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Bank Excess Reserves in Emerging Economies: A Critical Review and Research Agenda

Abstract

This paper reviews academic studies of excess reserves in the banking system of emerging economies from 2000 through 2014. While excess reserves in emerging countries have attracted increasing attention from scholars, virtually no work has reviewed and synthesised the extant knowledge. This paper takes the necessary step of consolidating and integrating the past literature on emerging country excess reserves. Focusing on articles published in major scholarly journals, we classify the existing literature on excess reserves into three broad taxonomies, namely excess liquidity sources, excess liquidity's effects, and the response policies of central banks of emerging countries. Achievements within each of the three research areas are reviewed, critical gaps identified, and recommendations for future research provided.

Keywords: Excess reserve, excess liquidity, bank, emerging economies, review.

JEL Classification: E50

1. Introduction

Excess reserves, which is defined as the current account holdings of commercial banks with the central bank beyond required reserves (Bindseil et al., 2006), has attracted considerable interest over the last decade (see Chen, 2008; Zhang, 2009; Huang et al., 2010). Prior literature indicates that excess reserves raise two major concerns for an economy: (i) the impact of excess reserves on the effectiveness of the monetary policy (Green, 2005; Liu et al., 2009); and (ii) the impact of excess reserves on the profitability and risk-taking behaviour of commercial banks (Acharya and

Naqvi, 2012). For example, central banks have consistently employed reserve requirements as the main monetary instrument to sterilise excess reserves over the past decade (Conway et al., 2010). The incomplete sterilisation may adversely affect banking profitability and encourage risk-taking behaviours (Yu, 2008), thereby leading to a high inflation rate and asset price bubbles (Glick and Hutchison, 2009). Moreover, emerging economies operate in highly uncertain environments, have relatively less developed financial markets, and have banks that tend to play a crucial role in lending (see Vives, 2006). The efficient management of excess reserves is therefore crucial for effective monetary policy and risk-taking behaviour in the banking sector.

Despite the above, the literature on emerging economies appears fragmented and lacks theoretical integration with virtually no study synthesizing prior literature over the past decade. It is therefore difficult to assess the notable contributions to the literature. This paper reviews academic studies on excess reserves in an effort to evaluate and synthesize the existing literature, in order to provide a more integrated understanding of excess reserves. This paper has three goals: (i) to systematically review conceptual developments and empirical findings on the banking excess reserves in emerging markets; (ii) to provide a framework for classifying the areas the past research has concentrated on; and (iii) to identify critical gaps and suggest future research agendas. This paper contributes to the literature in two important ways: (i) the paper provides a timely synthesis and consolidation of extant literature relating to excess reserves in emerging economies and provides a basis for theory extension and

building in the subject area; and (ii) the review sheds light on how excess liquidity affects the effectiveness of the monetary policies carried out by the central banks.

The rest of the paper is organised as follows. Section 2 describes the research method employed and introduces the consolidating framework whose components are analysed in the subsequent sections. Section 3 summarises theoretical perspectives and reviews the sources of excess liquidity in emerging economies. The theoretical and analytical evaluation of the extant literature on the effects of excess liquidity and the central banks' responsive policies is presented in Section 4. Suggestions for future research directions are provided in Section 5. Section 6 concludes the paper.

2. Overview of Research Methods

This paper focuses on peer-reviewed English-language journal articles, excluding books, edited volumes, book chapters, teaching cases, working papers, conference papers, and other non-refereed publications. The sample was generated by applying a keyword search on major electronic databases including Business Source Premier Publications, ProQuest/ABI, and JSTOR. The keywords included 'emerging/transitional economies' and 'bank excess liquidity/excess reserves/surplus liquidity/surplus reserves'. Articles were only selected if they directly addressed banking excess reserves or overall excess liquidity in the emerging economies on a conceptual or empirical basis. No ex-ante definition of 'excess liquidity/excess reserves/surplus liquidity/surplus reserves' is provided because the definition variation is a part of the review analysis.

