supply interbank markets with additional liquidity. This is the case even when foreign exchange market intervention occurs relatively infrequently. How the additional liquidity is dealt with is the subject of this study.

Furthermore, although Malaysia and China rely on various types of capital controls and as such are often understood to retain their monetary policy autonomy, it is important to point out that capital controls are not binary but represent a range of possible choices. According to the 2003 Annual Report of China’s State Administration of Foreign Exchange, more than 50 per cent of China’s capital account transactions were either unrestricted or lightly restricted, whereas about 30

per cent were more restricted and less than 20 per cent tightly restricted at the time of the report's publication (SAFE, 2004). Recent years have seen further official step-wise liberalisation of controls as well as unofficial circumvention via over-invoicing and under-invoicing of current account transactions. Finally, while a fully closed capital account would prevent financial arbitrage, net current account receipts (export earnings) would still lead to payment inflows and associated liquidity expansion in the interbank system (Lavoie, 2001).

The approach chosen here avoids incorporating further theoretical assumptions so as not to disadvantage either of the perspectives under examination. Balance sheets are chosen as a basis for the analysis because they represent a coherent mathematical system that does not require any a priori assumptions about what drives the change in balance sheet items or how balance sheet items are related, aside from standard accounting consistency requirements (i.e. total assets must equal total liabilities plus equity capital). As such, any additional theoretical assumptions incorporated into the system would have the potential to bias the results in favour of one of the two perspectives. Also, incorporating additional assumptions would likely have little useful effect, since the purpose here is not to identify what drives movement in different balance sheet items, but rather to identify and quantify the relationship of central bank balance sheet items. VECM lend themselves well to such a task, as they account for the interaction of variables in multivariate systems where cointegration is present. In that respect, it makes no difference whether increases in foreign exchange inflows originate from larger current account transactions or from portfolio financial flows, since both would introduce additional liquidity into domestic interbank systems. The difference between these two perspectives lies in how this additional liquidity is dealt with, which makes balance sheets the logical starting point for the analysis here. Which theory is more plausible is what the following analysis aims to elucidate. Finally, rigorous robustness checks are conducted to rule out any remaining methodological imbalances.

2.3.2 Data

Monthly balance sheet data for the five economies analysed was obtained from the International Monetary Fund's (IMF) International Financial Statistics and from those economies' monetary authorities.⁴ Raw data was aggregated to obtain the series shown in Figure 2-1, where equity capital is excluded as it is not relevant to the question at hand. The specific time frames were chosen so that the sample periods would coincide with significant foreign exchange reserve accumulation in the target economies while avoiding structural breaks within their balance sheets, e.g. instances where the outstanding position of any item becomes zero.

The balance sheets of the five monetary authorities under study are shown in Figures 2-2 to 2-6, with assets stacked in positive territory and liabilities stacked in negative territory. All balance sheets indicate significant foreign exchange reserve accumulation in the period after the Asian Financial Crisis 1997–98 that, on the basis of a first-look visual observation, does not show any obvious association with the money base, which seems to merely increase linearly over time. Indeed, in several instances changes in the money base appear to correlate negatively with changes in net foreign exchange reserves in US dollars.

Several institutional observations are in order. While monetary policy in East Asia used to rely primarily on standing credit facilities, the accumulation of foreign exchange reserves since the Asian Financial Crisis has shifted the focus towards the liability side of central bank balance sheets. All of the economies under consideration issued central bank securities in large amounts (*LCS*), which, in Taiwan's case, were complemented by so-called "re-deposits", reserves financial institutions are obliged to hold with the central bank (Yang & Shea, 2006). In China, central bank bills played an important role up to 2007 (Lavoie & Wang, 2011; Körner & Ehnts, 2013),

⁴All statistics for Taiwan were obtained from the Central Bank of the Republic of China (Taiwan). Data on required reserves in China was obtained from the People's Bank of China. Data on Exchange Fund Bills and Notes in Hong Kong were obtained from the Hong Kong Monetary Authority.

when emphasis shifted towards required reserves (LRR), the ratios of which are substantially higher and more frequently adjusted than in other economies (Ma et al., 2013). Also, government deposits (LGD) have been a prominent item on the balance sheet of the Bank of Korea for several years. They have also served as a counterbalancing item to foreign exchange inflows in Hong Kong, which is a feature of many currency boards (Dobrev, 1999).

In order to ensure consistent treatment of balance sheet items across all five economies, the “money base” as defined in China and Hong Kong requires modification to correspond to the same concept as in other economies. According to conventional definition, the money base is made up of currency in circulation and commercial bank reserves which are perfectly liquid and held in a discretionary manner (US Fed, 2014; ECB, 2015). Unless monetary authorities have adopted unconventional monetary policy measures involving interest payments on bank reserves, excess reserves carry an opportunity cost vis-à-vis other interest-earning assets, which is the underlying assumption in both the Trilemma and the Compensation view. Components of the money base with a maturity greater than zero or items kept in a non-discretionary fashion remove this opportunity cost and therefore need to be subtracted when they make up a substantial part of the money base.

In China, this requires accounting for the large positions of required reserves, which are either negligible or absent in other economies. Reserves absorbed in this way cannot be used for other purposes, so they essentially function like any other central bank security (Bindseil, 2014, pp. 93–95).⁵ The outstanding amount of required reserves is consequently approximated (as LRR) and taken out of the money

⁵It deserves mentioning at this point that Zhou Xiaochuan, governor of the Chinese central bank, also draws a distinction between monetary policy and the management of foreign exchange reserves (Caixin, 2012).

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base.⁶ This item is then summed up with central bank securities into a pseudo-instrument “required reserves plus central bank bills” (*LR RCS*) to compensate for the structural shift between these two items (Ma et al., 2013).

Similarly, securities issued by the Hong Kong Monetary Authority (HKMA) are treated separately (as *LCS*) in the case of Hong Kong. While the HKMA goes to great lengths to demonstrate that its securities are fully backed by US dollar reserves, are issued in a non-discretionary manner and have the same standing as other components of the money base with respect to its convertibility undertakings (HKMA, 2011), other currency boards (an example being Macao, which itself pegs to the Hong Kong dollar) do make an explicit distinction here. The situation is complicated somewhat by the fact that a money base as such did not exist in Hong Kong until the late 1990s, as interbank settlement and clearing were conducted through balances with the HSBC, formerly the “Hong Kong and Shanghai Banking Corporation” (Latter, 2009). Even after these functions were taken over by the HKMA, variation on the liability side remained extremely small until the first decade of the new millennium.

⁶Since the actual calculation of required reserves is complex and differs by type of deposit and size of institution, the outstanding amount of required reserves is approximated on the basis of the average reserve requirement rate for small and large banks and total demand and savings deposits in the banking system.

2.3 Empirical analysis

Finally, in order to eliminate cases where central banks increase foreign reserve holdings by incurring foreign liabilities and to reduce variation stemming from changes in the exchange rate, foreign liabilities (LFR) are subtracted from reserves (AFR) to obtain net figures ($ALFR$ in Figure 2-1), which are subsequently converted to US dollars ($ALFRU$) using the prevailing market exchange rate vis-à-vis local currency units (LCU) before entering the model. This modification ensures that the remaining movement in net foreign exchange reserves in US dollar terms ($ALFRU$) is a closer approximation of actual net accumulation of foreign exchange reserves.

$$ALFRU_t = (AFR_t - LFR_t) \cdot e_t^{USD/LCU} \quad (2.1)$$

[Figure 2-2 “Balance sheet of the Bank of Korea”]

[Figure 2-3 “Balance sheet of the Central Bank of the Republic of China (Taiwan)”]

[Figure 2-4 “Balance sheet of the Bank Negara Malaysia”]

[Figure 2-5 “Balance sheet of the People’s Bank of China”]

[Figure 2-6 “Balance sheet of the Hong Kong Monetary Authority”]

2.3.3 Estimations

In preparation for the estimations, all series were converted to natural logarithms and subjected to unit root tests to ensure that non-stationary series were present in all data sets. Furthermore, in each economy's data set, the presence of deterministic trends could not be ruled out for one or more balance sheet items. This was accounted for by including unrestricted constants and restricted trend terms in the specification of the VECM, in line with Doornik (1998):

$$\Delta y_t = \mu_0 + \mu_1 t + \Pi y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \epsilon_t \quad \text{with } \alpha^T \perp \mu_1 = 0 \quad (2.2)$$

where Π can be represented by a loading matrix α and a cointegration matrix β , which determine the speed of adjustment and the cointegration space respectively:

$$\Pi = \alpha\beta'$$

Using a lag order suggested by the Hannan-Quinn information criterion, the number of long-run stationary relations was determined using Johansen cointegration tests and specified in the final models that were used to obtain the orthogonalised impulse responses, on the basis of which the reactions of balance sheet items to a one-standard deviation increase in the natural log of net foreign exchange reserves in US dollars (*lnALFRU*) were analysed. Finally, since interest lies primarily in the absolute size and direction of responses, the logged impulse responses were converted to mean responses in level terms (i.e. local currency terms), averaged over short and long horizons. The results are presented in Figure 2-7. Detailed estimation results and impulse response graphs are provided in the statistical appendix.

2.3.4 Results

[Figure 2-7 “Mean impulse responses in levels”]

No strong endogenous relation between the money base (*LMB*) and net foreign exchange reserves (*ALFRU*) was found in the economies analysed. The response of the money base to foreign exchange inflows is typically quantitatively small, mostly indeterminate and statistically insignificant given the 68% confidence bands used here. Rather, it appears that there exists an endogenous link between net foreign exchange reserves and other balance sheet items, since one or several items generally dominate the effect on the money base, with the direction of large responses corresponding to the predictions of the Compensation view for most of the significant and even most of the insignificant items.

There is evidence of asset-side sterilisation through claims on the private sector (*APR*) in South Korea and China, indicating potentially automatic demand-side sterilisation at the initiative of the private sector, as predicted by the Compensation view. This appears to be taking place even within the highly regulated financial system of China, although here the amount of liquidity absorbed in this way is comparatively small in level terms, possibly due to the People’s Bank’s increasing emphasis of open market operations as its primary policy tool, away from traditional discount window policies (Conway et al., 2010). While the corresponding item for Taiwan appears to be positive and significant, which is the opposite of what theory predicts, this association is small in level terms and quickly turns insignificant when lag order is increased. Central bank securities (*LCS*), in contrast, seem to play a more important role in Taiwan and Malaysia. They are also used in China in combination with required reserves (*LRRCs*). Interestingly, central bank securities do not seem to be directly related to foreign exchange inflows in South Korea, where they are issued at regular intervals and not exclusively for the purpose of sterilisation (BOK, 2013, pp. 84–88). Rising government deposits (*LGD*) can further be

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observed to offset the inflow of liquidity in South Korea, Hong Kong and China, although this effect was not as pronounced in the case of Korea when experimenting with alternative time frames.

A small reaction of the money base, where present at all, can be attributed to transitory or liquidity effects. The only case where the money base shows a significant increase over several horizons, which is also somewhat relevant in level terms, is Hong Kong. The HKMA appears to be following a more passive strategy of maintaining financial market integrity within the limits of its convertibility undertaking arrangement, allowing for more variation of the money base. It should also be noted that the response of the money base observed here is most likely at least partly the result of large liquidity injections undertaken in reaction to stress in the financial system in 2008 (HKMA, 2010) and so may be somewhat overstated. In any case, sterilisation plays an overriding role in Hong Kong similar to that in the other economies under consideration, suggesting that there is no inherent incompatibility between sterilisation and exchange rate stabilisation, as demonstrated by the remarkable stability of Hong Kong's peg.

In summary, these findings suggest that sterilisation is in fact the norm rather than the exception in all of the economies analysed. Although the means of achieving sterilisation are distinct, relying on different items, varying in timing and scope, and encompassing transactions initiated on the demand side alone as well as transactions involving a dual decision by the central bank and the private sector, they all aim at maintaining policy conditions in line with official objectives. Sterilisation isolates the money base from external impacts and thus occurs systematically, as held by the Compensation view.

The dynamics found here are fairly robust across a variety of specifications. Variations of the estimation procedure, such as changing the Cholesky ordering of the variables, raising the lag order, increasing the size of confidence bands, removing trends in borderline cases, and restricting sample periods to the most recent decade,

typically reinforce the results presented above. Some instability remains in the case of Hong Kong, which highlights the difficulty of tracing balance sheet effects in the presence of large official liquidity injections, especially when the interbank overnight rate is allowed to fluctuate more. While Hong Kong's interest rates follow those in the US more closely, they are not identical and do diverge significantly at times. The fact that the HKMA creates a spread within which private market agents maintain the exchange rate peg, and only intervenes when upper or lower exchange rate limits are reached, further substantiates the argument that exchange rate stabilisation is not necessarily related to monetary authorities' operations and the domestic money base. Results of selected robustness tests are reported in the statistical appendix.

2.4 Interpretation

The lack of empirical support for the Trilemma's working mechanisms stems from several contradictions inherent in the model. The first is the assumption that perfect capital mobility equals perfect asset substitutability, which does not hold true in general. Capital account liberalisation in East Asia in the 1990s, for example, produced currency mismatches and maturity mismatches on regional balance sheets and subsequent capital flight during the 1997–98 crisis rather than greater substitutability between East Asian and US securities.

Another contradiction is the conceptualisation of central banking in terms of quantities rather than prices. Sterilising transactions of the kind empirically observed here are present precisely because central banks have the ability to control the opportunity cost of reserves and thereby create spreads to which the private sector reacts. Different rates of return thus mediate public and private sector balance sheets, and therefore sterilisation is a fundamental part of the system rather than a theoretically inconsequential exception. Obviously, this cannot be captured in models which know only one explicit rate of return (Tobin, 1982). Although even the most influential contemporary macroeconomic models account for interest rate targeting (e.g. Woodford, 2003), the consequences of this shift in perspective are not fully reflected in the treatment of the open economy. Indeed, various notions of a Trilemma are still present in a wide variety of theoretical orientations.

The Compensation view reflects a distinction between central banks' balance sheet policy and interest policy, also noted by Borio & Disyatat (2010). While foreign exchange transactions are managed using the former, autonomy is exercised using the latter. In absence of a mechanism relating financial inflows and outflows to the domestic money base, there cannot be an automatic transmission of foreign exchange transactions to domestic monetary policy. As long as an economy is accumulating foreign currency, its central bank can always absorb the additional liquidity entering

the economy and set the overnight interest rate in line with domestic policy objectives. Interest rate arbitrage along the lines of the interest rate parity condition is thus restricted to those rates further removed from official control, i.e. rates at the long end of the yield curve, yields on private sector securities, or rates on offshore markets.

Even these asset classes are not completely removed from official rates. Central banks can and do at times intervene in long-term rates, a recent example being the US Fed's "Operation Twist". Offshore markets also differ from onshore markets with regard to liquidity and risk parameters. Eurodollar markets, for example, turned out to be more of a "good-weather" substitute for US federal funds during the Global Financial Crisis.

It is true that in a world of highly mobile international financial flows and buoyant global liquidity, there may be other practical or political limits to sterilisation. Policymakers may be concerned about the costs associated with sterilisation, as especially large-scale sterilisation is said to incur "quasi-fiscal costs" due to a possible negative interest rate differential between low-yielding foreign assets and high-yielding domestic liabilities. While these costs do not constrain a central bank's ability to issue claims denominated in local currency, they may affect the central bank's equity position, which is an issue of political significance. Wide deviations from global financial cycles or global business cycles may also quickly turn foreign exchange inflows into outflows. Similarly, even a positive position of foreign exchange reserves may be perceived as low by international investors and trigger a reversal of financial flows (Kregel, 2014). These factors reduce the scope within which policy can operate. They do not, however, remove all room for discretion (Moore, 1988, p. 274). Policymakers may choose not to exercise this discretion, nonetheless they do have it.

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Pegging may thus not be as costly in autonomy terms as traditionally assumed, whereas the gains from floating or monetary union may not be as high as expected. Small economies may lean towards giving up their monetary sovereignty and joining a larger monetary body in the hope of increasing their de facto autonomy as measured by their ability to influence policymaking on supranational levels, but as the crisis of the euro area has demonstrated, the institutional structure of an incomplete monetary union can severely restrict a member's autonomy in matters far beyond the monetary. A well-designed currency basket that supports domestic policy objectives (Yoshino et al., 2004) may offer advantages in flexibility over monetary integration and floating while avoiding their associated disadvantages.

Naturally, on a systemic level, the necessity to sustain a net foreign exchange inflow may be regarded as a loss of autonomy in real terms. In the absence of fundamental reform of the international monetary system (Keynes, 1980), however, this issue will continue to confront all economies equally, with the alternative of dealing with foreign exchange losses being even costlier. Given the present hierarchical structure of the international monetary system, the only way around this remaining constraint is to become the centre country supplying the international key currency, a non-trivial undertaking which is also not without cost. Consequently, instead of a choice between monetary policy autonomy and pegging, economies with an open capital account face a trade-off between monetary policy autonomy and a sustained outflow of foreign exchange, only one of which can be maintained in the long run.

2.5 Conclusion

This study examined the predictions of the Trilemma view and the Compensation view with regard to the relationship between an economy's foreign exchange reserves and its domestic money base, in an effort to ascertain whether a link exists between the two which constrains monetary policy independence under a fixed peg or a managed float regime. Analysis of five East Asian economies could not confirm the prediction of the Trilemma view that foreign reserve accumulation leads primarily to a large, significant and lasting increase of the money base. Rather, the results indicate that sterilisation offsets foreign exchange inflows systematically and endogenously, with the direction, size and significance of the movement in central bank balance sheet items corresponding more closely to the predictions of the Compensation view.

The absence of a mechanical relation between foreign exchange reserves and the domestic money base suggests that economies do not face a constraint on their monetary policy autonomy so long as they sustain and sterilise net foreign exchange inflows. In that light, pegging one's exchange rate may not be as costly in autonomy terms as traditionally assumed, whereas the gains from floating or monetary union may not be as high as assumed.

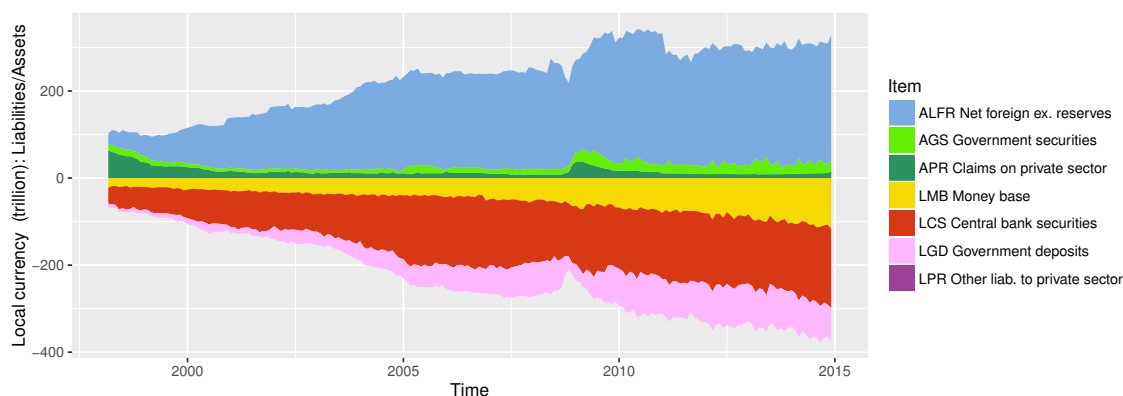
2.6 Appendix

2.6.1 Figures

Figure 2-1: Stylised central bank balance sheet

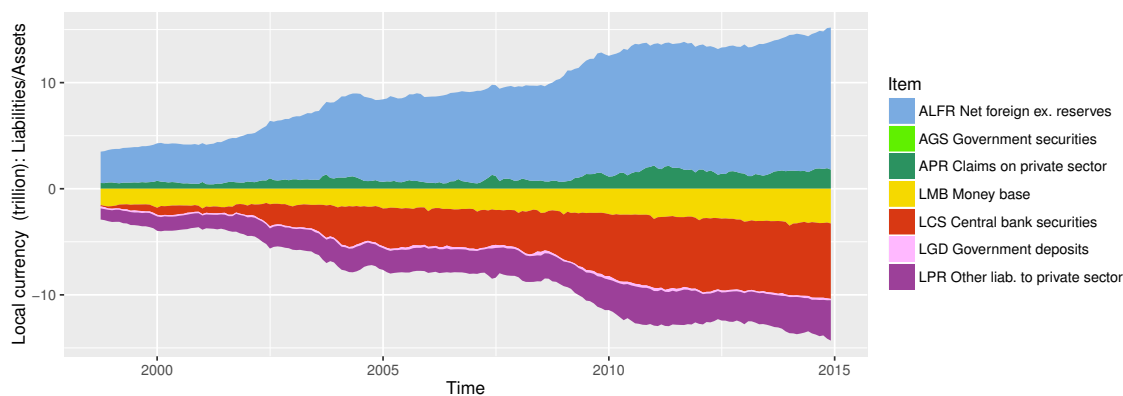
Assets		Liabilities	
<i>ALFR</i>	Net foreign exchange reserves	Money base	<i>LMB</i>
<i>AGS</i>	Government securities	Central bank securities	<i>LCS</i>
<i>APR</i>	Claims on private sector	Government deposits	<i>LGD</i>
		Other liabilities to private sector	<i>LPR</i>

Figure 2-2: Balance sheet of the Bank of Korea



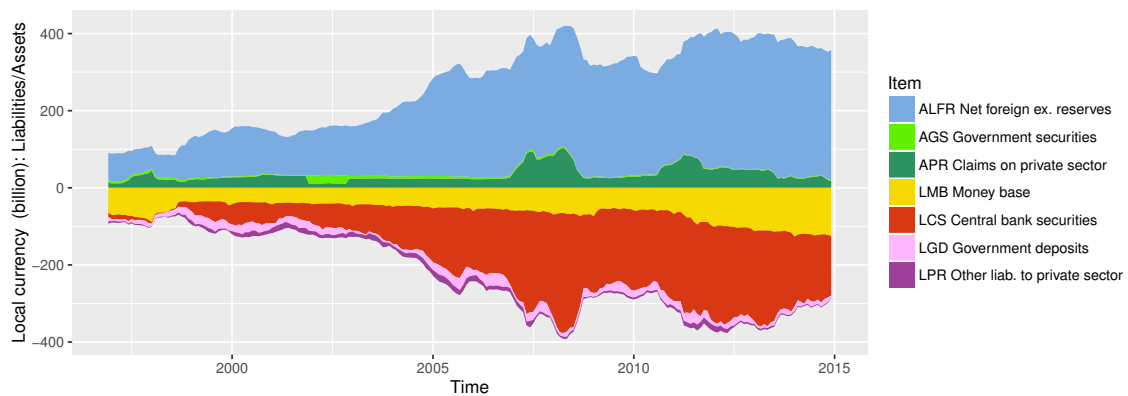
Source: IMF International Financial Statistics

Figure 2-3: Balance sheet of the Central Bank of the Republic of China (Taiwan)



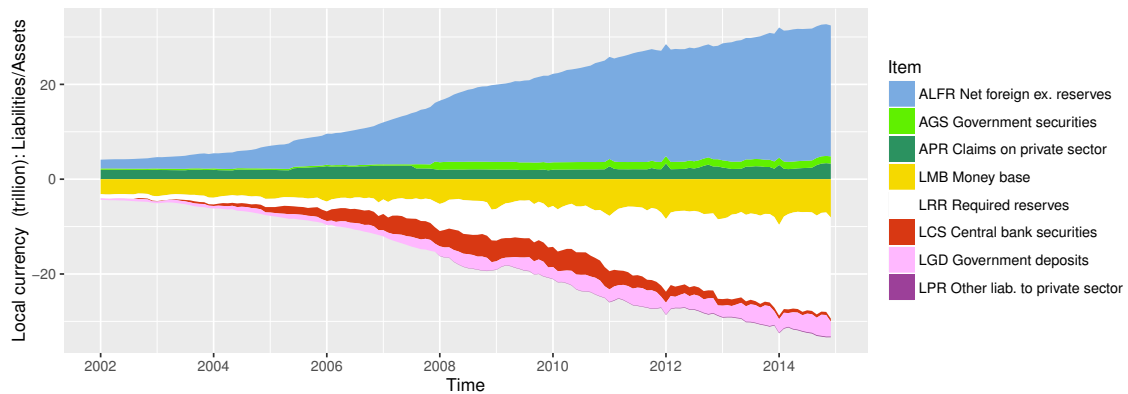
Source: Central Bank of the Republic of China (Taiwan)

Figure 2-4: Balance sheet of the Bank Negara Malaysia



Source: IMF International Financial Statistics

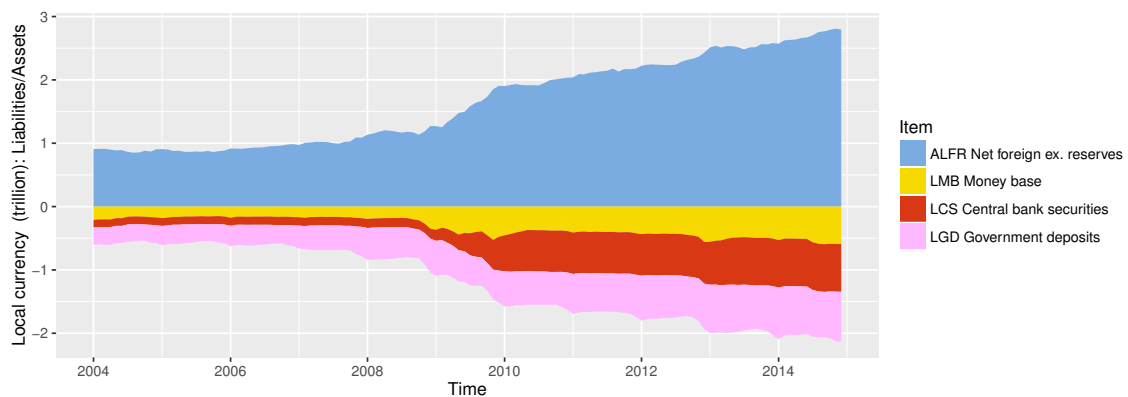
Figure 2-5: Balance sheet of the People’s Bank of China



Note: The area *LRR* represents the share of the money base which is held as required reserves. The remaining area *LMB* thus represents excess reserves.

Source: IMF International Financial Statistics, People’s Bank of China

Figure 2-6: Balance sheet of the Hong Kong Monetary Authority



Note: Exchange Fund Bills and Notes (*LCS*) are by definition part of the money base in Hong Kong but analysed separately here for reasons of consistency.