The rigorous searching generated a sample of 46 articles from 29 journals, including high ranking journals such as *Journal of Financial Economics*, *Journal of Banking & Finance*, *Economic Journal*, *Cambridge Journal of Economics*, *Journal of International Money & Finance*, *Journal of International Financial Markets*, *Institutions & Money*, *International Review of Financial Analysis*, *Review of International Economics*, and *Economic Letters*. Although the search was conducted with our best efforts, the possibility remains that articles were missed. Table 1 provides the number of articles and the sample journals. Two observations can be made from Table 1. First, 61% of the articles relate to excess liquidity studies in the context of China, with the rest (39%) of the articles focusing on excess liquidity on a multi-country basis (including China). This is unsurprising as China accounts for more than 50% of the total reserve growth in Asia and the pace at which China has been accumulating reserves is twice as fast as the rest of the world (Park and Estrada, 2010). The contribution of China to the reserve build-up is notable, but at the same time, the build-up is a region-wide phenomenon (Park and Estrada, 2010). In terms of research themes, the papers are unequally allocated among three main areas (excess reserve sources, excess reserve impacts, and the response of central banks). The majority of the papers focused on the sources of excess reserves and accounted for 43% of the literature reviewed, the impact of excess reserves accounted for 32%, while papers on the responsive policy of central banks accounted for 24%. Compared to the literature of advanced market economies, we observe an inadequate academic attention to the political framework addressing the issue of excess liquidity.

(Insert Table 1 here please)

3. Taxonomies of Extant Literature

The consolidating framework (Figure 1) on the excess reserves in the banking sector was derived from a systematic and robust literature review of the 46 articles and summarised in Appendix 1. Following the methodology of content analysis (Krippendorff, 2004), we classified the past studies, as shown in Figure 1, into three inter-related areas, namely excess reserve sources, excess reserve impact, and the central banks' response. In addition to the three categories we included several themes which are unexplored and significantly under-researched in the Figure We review these classifications below.

(Inset Figure 1 here please)

3.1 Excess Reserves: Sources and Theory

Our review suggests that a number of theoretical perspectives have been used to explain the issue of excess liquidity in emerging economies. These include the Quantity view, the Modern Post-Keynesian view, and the Banking Liquidity Management view. The conventional Quantity view defines liquidity as a combination of money and savings (Tsiang, 1956). Money is treated as exogenous to real economic activities, as Friedman's (1969) seminal work assumes that money is

dropped from the central bank's helicopters. Liquidity becomes excessive when the government injects too much money into the economy as indicated by high M2/GDP ratios. When money is plentiful, banks have sufficient lendable funds to finance investment. This allows borrowers to bid up asset prices and eventually causes bubbles, commodity price appreciation, and thus inflation.

It is argued that the massive holding of foreign exchange reserves in association with the managed exchange rate regime is the main cause of emerging countries' large excess reserves above required levels since the early 2000s (Anderson, 2009; Forssbäck and Oxelheim, 2007, Park and Estrada, 2010). For example, the increased hoarding of international reserves in China puts pressure on renminbi (RMB) appreciation. In response, the central bank tends to intervene to offset upward pressure on its desired parity (managed-float exchange regime), and if the government's intervention is not fully sterilised, excess reserves will accumulate in the banking system (Ganley, 2004). This argument is consistent with the Quantity Theory of Money in that the price levels in an economy are determined by the volume of money relative to the volume of output (Friedman, 1987), and if the money supply grows faster than output, the price level will increase.

The Quantity Theory appears to be the dominant explanation for the prevalence of excess liquidity in emerging economies according to the literature. Chen (2008) concurs and notes that the current and capital account surpluses are frequently seen as important causes of the large foreign exchange reserves that ultimately lead to the accumulation of excess reserves in the banking system.

Following this argument, the mainstream literature focuses on the causes of the excess foreign exchange reserves (international reserves). China's export-led strategy builds up a large current account surplus, which is interpreted as strong economic fundamentals and attracts intensive capital inflows (Zhang, 2009; Knight and Wang, 2011). These twin surpluses build up foreign exchange reserves to high levels (Chen, 2008). In addition to strong economic fundamentals, Bouvatier (2010) argues that the interest rate differences between China and the U.S. and expectation on RMB appreciation are responsible for the large capital inflows, mostly in the form of "hot money". This argument has been supported by Zheng and Yi (2007), who indicate that 22% of capital inflows can easily be converted out of China in the short run.

In addition, the literature provides two rationales for the large accumulation of international reserves at central banks of emerging economies, namely precautionary motives and a mercantilist motive. Under the precautionary view, international reserves are desired for self-insurance against exposure to future sudden stops of capital inflows or rapid capital outflows that may shape a financial crisis (Mendoza, 2004; Aizenman, 2007; Aizenman and Lee, 2007; Cheung and Qian, 2009; Mendoza, 2010; Jeanne and Rancière, 2011; Joyce and Razo-Garcia 2011; Nor et al, 2011; Sula, 2011; Steiner, 2013). Under the mercantilist view, international reserve accumulation is a by-product of export promotion to create more jobs and reserve accumulation facilitates export growth by preventing currency appreciation (Dooley et al., 2003; Fee, 2006; Aizenman, 2007; Ferguson and Schularick, 2007; Cheung and Qian, 2009; Wan and Chee, 2009; Pontines and Rajan 2011; Bahmani-Oskooee and Hegerty,

2011). Based on these two motives, the literature also analyses the optimality of reserve holdings and finds evidence of excess reserves in the sense that reserves exceed those explained by economic fundamentals (Bird and Rajan, 2003; Park and Estrada, 2010; Jeanne and Rancière, 2011).

On the other hand, Keynes (1973) views liquidity as a characteristic of assets in which money is considered to be the most liquid asset. He argues that money is non-neutral because the preference of holding money varies according to the levels of perceived uncertainty about the future. When investors are pessimistic about the economy, they prefer to hoard liquid assets, and hence, demand for money increases. However, no effort is made to produce more money to satisfy the higher demand. Instead, returns on less liquid assets must rise to induce investors to hold them, and hence, asset prices fall. When investors are optimistic, investment increases, and asset prices will go up. This mechanism shows how liquidity preference can affect real economic output. Moreover, thanks to banks providing credit lines and overdraft protection, the money supply is argued to be altered according to investment preference. Hence, money is not only non-neutral but also endogenous to the business cycle. Under this view, the increase in the money supply does not necessarily lead to asset price bubbles, and indeed, China's liquidity is much ado about nothing (Liu and Wray, 2010).

Following Post-Keynesian monetary theory, Liu and Wray (2010) examine whether Chinese excess liquidity has ever been a phenomenon. When investors are optimistic about the economy, they reduce holdings of liquid assets and invest more in illiquid

assets. Investors borrow more from banks, and hence, money supply increases positively to the investment preference and negatively to the liquidity preference. Liu and Wray's (2010) view is in line with that of Moore (1988), who claims that money is supplied on demand and that there is no unplanned money dropped down from the central bank's helicopters as argued by Friedman (1969). Liu and Wray (2010) argue that China's excess liquidity is hardly a case because liquidity supply is endogenous to both the liquidity preference and the investment preference. They further note that China's asset price bubbles are caused by investors' over-optimistic perception of future Chinese economic performance, not because of the increasing volume of money. Liu and Wray's (2010) line of reasoning completely contradicts that of Guo and Li's (2011) Quantity Theory approach. The latter authors argue that the People's Bank of China (PBOC – the central bank of China) injects large amounts of money into the banking system to stimulate economic growth, more intensively since the U.S. subprime crisis in 2008, resulting in large banking excess reserves. In addition to the money injection, the high saving rate in China appears to be another cause of the large banking excess reserves (Chen, 2008). Chen (2008) noted that when savings outpace investments and spending, money is hoarded within the banking system and liquidity increases quickly. Consistent with this argument, Ferguson and Schularick (2007) showed that the Chinese 'savings glut' was not primarily a function of precautionary household behaviour but of surging corporate profits in China due to an increasing exchange rate undervaluation.