Source: IMF International Financial Statistics, Hong Kong Monetary Authority

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Figure 2-7: Mean impulse responses in levels

Mean level responses to a 1% increase in net foreign exchange reserves, averaged over short-run (horizon 0 to 5) and long-run (6 to 47), in millions of local currency units

Economy	Horizon	AGS	APR	LMB	LRR	LCS	LGD	LPR
Korea	Short	-57 040	-44 811	31 700	-	85 169	385 774	-194
	Long	-44 042	-64 327	23 003	-	-103 000	72 146	-149
Taiwan	Short	-33	7 651	42	-	70 865	507	2 334
	Long	-52	15 501	280	-	61 874	396	2 402
Malaysia	Short	-12	-110	-254	-	3 225	11	106
	Long	-9	-83	-252	-	4 087	111	110
China	Short	4 042	-22 635	-23 709	108 702		38 242	-2 482
	Long	59 596	-55 669	5 589	474 457		80 557	33 413
Hong Kong	Short	-	-	1 637	-	685	5 152	-
	Long	-	-	2 667	-	6 707	1 283	-

Shaded cells: response different from zero given 68% confidence bands for majority of horizons within range

Mean response in levels obtained by scaling shock to 1% and multiplying the response of each item in log terms by its mean in level local currency terms

2.6.2 Statistical appendix for South Korea

Figure 2-8: Unit root tests: South Korea

Augmented Dickey-Fuller test and Kwiatkowski-Phillips-Schmidt-Shin test

Critical values and corresponding significance level

Item	Det.	ADF	KPSS	Item	Det.	ADF	KPSS
lnALFRU	C, T	-2.114	0.324 ***	lnLCS	C, T	-1.804	0.311 ***
lnALFRU	C	-2.101	1.169 ***	lnLCS	C	-2.009	1.201 ***
lnAGS	C, T	-2.892	0.182 **	lnLGD	C, T	-3.151 *	0.299 ***
lnAGS	C	-0.737	1.095 ***	lnLGD	C	-2.202	1.296 ***
lnAPR	C, T	-3.030	0.175 **	lnLPR	C, T	-2.473	0.276 ***
lnAPR	C	-3.177 **	0.583 **	lnLPR	C	-2.834 *	0.886 ***
lnLMB	C, T	-2.463	0.130 *				
lnLMB	C	0.031	1.438 ***				

Sign.: *** 0.01, ** 0.05, * 0.1; Det. = Deterministic components: C = Constant, T = Trend

Figure 2-9: Johansen cointegration test: South Korea

Number of equations = 7

Lag order = 1

Estimation period: 1998:04 - 2014:12 (T = 201)

Case 4: Restricted trend, unrestricted constant

Log-likelihood = 1602.16 (including constant term: 1031.75)

Rank	Eigenvalue	Trace	p-value	Lmax	p-value	Lmax*	p-value
0	0.48749	366.96	0.0000	134.36	0.0000	366.96	0.0000
1	0.35291	232.61	0.0000	87.491	0.0000	232.61	0.0000
2	0.2502	145.12	0.0000	57.877	0.0000	145.12	0.0000
3	0.17683	87.24	0.0001	39.112	0.0039	87.24	0.0001
4	0.13349	48.128	0.0123	28.799	0.0164	48.128	0.0135
5	0.053218	19.328	0.2672	10.992	0.5258	19.328	0.2726
6	0.040625	8.3362	0.2321	8.3362	0.2322	8.3362	0.2321

* Degrees of freedom corrected for sample size

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Figure 2-10: Vector error correction model: South Korea

(Only error correction part shown to save space, full estimations available from author upon request)

VECM system, lag order 1
Maximum likelihood estimates, observations 1998:04–2014:12 ($T = 201$)
Cointegration rank = 5
Case 4: Restricted trend, unrestricted constant
Cointegrating vectors (standard errors in parentheses)

lnALFRU _{<i>t</i>-1}	1.00000	0.00000	0.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
lnLMB _{<i>t</i>-1}	0.00000	1.00000	0.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
lnLCS _{<i>t</i>-1}	0.00000	0.00000	1.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
lnLGD _{<i>t</i>-1}	0.00000	0.00000	0.00000	1.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
lnAGS _{<i>t</i>-1}	0.00000	0.00000	0.00000	0.00000	1.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)	(0.00000)
lnAPR _{<i>t</i>-1}	-3.91122	0.853455	-4.35373	-1.70822	-1.38861
	(0.900984)	(0.172070)	(0.942829)	(0.431992)	(0.181125)
lnLPR _{<i>t</i>-1}	0.0306490	-0.00332421	0.0231280	0.0330550	0.000831883
	(0.0526807)	(0.0100609)	(0.0551273)	(0.0252586)	(0.0105904)
trend	0.00391389	-0.00992477	0.00525455	-0.00378176	-0.00762481
	(0.00832915)	(0.00159070)	(0.00871598)	(0.00399355)	(0.00167441)

Adjustment vectors

lnALFRU _{<i>t</i>-1}	1.00000	-0.364920	5.59043	-0.239394	0.0518858
lnLMB _{<i>t</i>-1}	-0.643444	1.00000	-5.19514	0.267387	0.111176
lnLCS _{<i>t</i>-1}	0.181887	-0.0766385	1.00000	-0.0883768	0.0897360
lnLGD _{<i>t</i>-1}	-1.12685	-0.442380	-1.88953	1.00000	-0.171502
lnAGS _{<i>t</i>-1}	0.818716	0.489257	5.05598	-0.0256014	1.00000
lnAPR _{<i>t</i>-1}	-0.0203868	0.303700	1.30205	0.602168	-0.0273180
lnLPR _{<i>t</i>-1}	11.0527	-2.84196	49.2174	-6.23210	1.18036

Log-likelihood = 1022.08

Determinant of covariance matrix = 0.00000

AIC = -9.7521

BIC = -9.0618

HQC = -9.4728

Figure 2-11: Impulse responses: South Korea

Impulse responses to one standard deviation shock in $\ln ALFRU$
 48 period forecast, 68% bootstrapped confidence bands

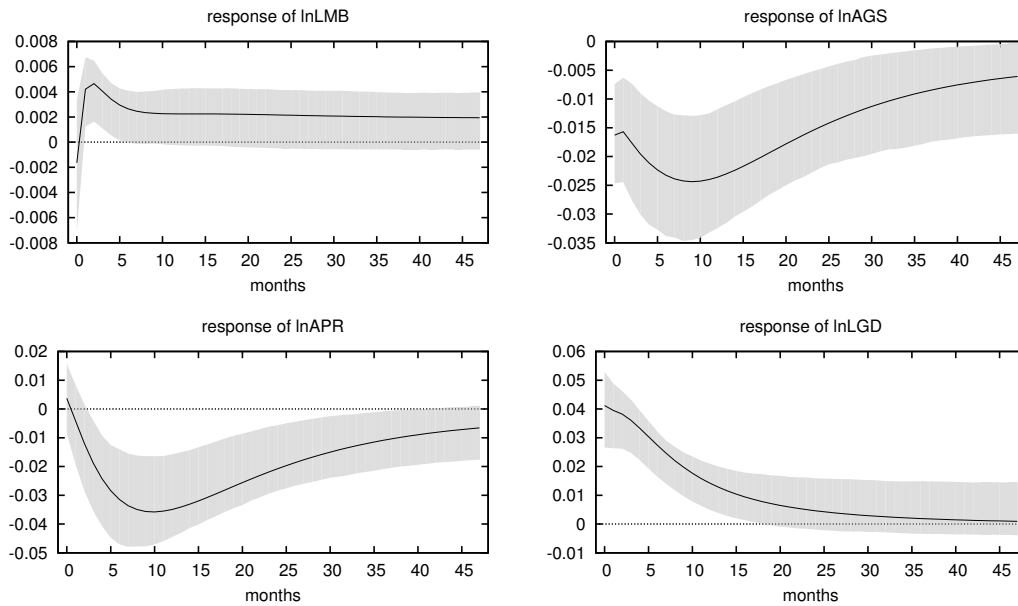
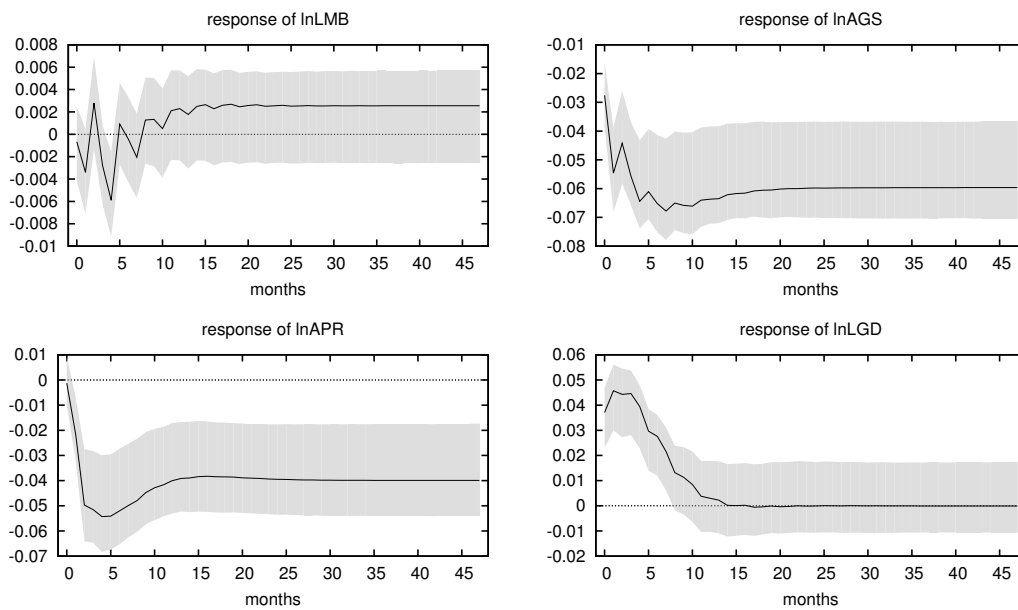


Figure 2-12: Robustness check: South Korea

Removal of restricted trend term causes HQ information criterion to rise to 3 and
 cointegration rank to decrease to 2

Impulse responses to one standard deviation shock in $\ln ALFRU$ for a
 corresponding VECM below



2.6.3 Statistical appendix for Taiwan

Figure 2-13: Unit root tests: Taiwan

Augmented Dickey-Fuller test and Kwiatkowski-Phillips-Schmidt-Shin test

Critical values and corresponding significance level

Item	Det.	ADF	KPSS	Item	Det.	ADF	KPSS
lnALFRU	C, T	-1.090	0.266 ***	lnLCS	C, T	-1.999	0.280 ***
lnALFRU	C	-2.724 *	1.338 ***	lnLCS	C	-3.059 **	1.236 ***
lnAGS	C, T	-1.683	0.245 ***	lnLGD	C, T	-4.409 ***	0.222 ***
lnAGS	C	-1.870	1.035 ***	lnLGD	C	-4.340 ***	0.625 **
lnAPR	C, T	-3.202 *	0.110	lnLPR	C, T	-2.873	0.204 **
lnAPR	C	-2.016	1.088 ***	lnLPR	C	-1.569	1.286 ***
lnLMB	C, T	-4.413 ***	0.267 ***				
lnLMB	C	0.172	1.334 ***				

Sign.: *** 0.01, ** 0.05, * 0.1; Det. = Deterministic components: C = Constant, T = Trend

Figure 2-14: Johansen cointegration test: Taiwan

Number of equations = 7

Lag order = 1

Estimation period: 1998:11 - 2014:12 (T = 194)

Case 4: Restricted trend, unrestricted constant

Log-likelihood = 2041.76 (including constant term: 1491.21)

Rank	Eigenvalue	Trace	p-value	Lmax	p-value	Lmax*	p-value
0	0.33509	265.97	0.0000	79.172	0.0000	265.97	0.0000
1	0.26685	186.8	0.0000	60.219	0.0002	186.8	0.0000
2	0.22839	126.58	0.0000	50.3	0.0006	126.58	0.0000
3	0.16738	76.276	0.0025	35.536	0.0149	76.276	0.0031
4	0.1108	40.74	0.0801	22.783	0.1211	40.74	0.0856
5	0.04836	17.958	0.3541	9.6163	0.6655	17.958	0.3604
6	0.042086	8.3415	0.2316	8.3415	0.2318	8.3415	0.2317

* Degrees of freedom corrected for sample size

Figure 2-15: Vector error correction model: Taiwan

(Only error correction part shown to save space, full estimations available from author upon request)

VECM system, lag order 1
 Maximum likelihood estimates, observations 1998:11–2014:12 ($T = 194$)
 Cointegration rank = 4
 Case 4: Restricted trend, unrestricted constant
 Cointegrating vectors (standard errors in parentheses)

lnALFRU _{<i>t</i>-1}	1.00000	0.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
lnLMB _{<i>t</i>-1}	0.00000	1.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
lnLCS _{<i>t</i>-1}	0.00000	0.00000	1.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
lnLPR _{<i>t</i>-1}	0.00000	0.00000	0.00000	1.00000
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
lnAPR _{<i>t</i>-1}	-0.333291	-0.0633080	-0.728973	0.0423070
	(0.0831136)	(0.0759276)	(0.310062)	(0.128900)
lnLGD _{<i>t</i>-1}	-0.424872	0.634565	-1.62857	-1.35297
	(0.102555)	(0.0936882)	(0.382590)	(0.159052)
lnAGS _{<i>t</i>-1}	0.00977772	0.00793683	0.00953128	-0.0162883
	(0.00387523)	(0.00354018)	(0.0144568)	(0.00601005)
trend	-0.00314988	-0.00409977	-0.00275080	-0.00563392
	(0.000928038)	(0.000847800)	(0.00346212)	(0.00143929)

Adjustment vectors

lnALFRU _{<i>t</i>-1}	1.00000	0.141707	-0.0186139	0.0818403
lnLMB _{<i>t</i>-1}	-0.754349	1.00000	0.291614	8.45047
lnLCS _{<i>t</i>-1}	-3.03429	-0.0487415	1.00000	-6.16341
lnLPR _{<i>t</i>-1}	-0.173820	0.139563	0.0564749	1.00000
lnAPR _{<i>t</i>-1}	-6.12842	0.0962238	0.590954	0.447984
lnLGD _{<i>t</i>-1}	-0.521101	0.473772	0.413446	-17.2171
lnAGS _{<i>t</i>-1}	23.5230	-4.79002	-2.63478	-58.7449

Log-likelihood = 1470.84

Determinant of covariance matrix = 0.00000

AIC = -14.8025

BIC = -14.2129

HQC = -14.5637

Figure 2-16: Impulse responses: Taiwan

Impulse responses to one standard deviation shock in $\ln ALFRU$
 48 period forecast, 68% bootstrapped confidence bands

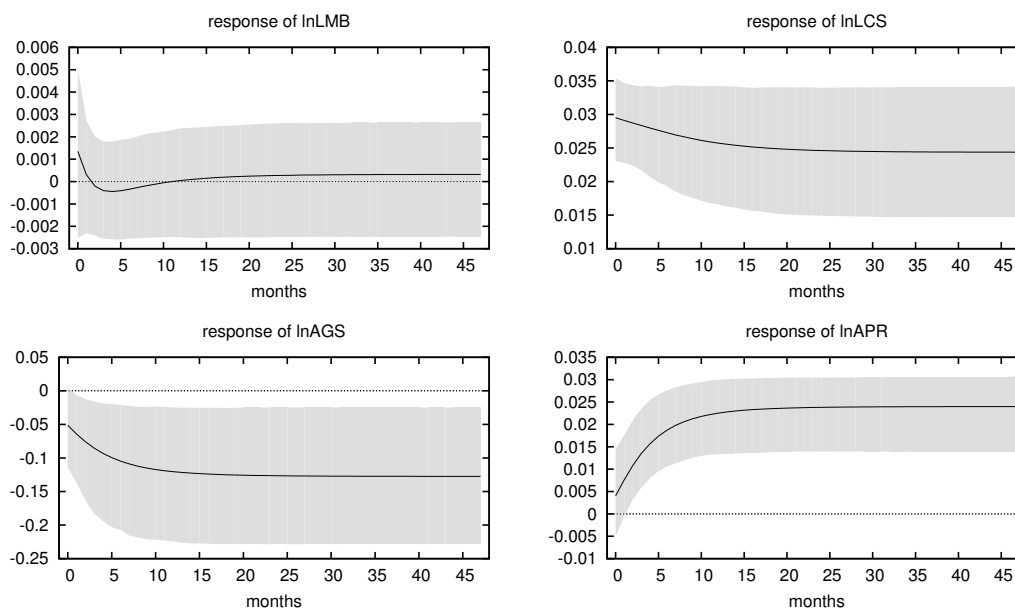
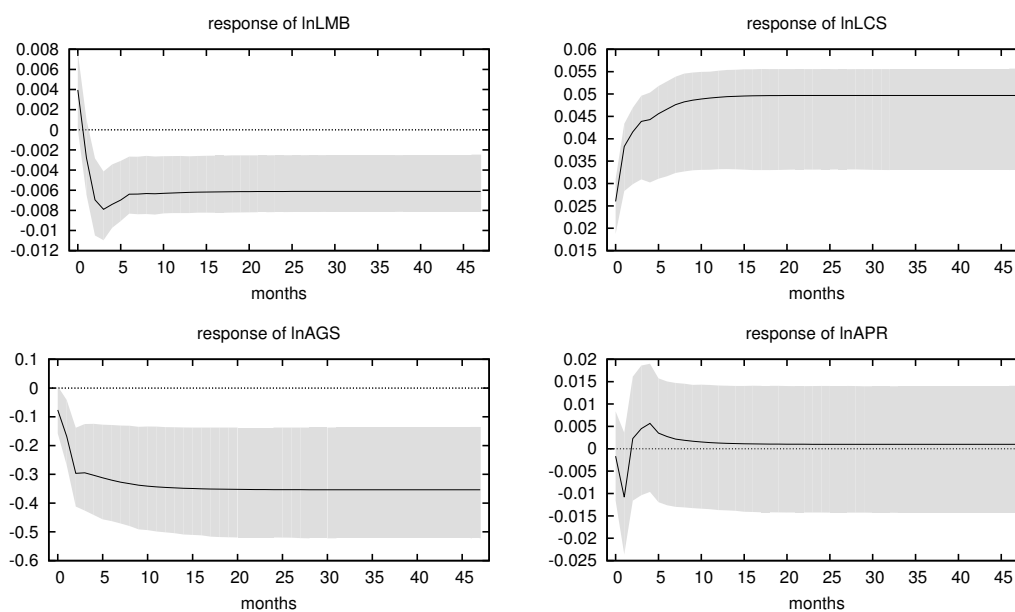


Figure 2-17: Robustness check: Taiwan

Increase of lag order to 3 causes cointegration rank to decrease to 3
 Impulse responses to one standard deviation shock in $\ln ALFRU$ for a
 corresponding VECM below



2.6.4 Statistical appendix for Malaysia

Figure 2-18: Unit root tests: Malaysia

Augmented Dickey-Fuller test and Kwiatkowski-Phillips-Schmidt-Shin test

Critical values and corresponding significance level

Item	Det.	ADF	KPSS	Item	Det.	ADF	KPSS
lnALFRU	C, T	-0.979	0.206 **	lnLCS	C, T	-1.823	0.278 ***
lnALFRU	C	-1.440	1.418 ***	lnLCS	C	-2.943 **	1.179 ***
lnAGS	C, T	-2.614	0.171 **	lnLGD	C, T	-4.114 ***	0.069
lnAGS	C	-2.238	0.607 **	lnLGD	C	-4.053 ***	0.071
lnAPR	C, T	-2.232	0.078	lnLPR	C, T	-2.909	0.230 ***
lnAPR	C	-2.312	0.615 **	lnLPR	C	-2.123	0.254
lnLMB	C, T	-2.206	0.234 ***				
lnLMB	C	0.264	0.986 ***				

Sign.: *** 0.01, ** 0.05, * 0.1; Det. = Deterministic components: C = Constant, T = Trend

Figure 2-19: Johansen cointegration test: Malaysia

Number of equations = 7

Lag order = 1

Estimation period: 1997:01 - 2014:12 (T = 216)

Case 4: Restricted trend, unrestricted constant

Log-likelihood = 1601.31 (including constant term: 988.327)

Rank	Eigenvalue	Trace	p-value	Lmax	p-value	Lmax*	p-value
0	0.25528	170.2	0.0020	63.666	0.0006	170.2	0.0034
1	0.14852	106.53	0.2053	34.729	0.3953	106.53	0.2402
2	0.10383	71.804	0.4403	23.68	0.7631	71.804	0.4723
3	0.087453	48.124	0.5033	19.767	0.6775	48.124	0.5242
4	0.060972	28.356	0.6052	13.589	0.7594	28.356	0.6170
5	0.039686	14.768	0.6002	8.7468	0.7503	14.768	0.6059
6	0.027489	6.0208	0.4681	6.0208	0.4692	6.0208	0.4689

* Degrees of freedom corrected for sample size

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Figure 2-20: Vector error correction model: Malaysia

(Only error correction part shown to save space, full estimations available from author upon request)

VECM system, lag order 1

Maximum likelihood estimates, observations 1997:01–2014:12 ($T = 216$)

Cointegration rank = 1

Case 4: Restricted trend, unrestricted constant

Cointegrating vectors (standard errors in parentheses)

lnALFRU _{<i>t</i>-1}	1.00000 (0.00000)
lnLMB _{<i>t</i>-1}	-1.05323 (0.122034)
lnLCS _{<i>t</i>-1}	-0.589654 (0.0501277)
lnAPR _{<i>t</i>-1}	0.0527458 (0.0512642)
lnLGD _{<i>t</i>-1}	-0.135536 (0.0380666)
lnLPR _{<i>t</i>-1}	0.165438 (0.0428550)
lnAGS _{<i>t</i>-1}	0.0327651 (0.0415662)
trend	0.00443042 (0.00116740)

Adjustment vectors

lnALFRU _{<i>t</i>-1}	1.00000
lnLMB _{<i>t</i>-1}	0.0250381
lnLCS _{<i>t</i>-1}	4.53212
lnAPR _{<i>t</i>-1}	0.593058
lnLGD _{<i>t</i>-1}	4.57993
lnLPR _{<i>t</i>-1}	0.331058
lnAGS _{<i>t</i>-1}	0.382450

Log-likelihood = 935.061

Determinant of covariance matrix = 4.09799e-13

AIC = -8.5283

BIC = -8.3096

HQC = -8.4400

Figure 2-21: Impulse responses: Malaysia
 Impulse responses to one standard deviation shock in $\ln ALFRU$
 48 period forecast, 68% bootstrapped confidence bands

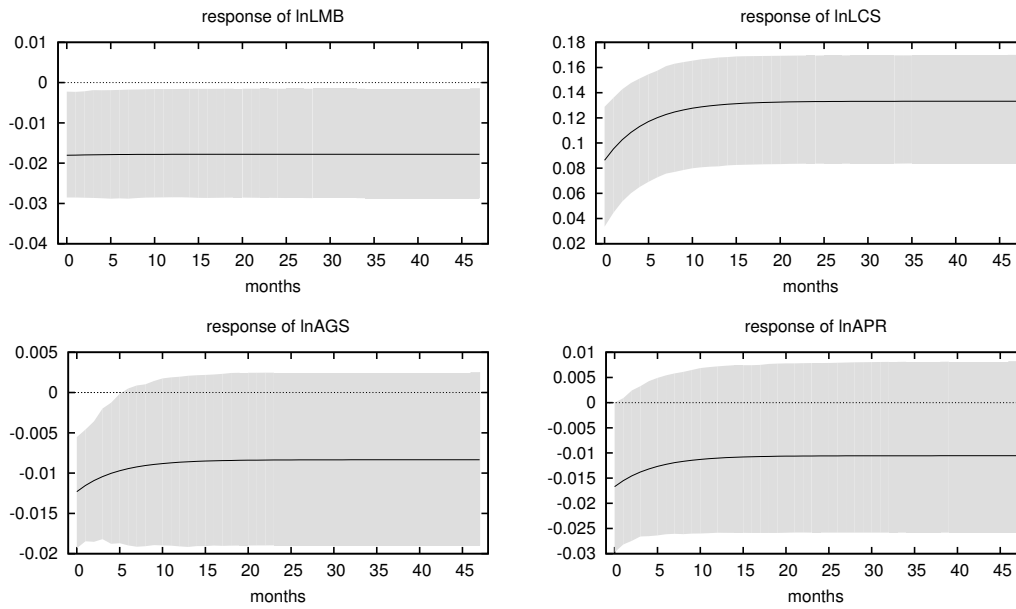
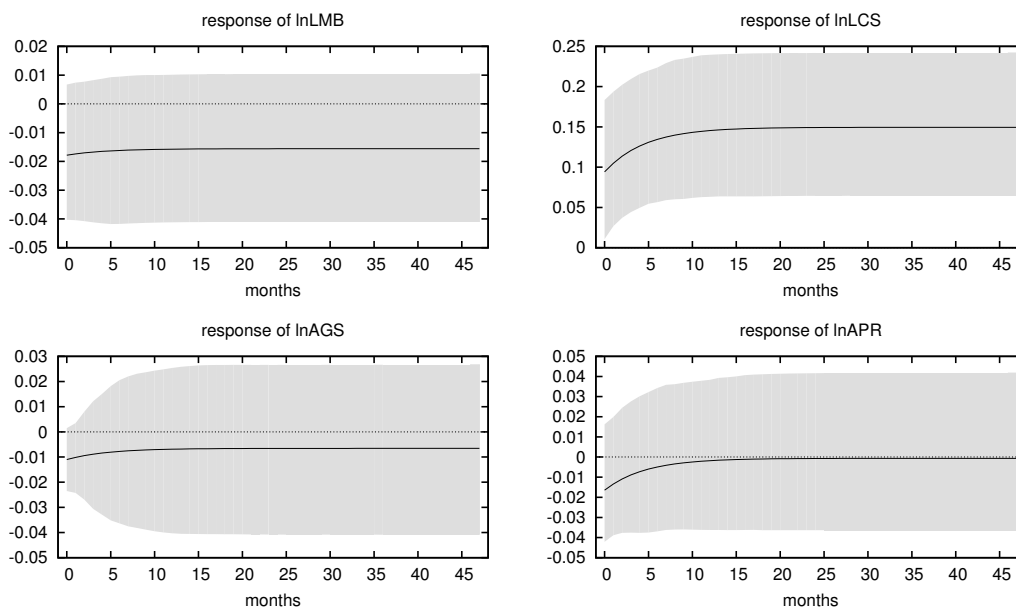


Figure 2-22: Robustness check: Malaysia
 Removal of restricted trend term, $\ln LMB$ put last in the Cholesky ordering,
 increase of confidence bands to 95%
 Impulse responses to one standard deviation shock in $\ln ALFRU$ for a
 corresponding VECM below



2.6.5 Statistical appendix for China

Figure 2-23: Unit root tests: China

Augmented Dickey-Fuller test and Kwiatkowski-Phillips-Schmidt-Shin test

Critical values and corresponding significance level

Item	Det.	ADF	KPSS	Item	Det.	ADF	KPSS
lnALFRU	C, T	-0.618	0.300 ***	lnLRRCS	C, T	-2.228	0.309 ***
lnALFRU	C	-3.978 ***	1.173 ***	lnLRRCS	C	-5.118 ***	1.146 ***
lnAGS	C, T	-1.957	0.145 *	lnLGD	C, T	-1.890	0.285 ***
lnAGS	C	-1.537	1.004 ***	lnLGD	C	-1.830	1.138 ***
lnAPR	C, T	-2.302	0.105	lnLPR	C, T	-1.701	0.129 *
lnAPR	C	-2.112	0.325	lnLPR	C	-1.274	1.028 ***
lnLMB	C, T	-1.926	0.127 *				
lnLMB	C	-0.797	1.193 ***				

Sign.: *** 0.01, ** 0.05, * 0.1; Det. = Deterministic components: C = Constant, T = Trend

Figure 2-24: Johansen cointegration test: China

Number of equations = 7

Lag order = 6

Estimation period: 2002:07 - 2014:12 (T = 150)

Case 4: Restricted trend, unrestricted constant

Log-likelihood = 2081.3 (including constant term: 1655.62)

Rank	Eigenvalue	Trace	p-value	Lmax	p-value	Lmax*	p-value
0	0.3025	170.62	0.0018	54.038	0.0169	170.62	0.0054
1	0.19863	116.59	0.0569	33.215	0.4911	116.59	0.0917
2	0.18451	83.371	0.1143	30.595	0.3045	83.371	0.1514
3	0.13808	52.776	0.3016	22.289	0.4855	52.776	0.3408
4	0.092626	30.487	0.4796	14.58	0.6799	30.487	0.5044
5	0.06063	15.907	0.5079	9.3818	0.6889	15.907	0.5197
6	0.04257	6.5254	0.4072	6.5254	0.4081	6.5254	0.4084

* Degrees of freedom corrected for sample size

Figure 2-25: Vector error correction model: China

(Only error correction part shown to save space, full estimations available from author upon request)

VECM system, lag order 6

Maximum likelihood estimates, observations 2002:07–2014:12 ($T = 150$)