Another theoretical explanation of the source of excess reserves is viewed from the banking liquidity management perspective. Forssbäck and Oxelheim (2007) argue that the absence of an efficient interbank market makes commercial banks rely primarily on central bank facilities to gain access to liquidity even when other commercial banks have excess liquidity. Banks do not find the need to participate in the interbank market. Hence, liquidity cannot be channelled from liquidity-rich banks to their counterparts, creating a situation of excess liquidity in the banking system. On the other hand, Chen (2008) looks at the lending side and notes that the Chinese excess liquidity is not absolute but relative because some industry sectors have difficulties in accessing credit when banks hoard excess liquidity but hesitate to lend.

3.2 The Effects of Excess Reserve

The effects of excess reserves have been studied at both micro and macro levels. At the micro level, Agenor and Aynaoui (2010) and Acharya and Naqvi (2012) lay the fundamental theoretical background of the behaviour of commercial banks in a situation where a large excess of reserves is present in the banking system. Agenor and Aynaoui (2010) note that excess reserves accumulated above the precautionary level is deemed involuntary and further argue that only involuntary excess reserves affect banks' lending behaviour in the way that banks with larger involuntary excess reserves are more willing to relax collateral standards. Agenor and Aynaoui (2010) also note that tightening monetary policy may increase the cost of holding precautionary excess reserves, and therefore, commercial banks tend to reduce

precautionary excess reserves holding, which results in the corresponding increase in involuntary excess reserves and credit lending, consequently making monetary policy less effective. Supporting this argument, Nguyen and Boateng (2013) find that banks with larger excess reserves beyond precautionary levels are less responsive to monetary policy interest rate shocks in China. In addition, they report that in the presence of excess reserves beyond precautionary levels, liquid banks are more responsive to monetary policy interest rate shocks in China. Nguyen and Boateng (2013) note that, in the presence of large excess reserves, liquid banks tend to take greater risk, and hence, liquid banks are more vulnerable to monetary policy shocks in China.

Examining the risk-taking behaviour of commercial banks, Acharya and Naqvi (2012) argue that surplus liquidity in the banking system leads to the perception of a low probability of illiquidity risk among bank managers, makes risk easy to conceal, and consequently induces bank managers to take more risk. Under the circumstance of excess reserves, bank managers tend to relax lending standards and charge lending interest rates below the fundamental level to facilitate aggressive lending and increase their remuneration, which is often tied to credit volume (Acharya and Naqvi, 2012). Nguyen and Boateng (2015) find evidence that involuntary excess reserves lead to more aggressive risk-taking of commercial banks in China. In addition, banks with larger involuntary excess reserves tend to reduce risk-taking more rapidly under the tightening monetary policy regime as their credit risks materialise more rapidly (Nguyen and Boateng, 2015).

At the macro level, research on the impacts of excess reserves prominently follows Friedman's (1987) Quantity Theory in which money is neutral, and hence, asset prices increase in the volume of money supply. Most of the studies under the 'impact' area pay great attention to inflation and asset price bubbles and find empirical evidence that excess liquidity (indexed by the ratio of money supply M2 to nominal GDP (M2/NGDP) imposes significant pressure on the consumer price index (CPI) in China (Zhang and Pang, 2008; Zhang, 2009; Yang, 2010; Huang et al., 2010; Guo and Li, 2011). Mehrotra (2008) finds that excess liquidity pushes up not only price inflation but also output. Guo and Li (2011) note that excess liquidity has a larger impact on housing prices than on CPI, and therefore, the cost of excess liquidity on inflation is underestimated. Besides real estate prices, Bondt et al. (2011) document that excess liquidity leads to high stock prices above the fundamentals in China. An issue under this strand of research is the measure of excess liquidity because the M2/NGDP ratio fails to take the interest rate into the measurement of the long-term liquidity trend as noted by Berger and Harjes (2009). The literature also raises concerns on the cost of holding large foreign exchange reserves (see Liang, 2007). The cost of accumulating a unit value of foreign exchange reserve assets is the spread between the private sector's cost of obtaining foreign capital and the yield that the central bank earns on foreign government bonds (Rodrik, 2006). Some studies suggest that the excess of international reserves has a cost of approximately 1% of GDP (Bird and Rajan, 2003; Rodrik, 2006). Cruz and Walters (2008) view this cost as

significant in the context where emerging economies are most in need of capital for development.