Cointegration rank = 1

Case 4: Restricted trend, unrestricted constant

Cointegrating vectors (standard errors in parentheses)

lnALFRU _{<i>t</i>-1}	1.00000 (0.00000)
lnLMB _{<i>t</i>-1}	0.836170 (0.286496)
lnLRRCS _{<i>t</i>-1}	-1.59848 (0.150662)
lnLGD _{<i>t</i>-1}	0.748300 (0.180364)
lnAPR _{<i>t</i>-1}	0.976738 (0.213392)
lnAGS _{<i>t</i>-1}	2.41410 (0.459422)
lnLPR _{<i>t</i>-1}	-0.166708 (0.0302810)
trend	-0.00448302 (0.00252180)

Adjustment vectors

lnALFRU _{<i>t</i>-1}	1.00000
lnLMB _{<i>t</i>-1}	16.7515
lnLRRCS _{<i>t</i>-1}	-24.8754
lnLGD _{<i>t</i>-1}	57.3108
lnAPR _{<i>t</i>-1}	80.7192
lnAGS _{<i>t</i>-1}	-14.5189
lnLPR _{<i>t</i>-1}	-0.876715

Log-likelihood = 1597.32

Determinant of covariance matrix = 0.00000

AIC = -17.8443

BIC = -12.6459

HQC = -15.7324

Figure 2-26: Impulse responses: China

Impulse responses to one standard deviation shock in $\ln ALFRU$
 48 period forecast, 68% bootstrapped confidence bands

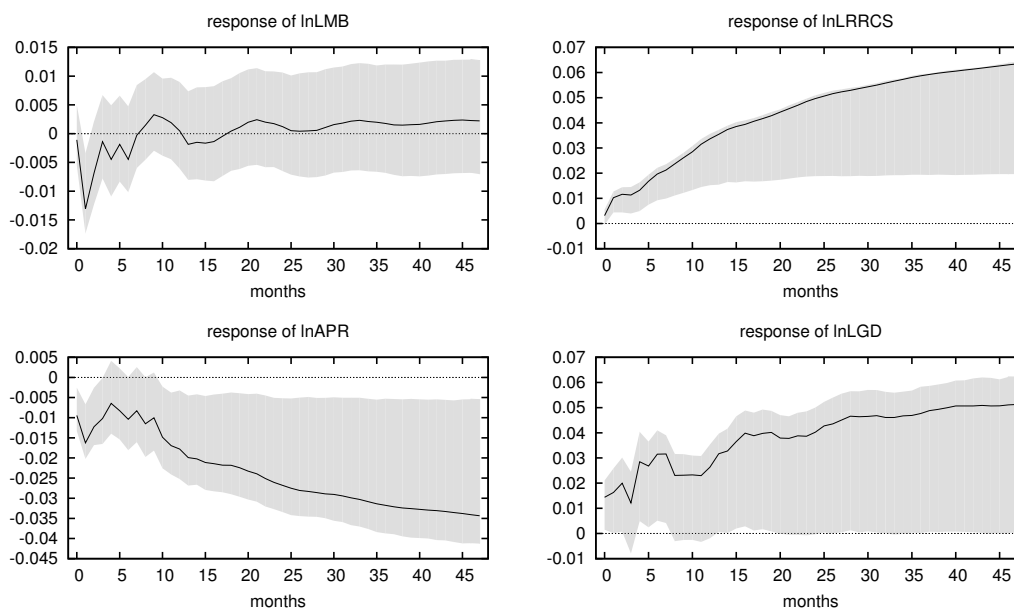
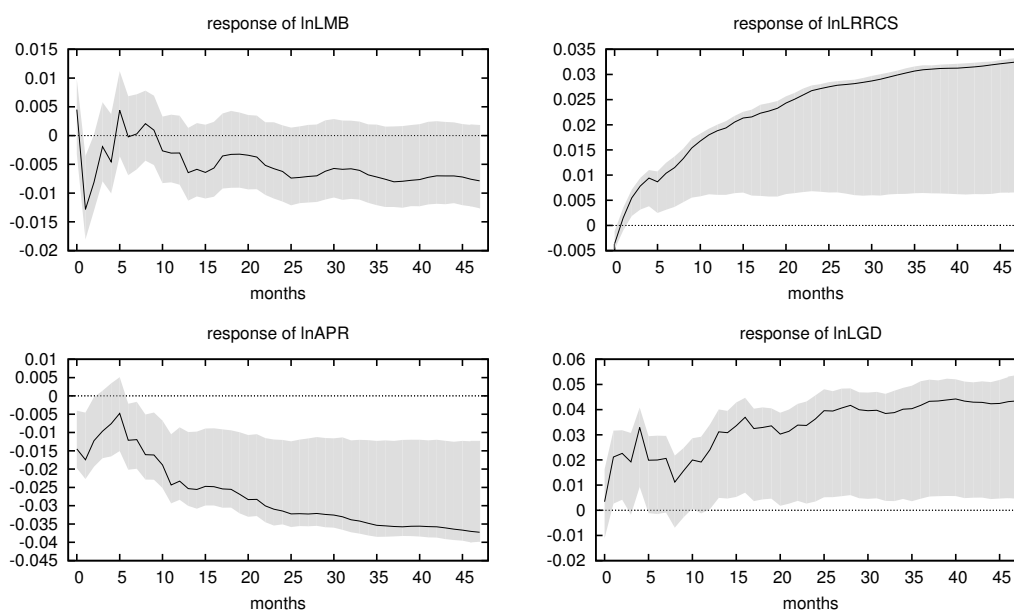


Figure 2-27: Robustness check: China

Sample restricted to most recent decade, model specification identical
 Impulse responses to one standard deviation shock in $\ln ALFRU$ for a
 corresponding VECM below



2.6.6 Statistical appendix for Hong Kong

Figure 2-28: Unit root tests: Hong Kong

Augmented Dickey-Fuller test and Kwiatkowski-Phillips-Schmidt-Shin test

Critical values and corresponding significance level

Item	Det.	ADF	KPSS	Item	Det.	ADF	KPSS
lnALFRU	C, T	-0.899	0.133 *	lnLCS	C, T	-2.067	0.123 *
lnALFRU	C	-0.944	1.086 ***	lnLCS	C	-1.347	1.009 ***
lnLMB	C, T	-2.061	0.105	lnLGD	C, T	-3.753 **	0.151 **
lnLMB	C	-0.815	0.998 ***	lnLGD	C	-1.804	1.082 ***

Sign.: *** 0.01, ** 0.05, * 0.1; Det. = Deterministic components: C = Constant, T = Trend

Figure 2-29: Johansen cointegration test: Hong Kong

Number of equations = 4

Lag order = 5

Estimation period: 2004:06 - 2014:12 (T = 127)

Case 4: Restricted trend, unrestricted constant

Log-likelihood = 1659.5 (including constant term: 1299.09)

Rank	Eigenvalue	Trace	p-value	Lmax	p-value	Lmax*	p-value
0	0.42	122.78	0.0000	69.18	0.0000	122.78	0.0000
1	0.18639	53.604	0.0024	26.197	0.0413	53.604	0.0030
2	0.15383	27.407	0.0297	21.213	0.0239	27.407	0.0321
3	0.047599	6.1937	0.4467	6.1937	0.4478	6.1937	0.4481

* Degrees of freedom corrected for sample size

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Figure 2-30: Vector error correction model: Hong Kong

(Only error correction part shown to save space, full estimations available from author upon request)

VECM system, lag order 5

Maximum likelihood estimates, observations 2004:06–2014:12 ($T = 127$)

Cointegration rank = 3

Case 4: Restricted trend, unrestricted constant

Cointegrating vectors (standard errors in parentheses)

lnALFRU _{<i>t</i>-1}	1.00000	0.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)
lnLMB _{<i>t</i>-1}	0.00000	1.00000	0.00000
	(0.00000)	(0.00000)	(0.00000)
lnLGD _{<i>t</i>-1}	0.00000	0.00000	1.00000
	(0.00000)	(0.00000)	(0.00000)
lnLCS _{<i>t</i>-1}	-0.295265	-0.356182	-0.159154
	(0.0233045)	(0.0594010)	(0.0612509)
trend	-0.00541000	-0.00571726	-0.00596537
	(0.000516984)	(0.00131775)	(0.00135878)

Adjustment vectors

lnALFRU _{<i>t</i>-1}	1.00000	-1.13821	-0.337195
lnLMB _{<i>t</i>-1}	0.762491	1.00000	-1.02024
lnLGD _{<i>t</i>-1}	-1.23164	3.05580	1.00000
lnLCS _{<i>t</i>-1}	0.815976	-2.57344	-0.537193

Log-likelihood = 1295.99

Determinant of covariance matrix = 0.00000

AIC = -19.1495

BIC = -17.3579

HQC = -18.4216

Figure 2-31: Impulse responses: Hong Kong
 Impulse responses to one standard deviation shock in $\ln ALFRU$
 48 period forecast, 68% bootstrapped confidence bands

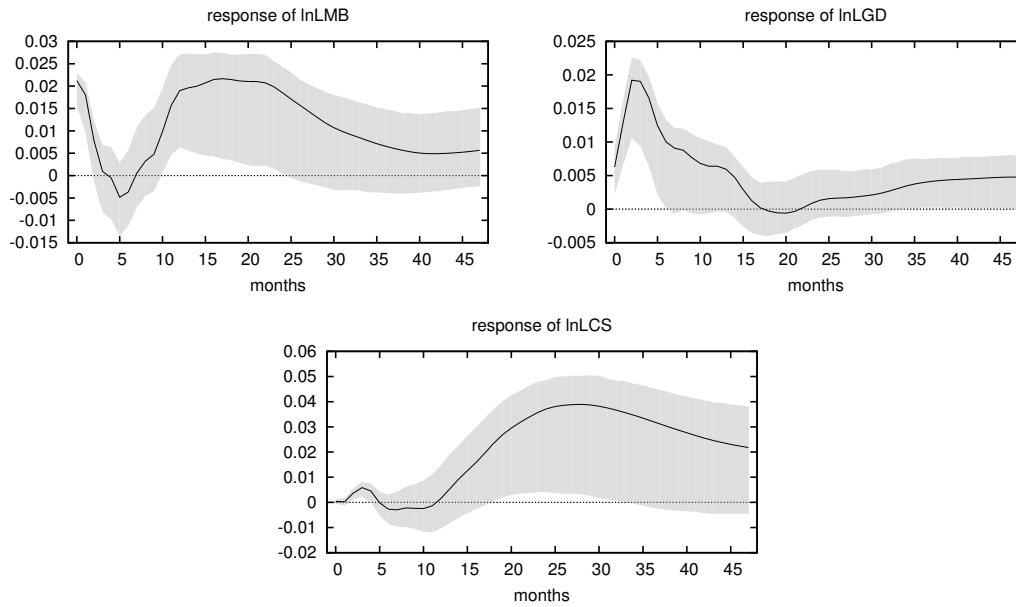
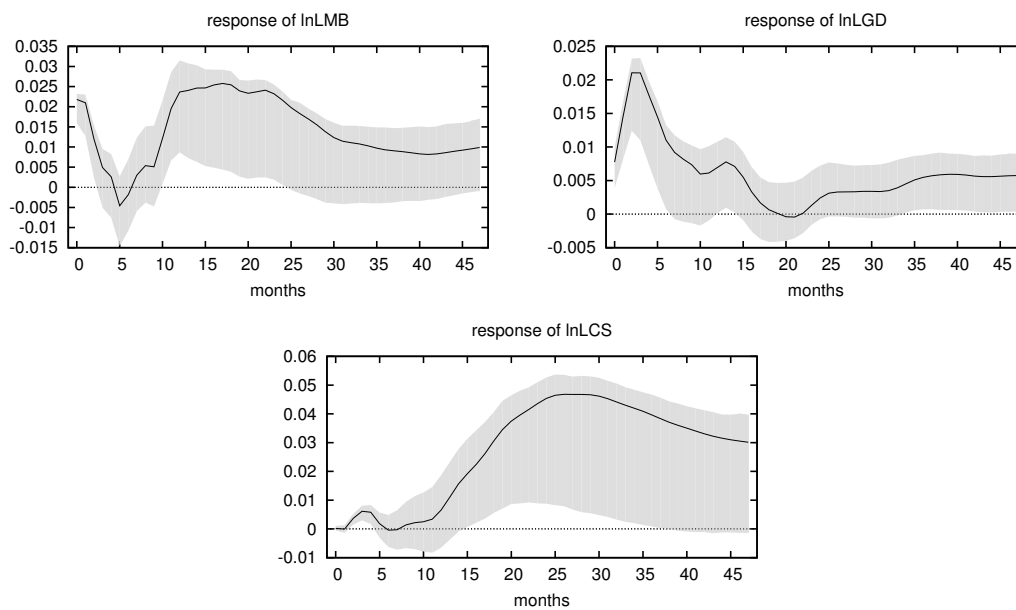


Figure 2-32: Robustness check: Hong Kong
 Increase of lag order to 6, $\ln LMB$ put last in the Cholesky ordering
 Impulse responses to one standard deviation shock in $\ln ALFRU$ for a
 corresponding VECM below



3 Quantities and Prices in China's Monetary Policy Transmission

Whereas monetary policy in most major economies is conducted by an independent central bank manipulating the interbank overnight interest rate to achieve a price stability target, monetary policy in China is influenced by multiple actors and characterised by both quantity-based and price-based instruments and targets. Chinese monetary policy is further exercised through non-public practices such as “window guidance”, a policy by which authorities seek to guide commercial banks’ lending volumes by persuasion. The resulting complex interplay of these different factors is the subject of this chapter, which investigates the transmission mechanism of Chinese monetary policy for the period 2000–2015 in order to determine the effectiveness of different instruments in controlling domestic credit growth. Towards this end, a qualitative institutional analysis is conducted, followed by quantitative econometric analyses based on exogeneity tests and Structural Vector Autoregression models. The study explicitly accounts for the influence of window guidance by incorporating information from a text-based analysis of People’s Bank of China reports in the tradition of Romer & Romer (1989). To trace the evolution of each instrument, estimations are also applied to subsamples as indicated by a Chow test for structural breaks. Results indicate that window guidance has played an important role in Chinese monetary policymaking in the period up to the Global Financial Crisis. Since then, the interbank overnight rate appears to have become more in-

3 Quantities and Prices in China's Monetary Policy Transmission

fluent and exogenous. The study concludes by providing suggestions for further strengthening this interest rate channel, the stated goal of the People's Bank of China.

3.1 Introduction

For several decades, monetary policymaking in most advanced economies has been conceptualised as the manipulation of interbank overnight interest rates by monetary authorities (Bindseil, 2004). Central banks in these economies typically signal a target interest rate to the interbank market and engage in open market operations, lending to commercial banks and/or payment of interest on commercial bank reserves as necessary to achieve this target rate (Borio & Disyatat, 2010).¹ The interest rate so established is understood to trigger changes in other macroeconomic variables in a way that allows authorities to maintain a certain level of price stability. While the specific operational procedures differ, and despite recent changes associated with the introduction of unconventional monetary policies, the pairing of interbank rate control and inflation targeting is present in all major advanced economies, explicitly or implicitly.

Things are less simple in China, where monetary policy is conducted by multiple actors and characterised by both quantity-based *as well as* price-based instruments and targets. Studies of Chinese monetary policy frequently point to factors such as underdeveloped financial markets, credit controls, high volatility of market liquidity, segmentation of credit markets, and interest rate insensitivity of market participants as factors that impede the exclusive use of interbank rates as a monetary policy tool (see, e.g., Shu & Ng, 2010; Xiong, 2012; Ma et al., 2016). While the very first report published by the People’s Bank of China’s (PBOC) Monetary Policy Committee in the second quarter of 2000 already mentions the establishment of a central bank interest rate as a central goal, authorities still rely on target growth rates for various monetary aggregates, e.g. M1, M2, bank credit and central bank reserves, yet rarely come close to achieving them. All of these factors complicate the interpretation of Chinese monetary policy.

¹With the advent of “unconventional monetary policy”, interest on commercial bank reserves have become the primary policy lever in many advanced economies (see Borio & Disyatat, 2010).

3 Quantities and Prices in China's Monetary Policy Transmission

The present study seeks to disentangle the transmission mechanism of Chinese monetary policy by studying the different channels that affect commercial banks' credit creation for the period 2000–2015. The purpose is to identify which monetary policy tools have the greatest effect on domestic credit growth (and thereby, it is assumed, on the broader macroeconomy). Towards this end, a qualitative institutional analysis is conducted, followed by quantitative econometric analysis based on exogeneity tests and Structural Vector Autoregression (SVAR) models. The exogeneity tests are based on the paper by Revankar & Yoshino (1990), who develop a test to determine whether central banks are in fact controlling interbank overnight rates. The authors apply this test to US monetary policy in the 1970s to early 1980s and find that authorities did indeed control interbank rates. Applied in a subsequent paper to Japan, Yoshino & Yoshimura (1997) find support for interbank rate exogeneity from the 1980s onwards. The present analysis adapts this approach for China to determine the exogeneity of the interbank overnight rate in the context of the Chinese system.

Such an examination is complicated by the fact that Chinese authorities in part rely on tools on which information is not publicly or directly available. A prime example is the practice of “window guidance”, by which the authorities seek to guide commercial banks' lending volumes through persuasion. Also applied in Japan in the past, window guidance by the Bank of Japan (BOJ) was one central lever by which the central bank influenced banks' credit creation, as shown by Rhodes & Yoshino (1999). The present study also draws inspiration from that paper and attempts to capture the influence of indirect and non-public policy measures like window guidance by constructing a monetary policy indicator based on a text-based analysis of the quarterly reports of the PBOC Monetary Policy Committee and the PBOC's Monetary Policy Reports, in a manner similar to the “narrative approach” taken by Romer & Romer (1989).

To trace the evolution of each instrument, the estimations are applied to subsamples as indicated by a Chow test for structural breaks. Results suggest that both quantity-based and price-based policy levers had substantial effects on domestic credit growth in China, with window guidance (as captured by the monetary policy indicator) having played an especially important role in the period up to the Global Financial Crisis and the interbank overnight rate having become more influential since then.

In what follows, an in-depth institutional analysis of the PBOC's monetary policy operating procedures is conducted and key variables are selected for examination. Aside from the interbank overnight rate and window guidance, the reserve requirement ratio as well as benchmark lending and deposit rates are analysed. The interbank overnight interest rate is subsequently tested for exogeneity vis-à-vis domestic money markets and an SVAR model is specified to obtain impulse responses to gauge the strength of each policy lever. Both examinations are repeated for subsample periods before and after the Global Financial Crisis. Proceeding from these results, conclusions are drawn regarding the relative influence of quantity-based tools versus price-based tools and suggestions are presented for further strengthening the interest rate channel, the stated goal of the PBOC.

3.1.1 Literature review

The body of academic literature on monetary policy transmission is vast. Studies differ both by their conception of primary transmission channels and by definition of instruments and targets. As such, this brief overview shall be limited to analyses of Chinese monetary policy and empirical studies in particular.

On the policy side, there exist several in-depth institutional studies of monetary policy operation in China, of which Conway et al. (2010) and Geiger (2008) deserve special mentioning. These two studies explore the actual principles of mon-

3 Quantities and Prices in China's Monetary Policy Transmission

etary policymaking in China and are drawn on extensively in applied analyses. Conway et al. (2010) trace the evolution of the PBOC's operations throughout history, arguing that the PBOC now has significant control over market interest rates, which are an important determinant of investment spending. They advocate greater use of interest rates in implementing monetary policy on the grounds that this would enhance macroeconomic stability while avoiding the drawbacks associated with quantity-based tools.

The paper by Geiger (2008) provides an institutional overview of similar depth. The author points out that the PBOC frequently missed its quantity targets even while it achieved its inflation targets, arguing that this is the result of a "heterodox" policy mix of quantity-based and price-based central bank instruments with non-central bank instruments (wage controls, price controls, etc.). Geiger notes that this approach has been successful in the past, but cautions that it contradicts market principles and has distortionary effects on the economy. The author argues these distortions could be avoided by moving towards price-based instruments alone.

More closely related to the topic at hand, several (S)VAR-based studies have analysed the transmission of monetary policy in China. Dickinson & Liu (2007) use data on total loans and the central bank lending rate over the period 1984–1997 to analyse the effect of monetary policy on output, finding that the influence of the lending rate has increased, which they suggest is a result of the reform of the banking system. Mehrotra (2007) estimates an open economy SVAR model for China using data from 1996 to 2004 and determines that neither interest rates nor exchange rate changes significantly affect price developments. Laurens & Maino (2007) estimate a VAR model for China using data for the period 1994–2005 to explore the impact of monetary policy on inflation, and find that the link between interest rates and GDP is weak. Koivu (2009) employs a vector error correction model (VECM) to study the interest rate elasticity of loan demand for the period 1998–2007, which is found to have increased, despite a low effect of interest rates

on the real economy. Similarly, Sun et al. (2010) use VAR models and VECM to uncover several transmission channels of monetary policy in China between 1996 and 2006, including a bank lending channel, an interest rate channel and an asset price channel. They find that China's monetary policy does affect several real and financial macro variables. Finally, there are Factor-Augmented VAR analyses which uncover transmission channels of Chinese monetary policy similar to those found in advanced economies (Fernald et al., 2014; He et al., 2013).

While this list is not exhaustive, and although the results of these studies differ in places, if one were to generalise, the findings could be summed up as follows: All of the studies find that interest rates alone are not the only factor of influence, but one of many different factors affecting the real and the financial side of the economy, which are difficult to disentangle (this is reflected in a lack of significance of the results). At the same time, several studies find an *increasing* importance of interest rates, suggesting that monetary policy is moving towards price-based measures. Authors generally welcome this trend and encourage its continuation (see, e.g., Conway et al., 2010; Laurens & Maino, 2007).

Aside from the (S)VAR-based literature, there exist several semi-empirical analyses with extensive theoretical sections on China's monetary policy framework which deserve mentioning. One such study is that of Porter & Xu (2009), who demonstrate how the regulation of retail interest rates diminishes the role of market-determined interest rates to act as price signals. Building upon this model, Chen et al. (2013) analyse the impact of different monetary policy instruments used in China and provide a compelling demonstration for how different policy tools may contradict one another when applied in combination. Again building upon the work of the previous authors, He & Wang (2012) model how monetary policy instruments affect market interest rates, which, they argue, are the ultimate means by which the real economy is affected.

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Lastly, there exists a body of literature that attempts to capture the monetary policy stance of the PBOC in a single numerical indicator, either on the basis of a “narrative approach” (e.g. Shu & Ng, 2010; Sun, 2015) or by aggregation of other monetary policy-related variables (e.g. Xiong, 2012; He & Pauwels, 2008). The present study constructs a monetary policy indicator in correspondence with the former approach, which traces its roots back to an influential study by Romer & Romer (1989), to capture window guidance. In a nutshell, this approach consists of a text-based analysis of monetary authorities’ publications for the purpose of gaining further insight into their intentions. While the original Romer & Romer (1989) study and papers following in its footsteps (for China, e.g., Sun, 2013; Xiong, 2012) place great emphasis on identifying *exogenous* policy changes which are unrelated to endogenous policy reactions to changes in the central bank’s target variable, other studies do not make such a distinction (again, for China, e.g., Shu & Ng, 2010; Sun, 2015).² The present study is similar to the second group as the purpose here is simply to capture the “tone” of the publications, which is assumed to more directly reflect policymakers intentions and window guidance.

²For an overview of an application of the narrative approach to East Asian monetary policies, see Shu & Ng (2010).

3.2 Institutional analysis

3.2.1 Monetary authorities

Most discussions of Chinese monetary policy relate the topic to the country's central bank, the PBOC. The PBOC was the only bank in the People's Republic of China's mono-bank system up until the 1980s, when its commercial banking activities were split off into four large state-owned banks (the "Big Four") and the PBOC became the country's de facto central bank, a status that was legally institutionalised in 1995 (Wang & Hu, 2011). Even so, monetary policy in China is not exclusively about the central bank, but more so, and perhaps primarily, about the government and its various subdivisions. Although the PBOC has been granted limited autonomy in several areas, most of its decisions still require approval by the State Council. Competencies between the PBOC and government bodies also overlap in several monetary policy-related areas. For example, the China Banking Regulatory Commission (CBRC) was briefly involved in window guidance policies, which are usually the *métier* of the PBOC, whereas capital controls are managed by the State Administration of Foreign Exchange (SAFE), an institution acting under the leadership of the PBOC (see Geiger, 2008, on both points). Consequently, when this study refers to "monetary authorities", this includes the PBOC as well as the Chinese Communist Party and the broader government with all departments involved in monetary policymaking and departments which execute policies that affect monetary variables.

3.2.2 Targets

Due to these multiple layers of agency involved in Chinese monetary policymaking, the PBOC is neither goal-independent nor instrument-independent. According to the 1995 People's Bank of China Act, the PBOC's objective is to "maintain the sta-

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bility of the value of the currency and thereby promote economic growth” (PBOC, 2003). Geiger (2008) argues that, given the current institutional set-up, this can be interpreted to define a hierarchical goal structure with price stability on top, a less important economic growth target, and an additional exchange rate target. The majority of the literature, including empirical studies, appears to agree with this assessment, especially regarding the dominance of the price stability mandate (Conway et al., 2010; He & Pauwels, 2008; Sun, 2013; Xiong, 2012). Price stability is also an important keyword frequently mentioned in the PBOC's Monetary Policy Committee meeting reports. Other targets that have been mentioned in the literature include employment growth, external balance, as well as financial liberalisation and stability (according to PBOC Governor Zhou, as cited in Liu & Zhang, 2007).

Given these objectives, the PBOC sets intermediate targets for monetary aggregates (M1 and M2) and credit growth, underlining the priority policymakers attach to quantitative measures. In practice, however, these intermediate targets were missed in the majority of years, often by double-digit percentage deviations. Possible reasons for this will be given below, but it shall be mentioned at this point that such deviations are not necessarily related to the specificities of China's monetary policy operations, but may reflect more fundamental difficulties in central bank's quantity-targeting, as similar problems were experienced by central banks in the United States and Europe when targeting monetary aggregates in the past.

3.2.3 Instruments

Figure 3-1 presents an overview of the monetary policy instruments used by Chinese authorities, which include both market-based and non-market-based, as well as quantity-based and price-based tools. Market-based instruments involve market transactions between authorities and financial market participants, whereas non-market-based instruments involve direct influence of market participants by regulat-

ory means. Conversely, quantity-based instruments aim at influencing interbank liquidity and monetary aggregates, whereas price-based instruments are used to influence interest rates. Scholars interpret monetary policy tools differently and as such may favour a different classification than the one presented in Figure 3-1, e.g. with reserve requirements labelled as a non-market-based tool. The point here, however, is not to claim that the above is the only plausible taxonomy, but to provide a compact overview of the number and nature of different tools.

[Figure 3-1 “Monetary policy tools used in China”]

Until the late 1990s, monetary policy operated primarily through direct controls and on the basis of a credit plan by which the government directly influenced lending decisions. Back then, central bank lending was one of the primary policy levers, with the interest rate charged on central bank loans acting as a guiding rate for the larger economy (Dickinson & Liu, 2007). Around the end of the decade, however, open market operations and adjustments of reserve requirement ratios replaced central bank lending as the primary policy tool (Geiger, 2008), so official lending rates are now largely symbolic (Conway et al., 2010; Geiger, 2008; Fungáčová et al., 2015). The end of the 1990s also saw the abolishment of the credit plan (Naughton, 2007, p. 456). Nevertheless, lending decisions are still subject to “window guidance”, which will be addressed below.

The PBOC conducts open market operations using PBOC bills, national bonds and bonds issued by financial institutions (policy banks) to influence liquidity in the interbank system (Geiger, 2008). Aside from outright transactions, repurchase agreements are frequently used to inject (repo) or drain (reverse repo) bank reserves temporarily. Central bank bills were used in open market operations especially during the first decade of the new millennium to sterilise foreign exchange inflows

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and outflows, i.e. to offset their effect on the domestic money base. Since then, this task has been largely taken over by required reserves (Ma et al., 2013), as reflected in the PBOC's balance sheet shown in Figure 3-2.

Reserve requirement ratios were introduced in 1984 and have been adjusted only infrequently until 2004, when authorities introduced ratios that differed by size of the financial institution (Geiger, 2008). Unlike in most major advanced economies, there are no averaging provisions for required reserves, so if a commercial bank fails to meet its required reserve target at the end of any given business day, it receives an overdraft from the central bank to which a penalty interest rate is applied (IIMA, 2004). Meanwhile, interest rates on required and excess reserves are relatively low and adjusted very infrequently, which allows the central bank to avoid a negative spread between the interest rate it receives on its foreign assets versus the interest rate it pays on its domestic liabilities (so-called “quasi-fiscal costs”).³ With declining interest rates abroad and an appreciating currency, this has become more difficult, however.

At times, the PBOC also conducts selective transactions targeting specific banks. Examples of such transactions include targeted bill issuance or foreign currency swaps (Shu & Ng, 2010). The goal is often to adjust interbank liquidity, but at times this channel has also been used to request that banks make penalty deposits with the PBOC when they disregard window guidance (Chen et al., 2013). On the opposite side, the central bank has sometimes provided special funds at lower costs to particular industries or regions (Sun, 2013). These non-market-based instruments are accompanied by capital controls as another lever to control liquidity in the interbank market.

³These “quasi-fiscal” sterilisation costs are frequently raised as arguments against a yuan-dollar peg. Yet, several studies have found these costs to be low or negative up until at least 2005 and potentially much longer (e.g. Wang & Hu, 2011; Cappiello & Ferrucci, 2008; Green, 2005; Qu, 2005).

[Figure 3-2 “Balance sheet of the People’s Bank of China”]

[Figure 3-3 “Comparison of narrative monetary policy indicators”]

[Figure 3-4 “Major monetary policy-related variables”]

3.2.4 Interest rates

Besides quantity-based policy tools, Chinese monetary authorities also employ a variety of price-based policy tools. The two rates most popularly quoted for overnight interbank transactions are the China Interbank Offered Rate (CHIBOR) and the Shanghai Interbank Offered Rate (SHIBOR). The CHIBOR, available since 1996, is a transaction-based rate which refers to the weighted average of the actual transactions taking place in the interbank market. The SHIBOR, available since 2006, is a quote-based rate (similar to LIBOR, the London Interbank Offered Rate) which represents the daily average of the lending rates quoted by major banks. SHIBOR rates are available also when there are no market transactions taking place, but banks are not obliged to trade at their quoted rates. CHIBOR and SHIBOR rates tend to move together closely with repo rates and PBOC bill yields (Conway et al., 2010; Sun, 2015; Porter & Xu, 2009).

While the discount window used to be an important policy tool (Dickinson & Liu, 2007), lending from the PBOC has not played a major role since the turn of the century (Wang & Hu, 2011). Similarly, interest rates on required and excess reserves are very low and adjusted very infrequently. Another particular feature of the Chinese monetary system is the presence of benchmark rates specifying targets and accompanying tolerance bands for retail loan and deposit rates. These benchmarks are adjusted from time to time, e.g. in 2004 the lending rate ceiling and deposit rate floor were abolished, and in 2007 the tolerance bands around the benchmark rates were widened. In June 2013, then, the lending rate floor was abolished (Sun, 2015). So long as the benchmark rates are binding, this arrangement crates *reverse*

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transmission from retail rates to wholesale rates (Chen et al., 2013), the opposite of what would be expected without these limits. In addition to these measures, the PBOC has the authority to use regulatory means to affect financial prices, e.g. the adjustment of the proportion of down payments in mortgage lending (Shu & Ng, 2010).

3.2.5 Window guidance

Not all of the policy tools described can be quantified, since necessary information is not always available. This applies first and foremost to window guidance, which Geiger (2008) defines as a “policy [that] uses benevolent compulsion to persuade banks and other financial institutions to stick to official guidelines”. Window guidance is a process by which the central bank applies pressure on financial institutions so that they adjust their lending volumes. This policy was commonly used in Japan during the period from 1961 to 1991, which Rhodes & Yoshino (1999) examine and find to be effective using publicly available information on target quotas set by the BOJ.

The Chinese system of window guidance is closely modelled on the Japanese system and is frequently named as one of the most important policy tools of the PBOC (Geiger, 2008; Green, 2005). Authors tend to see window guidance policies as effective (e.g. Lardy, 2005; Green, 2005; Fukumoto et al., 2010; Chen et al., 2013) in particular when other tools are ineffective or fail to constrain credit growth. Geiger (2008) calls attention to the fact that the PBOC governor ranks above commercial bank officials in Chinese political hierarchy, and that the PBOC can influence the appointment of senior personnel at commercial banks, suggesting these as potential reasons for the effectiveness of the PBOC's “moral suasion”. At the same time, authors frequently highlight downsides of the practice, such as disadvantaging com-

mercial banks that fail to comply with PBOC guidelines, creation of non-performing loans, misallocation of funds, efficiency losses and macroeconomic distortions (e.g. Conway et al., 2010; Geiger, 2008).

Since the scope of the application of window guidance is unknown, however, it is difficult to evaluate precisely the influence exercised through this policy instrument. While the PBOC reports its window guidance conferences and monthly meetings with commercial banks⁴ (Conway et al., 2010), the actual target quotas are not released to the public. Some limited insight into the practice can be gained from the quarterly reports of the PBOC’s Monetary Policy Committee meetings and the PBOC’s Monetary Policy Reports, however, which provide information on the central bank’s reading of the macroeconomy and the general credit situation. A text-based analysis of these documents along the lines of the “narrative approach” pioneered by Romer & Romer (1989) may hence yield insights regarding the direction of window guidance and the priorities authorities hold with regard to broader macroeconomic developments. Such an analysis is conducted here.

The narrative approach of Romer & Romer (1989) is a type of event study in the spirit of Friedman & Schwartz (1963) that relies on a text-based analysis of central bank publications for the purpose of constructing a numerical indicator of its monetary policy stance. Depending on the “tone” of the document, the policy stance can be captured, for example, by a negative number for expansionary periods, and a positive number for contractionary periods. The event study element is inherent in the fact that a change in emphasis or a change of the topics stressed is taken to indicate a change in policy. While the original Romer & Romer (1989) study and papers following in its footsteps (for China, e.g., Sun, 2013; Xiong, 2012) place great emphasis on identifying *exogenous* policy changes which are unrelated to endogenous policy reactions to changes in the central bank’s target variable, other studies do

⁴The PBOC also occasionally publishes notices aiming at curbing lending in particular sectors of the economy (Conway et al., 2010).

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not make such a distinction (again for China, e.g., Shu & Ng, 2010; Sun, 2015).⁵ The present study is similar to the second group as the purpose here is simply to capture the “tone” of each report, which is assumed to reflect the PBOC's intentions more directly than other policy measures (which are subject to approval by the State Council) and capture its exercise of window guidance.

The information extracted from the PBOC's Monetary Policy Committee meeting reports and its Monetary Policy Reports is here interpreted to represent a monetary policy stance on a 5-step scale of “very expansionary” (-2), “expansionary” (-1), “neutral” (0), “contractionary” (1), and “very contractionary” (2). This follows previous indicators of the PBOC's monetary policy stance constructed by Shu & Ng (2010) for the period 2001 Q1 to 2009 Q2, and Sun (2015) for the period 2000 Q1 to 2014 Q4. Examinations of both authors find that indicators constructed in this way not only capture the PBOC's policy stance well, they even outperform other available indicators (such as lending rates, reserve requirement ratios etc.) in places. An area where the approach taken here differs from previous studies is in the interpretation of documents as “as is” assessments of the situation, i.e. as the central bank's reading of the situation *as it is at any point in time*. This is warranted since reliance on an ex post interpretation (where reports are understood to reflect policies conducted in the preceding period), would carry the danger of exaggerating the central bank's ability to forecast the economy and thus overstate the role of window guidance.⁶

One challenge in applying a text-based analysis to central bank documents in the present context is the divergence of “words” and “deeds”, as the central bank may not necessarily be able to follow through on its intentions (Shu & Ng, 2010), or because

⁵For an overview of applications of the narrative approach to East Asian monetary policies, see Shu & Ng (2010).

⁶This point is best illustrated by the Monetary Policy Committee meeting report issued on 10 October 2008, which contains considerably more cautious language than the Monetary Policy Report issued subsequently in 11 November 2008, when the Global Financial Crisis hit China. This inconsistency has also been noted by Sun (2015). Instead of assigning the stronger value ex post, the indicator constructed here records different values for each month.

its actions are amplified or counteracted by other monetary policy tools. Another criticism levelled against the narrative approach is that the value assignment depends on the interpretation of the researcher reading the documents and so is inherently subjective (Bernanke & Mihov, 1998). These are valid concerns, but they do not outweigh the problems associated with omitting window guidance altogether, given the (presumed) importance of the tool. The difference between words and deeds is a less pressing concern within the application here, as window guidance is an area where the PBOC enjoys relatively substantial discretion. Subjectivity is certainly an issue, but previous indicators can serve as a benchmark for comparison (see Figure 3-3), and indeed, the correlation between the indicator here and the 5-step indicators of Shu & Ng (2010) and Sun (2015) is 0.9 in both cases. The author of this study also cross-checked his indicator with the frequency of certain key words and found that specific words appear more often in periods of tightening, e.g. “inflation”, while others appear more often in periods of easing, e.g. “development”, which generally supports the assignments given.⁷ Documents issued by authorities further do not vary much from one period to the next, leaving little room for misinterpretation.

As a final note, it shall be pointed out that the future extendibility of this approach is not necessarily guaranteed. Chinese monetary policy appears to be undergoing a period of structural change, and the latest Monetary Policy Committee reports do not vary a lot from one quarter to the next. While the downturn of the Chinese economy in late 2015 has prompted authorities to adjust policy levers so as to support the domestic economy, recent reports issued by the PBOC are strikingly devoid of any reference to the situation. It is too soon to tell whether this represents a deliberate attempt by the central bank to maintain a level of discipline in the financial sector, or a fundamental shift in its public communication strategy as financial market observers appear to think (Mitchell, 2016).

⁷Key phrases and signal words corresponding to the five categories, from “very expansionary” (-2) to “very contractionary” (+2) are provided in the appendix.

3.2.6 Comparison with price-based regimes

Given these features, the Chinese monetary system differs substantially from those of other major economies. In those economies, the central bank is granted a degree of independence from the general government and assigned a price stability target, which it is charged to achieve by instruments of its own choosing. Central banks typically rely on the interbank overnight interest rate as their primary policy instrument, which is adjusted by signalling a new target rate to market participants, engaging in open market operations (i.e. injection of reserves to lower the interbank rate or withdrawal of reserves to raise it), or by lending to financial institutions. Reserve requirements, *where still present at all*, are low and not adjusted frequently. Interest rate movement is bounded by the discount rate and interest on excess reserves (or a deposit facility). The wholesale interbank overnight rate established within this system is transmitted to retail rates, which are in turn assumed to affect activity in the real economy.

The transmission of monetary policy in China, in contrast, is more complex and blurred by the simultaneous application of different classes of tools as well as the simultaneous targeting of multiple objectives. Authorities use a large number of tools to affect aggregate variables (“intermediate targets”, including growth rates for bank credit, M1, M2 and central bank reserves) as well as real economic variables (“final targets”, including GDP growth, employment and inflation), which often produces outcomes that are difficult to interpret, including large deviations of M1 and M2 growth rates and highly volatile interest rates. Depending on the direction in which tools move, they may further offset or even counteract each other, so the resulting interbank rate may move in an unexpected direction (Chen et al., 2013). Structural constraints, such as underdeveloped financial markets, credit controls, high volatility

of market liquidity, segmentation of credit markets, and interest rate insensitivity of market participants⁸, are further said to limit the amount of information conveyed by interest rates (Shu & Ng, 2010; Xiong, 2012; Ma et al., 2016).

Nevertheless, it is worth keeping in mind that the transmission from interbank interest rates to macroeconomic variables is also less than clear in many advanced economies,⁹ despite their more straightforward institutional set-ups, so the difficulties outlined above may not necessarily be related to the specificities of Chinese monetary policymaking. Indeed, studies have found that a relatively stable yield curve is emerging and that the interest rate channel is becoming increasingly influential in China (Conway et al., 2010). So long as there is no indication that the PBOC is going to switch to a single-instrument regime (Sun, 2015), however, an examination of the interaction of different tools and their ultimate effect on credit growth is a worthwhile endeavour.

⁸Conway et al. (2010) and Geiger (2008) relate the interest rate insensitivity of market participants to the dominance of big banks in the interbank market and the lack of a profit motive in the state-owned sector.

⁹Microeconomic analyses, in contrast, provide clearer results (e.g., for Japan, Nagahata & Sekine, 2005).

3.3 Empirical analysis

3.3.1 Methodology

The goal of the following analysis is to gain an understanding of how the different monetary policy tools presented interact and how they affect banks' credit creation, in order to determine which tool is the most effective at increasing or decreasing credit growth. While the body of literature on monetary policy transmission is vast, offering a variety of potential transmission channels to study,¹⁰ the analysis presented here shall limit itself to exploring the transmission from different monetary policy instruments to bank credit creation in the macroeconomy. How window guidance and the interbank overnight rate affect credit growth is of particular relevance.

The economics literature offers different methods to examine such a research question, of which two are applied here: An exogeneity test and an SVAR model. The exogeneity test is based on the seminal paper by Revankar & Yoshino (1990), who establish a test to determine whether the interbank rate satisfies the theoretical conditions for exogeneity vis-à-vis money markets. The SVAR model, then, studies the effect of different tools on domestic credit growth, in order to gauge the strength of each channel. While the exogeneity test is more rigorous on theoretical assumptions, the SVAR model is more exploratory in nature. Contrasting the results from both approaches shall, it is hoped, provide the desired insight.¹¹

Both approaches rely on publicly available data as well as the monetary policy indicator constructed in accordance with the Romer & Romer (1989)-type of text-based analysis described above. While such indicators are typically treated as an end in itself and analysed separately, this study explicitly incorporates them into the estimations of monetary transmission channels so as to account for window

¹⁰See Taylor (1995) for an introductory exposition on monetary policy transmission.

¹¹Note that this study deliberately does not apply Granger causality tests so as to avoid falling victim to the *post hoc ergo propter hoc* fallacy (i.e. "Christmas cards causing Christmas"), since anticipatory effects are common in interbank markets where financial institutions take positions *before* authorities adjust policy levers.

guidance. The purpose is to approximate the analysis of Japanese window guidance by Rhodes & Yoshino (1999) and obtain results that, ideally, allow for some careful comparison of the role of window guidance in both economies.

3.3.2 Data and structural characteristics

The main variables relevant to the analysis at hand are shown in Figure 3-4 and include adjustments of the average reserve requirement ratio $RRRC$, the average of benchmark deposit and lending rates $BENCH$, our monetary policy indicator for window guidance MPI (with $MPI \in [-2..2]$, where negative values stand for loosening, positive values stand for tightening), the interbank overnight rate $IBOR$, the percentage growth of domestic credit $CRPC$ (i.e. retail bank lending), the percentage change of the yuan-dollar exchange rate $XRPC$, as well as the year-on-year percentage change of industrial value added $IVYOY$. Following Revankar & Yoshino (1990), the exogeneity test also incorporates information on the percentage growth of M1 and M2 monetary aggregates $M1PC$ and $M2PC$ and the percentage growth of the money base $MBPC$. Percentage growth rates, such as $M1PC$, are defined as $\Delta \log M1 \cdot 100$. Similarly, $RRRC$ is defined as ΔRRR . Explicitly *not* included are data on interest paid on required/excess reserves and data on lending/discount rates, as those rates seem to have played only symbolic roles during the period of analysis, as explained above.

Monthly-frequency data covering the period from April 2000 to September 2015 has been obtained from the International Monetary Fund (IMF) and Chinese authorities. All series were subjected to unit root tests in order to ensure stationarity or trend-stationarity. Where necessary, series were transformed to month-on-month or year-on-year (to remove seasonal effects) percentage changes. Detailed unit root test results are reported in the appendix.

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While the analysis will primarily focus on the full sample period to gain an overall picture of the dynamics of Chinese monetary policy, interest also lies in the evolution of these dynamics over time. A Chow test for structural breaks has been conducted to determine whether credit growth has been constant annually, and although the F test results presented in Figure 3-5 do not indicate a *strong* rejection of the null hypothesis of constant credit growth (i.e. no structural break), credit and monetary aggregates in level terms do evidently change at the indicated break point, as shown in Figure 3-6. Indeed, the break point marks the collapse of domestic credit growth in 2008 when the Global Financial Crisis hit China, which was followed by strong credit expansion, so the sample is split at that date.

The topic of structural breaks is not explored further, however, simply because the sheer number of institutional changes the Chinese monetary system has undergone within the period studied may potentially yield a large number of structural breaks. Examples are the changes of the exchange rate regime in 2005, 2008 and 2010, the switch to reserve requirements as the primary sterilisation tool in 2007, the numerous adjustments of benchmark retail interest rates as well as the period of the Global Financial Crisis and the accelerating loan growth in the period after the crisis. Firms' increasing reliance on commercial paper markets and the associated declining role of banks and benchmark rates are other potential sources of complication (Conway et al., 2010). Finally, as indicated above, monetary policy in China appears to be undergoing another period of change as judged by the paucity of substance in recent Monetary Policy Committee reports. Splitting the sample into smaller parts as indicated by these breaks would make the desired estimations infeasible for lack of degrees of freedom.

[Figure 3-5 "Chow test for structural change"]

[Figure 3-6 "Growth behaviour of credit and monetary aggregates in level terms"]

3.3.3 Exogeneity test

First, the Revankar & Yoshino (1990) exogeneity test is replicated for China to determine whether the interbank overnight interest rate is exogenous in the Chinese monetary system. The following simultaneous equation model is specified for this purpose:

$$M1PC_t = MBPC_t + IBOR_t + RRRC_t + MPI_t + u_{1t} \quad (3.1)$$

$$M1PC_t = IBOR_{t-1} + BENCH_t + IVYOY_t + u_{2t} \quad (3.2)$$

$$IBOR_t = MBPC_t + M1PC_{t-1} + IBOR_{t-1} + RRRC_{t-1} \\ + CPIYOY_{t-1} + IVYOY_{t-1} + XRPC_{t-1} + u_{3t} \quad (3.3)$$

The Revankar & Yoshino (1990) exogeneity test is based on the null hypothesis of exogeneity of the interbank overnight rate ($IBOR_t$), given by equation 3.3 (this can be regarded as a type of Taylor rule), vis-à-vis the money market described by equations 3.1 and 3.2. The interbank rate is judged to be exogenous if $Cov(u_{3t}, u_{1t}) = 0$ and $Cov(u_{3t}, u_{2t}) = 0$, as determined by the test. In comparison to other exogeneity tests, the test applied here has attractive properties such as higher power when the null hypothesis and alternative hypothesis are very close.¹² While the Revankar & Yoshino (1990) exogeneity test allows for a wide range of possible model specifications, attention here focusses on the growth of M1, as monetary aggregates move considerably faster than other macroeconomic variables and because the frequency of the data limits the possible modelling choices. Industrial value added, inflation and exchange rate movements are thus treated as given for present purposes, as attention here is restricted to the money market given by equations 3.1 and 3.2.

[Figure 3-7 “Revankar-Yoshino exogeneity test for full sample”]

¹²Readers are referred to the original paper by Revankar & Yoshino (1990) for more details.

[Figure 3-8 “Revankar-Yoshino exogeneity test for subsamples”]

As shown in Figure 3-7, the Revankar & Yoshino (1990) test is based on a Chi-square test. On the basis of the full sample period, this test indicates a clear rejection of the null hypothesis of interbank rate exogeneity at 5% significance level. Applied to the subsample periods, as shown in Figure 3-8, the test rejects the null hypothesis for the pre-crisis sample but fails to reject the null hypothesis for the post-crisis sample. Exogeneity of the interbank overnight rate thus appears to change depending on the sample period chosen: Whereas the interbank overnight rate is not exogenous over the full sample period and the pre-crisis sample, the test indicates that it is exogenous during the post-crisis sample.

3.3.4 Structural VAR model

Next, the interaction of monetary variables is analysed using an SVAR model to understand how each policy instrument relates to domestic credit growth. The SVAR model takes the general form of

$$AY_t = C_0^* + C_1^*t + A_1^*Y_{t-1} + A_2^*Y_{t-2} + C_2^*X_t + Be_t \quad (3.4)$$

where Y_t and X_t are given by

$$Y_t = \begin{bmatrix} RRRC_t & BENCH_t & MPI_t & IBOR_t & CRGR_t \end{bmatrix}^T$$

$$X_t = \begin{bmatrix} IVY OY_{t-1} & XRCH_{t-1} & INFL_{t-1} \end{bmatrix}^T$$

The model has a lag order of 2, as indicated by the Hannan-Quinn information criterion. The starred matrices on our lag terms (A^*) and the matrices on our deterministic terms and exogenous regressors (C^*) are unrestricted. The matrix B is a square matrix with unrestricted elements on the main diagonal and zeros elsewhere. The matrix A specifying the contemporaneous relation of the endogenous variables is restricted as follows:

$$A = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 \end{bmatrix}$$

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This identification strategy is based on a simple Cholesky-type causal ordering of the variables on top of which a zero restriction is placed on the contemporaneous correlation between reserve requirement ratio adjustments (*RRRC*) and benchmark rates (*BENCH*). In other words: It is assumed that reserve requirement ratio adjustments and benchmark rates contemporaneously affect window guidance (*MPI*), the interbank overnight rate (*IBOR*), and credit growth (*CRPC*), but that the reverse is not true. In addition, reserve requirement ratio adjustments are assumed not to be associated contemporaneously with benchmark rates.

In essence, this identification strategy exploits features of Chinese monetary policymaking, specifically the time lag inherent in policy implementation. Since adjustment of official policy levers is subject to approval by the State Council, any proposal for such an adjustment sets into motion a political process. Between the time a proposal is submitted to the State Council and the time a change becomes implemented can lie several months (He & Pauwels, 2008; Geiger, 2008; Fungáčová et al., 2015). The PBOC is understood to have greater discretion over adjustments of the reserve requirement ratio, however, whereas benchmark rates are controlled by the State Council more stringently and typically adjusted only later (Fungáčová et al., 2015). As such, these two instruments are put first in the causal ordering and simultaneous association between them is ruled out. Together, they are assumed to affect window guidance, since it is reasonable to expect policymakers to take into consideration the position of other policy variables when adjusting their window guidance stance. Reserve requirement ratio adjustments, benchmark rates and window guidance are in turn assumed to affect the interbank rate contemporaneously, since all of these variables affect the price of liquidity. Finally, all variables are assumed to affect banks' credit creation contemporaneously. The system is thus overidentified.

While identification is a complex problem that the present study cannot claim to have solved conclusively in terms of the research question at hand, the procedure chosen is in line with the qualitative analysis laid out in the beginning of this study, the findings of previous studies and data availability constraints. The Likelihood Ratio test for validity of the overidentifying restrictions also failed to reject the identification strategy (p-value of 0.74). This affords for some confidence in the chosen identification. Further, to determine the robustness of the results derived on the basis of the model specified, alternative specifications will be estimated.

Figure 3-9 shows the cumulated impulse responses to credit growth (*CRPC*) together with 90%, 68% and 38% bootstrapped confidence bands for the full sample period as well as the pre-crisis and post-crisis subsample periods. Level responses are not shown here as interest lies in the cumulated effect of the variables analysed and due to the high degree of uncertainty involved in tracing out the effects of monetary policy, which commonly results in a low degree of significance of level responses at many horizons (this is a common problem in the empirical analysis of monetary policy transmission not exclusive to China). The cumulated SVAR responses are more revealing by comparison.

[Figure 3-9 “Cumulated impulse responses for full sample and subsamples”]

Upward adjustment of the reserve requirement ratio (*RRRC*) appears to affect credit growth negatively, although subsample responses show that this effect is sustained only in the post-crisis sample. A rise in benchmark rates (*BENCH*) appears ineffective, considering that it seems to be associated with a significant *increase* in credit growth, as opposed to the theoretically expected *decrease*. This may be a result of the lagged application of benchmark rates and the fact that such increases are generally instituted when credit growth is high already, although a somewhat significant contractionary effect is present in the post-crisis sample. A contractionary window guidance stance (*MPI*) is associated with a lasting decrease in credit

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growth, suggesting some potential role of the tool. Most interestingly, window guidance appears to have a strongly significant contractionary effect in the pre-crisis sample, but is actually significantly associated with positive credit growth in the post-crisis sample. While increases of the interbank overnight rate (*IBOR*) also have a clearly contractionary effect on credit growth, this effect is only present in the post-crisis sample.

3.3.5 Robustness

Variations of the SVAR estimation procedure for the full sample can provide insight regarding the robustness of the overall impulse responses and the consistency of each of the tools analysed. Towards this end, the model specification was modified in seven different ways. Figure 3-10 shows the cumulated impulse responses obtained from the corresponding estimations.

[Figure 3-10 “Cumulated impulse responses for alternative model specifications”]

First, reserve requirement ratio adjustments ($RRRC$) have been replaced within the model specification by the reserve requirement ratio in level terms (RRR), which had been excluded previously due to a more uncertain growth behaviour (unit root tests differed on whether the series contained a unit root or was trend-stationary, depending on the time frame chosen). Second, the monetary policy indicator (MPI) has been replaced by Sun’s (2015) indicator, in order to determine whether the results presented depend on the author’s interpretation of the PBOC reports. Third, the lag order of the model was raised. Fourth, the trend term included in the original models was removed. Fifth, a standard VAR model was estimated and cumulated impulse responses were calculated using a Cholesky-type causal order which is the reverse of the order assumed above. Finally, two alternative models were estimated where M1 percentage growth ($M1PC$) and M2 percentage growth ($M2PC$) replace credit growth ($CRPC$) as the primary response variable.

Upward adjustments of reserve requirement ratios generally appear to have a decreasing effect on credit growth, but the significance and strength of the effect varies depending on the actual model specification. A downward impact is only observable in the models with Sun’s (2015) indicator, the model omitting a trend term and the model where M2 growth replaces bank credit growth. In other models, the impact of reserve requirement ratio adjustments on credit growth is either insignificant or even indeterminate. Benchmark rates appear positively associated with credit

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growth across most models. In the models with M1 and M2 growth and the model with a higher lag order, the respective impulse response graph tends to bounce in and out of significance and sometimes even changes sign at several horizons, suggesting that the tool is indeed inefficient.

The response of window guidance is largely unchanged, irrespective of whether Sun's (2015) indicator or that constructed here is used to approximate it, suggesting a consistent interpretation of PBOC reports between both authors. Contractionary window guidance has a consistently negative impact on credit growth that is at least marginally significant in all model specifications, except the model with M2 growth. The interbank overnight rate has a consistently negative significant effect on credit growth in all alternative models. Most notably, the sign and shape of the respective impulse response graphs are consistent across *all* model specifications, with the responses in the final two models with M1 and M2 growth rates being the most significant.

3.3.6 Interest rate effects

The foregoing analysis has shown that window guidance and especially the interbank overnight rate have the most consistent effects on credit growth. To complement this picture, Figure 3-11 also shows the cumulated impulse responses for shocks to the interbank overnight rate derived from the same model as above. In particular, reserve requirement adjustments and benchmark rate adjustments appear to have strong and significant effects on the interbank overnight rate. In contrast, the effects of window guidance and credit growth on the interbank rate appear insignificant or indeterminate.

[Figure 3-11 “Cumulated impulse responses of interbank overnight rate”]

3.4 Interpretation

The test results presented show certain patterns which are in line with the institutional analysis laid out at the beginning of this study and the findings of previous literature. As observed, the interbank overnight interest rate appears to be the most *consistent* policy tool, as it exhibits a negative and significant (when focussing on the 68% confidence band) effect on credit growth across all different model specifications. The effect of window guidance on credit growth also appears consistent in shape and sign across all model specifications, except the one with M2 growth.