3.3 Excess Reserve and Policy Response of Emerging Economies

The central banks' response research area has seen a large number of conceptual studies with respect to a more flexible exchange rate regime (see Wang, 2006). The excess liquidity in China has triggered the debate on the Chinese exchange rate flexibility to escape the liquidity trap (Makin, 2007). Roubini (2007) claims that RMB is undervalued and that China should float its exchange rate to reverse the trade imbalance with the U.S. On the other hand, McKinnon (2007) notes that the theory on the elasticity between exchange rate and trade balance fails to incorporate the income effect. The income effect will leave the trade balance indeterminate when the home currency appreciates because both exports and imports will decrease simultaneously. Review of the debate of whether China should float its currency is beyond the scope of this paper. Instead, the main work in 'The PBOC's response' area focuses on the effectiveness of the PBOC's sterilisation policies. Examining the relationship between capital inflows and the money base growth rate, Glick and Hutchison (2009) find that China's sterilisation is incomplete, leading to a high inflation rate, while the literature generally documents that China's sterilisation is almost perfect (approximately 90% of capital inflows) (Aizenman and Glick, 2009; Ouyang et al., 2010; Wang, 2010; Bouvatier, 2010) or completely perfect (Kurihara, 2011). The reserve requirement hike has been heavily employed as a sterilisation tool (Ma et al., 2011) and tends to

produce unexpected economic output increases in China (see Qin et al., 2005). Nguyen, Boateng and Newton (2015) find that Chinese banks with positive involuntary excess reserves one period after a reserve requirement shock experience a significantly increased credit supply in response to an increase in the reserve requirement ratio. They argue that involuntary excess reserves attenuate the liquidity effect of the reserve requirement hikes that reduce the funding cost of credit lending relative to the government securities investment, and therefore, banks increase credit supply.

4. Critical gaps and Agenda for Future Research

This section identifies critical gaps and provides future research directions for the three main areas in the framework.

4.1 Excess Reserve Sources

Regarding the foreign exchange reserves, to the best of our knowledge, no study has attempted to empirically model the relationship between current account surplus or capital account surplus and international reserve levels. Moreover, it is important to go beyond the mercantilist view and take export competition with other countries into account (Aizenman, 2007). The mercantilist view predicts that China will hold large international reserves if the cost of hoarding reserves is smaller than the benefit from export surplus (Moore, 1988). Aizenman (2007) argues that China will hold large foreign exchange reserves as long as the cost of hoarding reserves is smaller than that of other countries that compete with China on the same export market. Therefore, the

relationship between foreign exchange reserves and current and capital account surpluses should be conducted relative to other export competitors.

Although the relationship between expansionary monetary policy and the saving ratio to banking excess reserves has been built conceptually, no empirical test has been carried out. Moreover, the current literature ignores the spill-over effect of global excess liquidity in emerging economies. Ruffer and Stracca (2006) find a significant spill-over effect of global liquidity to the Eurozone economy and to a lesser extent to Japan, which is in line with the existing empirical literature suggesting that foreign monetary shocks have an expansionary effect. According to the Mundell-Fleming (MF) model, an expansionary monetary policy leads to a reduction of the domestic interest rate, which, in turn, triggers capital outflows (see Ruffer and Stracca, 2006). The capital outflows need to find a new home as inflows to other countries, and hence, excess liquidity is spilled over. Therefore, future research should examine the impact of global excess reserves on emerging countries, while Japan and the U.S. are currently awash with liquidity (Fukuda, 2011; Keister and McAndrews, 2009). Another issue that merits future attention is the measure of excess liquidity in the overall economy. The current literature defines excess liquidity as the gap between the growth rate of the money supply (M2) and nominal GDP (Guo and Li, 2011; Yang, 2010), or the deviation of ratio of M2 and nominal GDP from their long-term trends (Zhang and Pang, 2008; Zhang, 2009; Huang et al., 2010). It is crucial to take not only economic growth but also the interest rate into the measure of long-term

excess liquidity because the interest rate may induce variations in the output-velocity of money and complicate the link between standard monetary aggregates and prices (Orphanides and Porter, 2000); hence, the money demand will be altered according to price changes and so will the excess liquidity (Berger and Harjes, 2009).

The banking liquidity management view has received relatively little attention. In particular, no effort has been made regarding the commercial banks' demand for excess reserves. It is important to delve deeper into the reserve demand function to shed light on whether the large accumulation of banking excess reserves is due to the fall in loan demand or lending incentive (Agenor et al., 2004). Banks may voluntarily hold excess reserves above required levels as a precautionary buffer (i.e., payment settlement), and any level beyond precautionary liquidity is deemed involuntary excess reserves (unused or surplus reserves) (Agenor et al., 2004). For example, studying 14 Chinese banks that account for 90% of the amount transferred via the Chinese banking settlement system, Wei et al. (2008) found that the aggregate excess reserve was almost three times the payment transaction value, which indicates the surplus of the Chinese banking reserves. Wei et al. (2008) conclude that Chinese commercial banks are very conservative by holding too much unused excess reserves, beyond their liquidity settlement needs. Agenor et al. (2004) identify the demand for a bank's precautionary excess reserves as a function of the penalty rate, cash-deposit ratio deviation, output deviation, foreign exchange exposure and their lags. However, this framework does not consider a bank's credit risk, which is argued to be positively related to liquidity risk (Morris and Shin, 2009; Liang et al., 2013). Once liquidity risk

increases, banks will demand more excess reserves to buffer against uncertainty (Baltensperger, 1972). Therefore, the function of demand for precautionary excess reserves should take credit risk into account.

Empirical models should also be developed to verify Forssbæk and Oxelheim's (2007) observation that the Chinese inefficient interbank market prevents illiquid banks from obtaining liquidity from other liquidity-rich banks. There is a positive relationship between funding liquidity and market liquidity because the ease with which a bank can obtain funding depends on not only its funding availability (i.e., collaterals) but also the margin required by the market (Brunnermeier and Pedersen, 2009). Therefore, banks will adjust their precautionary liquidity in line with the market liquidity fluctuation.

Banks' lending behaviour is another unexplored area resulting in large reserve accumulation. Chen (2008) notes that the phenomenon of the emerging country excess reserves is not absolute but relative because many industries cannot access bank credit, while banks maintain large excess reserves. Stiglitz and Weiss (1981,1992) lay a very strong foundation for credit rationing theory, stating that under the circumstance of information asymmetry, banks reject loan applications to insulate their portfolios from credit risk resulting from loan borrowers' moral hazard and risk-taking incentives. This theory is particularly relevant to the Chinese banking market where information asymmetry is pervasive (Koivu, 2008; Allen et al., 2009).

4.2 Excess Reserve Impacts

While the current literature discusses the negative impacts of large foreign exchange reserves, little has been done on the positive side, i.e., economic growth stimulation (Cruz and Kriesler, 2010). Zheng and Yi (2007) suggest that China should spend the foreign exchange reserves on infrastructure investment to stimulate aggregate demand. Representing a large proportion of exchange reserves, “hot money” merits further examination on its impacts on monetary policy independence and financial instability because it can quickly and easily revert out of the country, resulting in a currency crisis (Maswana, 2008; Budsayaplakorn et al., 2010). Under large foreign reserves, the managed-float exchange rate regime forces central banks to sell securities at high interest rates to withdraw liquidity out of the economy, the high interest rates may attract additional capital inflows, and therefore, the central banks may lose control over monetary policy (Maswana, 2008). On the other hand, Budsayaplakorn et al. (2010) find evidence that excess money balances and the ratio of domestic credit to GDP are significant and have a positive correlation with the probability of a currency crisis. However, the co-dependence between financial market development (flexible capital account and exchange rate regime) and the effectiveness of monetary policy in the face of increased international integration appears to warrant attention in future research (Forssbäck and Oxelheim, 2007).