On the other hand, the effects of reserve requirement adjustments and benchmark rate adjustments on credit growth appear more uncertain. While reserve requirements *may* play *some* role, given the quantity-oriented set-up of the Chinese monetary system, exactly how they affect credit growth is uncertain given the instability of the impulse responses observed above. Benchmark rates appear to be ineffective in reducing credit creation, irrespective of which alternative model is chosen.

Impulse responses for the pre-crisis sample indicate that the impact of the interbank overnight rate on credit growth is indeterminate during that period, whereas that of window guidance appears to be strongly negative and significant. In contrast, impulse responses for the post-crisis sample show that the interbank overnight rate is associated with a reduction of credit growth, whereas window guidance is now positively associated with credit growth. These findings correspond to those of previous analyses of the role of window guidance and the interbank interest rate in the Chinese economy: The pre-crisis consensus used to be that interest rates are simply not as effective as quantities and administrative tools (see, e.g., Geiger, 2008), whereas studies conducted after the crisis have found signs that interest rates are becoming more effective (see, e.g., Conway et al., 2010).

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Indeed, the Revankar & Yoshino (1990) exogeneity test has found the interbank rate to be exogenous only during the post-crisis sample period, but it indicated a failure of the exogeneity hypothesis within the full sample and the pre-crisis sample. The failure of the exogeneity hypothesis over the full sample period in spite of the potency of the tool observed from its impulse response may indicate that some tools are partly operating *through* the interbank rate. As shown in Figure 3-11, reserve requirement ratio adjustments and benchmark rate adjustments have significant effects on the interbank rate. By comparison, window guidance seems to distort the interbank rate less, which may indicate that authorities systematically offset any effects window guidance exhibits on the interbank market. Interestingly, the interbank overnight interest rate has been found to be exogenous for that period where it is also considerably more volatile, as shown in Figure 3-12, which may be a result of the increasing transaction volumes in interbank markets and the associated stronger competition for central bank reserves.

The observed declining importance of window guidance has also been suggested in earlier studies. Chen et al. (2013) argue that with advancing financial liberalisation, firms will be able to access alternative sources of funding and reduce their reliance on commercial banks, which in turn reduces the effectiveness of window guidance in guiding credit creation. The different responses of our monetary policy indicator within the pre-crisis sample and post-crisis sample may be interpreted as evidence in favour of this view: While contractionary window guidance used to be associated with declining credit growth, it is now associated with rising credit growth, which may indicate that authorities are now merely following where they were previously leading.

In summary, it appears that the interbank rate plays an increasingly important role in influencing credit growth, especially in the post-crisis period. Similarly, window guidance appears to play a central albeit declining role in Chinese monetary policymaking. Readers are nevertheless asked to bear in mind that the data sets

chosen have limits in gauging the overall effect of monetary policy on the macroeconomy, as the role of banks in domestic financial markets has been declining while an increasing amount of finance is associated with the Chinese shadow banking system. Data on aggregate financing to the real economy shown in Figure 3-13 confirms a declining role of bank loans relative to other sources of funding since the Global Financial Crisis. Although the Chinese financial system is (so far) still largely bank-based (Yoshino, 2012), those alternative sources of funding may limit banks' ability to increase or decrease credit provision in line with official guidelines.

[Figure 3-12 "Interest rate corridor in China"]

[Figure 3-13 "Aggregate financing to the real economy"]

3.4.1 Strengthening interbank rates

Difficulties in the application of quantity-based tools are not exclusive to China, but have also been experienced by US and European central banks, for which instability of money velocity and money multipliers are frequently cited reasons. Several characteristics of the Chinese economic system may amplify these difficulties, however, such as the lack of a profit motive in the state-owned sector, quasi-autonomous credit creation by local governments, lack of sufficient risk evaluation at commercial banks and targeted central bank transactions, all of which contribute to a reduction of the economy's interest rate elasticity (Geiger, 2008; Conway et al., 2010). These issues motivate authorities to rely on quantity-based tools *in addition to* price-based tools, but at the same time those very quantity-based tools potentially offset or reverse the effect of price-based tools (Chen et al., 2013), making the eventual switch to a system based exclusively on prices more difficult (see Geiger, 2008, for a similar point). What is more, said quantity-based tools are arguably a primary factor behind the high volatility of the interbank rate in Chinese markets. Given that quantity *targets*

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are still being missed despite the multitude of tools being used, authorities are paying a high price (high interest rate volatility) without getting closer to their desired goal (quantity targets), giving them the worst of both systems.

Quantity-based tools are by their very nature non-market-conform, as they aim at changing the amount of some type of money without accounting for its price (Geiger, 2008). Authorities have to let prices adjust or peg them at extremely high/low levels in order to achieve their desired quantity target, which distorts the signalling function of prices and contributes to misallocation of funds. Greater reliance on interest-based tools may therefore go some way towards reducing inefficiencies and contribute to ongoing efforts at rebalancing the Chinese economy.¹³ As such, strengthening of the interest rate channel has recently attracted the interest of policymakers (Ma et al., 2016; Niu et al., 2015).

A primary reason for the high volatility of the interbank overnight rate in the Chinese economy is, arguably, the ineffectiveness of the existing interest rate corridor system. In theory, the (re-)discount rate and the interest paid on excess reserves represent the upper and lower limits for movement of the interbank overnight interest rate (Xie, 2004). In practice, the support rate paid by the PBOC on excess reserves is very low and adjusted only infrequently within excessively small steps, while the ceiling rate charged at the PBOC's discount window does not seem to provide an effective upper limit at times when interbank liquidity is short (Conway et al., 2010), leading to an interest rate corridor that is both considerably wider than comparable arrangements in other economies (e.g. the euro area) and, apparently, ineffective (as shown in Figure 3-12). Experience in other economies has shown that variability of short-term interbank rates is essentially a function of the size of the spread and the bindingness of the corridor's limits (Woodfort, 2001; Goodhart, 2008), so stabilisation of interbank rates is a relatively straightforward undertaking: Central bank's standing facilities need to be strengthened and the spread needs

¹³The relevance of economic rebalancing in China is returned to in chapter 4.

3.4 Interpretation

to be reduced so as to limit the range of possible market price movements. The latter point may not be without cost in China's case, however. In a managed exchange rate system, a low interest rate floor is essential in maintaining moderate sterilisation costs and safeguarding the central bank's equity position, although the ongoing reform of the exchange rate regime may loosen this constraint.

The discount window, on the other hand, should be relied upon to a greater degree, not only because of its usefulness in the past (Dickinson & Liu, 2007), but also because it provides authorities with important information about market conditions and the liquidity position of financial institutions. At the moment, the discount window does not play a major role in the PBOC's operations, but it may prove to be a useful alternative to window guidance as a source of information at some point in the future, provided corresponding institutional structures are put in place (Goodhart, 2008).

A reduction in the number of tools used simultaneously, together with enhanced transparency and greater adherence to market principles, would further go a long way towards enhancing the role of interbank rates. This cannot happen over night, however: On the one hand, a more straightforward transmission from central bank operations to the interbank overnight rate requires dismantling benchmark rates as a distortionary and potentially adverse source of influence (Chen et al., 2013; Laurens & Maino, 2007). Recent political initiative has moved in that direction and continuing financial liberalisation is likely to strip remaining benchmark rates of much of their relevance anyway. On the other hand, the outright abandonment of other, more quantity-based tools is unlikely, especially while price-based tools alone are ineffective. As Geiger (2008) points out, quantity-based tools are a legacy of the planned economy and so are likely to remain relevant during the transition period, despite their potentially negative effects.

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Finally, longer maintenance periods and averaging provisions for commercial bank reserves may help in reducing interest rate volatility. Such reforms would provide banks with more time to adjust their reserve positions in response to shocks to the interbank system. Instead of being forced to raise additional reserves immediately, leading to potentially large swings in interbank rates, banks could increase reserves more gradually in response to an unexpected rise in interbank payment and settlement commitments. Such a change would also give the PBOC more time to inject additional reserves into interbank markets as necessary, improving the system's overall stability and its ability to absorb shocks.

3.5 Conclusion

This study has analysed the transmission process of Chinese monetary policy on the basis of qualitative institutional analysis and quantitative econometric analysis. It has provided an in-depth account of the institutional set-up of Chinese monetary policymaking, outlining how the transmission of monetary policy is affected by several different actors which target multiple objectives and rely on quantity-based and price-based instruments.

The effectiveness of different monetary policy tools with regard to banks' credit creation has been analysed using Revankar & Yoshino (1990) exogeneity tests and SVAR models. Estimations explicitly accounted for the influence of window guidance using a monetary policy indicator constructed on the basis of a Romer & Romer (1989)-style text-based analysis of the PBOC's reports. Evidence has been provided showing that the interbank overnight rate appears to be the most influential policy tool overall, despite its high volatility. Subsample estimations further indicated that window guidance has played an important role up to the Global Financial Crisis, whereas the interbank overnight rate has become more important and exogenous since then.

On the basis of these results, the study has identified several problems associated with quantity-based tools and policy-targets, and provided suggestions for the improvement of the interest rate channel, the stated goal of the PBOC. These suggestions include the establishment of a well-defined and credible interest rate corridor, a reduction in the number of tools in favour of transparent and more market-oriented price-based tools, as well as the introduction of averaging provisions for commercial bank reserves and longer reserve maintenance periods.

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As the interbank overnight rate appears to be the most important factor in influencing domestic credit growth, strengthening its role as a central macroeconomic price variable in this way appears warranted. Such a step is also likely to enhance overall macroeconomic stability and contribute to the ongoing rebalancing of the Chinese economy.

3.6 Appendix

3.6.1 Figures

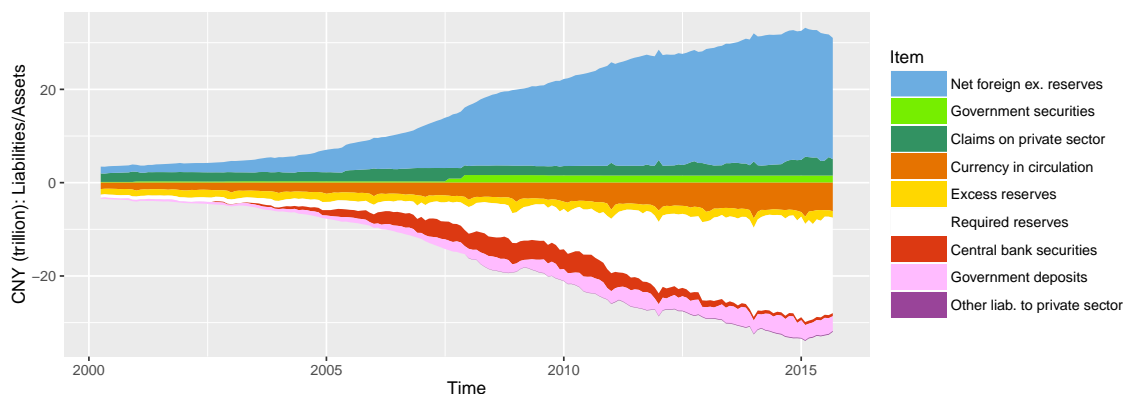
Figure 3-1: Monetary policy tools used in China

	Market-based	Non-market-based
Quantity-based	<ul style="list-style-type: none"> • Central bank bill issuance amount • (Reverse) Repo amount • Required reserve amount 	<ul style="list-style-type: none"> • Targeted central bank transactions (bills, deposits, lending, foreign currency swaps) • Credit controls/window guidance • Capital controls
Price-based	<ul style="list-style-type: none"> • Central bank bill rate • (Reverse) Repo rate • (Re-)Discount rate • Interest on (required and excess) reserves 	<ul style="list-style-type: none"> • Benchmark lending and deposit rates • Regulatory controls (e.g. down payment ratios in mortgage lending)

Source: Author's compilation, following Shu & Ng (2010), Chen et al. (2013), and Geiger (2008); Geiger (2008) further names price controls and wage controls as non-central bank instruments.

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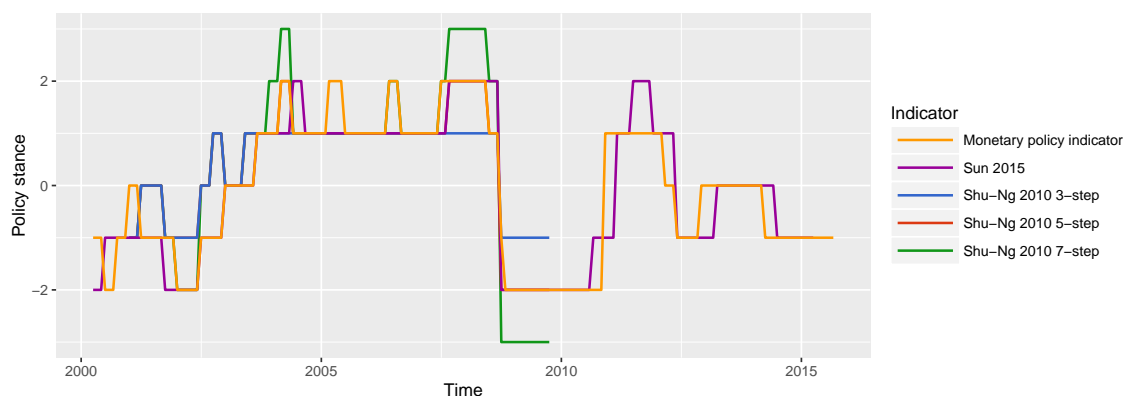
Figure 3-2: Balance sheet of the People's Bank of China



Note: The outstanding amount of required reserves is approximated using data on the average reserve requirement ratio and total demand and savings deposits.

Source: IMF International Financial Statistics, People's Bank of China

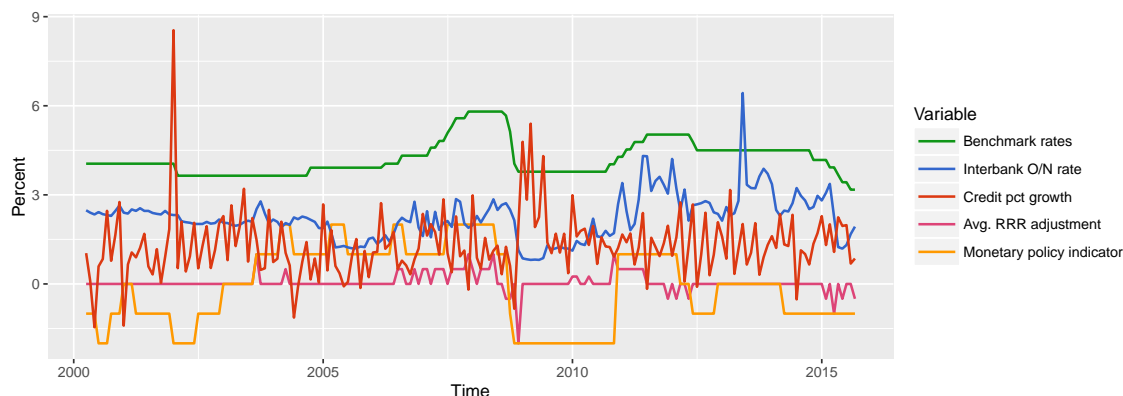
Figure 3-3: Comparison of narrative monetary policy indicators



Note: "Monetary policy indicator" is the indicator constructed by this study's author.

Source: Shu & Ng (2010); Sun (2015); author's calculations

Figure 3-4: Major monetary policy-related variables

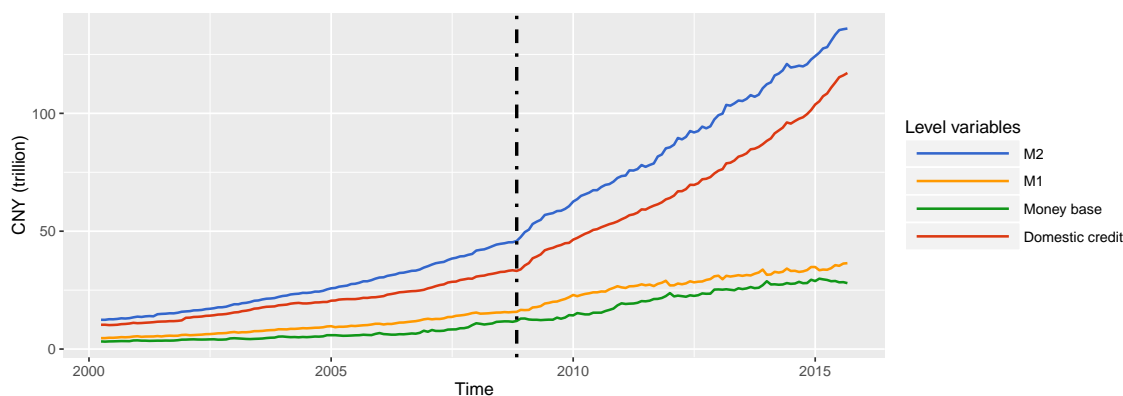


Source: IMF International Financial Statistics, People's Bank of China, Finance Yearbook of China, National Bureau of Statistics of China

Figure 3-5: Chow test for structural change H_0 : Constant annual credit growth

F test

Statistic = 6.481, p-value = 0.1326, break point = 2008/11

Figure 3-6: Growth behaviour of credit and monetary aggregates in level terms

Source: IMF International Financial Statistics

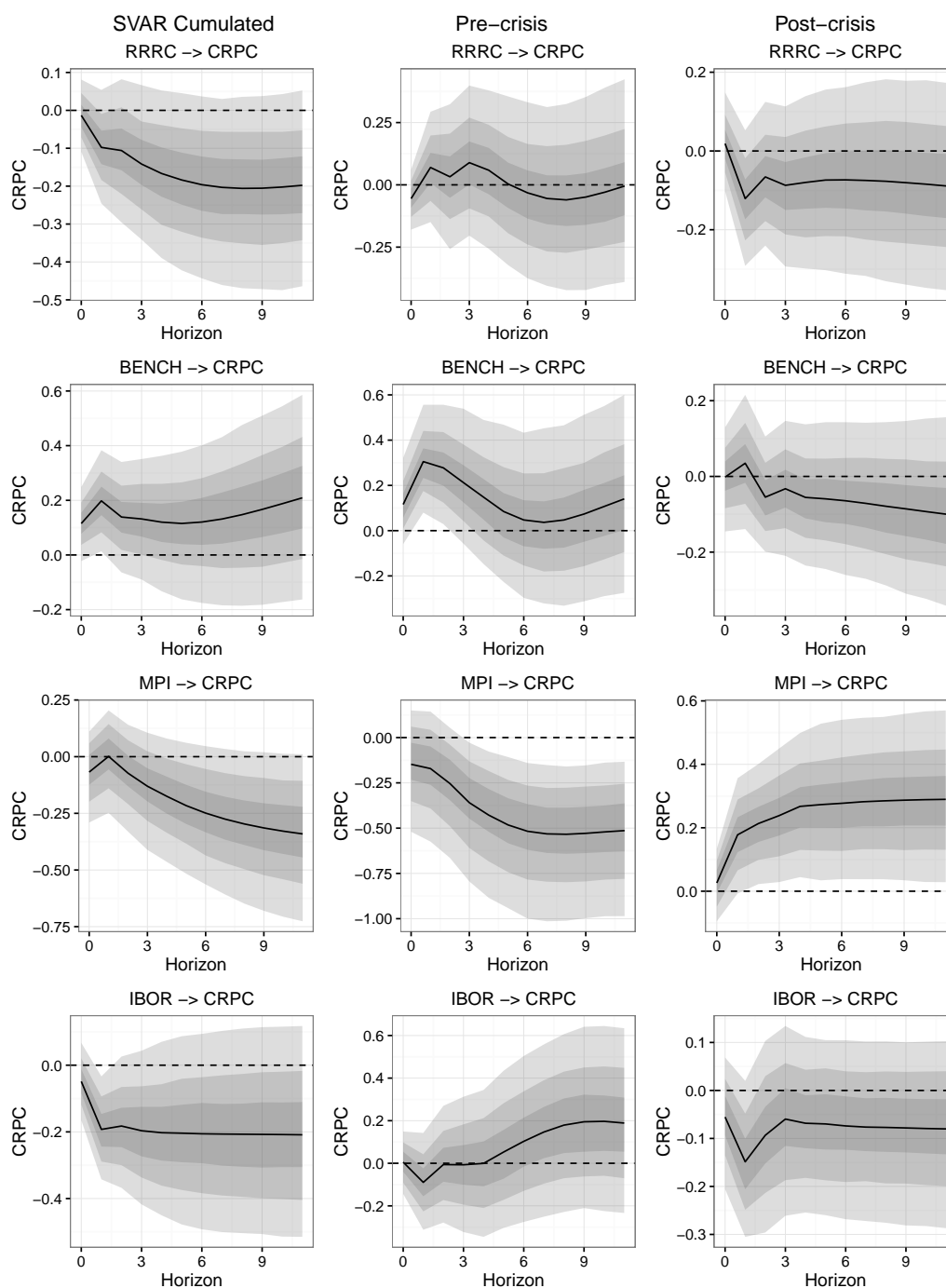
Figure 3-7: Revankar-Yoshino exogeneity test for full sample H_0 : Exogeneity of interbank overnight rate vis-à-vis domestic money markets

Chi-square test

 $\chi^2 = 58.1857$, $df = 2$, $p\text{-value} = 0.0000$ **Figure 3-8:** Revankar-Yoshino exogeneity test for subsamples H_0 : Exogeneity of interbank overnight rate vis-à-vis domestic money markets

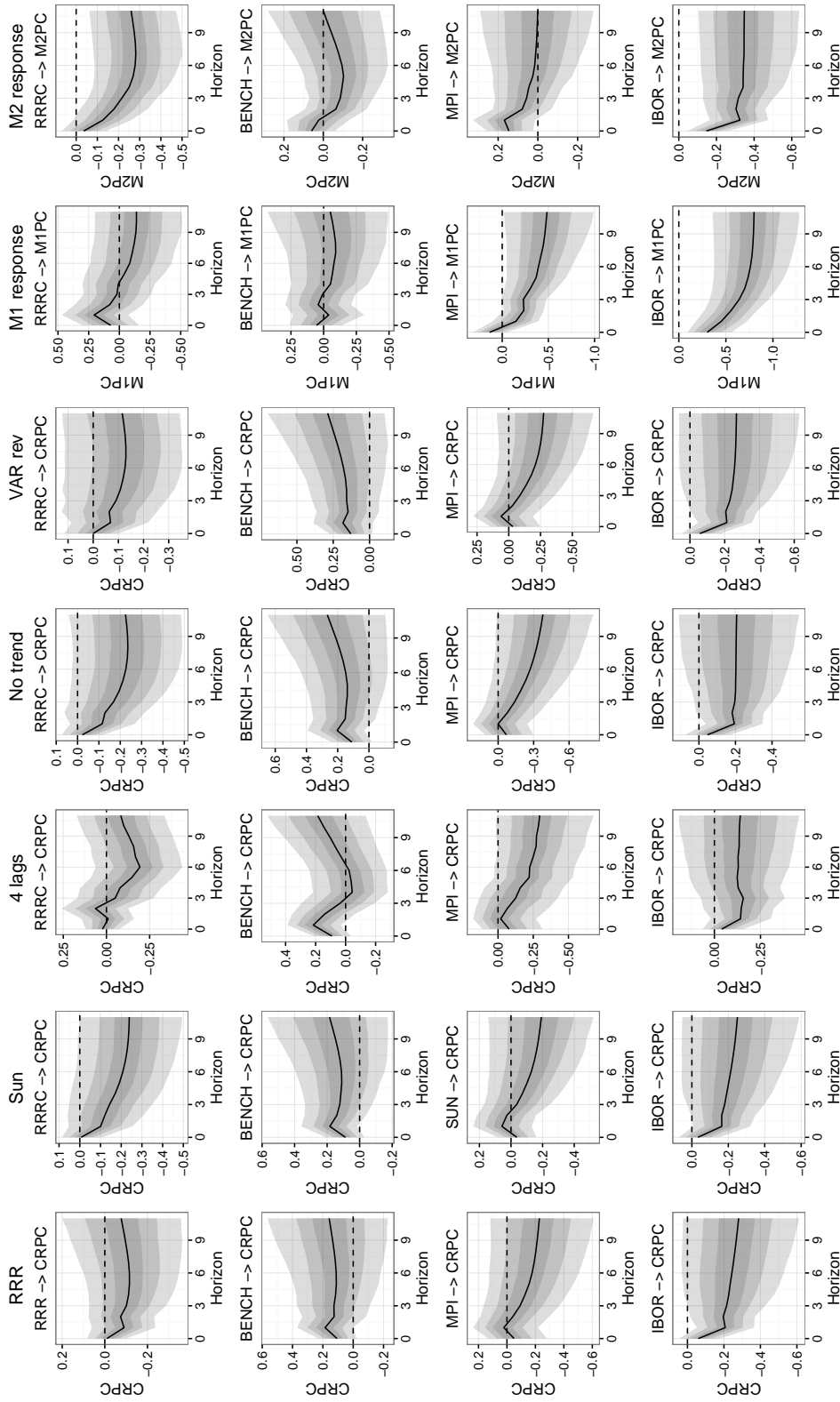
Pre-crisis: 2000/4-2008/11	Post-crisis: 2008/12-2015/9
Chi-square test	Chi-square test
$\chi^2 = 30.1654$, $df = 2$, $p\text{-value} = 0.0000$	$\chi^2 = 3.9815$, $df = 2$, $p\text{-value} = 0.1366$

Figure 3-9: Cumulated impulse responses for full sample and subsamples



Impulse responses of credit growth (*CRPC*) to one standard deviation shock of other endogenous variables
 12 period forecast, 90%, 68% and 38% bootstrapped confidence bands
 Full sample, pre-crisis and post-crisis periods

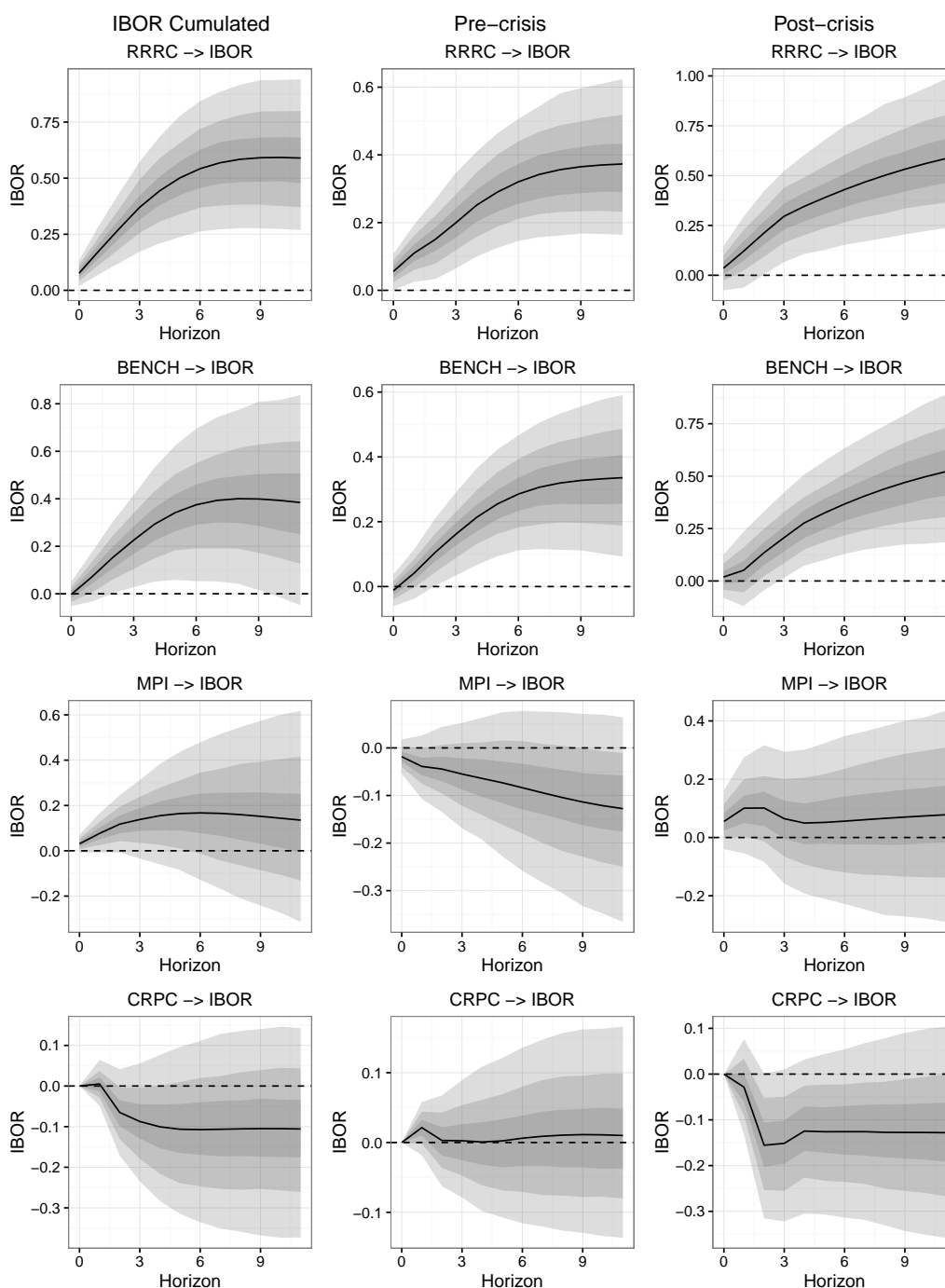
Figure 3-10: Cumulated impulse responses for alternative model specifications



Cumulated impulse responses, 12 period forecast, 90%, 68% and 38% bootstrapped confidence bands

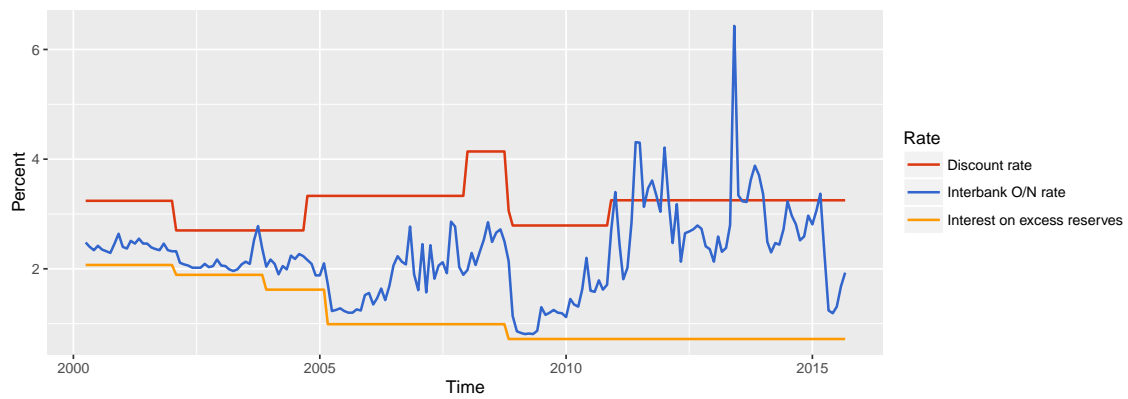
Selected robustness checks: (1) Reserve requirement ratio in levels (*RRR*); (2) Monetary policy indicator by Sun (2015) (*SUN*); (3) Higher lag order; (4) No trend; (5) VAR with reverse ordering; (6) M1 growth rate (*M1PC*); (7) M2 growth rate (*M2PC*)

Figure 3-11: Cumulated impulse responses of interbank overnight rate



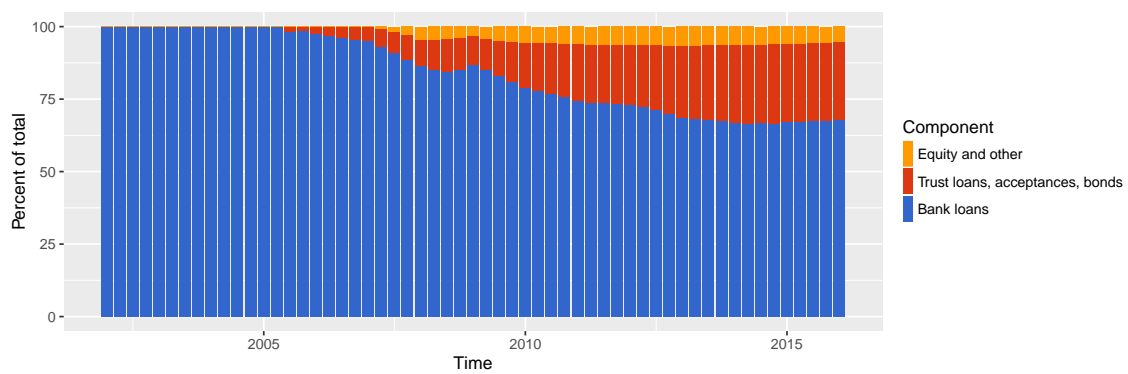
Impulse responses of interbank overnight rate (*IBOR*) to one standard deviation shock of other endogenous variables
 12 period forecast, 90%, 68% and 38% bootstrapped confidence bands
 Full sample, pre-crisis and post-crisis periods

Figure 3-12: Interest rate corridor in China



Source: IMF International Financial Statistics, People’s Bank of China

Figure 3-13: Aggregate financing to the real economy



Note: Percentage shares of each component of “aggregate financing to the real economy”.

Source: People’s Bank of China

3.6.2 Monetary policy indicator

Overview of major policy events, associated key phrases and MPI adjustments.

Figure 3-14: Monetary policy indicator (1)

Publication	Issue	Date	MPI
Monetary Policy Committee meeting report	2000Q2	2000/4/23	-1
<p>First meeting; economy off to a good start in Q1; priority henceforth is relationship between avoidance of risk and support for economic growth 本次会议是新一届货币政策委员会组成后举行的首次会议; 一季度我国经济开局良好; 二季度及今后一段时间货币政策的重点是, 正确处理防范金融风险和支持经济增长的关系; 从多方面加大对经济增长的支持力度</p>			
Monetary Policy Committee meeting report	2002Q1	2002/1/20	-2
<p>Economy continues stable expansion, stable monetary policy plays important role; first year of WTO membership and associated uncertainties; continue stable monetary policy; expand support for the economy, prevent slowdown 我国国民经济保持稳定增长; 稳健的货币政策继续发挥重要作用; 今年是我国加入世界贸易组织的第一年, 经济发展和货币政策调控面临一些新的不确定因素; 继续实行稳健的货币政策, 加大对经济发展的支持力度, 防止经济增长速度进一步减缓</p>			
Monetary Policy Committee meeting report	2003Q1	2003/1/29	0
<p>Actively guide commercial banks to improve business management; while economy is doing well, need to continue managing the relationship between prevention of financial risks and supporting growth, further strengthen credit management; work to reduce NPLs progressing; need to pay attention to real estate and excessive lending growth 积极引导商业银行完善经营机制; 在经济景气趋好的形势下, 要继续处理好防范金融风险和支持经济增长的关系, 进一步加强信贷管理; 把降低不良贷款率的工作扎扎实实地持续抓好; 要密切关注一些地区房地产投资与贷款增长过快的问题</p>			

Figure 3-15: Monetary policy indicator (2)

Publication	Issue	Date	MPI
Monetary Policy Committee meeting report 2004Q1		2004/3/25	2
<p>Economy maintained positive momentum of rapid growth; measures taken have achieved some initial success, but some contradictions have not yet been resolved; fixed asset investment not decreasing, overall demand still strong, consumer prices keep rising; need to strengthen and improve macroeconomic regulation; should continue stable monetary policy; need to maintain economic growth but also avoid inflationary and financial risks</p> <p>我国国民经济保持了持续快速增长的良好势头; 认为去年以来采取的一些调控措施已取得初步成效, 但当前经济运行中的一些矛盾还没有得到有效缓解。固定资产投资增势不减, 全社会需求依然十分旺盛, 去年下半年以来居民消费价格保持上涨的趋势; 要加强和改善宏观调控; 应继续执行稳健的货币政策; 既要支持经济增长, 又要防止通货膨胀和金融风险</p>			
Monetary Policy Committee meeting report 2007Q2		2007/7/3	2
<p>Economy maintained steady and rapid growth; general economic situation good, but still facing irrational structural problems, unrestrained economic growth patterns, international balance of payments imbalances; continue to strengthen and improve macro control, prevent economic growth shifting from fast to overheating; policy coordination, actively expand domestic consumption demand, rationally control scale of fixed asset investment; appropriately tight monetary policy; strengthen policy coordination and banking system liquidity management; maintain basic stability of overall price level</p> <p>我国国民经济继续保持平稳快速发展; 我国经济形势总体良好, 但仍面临着结构不合理、经济增长方式粗放、国际收支不平衡等问题; 继续加强和改善宏观调控, 防止经济增长由偏快转向过热; 政策的协调配合, 积极扩大国内消费需求, 合理控制固定资产投资规模; 应继续实施稳健的货币政策, 稳中适度从紧; 加强本外币政策的协调和银行体系流动性管理; 保持价格总水平基本稳定</p>			

Figure 3-16: Monetary policy indicator (3)

Publication	Issue	Date	MPI
Monetary Policy Committee meeting report 2008Q3	2008Q3	2008/10/10	-1
<p>Analysed current domestic and international economic and financial situation, focussing on potential impact of international financial turmoil on China's economic and financial development; US Sub-prime Crisis is causing volatility of financial markets, affecting financial institutions and real economy, global economic outlook not optimistic, which we must address; Chinese economy continues to move in expected direction of macro control, financial system stability, overall situation is good; efforts to expand domestic demand</p> <p>会议分析了当前国内外经济金融形势，重点讨论了国际金融动荡对我国经济金融发展可能产生的影响；美国次贷危机造成金融市场剧烈波动，并影响到金融机构以至实体经济，全球经济前景不容乐观，必须妥善应对；我国国民经济继续朝着宏观调控预期方向发展，金融体系稳健安全，总体形势是好的；着力扩大内需</p>			
Monetary Policy Report	2008Q3	2008/11/11	-2
<p>[...] Implement appropriately loose monetary policy [...]</p> <p>[...] 实行适度宽松的货币政策 [...]</p>			
Monetary Policy Committee meeting report 2010Q4	2010Q4	2010/12/27	1
<p>World economy is expected to continue recovering next year, but unstable and uncertain factors still numerous; Chinese economy moving in direction of positive momentum and further consolidation, financial system continues to operate smoothly, but monetary, credit and liquidity management and prevention of financial risks still formidable task; need to seriously implement stable monetary policy; stable price level needs to be put on more prominent position</p> <p>会议认为，明年世界经济有望继续恢复增长，但不稳定不确定因素仍然较多；我国经济向好势头进一步巩固，金融体系继续平稳运行，但货币信贷和流动性管理及防范金融风险的任务仍然艰巨；要认真实施稳健的货币政策；把稳定价格总水平放在更加突出的位置</p>			

Figure 3-17: Monetary policy indicator (4)

Publication	Issue	Date	MPI
Monetary Policy Committee meeting report 2012Q2		2012/6/29	-1
<p>Economic and financial operations generally stable, economic growth within target range, price inflation continued to decline; global economic recovery on difficult and winding road, repeated shocks from European debt crisis, uncertainties relatively large; continue to implement stable monetary policy; according to changes in situation, need to appropriately and timely implement fine-tuning measures, maintain stable and rapid economic development; prevent financial risks; better support real economy; promote stable and rapid development of national economy</p> <p>当前我国经济金融运行总体平稳, 经济增长处于目标区间, 物价涨幅继续回落; 全球经济复苏艰难曲折, 欧债危机反复震荡, 不确定性较大; 继续实施稳健的货币政策; 根据形势变化适时适度进行预调微调, 正确处理保持经济平稳较快发展; 防范金融风险; 更好地支持实体经济; 促进国民经济平稳较快发展</p>			
Monetary Policy Committee meeting report 2012Q4		2012/12/28	0
<p>Economy and financial operations generally stable; price situation basically stable, global economy is still weak, uncertainties remain; continue to implement stable monetary policy, manage the relationship between stable growth, structural adjustment, inflation control and risk prevention; guide monetary and credit and social financing towards more appropriate growth; solve structural contradiction between supply and demand of credit, prevent financial risks, improve financial services for the real economy</p> <p>当前我国经济金融运行总体平稳; 物价形势基本稳定, 全球经济仍较为疲弱, 不确定性依然存在; 继续实施稳健的货币政策, 处理好稳增长、调结构、控通胀、防风险的关系; 引导货币信贷和社会融资规模平稳适度增长; 有效解决信贷资金供求结构性矛盾, 防范金融风险, 着力改进对实体经济的金融服务</p>			
Monetary Policy Committee meeting report 2014Q1		2014/4/3	-1
<p>Economy still operates within rational range; prices basically stable, but facing complex situation, favourable and unfavourable factors coexist; positive signs increasing in developed economies like US and Europe, but some emerging markets slowing down; continue to implement stable monetary policy, maintain appropriate liquidity to achieve rational growth of money and credit and social financing</p> <p>当前我国经济运行仍处在合理区间; 物价基本稳定, 但所面临的形势依然错综复杂, 有利条件和不利因素并存; 美欧等发达经济体积极迹象增多, 部分新兴经济体增速持续放缓; 继续实施稳健的货币政策, 保持适度流动性, 实现货币信贷及社会融资规模合理增长</p>			

3.6.3 Unit root tests

Figure 3-18: Unit root tests: Full sample

Augmented Dickey-Fuller test and Kwiatkowski-Phillips-Schmidt-Shin test

Critical values and corresponding significance level

Item	Det.	ADF	KPSS	Item	Det.	ADF	KPSS
RRRC	C, T	-3.981 **	0.126 *	CRPC	C, T	-4.779 ***	0.064
RRRC	C	-3.854 ***	0.152	CRPC	C	-4.756 ***	0.183
BENCH	C, T	-1.584	0.094	IVYOY.11	C, T	-3.803 **	0.218 ***
BENCH	C	-1.885	0.297	IVYOY.11	C	-2.176	0.461 *
MPI	C, T	-2.905	0.144 *	XRPC	C, T	-2.363	0.200 **
MPI	C	-2.428	0.162	XRPC	C	-2.411	0.200
IBOR	C, T	-4.199 ***	0.146 **	CPIYOY.11	C, T	-2.940	0.107
IBOR	C	-3.871 ***	0.302	CPIYOY.11	C	-3.015 **	0.290

Sign.: *** 0.01, ** 0.05, * 0.1; Det. = Deterministic components: C = Constant, T = Trend

Figure 3-19: Unit root tests: Pre-crisis sample

Augmented Dickey-Fuller test and Kwiatkowski-Phillips-Schmidt-Shin test

Critical values and corresponding significance level

Item	Det.	ADF	KPSS	Item	Det.	ADF	KPSS
RRRC	C, T	-4.357 ***	0.080	CRPC	C, T	-5.136 ***	0.082
RRRC	C	-3.990 ***	0.423 *	CRPC	C	-5.064 ***	0.106
BENCH	C, T	-1.591	0.202 **	IVYOY.1	C, T	-2.724	0.120 *
BENCH	C	-2.833 *	0.524 **	IVYOY.11	C	-2.976	0.426 *
MPI	C, T	-0.713	0.146 *	XRPC.11	C, T	-4.365 ***	0.155 *
MPI	C	-2.169	0.676 **	XRPC.11	C	-3.282 **	0.630 **
IBOR	C, T	-2.625	0.153 **	CPIYOY.11	C, T	-1.870	0.075
IBOR	C	-2.569	0.221	CPIYOY.11	C	-1.739	0.578 **

Sign.: *** 0.01, ** 0.05, * 0.1; Det. = Deterministic components: C = Constant, T = Trend

Figure 3-20: Unit root tests: Post-crisis sample
 Augmented Dickey-Fuller test and Kwiatkowski-Phillips-Schmidt-Shin test
 Critical values and corresponding significance level

Item	Det.	ADF	KPSS	Item	Det.	ADF	KPSS
RRRC	C, T	-3.167 *	0.112	CRPC	C, T	-4.590 ***	0.164 **
RRRC	C	-3.065 **	0.176	CRPC	C	-4.636 ***	0.394 *
BENCH	C, T	-1.183	0.181 **	IVYOY.11	C, T	-4.856 ***	0.141 *
BENCH	C	0.294	0.207	IVYOY.11	C	-1.249	0.451 *
MPI	C, T	-2.105	0.152 **	XRPC.11	C, T	-2.664	0.152 **
MPI	C	-1.470	0.226	XRPC.11	C	-1.602	0.305
IBOR	C, T	-3.975 **	0.178 **	CPIYOY.11	C, T	-1.483	0.147 **
IBOR	C	-3.663 ***	0.389 *	CPIYOY.11	C	-1.268	0.148

Sign.: *** 0.01, ** 0.05, * 0.1; Det. = Deterministic components: C = Constant, T = Trend

3.6.4 Detailed VAR estimation results

Figure 3-21: VAR model for full sample period
VAR Estimation Results

Endogenous variables: RRRC, BENCH, MPI, IBOR, CRPC

Deterministic variables: both

Sample size: 184

Log Likelihood: -286.988

Roots of the characteristic polynomial:

0.9465 0.7975 0.7975 0.7435 0.3482 0.3482 0.3424 0.2542 0.2542 0.02264

Heteroskedasticity and autocorrelation consistent (HAC) standard errors in parentheses

	RRRC	BENCH	MPI	IBOR	CRPC
RRRC.11	0.06 (0.09)	0.12 (0.07)	0.37 (0.25)	0.26 (0.16)	-0.31 (0.41)
BENCH.11	1.03 (0.38)	1.12 (0.10)	-0.17 (0.20)	0.66 (0.35)	0.69 (0.68)
MPI.11	0.01 (0.05)	0.04 (0.04)	0.92 (0.07)	0.08 (0.07)	0.21 (0.15)
IBOR.11	-0.09 (0.05)	0.01 (0.01)	0.01 (0.04)	0.59 (0.15)	-0.35 (0.13)
CRPC.11	0.02 (0.01)	-0.00 (0.01)	0.03 (0.03)	0.01 (0.03)	-0.04 (0.06)
RRRC.12	0.12 (0.07)	0.05 (0.04)	-0.03 (0.10)	0.03 (0.12)	-0.05 (0.21)
BENCH.12	-1.01 (0.38)	-0.20 (0.12)	-0.08 (0.22)	-0.55 (0.35)	-0.42 (0.63)
MPI.12	-0.03 (0.04)	-0.04 (0.04)	-0.02 (0.05)	-0.08 (0.07)	-0.36 (0.15)
IBOR.12	0.01 (0.04)	-0.00 (0.02)	0.04 (0.04)	0.11 (0.11)	0.16 (0.14)
CRPC.12	0.02 (0.02)	0.00 (0.01)	0.01 (0.02)	-0.08 (0.04)	0.05 (0.08)
const	0.00 (0.25)	0.20 (0.15)	0.66 (0.53)	0.53 (0.42)	0.59 (0.93)
trend	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
IVYOY.11	0.00 (0.00)	0.00 (0.00)	0.01 (0.01)	-0.02 (0.01)	-0.00 (0.03)
XRPC.11	-0.06 (0.03)	-0.02 (0.02)	-0.07 (0.05)	0.04 (0.09)	-0.08 (0.08)
CPIYOY.11	0.03 (0.01)	0.01 (0.01)	0.05 (0.03)	0.00 (0.02)	-0.06 (0.05)
Observations	184	184	184	184	184
R ²	0.47	0.97	0.91	0.63	0.12
Adjusted R ²	0.43	0.97	0.90	0.60	0.04
Residual SE (df=169)	0.23	0.11	0.41	0.48	1.07
F-Stat. (df=14; 169)	10.72	386.90	124.20	20.26	1.60

Covariance matrix of residuals

	RRRC	BENCH	MPI	IBOR	CRPC
RRRC	0.05	0.00	0.01	0.02	-0.00
BENCH	0.00	0.01	0.01	-0.00	0.01
MPI	0.01	0.01	0.17	0.02	-0.01
IBOR	0.02	-0.00	0.02	0.23	-0.03
CRPC	-0.00	0.01	-0.01	-0.03	1.15

Correlation matrix of residuals

	RRRC	BENCH	MPI	IBOR	CRPC
RRRC	1.00	0.02	0.13	0.17	-0.02
BENCH	0.02	1.00	0.28	-0.01	0.11
MPI	0.13	0.28	1.00	0.09	-0.03
IBOR	0.17	-0.01	0.09	1.00	-0.05
CRPC	-0.02	0.11	-0.03	-0.05	1.00

3.6.5 Detailed SVAR estimation results

Figure 3-22: SVAR model for full sample period
SVAR Estimation Results

Type: AB-model
 Sample size: 184
 Log Likelihood: -326.16
 Method: scoring
 Number of iterations: 9
 LR overidentification test:
 $\chi^2 = 0.11$, $df = 1$, $p\text{-value} = 0.74$

Estimated A matrix

	RRRC	BENCH	MPI	IBOR	CRPC
RRRC	1.00	0.00	0.00	0.00	0.00
BENCH	0.00	1.00	0.00	0.00	0.00
MPI	-0.22	-1.03	1.00	0.00	0.00
IBOR	-0.34	0.13	-0.09	1.00	0.00
CRPC	0.02	-1.30	0.17	0.10	1.00

Estimated standard errors for A matrix

	RRRC	BENCH	MPI	IBOR	CRPC
RRRC	0.00	0.00	0.00	0.00	0.00
BENCH	0.00	0.00	0.00	0.00	0.00
MPI	0.13	0.26	0.00	0.00	0.00
IBOR	0.15	0.33	0.09	0.00	0.00
CRPC	0.35	0.75	0.20	0.17	0.00

Estimated B matrix

	RRRC	BENCH	MPI	IBOR	CRPC
RRRC	0.23	0.00	0.00	0.00	0.00
BENCH	0.00	0.11	0.00	0.00	0.00
MPI	0.00	0.00	0.39	0.00	0.00
IBOR	0.00	0.00	0.00	0.47	0.00
CRPC	0.00	0.00	0.00	0.00	1.06

Estimated standard errors for B matrix

	RRRC	BENCH	MPI	IBOR	CRPC
RRRC	0.01	0.00	0.00	0.00	0.00
BENCH	0.00	0.01	0.00	0.00	0.00
MPI	0.00	0.00	0.02	0.00	0.00
IBOR	0.00	0.00	0.00	0.02	0.00
CRPC	0.00	0.00	0.00	0.00	0.06

Covariance matrix of reduced form residuals (*100)

	RRRC	BENCH	MPI	IBOR	CRPC
RRRC	5.22	-0.00	1.17	1.86	-0.48
BENCH	-0.00	1.18	1.22	-0.06	1.33
MPI	1.17	1.22	16.79	1.66	-1.50
IBOR	1.86	-0.06	1.66	23.11	-2.65
CRPC	-0.48	1.33	-1.50	-2.65	115.16

4 Institutional Conditions for Currency Internationalisation

This chapter examines the relationship between currency internationalisation and the institutional structure of the international monetary system. It demonstrates how the hierarchy and asymmetry inherent in the international monetary system impose a “survival constraint” upon non-centre countries, as they need to generate net inflows of the international centre currency to finance their international obligations. It is shown why management of this constraint is associated with current account surpluses. Drawing on the historical experience of Japan and China, the manner in which these surpluses have been achieved, by means of a development approach that promotes investment over consumption, is presented in detail. Since this approach is subject to path dependence and network effects, it tends to perpetuate the status of currency user. This complicates the switch to the role of currency supplier, since currency internationalisation requires rebalancing towards greater domestic consumption and towards higher imports. The above constitutes a topic of increasing relevance in China today.

4.1 Introduction

The *Global Financial Crisis 2007–08* brought the topic of currency internationalisation back to the top of the agenda of official debate on the international financial system. Concerns over the sustainability of the global monetary system’s US dollar-centric structure triggered calls for a more multipolar monetary system (Eichengreen, 2011; Rajan, 2016) and prompted policymakers around the world to announce intentions to internationalise their currencies (Rajan, 2013; Johnson, 2013). Most attention has focussed on the Chinese yuan, especially after its recent inclusion in the International Monetary Fund’s (IMF) Special Drawing Rights (SDR), and studies have sought to determine which steps toward capital account liberalisation and financial deregulation are required to achieve greater international use of the yuan. By contrast, this study highlights how currency internationalisation relates to the institutions making up the international monetary system.

It is argued here that the international monetary system is a hierarchical and asymmetric institution which shapes and which is shaped by the behaviour of the actors operating within it (Mehrling, 2015). As a result of this hierarchy and asymmetry, countries within the system are required to use the international centre currency to finance their international obligations. The resulting need to generate net inflows of the international centre currency is metaphorically referred to here as the “survival constraint” (Minsky, 2004, p. 85–101, 160–175). The analysis presented shows why current account surpluses provide a way to generate such net inflows, whereas continued borrowing abroad leads to increasing and ultimately unsustainable dependence on foreign finance. Relying on macroeconomic balances (see, e.g., Minsky, 2004; Pettis, 2013b; Koo, 2014), it is illustrated why this tends to lead to a development approach that promotes investment over consumption in order to produce external surpluses. While successful application of such an export-focussed strategy ensures net accumulation of centre currency, this study argues that it also entails

path dependence and network effects, which produce a tendency to perpetuate the status of the country as a user of the international currency. This complicates the switch to the role of currency supplier, since currency internationalisation requires rebalancing towards greater domestic consumption and towards higher imports, a topic of increasing relevance in China today.

These dynamics are examined on domestic, regional and global levels within five sections. The next section lays out the institutional characteristics of the international monetary system. On this basis, the following section lays out the working mechanism of the survival constraint and the way in which successful management of the survival constraint necessitates that countries attain current account surpluses. The subsequent section presents a characterisation of the way in which this mechanism leads to a highly path dependent economic structure based on investment and external surpluses. The following section demonstrates how the survival constraint operating across borders has the potential to produce network effects. Both path dependence and network effects, it is argued, limit the ability of a country to rebalance economic policies and promote its own currency internationally. Finally, systemic considerations and public-private hybridity are analysed in detail. A detailed conclusion follows.

Empirically, this study relies on the historical experience of the Japanese yen and the Chinese yuan as a foundation for its theoretical arguments. The reason for this is twofold: On the one hand, the arguments presented apply primarily within a system of fiat currencies, specifically related to the era since the breakdown of the Bretton Woods System. Going further back in time would require an examination of metal-based monetary systems, which is left for future research. On the other hand, the international monetary system is a relatively static institution with regard to the position of different currencies within the system. During the period analysed, the US dollar, the British pound and several currencies now part of the euro have

4 Institutional Conditions for Currency Internationalisation

played significant roles, but other than that only the Japanese yen and the Chinese yuan have seen variability in their international roles significant enough to deserve analysis.

Finally, it should be pointed out that the analysis presented here is based on country levels for reasons of simplicity, but the constraints presented apply on subnational levels as well. While position-taking by private actors can amplify or counteract actions of the public sector, the crucial point is that they have to meet aggregate balance sheet constraints. Even when their actions offset each other, public and private sector balance sheets are linked through public lender of last resort backstops or through bailouts, for example, as the Asian Financial Crisis 1997–98 demonstrates.

4.1.1 Literature review

The literature on the topic of currency internationalisation is extensive and encompasses a range of different approaches. One group of studies focusses on capturing the international influence of currencies quantitatively, via economic measures (e.g. Chinn & Frankel, 2008; Lee, 2014), the exchange rate channel (e.g. Kawai & Pontines, 2014; Subramanian & Kessler, 2012; Ito, 2010; Frankel & Wei, 1994), or political factors (Liao & McDowell, 2016, 2014). Other studies have attempted to identify qualitatively important economic conditions associated with currency internationalisation (e.g. Wu et al., 2010; Park, 2010; McCauley, 2011; Subramanian, 2011; Chen & Cheung, 2011; Subacchi, 2013; Yu, 2014; Cohen & Benney, 2014; Germain & Schwartz, 2014), while yet others have looked at political (e.g. Grimes, 2003; Katada, 2008; Helleiner & Malkin, 2011; Chey, 2013; Eichengreen, 2013; Kirshner, 2014; Stokes, 2014), or historical conditions (Frankel, 2012; McDowell, 2013; Cohen, 2014). In particular the openness of the capital account, financial deregulation and the transparency of political institutions have been widely explored.