Potential areas remain of how excess reserves affect the banking profitability of commercial banks. In an effort to sterilise capital inflows, the PBOC enjoins commercial banks to purchase central bank bills at low yields, which adversely affects

banking profitability (Yu, 2008). Moreover, interest on excess reserves in China is consistently below lending rates (Anderson, 2009), which represents the opportunity cost of holding excess reserves and lowers banking profitability. In turn, low profitability tends to encourage commercial banks to lend to risky customers (Yu, 2008). Although the conceptual framework on the relationship between excess reserves and credit risk is well-established in mature markets (Acharya and Naqvi, 2012), further studies should be conducted for the emerging economies. Acharya and Naqvi (2012) build a theoretical model in which risk-taking increases in excess reserve levels because the higher the excess reserve levels, the lower is the liquidity shortage risk. Consequently, bank managers lend out aggressively to increase their remuneration. Yet, this theory assumes that the banking sector is profit-oriented, while state-owned commercial banks serve dual roles of profit maximisation and social-welfare maximization in association with central banks' window guidance (Allen et al., 2009). This leaves room for further theoretical extension in the context of the transitional market.

4.3 The Central Banks' Response

A research gap remains regarding the effectiveness of the reserve requirement as a sterilisation tool. Since 2003, central banks have primarily relied on the increase in the reserve requirement ratios as the sterilisation tool to offset the increased capital inflows while the issuance of central bank bills has slowed (Conway et al., 2010; Geiger, 2008). Friedman and Schwartz (1963) suggest that banks move to restore their

liquidity cushion by reducing lending when the reserve requirement ratio increases. As the emerging country banking sector dominates the capital market (Liu and Zhang, 2007) and serves as a major source of finance for enterprises (Allen et al., 2009), credit shrink should lead to the fall in the GDP growth rate. Nevertheless, Qin et al. (2005) report that an increase in the reserve requirement ratio unexpectedly generates a small rise in GDP growth. This controversial finding deserves further investigation both empirically and theoretically. It is important to study the two conflicting effects of the increase in reserve requirement ratios. On the one hand, banks face tougher liquidity constraints because more funds are frozen as required reserves and hence curtail lending (Friedman and Schwartz, 1963). On the other hand, the higher opportunity cost of holding larger required reserves may encourage banks to lend aggressively to maintain profitability. These contradicting effects provide research opportunities to investigate the interaction between excess reserve, reserve requirement, and liquidity cost.

As international reserves incur high costs, Cruz and Walters (2008) propose that capital control and restriction on currency convertibility are two alternative policies to international reserves to prevent financial crises. Cruz and Walters (2008) argue that capital control and restrictions on currency convertibility can impede capital flight and, hence, mitigate speculative attacks. Further research should shed light on the effectiveness of those policies relative to international reserve accumulation.

Regarding global liquidity, as liquidity has a spill-over effect across the borders, Belke and Gros (2010) suggest that mopping up excess liquidity will be one major

task for central banks worldwide. This needs to be done in a coordinated fashion. Wan and Chee (2009) propose to establish a regional excess currency reserve pool providing a workable framework to prevent future currency attacks and better utilization of reserves for regional investment and trade. This framework will further enhance risk sharing and consumption smoothing possibilities among emerging economies (Wan and Chee, 2009). Nevertheless, there is virtually no paper working on the global policy coordination to handle the global excess liquidity.