As these are mostly supply side matters, however, recent contributions have given greater attention to the demand side (Chey, 2015) and the actual use of currency by non-residents (Ito et al., 2010), which are also factors emphasised here.

The present study seeks to address the topic of currency internationalisation in an institutionalist setting that emphasises financial factors. It draws on institutional analyses of economic development (Lin, 2010; Chang, 2003; Aoki et al., 1997) and global finance (Minsky, 2004; Pettis, 2013b; Kregel, 2013) as well as financial economic literature on the relationship of onshore and offshore money markets, net and gross liquidity (Mehrling, 2015; Bordo & McCauley, 2016; Borio & Disyatat, 2015; Lane & Milesi-Ferretti, 2001, 2007). In essence, the points presented here about the importance of institutional structures, net liquidity provision and hierarchy in international monetary matters echo observations made by Keynes when the post-war international monetary system was established at the Bretton Woods Conference, 1944 (see, e.g., Keynes, 1980). In highlighting how these points are linked to currency internationalisation, the study seeks to draw attention to important aspects of the topic which have so far received too little attention. It is hoped that in doing so, the insights gained can complement previous studies of currency internationalisation in a meaningful way and motivate deeper inquiry into the role of institutions in international financial and monetary matters.

4.2 Institutional context

A country's external use of currency is related to its position within the international monetary system. Viewed through an institutional lens, the international monetary system can be characterised as a *system of established social rules* (Hodgson, 2006) which shapes and is shaped by the behaviour of the economies operating within it. In its present form, the international monetary system is centred around the US dollar and is fundamentally hierarchical and asymmetric (Mehrling, 2015).¹ This hierarchy is underpinned by a vast complex of public and private market structures in which national actors interact with supranational actors. In the words of Mehrling (2013): *“States have interests, and to some extent therefore the hierarchy of money follows the political hierarchy of states. But private businesses have interests as well, and the hierarchy of money also follows the hierarchy of national economic development. [...] The international hierarchy of money is a hybrid hierarchy.”* Aside from the US dollar, several other currencies including the euro, the British pound, the Japanese yen and, lately, the Chinese yuan, play some international roles, generally limited to specific geographical regions. Thus, for all intents and purposes, the “international centre currency” is the only currency with a truly global role, the US dollar, accounting for 87% of all international foreign exchange transactions (BIS, 2013), as shown in Figure 4-1.²

[Figure 4-1 “Currencies in forex transactions and worldwide payments”]

As a result of this hierarchy, economies within the system operate under a “survival constraint”, a concept originally applied by Minsky (2004, p. 85–101, 160–175) to the analysis of financial agents' balance sheet management.³ Just as financial

¹The hierarchy of the international monetary system is also a topic stressed by Cohen (1998, pp. 92-118)

²This is far ahead of the next most commonly used currency, the euro, at 33.4%. Note that according to Bank for International Settlements convention, these shares sum to 200%, since two currencies are involved in each transaction.

³Mehrling (2013) applies the concept of the “survival constraint” in an international context to the formulation of exchange rates between currencies.

agents have to conduct business under the constraint that their cash flow meets their payment commitments as they come due, economies dependent on the international centre currency need to generate cash flow denominated in the centre currency to meet their international obligations. They thus have a structural need to build up net positions in the international centre currency.

Emerging market economies unable to use their local currency in international transactions (the so-called issue of *original sin*, see McKinnon & Schnabl, 2005; Eichengreen & Hausmann, 2005; Shin & Turner, 2015) are more dependent on international finance and thus face a more restrictive survival constraint than economies which have the ability to use their local currencies for at least part of their international transactions. At the early stages of their economic development, both Japan and China found themselves in exactly this situation, as is evident from the negligible share of Japanese yen and Chinese yuan, respectively, in their total external trade at that time, shown in Figure 4-2. Japan and China thus depended on net inflows of the international centre currency to finance resource imports (especially Japan) or to finance the import of capital goods for domestic development (especially China).

Historical experience has shown that countries accumulate the international centre currency in two ways: by borrowing from the centre country, or by selling goods and services to the centre country. The first option entails a creditor-debtor relationship and an obligation to generate future foreign currency revenue sufficiently large to repay the loan with interest, the sum of the two being necessarily larger than the principal alone (Germain & Schwartz, 2014). Borrowed funds have a cost (the interest rate charged), so the borrowing country's international liabilities will grow more than its international assets when a foreign currency-denominated loan is assumed. This automatically reduces the country's net worth. All else being equal, borrowers will thus minimise borrowed funds and lean towards the second option, exports, as a source of foreign currency revenue.

4.3 Survival constraint

These dynamics are best illustrated using balance sheets. Figure 4-3 illustrates financial flows between the centre country issuing the international currency (US) and a non-centre country dependent on centre currency (N) when the two are engaged in international trade. For present purposes, the centre country is the US and the centre currency is the US dollar. Balance sheets are represented as T-accounts, which track the changes in assets (ΔA) on the left-hand side and the changes in liabilities (ΔL) on the right-hand side. As a first-order abstraction, the non-centre country N can be seen as an aggregate of the rest of the world collectively, but the fundamental mechanics do not change when introducing subunits for N, as all non-centre countries still need to fulfil aggregate balance sheet constraints.

[Figure 4-2 “Local currency shares in Japanese and Chinese trade settlement”]

[Figure 4-3 “Balance sheet mechanics of the survival constraint”]

Production typically requires the purchase of inputs from abroad. In a world where most international trade is denominated in the centre currency, production therefore necessitates that N have access to centre currency. In the present case, the US finances production by granting N a loan for a nominal \$100 at 5% interest, thus increasing N’s assets by \$100 (the amount of finance received) and its liabilities by \$105 (the principal and interests payments to be paid at a future date). Conversely, the US acquires a \$105 claim on N and incurs a \$100 liability to N (US dollar deposits are liabilities of the US banking system). The net worth of country N is now negative.

In step 2, N now uses all of the funds obtained in step 1 to purchase inputs for production from a firm in the US, thus reducing its US dollar holdings by \$100. The firm in the US receives these funds as payment, thus increasing its assets by \$100. Since N draws down its US bank deposit while the US firm increases its bank

deposits, the net change in liabilities on the US side is $\Delta L = -\$100 + \$100 = \$0$. Note that the corresponding real resource flows (i.e. the intermediate goods shipped from the US to N) do not enter the balance sheet explicitly, as the focus here is on the underlying financial transactions (and because adding real resource transactions would not provide any additional insight).

In step 3, N now uses the inputs to produce goods for export, which it sells in total to the US at a price of \$150, which includes production costs and a profit margin. US clients purchase these goods, thus reducing their asset holdings by \$150. Again, from the perspective of the US, the reduction of US clients' bank balances is compensated by an increase of N's bank balance, so the net change in liabilities on the US side is $\Delta L = -\$150 + \$150 = \$0$. Finally, in step 4, N repays its loan to the US by drawing on its bank deposit with a US bank, thus extinguishing its liability to the US. The balance sheet transactions taking place within the US mirror those taking place on the balance sheet of N.

Tallying up the changes on the asset and liability sides of both countries shows that N acquired a +\$45 net position in the centre currency, which is mirrored by an equivalent negative amount in the US. The amount of \$45 corresponds to the current account balance between both countries after all four periods. From the perspective of N, the current account is made up of $-\$100$ imports from US, $+\$150$ exports to US, $-\$5$ interest payment to US, which gives the positive current account position of \$45 (net exporter). N thus acquired *net* balances in the international centre currency by running a current account surplus. It can now use these funds to pay for future ventures or domestic economic objectives.

If country N had not been able to export its produce to the US, it would have required a subsequent loan to cover repayment of the original loan, which would most likely entail less favourable conditions. Such a failure to export could be the result of different factors, including trade restrictions and a lack of international competitiveness. The crucial point is that without *net* exports to the US, there will

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be no *net* inflows of dollar liquidity into N. In this case N could still hold *gross* US dollar positions if required for political objectives (e.g. exchange rate management), but as pointed out above, borrowed funds have a cost, so incentives are such that N would minimise such positions. Since borrowing also entails the commitment to repay principle *and* interest at some point in the future, it requires positive net inflow of US dollar liquidity at a future date to maintain these gross US dollar positions, unless credit lines provide a means of rolling over funding at no additional cost. This is not typically the case in emerging market economies, where additional borrowing entails rising costs, potentially higher future borrowing needs and declining creditworthiness. This ultimately reduces access to international markets, since private market agents and international organisations become unwilling to provide funding at affordable rates or do so only with strict conditionality attached.⁴

Conversely, from the perspective of the centre country, sustained lending to non-centre countries running current account deficits is ultimately self-defeating as a strategy to raise the international profile of one's currency, as those very deficits imply declining creditworthiness on the part of non-centre countries. For example, after the Bank of Japan's adoption of zero interest rate policies, the yen saw substantial use in international carry trade. This was based on foreigners borrowing yen in Japan and investing them in higher-yielding assets abroad. Despite this, the international profile of the Japanese currency did not otherwise expand. Similarly, efforts of the euro area to generate an external surplus eventually reduced the euro's international role, rather than improve it (a point made more thoroughly by Germain & Schwartz, 2014).

In summary, the hierarchy and asymmetry inherent in the institutional structure of the international monetary system requires countries to generate *net* inflows of the international centre currency in order to finance their international obligations.

⁴This is the kind of autonomy loss associated with a sustained outflow of foreign exchange, as described in Chapter 2.

This is metaphorically referred to here as the “survival constraint”. Current account surpluses provide a sustainable way of generating net inflows of international centre currency, whereas continued borrowing from abroad leads to increasing and ultimately unsustainable dependence on foreign finance. Current account deficits run by the centre country (the currency *supplier*) are thus the mirror image of current account surpluses run by non-centre countries (the currency *users*).

4.4 Path dependence

The necessity of acquiring centre currency has a substantial impact on economic policymaking in non-centre countries. Japan and China have both relied primarily on export revenue as a source of foreign exchange, since their economic models targeted external surpluses heavily, as shown in Figure 4-4. Policymakers in both economies aimed to ensure that scarce foreign exchange reserves would be directed towards *productive* domestic investment that yielded output which could be sold on world markets at a price that ensured sufficient revenue to raise the domestic capital stock. They did so by restricting access to and use of foreign currency, discouraging domestic consumption and promoting domestic investment and export production (Brown, 1994, pp. 27–71; Pettis, 2013a, pp. 1–44). Households were encouraged to save (Garon, 2011; Pettis, 2013a, pp. 26–46) while credit was directed to industries deemed beneficial to economic development. This system was backed by a financial structure based on low deposit interest rates, managed exchange rates and a managed capital account (Brown, 1994, pp. 66-67, 72 ff., 76 ff.; Kregel, 2013). Taken together, these policies reduced domestic consumption and raised domestic investment and saving, as shown in Figures 4-5 and 4-6, pushing the private

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sector into a surplus position.⁵ Since government deficits were small or smaller in absolute terms than the private sector surplus, traditional macroeconomic balances determined that a current account surplus (or equivalently, a capital account deficit) must result (Minsky, 2004; Pettis, 2013b; Koo, 2014).

[Figure 4-4 “Sectoral balances for Japan and China”]

[Figure 4-5 “Contributions to nominal GDP growth in Japan and China”]

[Figure 4-6 “GDP components in Japan and China”]

A development approach based on strong domestic investment and low consumption, while having a long history (List, 1909; Nurkse, 1954; Sen, 1960; Chang, 2003; Lin, 2010), is not trivial to execute. Kregel (2013) stresses that Latin American economies’ failure to restrain domestic consumption has been linked to low general levels of investment and growth in the region, even though many Latin American economies pursued policies that were in many respects similar to those applied in East Asia. Economic policy measures that selectively support capacity building in one sector while disadvantaging others may lead to misallocation of capital, inefficient use of funds and the build-up of overcapacity. Industries benefiting from official support and politicians within their respective localities have a natural interest in maintaining this system and are likely to exert political pressure towards this end, making reform difficult (Germain & Schwartz, 2014). In other words, once policies are in place to support an export-oriented and investment-oriented production structure, a specific and persistent economic and political economic structure will result. As such, this development approach exhibits *strong path dependence*.

⁵Readers are asked to bear in mind that this refers to the aggregate balance of the private sector, i.e. the combined savings of households *and* corporations (retained earnings). The fact that the aggregate balance is positive says nothing about the relative size and sign of its sub-balances, however.

Indeed, while Japan reduced its reliance on investment as a main driver of domestic growth, it continued to maintain current account surpluses. In other words, while it rebalanced domestically, it failed to rebalance externally (Fukumoto & Muto, 2012). Unless domestic rebalancing is accompanied by external rebalancing, however, there is a limit to the degree of internationalisation a currency can achieve.⁶ Maintenance of current account surpluses restricts the degree to which international agents can build up *net* positions in one's currency, even if international demand for said currency exists and even if lending to foreigners is made possible via financial deregulation. While a development approach that emphasises investment over consumption may be successful at generating current account surpluses, net inflows of international currency and high economic growth rates, the path dependent structure resulting from this approach makes reform of the system difficult. It thereby tends to perpetuate a country's role as a *user* of the international currency rather than a *supplier* of an international currency.

4.5 Network effects

Aside from domestic path dependence, international factors can affect the potential for a country to turn itself from a currency user into a currency supplier. Together with a country's industrial upgrading and its economic advance, dependence on foreign finance as a means of gaining access to know-how and technology is reduced while international demand for its currency increases. This gives a country the ability to finance part of its international commitments using its own currency, as seen in Figures 4-2 and 4-7, which loosens the survival constraint and offers a potential avenue for currency internationalisation. The degree of internationalisation

⁶This is similar to the point made by Kregel (2013), who suggests that all components of the system need to be reformed together.

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achievable is not exclusively a matter of putting regulatory prerequisites into place, however, but also, and perhaps primarily, a matter of international and particularly regional economic structure.

[Figure 4-7 “International use of Japanese yen and Chinese yuan”]

Such difficulties were faced by Japan, which managed to make considerable progress towards internationalising the yen until the late 1990s (Takagi, 2011; Kregel, 2014). While the yen became one of the few currencies of *some* international significance, the reason why the currency’s role did not expand further, aside from Japan’s economic deceleration, lies in the structural characteristics of the East Asian economy of that era. These characteristics produced *network effects* that favoured the incumbency of the US dollar and endogenously limited the potential for the yen to assume a greater international role.

For most of the second half of the 20th century, East Asia was largely made up of low income economies which relied heavily on US dollar-denominated finance and thereby faced a very binding survival constraint. Economies in the region developed clusters of production (Sonobe & Otsuka, 2006) which linked with clusters of production in neighbouring economies to form a *regional supply chain* that produced goods for export to the United States. Primary products would undergo some basic processing in the region’s low income economies before entering into industrial manufacturing in its mid-income economies, with logistics, product development and marketing taking place in the region’s high-income economies (Kwan, 2001, pp. 15–37).

Figure 4-8 provides a visualisation of this structure using data on East Asian exports to the United States (adopting a method developed by Kwan, 2002), where the x-axis represents complexity of exports and the y-axis represents market share within a specific product group. In line with Akamatsu’s (1962) concept of “flying geese”, sophistication of an economy’s production traditionally correlated with

its income level, with less sophisticated goods being produced in low-income economies and more sophisticated goods being produced by high-income economies, with the small amount of overlap between the polygons indicating specialised and complementary productive structures.⁷ This was made possible by a high degree of trade integration which rested on a system of semi-fixed intra-regional exchange rates versus the US dollar, the so-called *East Asian dollar standard* (McKinnon & Schnabl, 2005). The dollar was the logical anchor currency for the region, given that the US was the ultimate destination for its exports and given that US financial markets mediated its financial flows, both as a source of funding and as a destination for investment (Yoshino, 2012), as shown in Figure 4-9.

[Figure 4-8 “Akamatsu graphs of East Asian exports to the United States”]

This shows that survival constraint which Japan faced in the early stages of its economic development applied equally to the countries in the vicinity. While the economic policies of these economies differed more significantly than common references to an “East Asian development model” may suggest (Shiraishi, 2014), their development approaches overlapped in a strong role of the state (Aoki et al., 1997; Lin, 2010), which put in place specific institutions centring on the US economy and US currency. This created *network effects* which reinforced the dollar’s centrality while simultaneously limiting the potential of other currencies to gain greater influence.⁸

⁷It is worth bearing in mind that these graphs do not capture intra-sectoral product diversification and provide no indication of net balances. Two countries may produce the same type of good, but within different product classes, e.g. one country may export low-end mobile phones to the United States, whereas another may export only high-end mobile phones. These countries would overlap in the graphs produced in Figure 4-8, yet their industries would not necessarily compete. Similarly, large exports to the United States in one product category may be outweighed by similarly large flows in the opposite direction, which may produce smaller or negative net figures. The graphs should consequently be seen as a rough approximation of existing trade patterns only.

⁸Empirical evidence for the continued relevance of these network effects within the context of the internationalisation of the Chinese yuan is presented in Chey (2015): “Moreover, when Korean firms use the RMB for trade settlement with their Chinese trade partners, they usually have to handle double exchange risks, both for the RMB and for the dollar, as many still have to

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This is considerably different from Europe, where regional currencies were widely used, in part because European economies were more advanced than East Asian economies at the time and therefore faced less strict survival constraints, but also because the European Monetary System (EMS) obliged member economies to use regional currencies to maintain intra-European exchange rate stability. In times of persistent imbalances, both surplus and deficit countries had to intervene in foreign exchange markets in concert, using the two countries' currencies simultaneously. So although Germany, like Japan, had a strong tendency to run current account surpluses, the country saw some international use of its currency, which served as the central anchor within the EMS. Japan, on the other hand, interacted with economies which relied on the US dollar-centred international monetary structure and so had little demand for Japanese yen (Chey, 2015; Takagi, 2011).⁹

[Figure 4-9 “East Asian intra-regional and extra-regional total trade and FDI”]

[Figure 4-10 “Japanese and Chinese trade balance”]

Since the turn of the millennium, this general pattern appears to have started changing, however, as shown in Figure 4-8. As China entered regional markets, it quickly began dominating exports to the US overall, leading to considerably greater overlap of productive structure and competition between East Asian economies. Kenen (1969) argues, in the context of *Optimum Currency Area* theory, that countries adopting common monetary standards should have similar yet diversified productive structures, so that goods-specific shocks do not destabilise the group. Entertaining this view on hypothetical grounds to, in the words of Goodhart (1998, p. 424), “assess the balance of purely economic benefits and costs”, the fact that trade and economic structures in China and the rest of Asia are still very different would,

continue using the dollar with their other trading partners”. (Note by the author: RMB stands for “renminbi”, literally “people’s currency”, which is the Chinese name for the Chinese currency, the yuan.)

⁹The author thanks Naoyuki Yoshino for highlighting the relevance of the European Monetary System in this context.

on the surface, warrant scepticism regarding the yuan's regional potential.¹⁰ More relevantly, China's still very strong dependence on exports to the United States is likely to limit the potential for *net* international yuan liquidity provision, and therefore the potential for expansion of the yuan's role.

There is reason to be somewhat more optimistic about the potential for the yuan to become more internationalised, however, as the relative shares of East Asian intra-regional trade and FDI have expanded greatly over the past years, as can be seen in Figure 4-9. This may be a factor in the yuan's favour, as China runs current account deficits with many of its East Asian trading partners (Chey, 2013, 2012), as shown in Figure 4-10. This also appears to be one of the primary channels through which China is providing yuan liquidity, as it uses its currency predominantly in import settlement, as seen in Figure 4-2 (PBOC, 2015). By doing so, China supplies the world with yuan liquidity while simultaneously absorbing dollar liquidity through its export surpluses, which is globally and historically unique (Ito & Kawai, 2016).¹¹

While the network effects supporting the US dollar have not disappeared, these are signs that regional trade patterns are evolving beyond the structure which was present when Japan tried to internationalise the yen, offering Chinese policymakers an avenue to promote the use of yuan beyond the country's borders. The success of this undertaking will depend on how well they manage changing global and domestic

¹⁰Goodhart (1998) and Chey (2009) both point to politics as a more relevant factor in explaining monetary matters, which is supported by the fact that East Asian economies have adopted common dollar-centric exchange rate regimes in the past, despite large differences in income and economic structure.

¹¹Note that this does not invalidate the argument that rebalancing towards imports is ultimately required to expand the Chinese yuan's international profile. The current strategy of providing yuan liquidity through import settlement while also being a net exporter on aggregate only works so long as international finance is dominated by the US dollar. In fact, so long as China continues to run net exports on aggregate, it supports the status and the incumbency of the US dollar.

economic conditions. In particular, given the workings of the survival constraint, progress towards rebalancing will be crucial in order to permit yuan liquidity provision to economies beyond East Asia.¹²

4.6 Global dimension

Currency internationalisation is likely to remain an attractive policy objective precisely because it offers economies an avenue to escape the survival constraint and finance international obligations using domestic currency.¹³ Where non-centre economies were previously subject to constraints, they are becoming the source of constraints for others as they begin to use their own currency for international transactions. They thereby turn into *suppliers* of the international centre currency and in the process transform the international monetary system, the very institution which previously constrained their policy space. While the institution stays hierarchical and asymmetric, the nature of the constraints imposed by the new set-up changes.

Given the role of current account deficits presented in the previous sections, two matters require elaborating upon in this respect: The first is the relevance of net versus gross positions, the second is the possibility of systemic instability resulting from persistent current account deficits of the centre country. Understanding the first issue will shed light on the second.

As alluded to in an earlier section, the two-country model used to illustrate the working mechanism of the survival constraint is a very rough abstraction of actual real world relationships between the centre economy and non-centre economies. In a world of free, globalised financial flows, the centre country interacts with several non-centre countries rather than only one. As such, the centre country does not

¹²Chapter 3 elaborates on which operational changes in terms of monetary policy could support rebalancing of the Chinese economy. Specifically, it is argued that greater reliance on price-based monetary policy tools like the interbank overnight rate would support the process of rebalancing.

¹³This is what Chapter 2 refers to as the “remaining real economic constraint” faced by non-centre countries.

necessarily have to finance production, supply inputs or purchase outputs. In fact, financing flows and current account transactions could be distributed among a number of countries, allowing for infinite possible combinations of lenders, borrowers, net exporters and net importers (Borio & Disyatat, 2015). Specifically, the existence of Eurodollar markets, on which US dollar liquidity is created offshore, raises the question of whether the survival constraint as presented above still holds.

Returning to the previous outline of balance sheet transactions presented in Figure 4-3, we could conceive of N as a group of countries, where initial financing, supply of inputs and purchase of final goods could all be provided by another non-centre country, thus leaving the balance sheet of the centre country untouched. In such a system, countries would not necessarily need to hold dollar balances a priori, but could instead create private US dollar liquidity themselves, as happens daily on Eurodollar markets. On Eurodollar markets, non-US entities create and trade US dollar claims, which are eventually netted out and settled via the private Clearing House Interbank Payments System (CHIPS), as opposed to onshore transactions, which are settled in real time and in gross terms via federal funds.¹⁴ Eurodollar markets thus represent the private component of the hybrid public-private international monetary system described by Mehrling (2013).

Figure 4-11 illustrates the consequences of this hybrid system by showing the financial flows between the centre country issuing the international currency (US) and two non-centre countries dependent on centre currency (A and B) engaging in international trade. As before, A starts off acquiring a loan to finance the production of goods in step 1. This time, the loan is not provided by the centre country, but by another non-centre country B through offshore markets. Just as on onshore markets, however, liquidity created in offshore markets (A's \$100 deposit) has a price, and so the borrowing country's liabilities will grow by more than its international assets

¹⁴The balance sheet mechanics of Eurodollar liquidity creation and Eurodollar transactions are illustrated in Stigum & Crescenzi (2007, pp. 209 ff.).

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when a loan is taken out (i.e. the \$100 principal plus 5% interest), automatically reducing its net worth. In step 2, country A uses the funds obtained to purchase inputs for production from country B.

[Figure 4-11 “Multilateral balance sheet mechanics of the survival constraint”]

The crucial point now is what happens when country A tries to sell its produce, shown in step 3. Country A could sell all of its produce to country B, in which case the balance sheet transactions would look identical to those of the two-country case shown in Figure 4-3 with country B replacing the US as the country incurring a net liability of \$45 against country A. Unless country B has a positive stock of dollar reserves to finance this *net outflow* of funds, it would have to rely on additional loans to maintain this negative net position. As argued above, this would not be sustainable in the long run, as country B would have to incur increasing international debt to service this net foreign currency liability. Hence, *net additions* to non-centre liquidity supplied by the centre country through current account deficits are still required to maintain the stability of system (Germain & Schwartz, 2014).

Whether net liabilities denominated in the centre currency are held by the centre country or by a non-centre country is fundamentally different. Only the centre country, through its banking system and its central bank, is ultimately able to guarantee claims denominated in the centre currency, potentially without limit (Buiters, 2008). Non-centre countries accumulating centre currency-denominated debt, however, can and do default. This applied during the interwar years, when the United States’ semi-constant provision of credit following the First World War ended in a breakdown of European finance (Ahamed, 2009, pp. 99–178; Nurkse, 1954; Keynes, 1920), much as it did for East Asian economies in 1997–98. Offshore markets, despite being a major financial innovation, do not change this fundamental dynamic, as they crucially rely on onshore markets and their lender of last resort backstops, as illustrated forcefully during the Global Financial Crisis. Gross liquidity creation in

offshore markets has a price, and thereby automatically leads to *net subtraction* of liquidity. Indebtedness by non-centre countries can thus not rise without limit, so non-centre countries operating on offshore markets must generate *net additions* to liquidity to sustain the system. One way of achieving this is through current account surpluses.

Conversely, this requires that the centre country run current account deficits, which is at times perceived to create a conflict between the requirements of the international economy and the status of the centre country's currency. This conflict is often raised with regard to the "Triffin dilemma" (Germain & Schwartz, 2014), but as Bordo & McCauley (2016) point out, Triffin's original analysis was about the link between the US dollar and gold rather than current account positions. Triffin, in his influential 1960 book, pointed out that the rise in post-war international trade and US dollar liquidity would have to be limited if the fixed exchange rate between the dollar and gold is to be sustained. Any such limitation would lead to deflation, but without it, the peg would have to give, hence the dilemma.

Since the breakdown of the Bretton Woods System, this analysis has been re-interpreted to indicate a conflict between US external indebtedness and the US currency, but as Bordo & McCauley (2016) illustrate, this does not follow. In a world of fiat currencies, liquidity is created independent of gold or commodity stocks, and identifying a point where international liabilities become unsustainable is non-trivial. As Eurodollar markets demonstrate, the US dollar is used widely outside the US, with dollar liquidity rising and falling independently of events in the US. Bordo & McCauley (2016) hence argue: "[...] even if one accepts that the U.S. dollar's role has forced the United States to run current account deficits, one is not necessarily forced to the view that the international monetary and financial system is unstable in a way that deserves an association with Triffin."

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Nevertheless, the foregoing is not to say that current account deficits are the *only* way towards currency internationalisation. Neither is it the point here to claim that current account deficits are a *sufficient* condition for currency internationalisation. In theory, international liquidity could also be provided through investment abroad or the purchase of foreign securities. However, this does require the willingness of domestic agents to engage in such ventures and, empirically, has been observed to generate factor income for the centre economy which is *larger than* the factor income transferred to foreigners (Lane & Milesi-Ferretti, 2001, 2007), i.e. *net* factor payments in favour of centre economy investors and *net liquidity absorption* by the centre economy, as shown in Figure 4-12.¹⁵

There is also the fact that the British Empire maintained a positive (albeit declining) current account while simultaneously supplying the world's centre international currency, as shown in Figure 4-12, yet this was the result of unique historical circumstances, a colonial structure and a global metal-based monetary system, none of which exist today (de Cecco, 1974; Nurkse, 1954). All of this underlines the importance of current account balances (Lane & Milesi-Ferretti, 2001, 2007).

Current account deficits do have concrete costs, such as a decline in manufacturing in the centre economy due to increasing inflows of foreign products (Pettis, 2013b, pp. 150–177). These costs require careful political management (Germain & Schwartz, 2014). Nevertheless, the point here is to illustrate why, from a systemic perspective, international liquidity provision by way of current account deficits in the centre country is a sustainable approach in the long-run.

[Figure 4-12 “Trade balance and current account of UK and US”]

¹⁵This point is also noted by Bordo & McCauley (2016): “There is also the puzzling observation that the U.S. economy is still earning net investment income from the rest of the world despite its net international liabilities”.

4.7 Conclusion

This study has analysed how currency internationalisation is intertwined with the institutions making up the international monetary system. It is argued here that the hierarchy inherent in the international monetary system imposes a survival constraint upon non-centre countries, as they need to finance their international transactions using the centre currency. The study has laid out the mechanism by which the survival constraint leads countries to adopt policies that reduce domestic demand and generate an external surplus. While said policies allow countries to sustain positive cash flow, meet their international payment commitments and advance their economic development, they also lead to the formation of a specific path-dependent economic structure. The study has further delineated the manner in which the survival constraint operating across borders generates network effects which reinforce the centrality of the existing centre currency. Both path dependence and network effects act to perpetuate a country's role as currency *user* and limit its potential to become a currency *supplier* of the international currency.

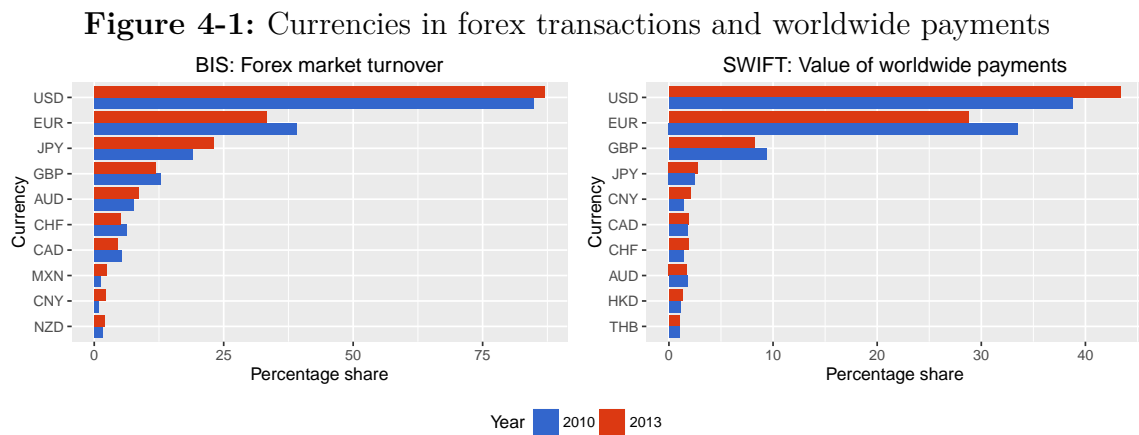
Finally, the study has elucidated the working mechanisms of the survival constraint on the international level and described how the survival constraint affects actors in the international monetary system. It has illustrated that international currencies are associated with current account deficits by the centre country as they provide net additions to liquidity in non-centre countries, whereas continued lending to foreign countries is ultimately self-defeating as it implies increasing indebtedness of the borrowing countries. The study argued that these dynamics remain valid even in the context of public-private hybridity of the international monetary system. Furthermore, it has been maintained that current account deficits by the centre country do not necessarily have a negative impact on the credibility of the centre currency.

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Relating these findings to the historical evolution of the international monetary system, it has been argued that internationalisation of the Japanese yen has been hindered by slow progress towards external rebalancing and regional constraints supporting the incumbency of the US dollar. While both domestic and external rebalancing are also crucial in the case of the Chinese yuan, the study has found signs that the regional constraints are beginning to change. In particular the increased importance of East Asian regional trade and net yuan liquidity provision through Chinese imports offer avenues for China's policymakers to expand the international profile of their currency. Fundamentally, these findings reflect Keynes's (1980) observations about the hierarchical and asymmetric structure of the international monetary system. It is hoped that this institutional inquiry into these features of the international monetary system will complement the results of previous studies of the topic in a meaningful way.

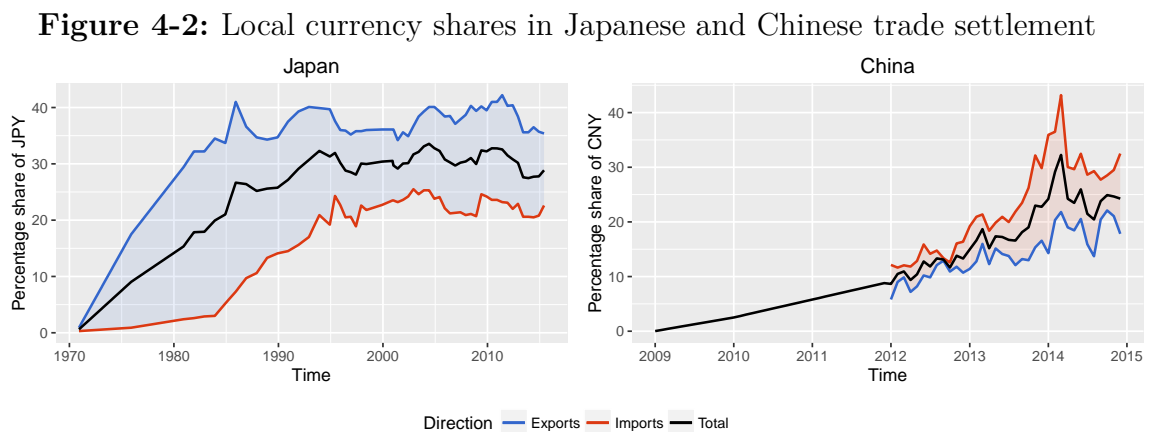
4.8 Appendix

4.8.1 Figures



Note: Currencies ordered by their 2013 rank.

Source: Bank for International Settlements, Society for Worldwide Interbank Financial Telecommunication (SWIFT) RMB Tracker



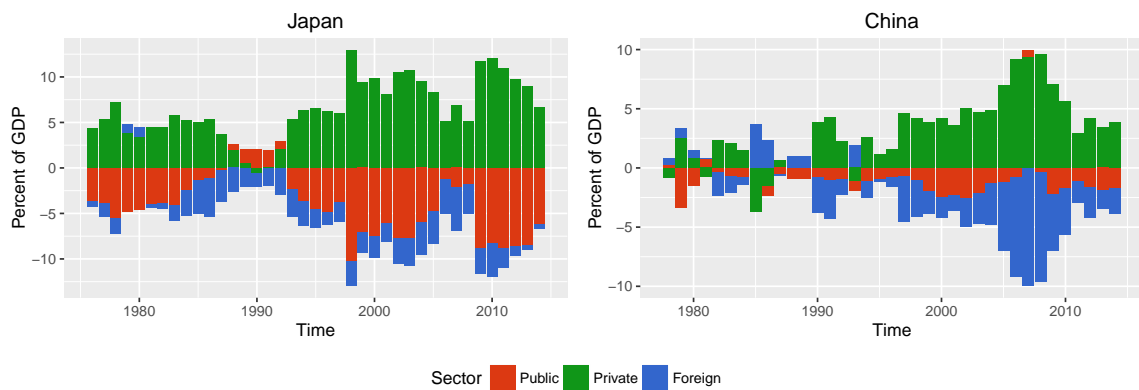
Source: Ministry of Finance Japan, Japan Customs, People's Bank of China

Figure 4-3: Balance sheet mechanics of the survival constraint

	N		US	
	ΔA	ΔL	ΔA	ΔL
(1) Loan from US to N, \$100 at 5%	+\$100	+\$105	+\$105	+\$100
(2) N buys inputs from US	-\$100		+\$100	
(3) N sells goods to US	+\$150		-\$150	
(4) N repays loan	-\$105	-\$105	-\$105	-\$105
Total flows 1-4	+\$45	\$0	-\$50	-\$5
Change in net balance	+\$45		-\$45	

Financial transactions (flows) of all economic units in each country

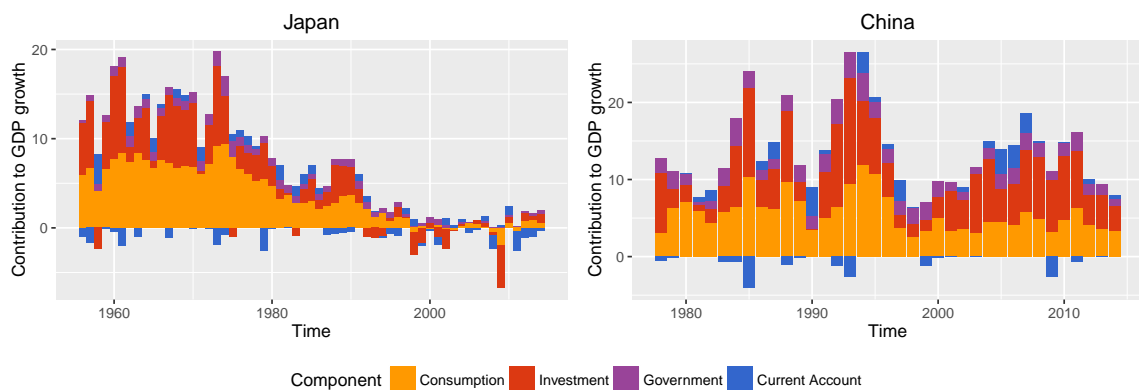
Figure 4-4: Sectoral balances for Japan and China



Note: The foreign balance is represented by the capital account. A negative foreign balance thus indicates a current account surplus.

Source: Statistics Japan, Government of Japan Cabinet Office, National Bureau of Statistics of China

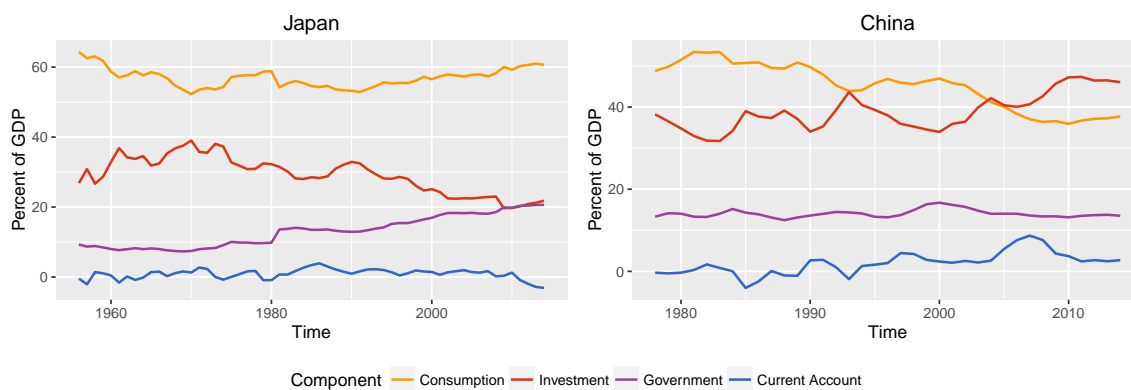
Figure 4-5: Contributions to nominal GDP growth in Japan and China



Source: Statistics Bureau Japan, National Bureau of Statistics of China

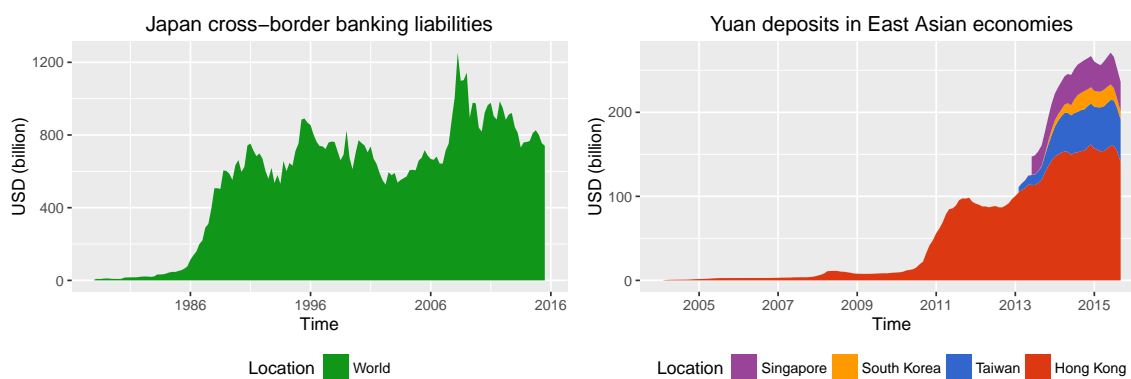
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Figure 4-6: GDP components in Japan and China



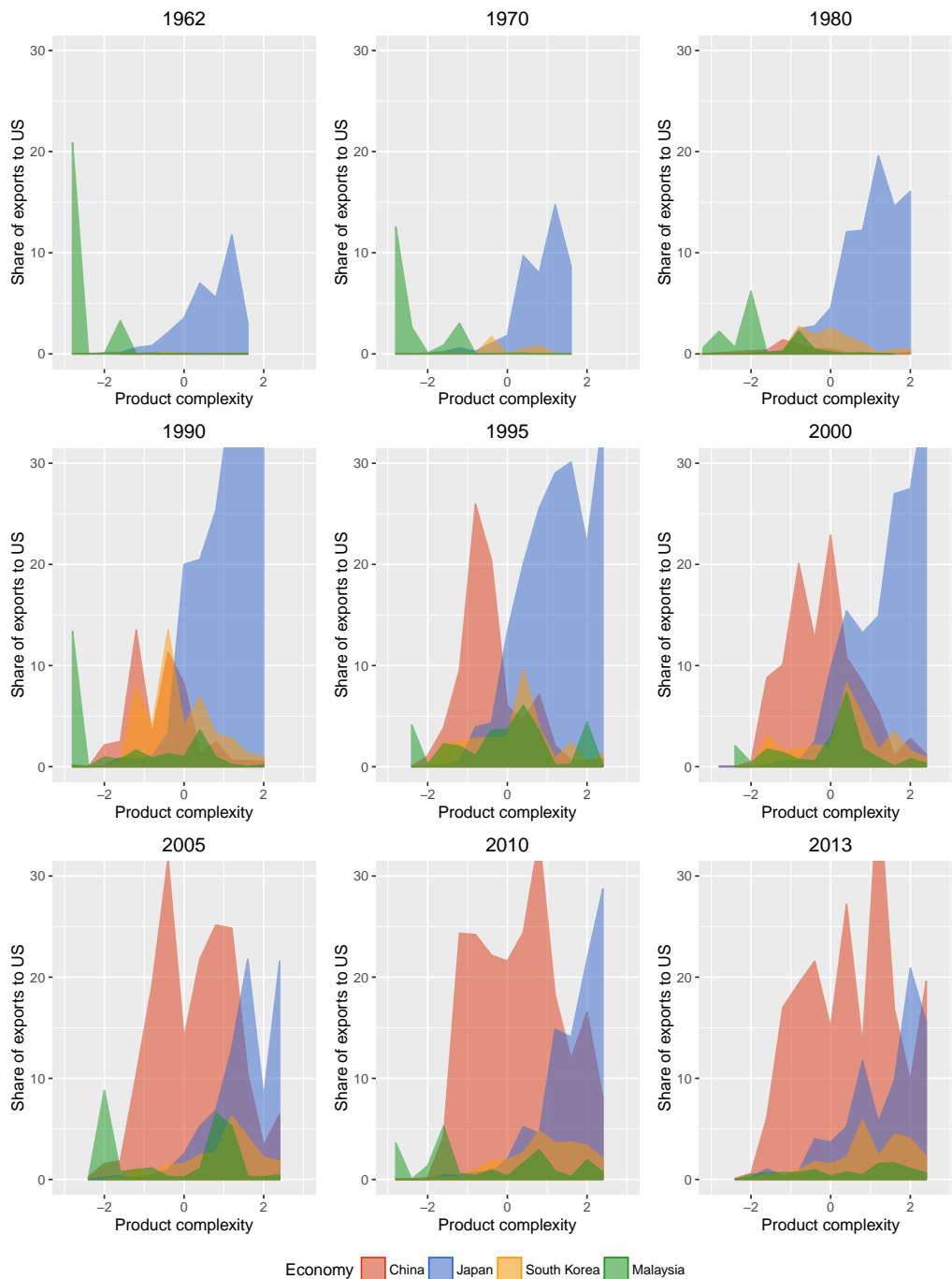
Source: Statistics Bureau Japan, National Bureau of Statistics of China

Figure 4-7: International use of Japanese yen and Chinese yuan



Note: Quarterly data padded to monthly frequency via linear interpolation.

Source: Bank for International Settlements, Hong Kong Monetary Authority, Central Bank of China (Taiwan), Bank of Korea, Singapore Monetary Authority

Figure 4-8: Akamatsu graphs of East Asian exports to the United States

Negative = low product complexity, positive = high product complexity

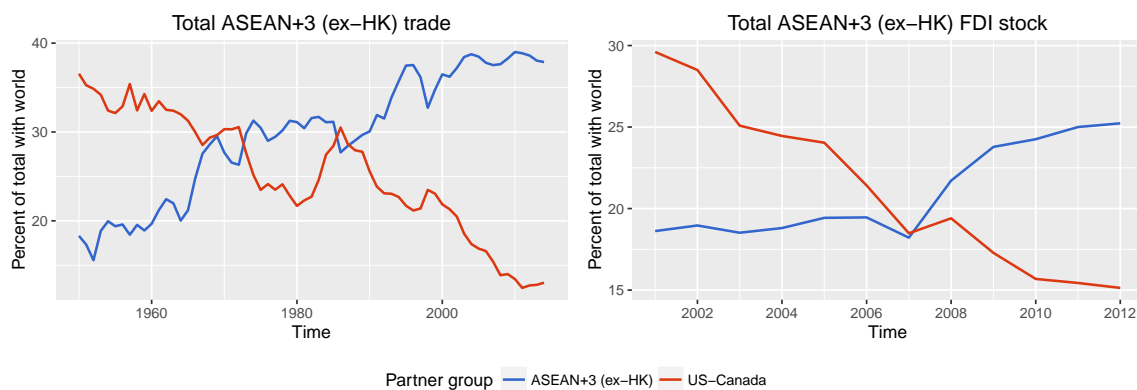
Excluding 5% most extreme values along x-axis and top 2.5% values along y-axis

Note: This study uses the “product complexity index” by Hausmann et al. (2011), which rates products produced by few countries higher and has been found to produce more stable distributions with less extreme outliers than GDP per capita used by Kwan (2002).

Source: Own calculations, following Kwan (2002), based on SITC4 rev. 2 (1962–2013) data and product complexity index from the Observatory of Economic Complexity (MIT)

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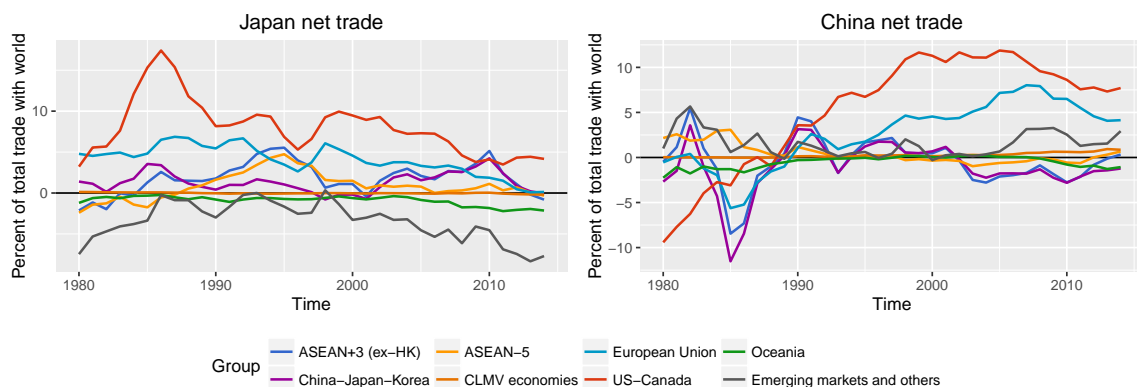
Figure 4-9: East Asian intra-regional and extra-regional total trade and FDI



Note: Hong Kong excluded from ASEAN+3 as its client role in Chinese foreign trade has declined since sovereignty returned to China. Statistics for both directions averaged to enforce symmetry.

Source: IMF Direction of Trade Statistics, UNCTAD

Figure 4-10: Japanese and Chinese trade balance



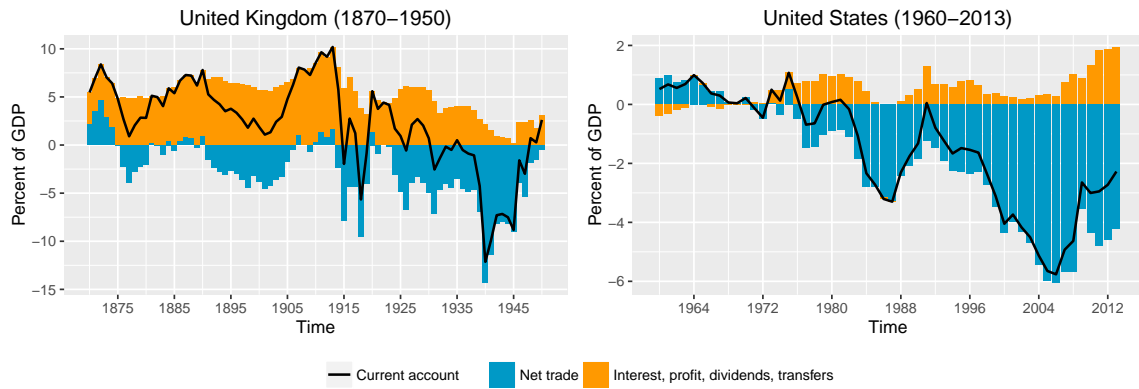
Note: Hong Kong excluded from ASEAN+3 as its client role in Chinese foreign trade has declined since sovereignty returned to China. Statistics for both directions averaged to enforce symmetry. CLMV economies are Cambodia, Laos, Myanmar and Vietnam.

Source: IMF Direction of Trade Statistics

Figure 4-11: Multilateral balance sheet mechanics of the survival constraint

	A		B		US	
	ΔA	ΔL	ΔA	ΔL	ΔA	ΔL
(1) Loan from B to A, \$100, 5%	+\$100	+\$105	+\$105	+\$100		
(2) N buys inputs from B	-\$100		+\$100			
(3) A sells goods to B and US	+\$150		-\$105		-\$45	
(4) N repays loan	-\$105	-\$105	-\$105	-\$105		
Total flows 1-4	+\$45	\$0	-\$50	-\$5		
Change in net balance		+\$45		\$0		-\$45
Financial transactions (flows) of all economic units in each country						

Figure 4-12: Trade balance and current account of UK and US



Source: Bank of England, Federal Reserve Bank of St. Louis Economic Data

5 Policy Implications and Concluding Thoughts

This thesis has demonstrated how assuming a central bank perspective towards the analysis of East Asian regionalism has profound consequences for the theoretical understanding of the interplay between autonomy, sovereignty and monetary policy. The preceding three chapters have shown that central banks, and thereby economies, retain their interest rate autonomy so long as they accumulate net foreign exchange reserves, the effectiveness of which depends on the domestic monetary policy set-up and the transmission from interest rates to macroeconomic outcomes. Further, the use of currencies by East Asian economies is shown to relate to institutional factors which operate on international and regional levels in addition to domestic levels, affecting economies' policy choices at early stages of their development and economies' potential for internationalisation of their currencies at later stages of their development.

These findings have important theoretical ramifications for traditional political economy and international relations theory on national sovereignty in international finance, such as Realism, Institutionalism, Intergovernmentalism or Neofunctionalism. Specifically, it has been argued that changes of exchange rate regimes cannot be treated simply as a reflection of the power relationship between states. Instead,

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greater attention to the specific operational procedures of central banks is necessary to understand a country's position in the global monetary system, its policy space and policy autonomy.

To illustrate how this affects thinking on East Asian regionalism, the readers are asked to consider the position of a small European economy prior to the introduction of the euro. At that time, European economies were generally understood to have given up their monetary policy *autonomy* in favour of pegging to the German mark (the Trilemma argument). Thus, joining the European Monetary Union and consequently giving up monetary *sovereignty* may have seemed like an attractive proposition (see DeMartino & Grabel, 2003, for a similar point). After all, policymakers assumed they could increase their *de facto autonomy* by gaining the ability to influence policymaking on supranational levels. The results presented here, however, point strongly to a reconsideration of that conclusion, as it has been shown that monetary policy autonomy depends on the ability to sustain positive net accumulation of foreign exchange, rather than the adoption of a specific exchange rate regime. The Euro Crisis, meanwhile, has served as a forceful reminder that monetary matters are fundamentally political and that, by renouncing sovereignty, countries may also surrender an important means towards achieving autonomy.

Many East Asian economies found themselves at a similar juncture following the Asian Financial Crisis 1997–98, when dissatisfaction with the IMF's crisis response led to calls for more formalised monetary integration as a form of protection from the negative externalities associated with dollar-pegging. While regional policymakers may have seen this as an attractive strategy, the argument here is that such a view is incomplete. Whether or not a trade-off exists between exchange rate stability and domestic monetary autonomy depends on a country's external position, not on the type of exchange rate regime. It is by no means clear that a union made up of highly heterogeneous states would be able to retain its union-wide policy autonomy. Nor

is it clear why states with greater monetary power and higher de facto autonomy would enter into a union that would benefit primarily the less powerful states (this mirrors a point also made by Hamilton-Hart, 2002).

Given the political realities in East Asia, institutionalisation of monetary policy coordination is a difficult if impossible undertaking, despite any potential advantages such a project might have (see Grimes, 2008, for the power politics at play). Present conditions neither suit *nor require* greater formality and associated sovereignty pooling. Existing integration in East Asia is based on pragmatism and informality,¹ and acceptance of this fact has served the region well in the past. While it is admirable that a number of policymakers and scholars continue to emphasise the common qualities of East Asian economies and the desirability of concerted action, there is simply no compelling reason to move monetary integration into the political domain. This is not to say that it would not be a welcome development if East Asian economies were to leave their political differences behind and move together closer in the future.

The strategy of many East Asian economies of adopting currency baskets after the Asian Financial Crisis appears to be the sensible choice in light of these findings. Currency baskets have contributed to keeping intra-regional exchange rate stability high while providing more flexibility than would monetary union (cf. Williamson, 1996; Yoshino et al., 2004). Recent efforts have concentrated on diversifying exchange rate regimes, and it appears that the Chinese yuan in particular is gaining greater influence in this regard. Resources should also be directed towards institution building and capacity building, especially towards the development of capital markets and the strengthening of central bank operations. The

¹The informality that can be observed in East Asian relations today has long been a significant factor in economic and political relations in East Asia (Katzenstein & Shiraiishi, 1997; Kang, 2010).

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rebalancing of economic policies towards the creation of more solid domestic foundations should also be given greater priority. Much of this is already being undertaken, e.g. within the *ASEAN+3 Asian Bond Markets Initiative*.

In the medium to long run, it appears likely that the Chinese yuan is going to gain more ground within the region, although its long-term potential will ultimately depend on the success of the rebalancing of the Chinese economy. Even with rebalancing, however, it is unlikely that the increasing influence of the yuan would be reflected in regional exchange rate regimes in a coherent way. Rather, the yuan's influence is likely to grow faster within specific subregions, especially in those economies already most integrated with China, such as Hong Kong or Macau. More encompassing forms of monetary integration appear infeasible, and indeed undesirable, given the region's heterogeneity. Money cannot be detached from politics, and as such it is inconceivable to integrate vastly different political systems on the basis of a common monetary standard without addressing questions of sovereignty. Putting pragmatism ahead of higher, possibly unattainable goals may be a more effective strategy for achieving regional stability and prosperity.

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