5. Conclusions

Using content analysis, this paper reviews the current literature on banking excess reserves and groups the extant literature into three broad classifications, namely excess reserve sources, excess reserve effects, and the central bank response policies in emerging countries. The paper also identifies critical gaps and potential areas for future investigation. We find that excess reserves come from not only internal and external imbalances but also commercial banks' hoarding motives. The adverse impacts of excess reserves such as inflation and asset price bubbles are well-examined. Yet, controversy remains regarding the impact of reserve requirements on banks' lending behaviours in the context where banks hold large excess reserves. This paper argues that the theories on money and banking liquidity management developed for the context of mature economies may not be applicable to the emerging and transitional economies where banking systems are not fully

profit-oriented. Therefore, theoretical extension to the emerging markets requires urgent attention.

References

- Acharya, V., and Naqvi, H. (2012). The Seeds of a Crisis: A Theory of Bank Liquidity and Risk-Taking over the Business Cycle. *Journal of Financial Economics*, 106(2), 349-366.
- Agenor, P-R., Aizenman, J., and Hoffmaister, A. W. (2004). The credit crunch in East Asia: what can bank excess liquid assets tell us? *Journal of International Money and Finance*, 23(1), 27-49.
- Agenor, P-R., and Aynaoui, K. E. (2010). Excess liquidity, bank pricing rules, and monetary policy, *Journal of Banking and Finance*, 34(5), 923-933
- Aizenman, J. (2007). Large hoarding of international reserves and the emerging global economic architecture, NBER Working Paper Series, No. 13277.
- Aizenman, J., and Glick, R. (2009). Sterilisation, Monetary Policy, and Global Financial Integration, *Review of International Economics*, 17(4), 777–801.
- Aizenman, J., and Lee, J. (2007). International reserves: Precautionary versus Mercantilist views, Theory and evidence. *Open Economies Review*, 18(2), 191-214.
- Allen, F., Qian, J. “QJ,” Qian, M., and Zhao, M. (2009). A review of China’s financial system and initiatives for the future. In: Barth, J.R., Tatom,J.A. and Yago,G. (Eds.), China’s emerging financial markets - Challenges and opportunities, Milken Institute, CA, USA.
- Anderson, J. (2009). The China monetary policy handbook. In: Barth, J.R., Tatom,J.A. and Yago,G. (Eds.), China’s emerging financial markets - Challenges and opportunities, Milken Institute, CA, USA
- Bahmani-Oskooee, M. and Hegerty, S. W. (2011). How stable is the demand for international reserves? *Applied Economics Letters*, 18(14), 1387–1392.
- Baltensperger, E. (1972). Costs of banking activities - Interactions between risk and operating costs, *Journal of Money, Credit and Banking*, 4(3), 595-611.
- Belke, A. and Gros, D. (2010). Global liquidity, world savings glut and global policy coordination, *Discussion Papers of DIW Berlin*, No. 973.

- Berger, H., and Harjes, T. (2009). Does global liquidity matter for monetary policy in the Euro area? *International Finance*, 12(1), 33-55.
- Bernanke, B. S. (2007). The financial accelerator and the credit channel. Speech given at The Credit Channel of Monetary Policy in the Twenty-first Century Conference, Federal Reserve Bank of Atlanta.
- Bernanke, B. S., and Blinder, A. S. (1988). Credit, money, and aggregate demand, *American Economic Review*, 78(2), 435-439.
- Bernanke, B. S., Gertler, M., and Gilchrist, S. (1996). The financial accelerator and the flight to quality, *The Review of Economics and Statistics*, 78(1), 1-15.
- Bindseil, U., Camba-Mendez, G., Hirsch, A., and Weller, B. (2006). Excess reserves and the implementation of monetary policy of the ECB, *Journal of Policy Modeling*, 28(5), 491-510.
- Bird, G., and Rajan, R. (2003). Too Much of a Good Thing? The Adequacy of International Reserves in the Aftermath of Crises, *The World Economy*, 26(6), 873-891.
- Bondt, de G. J., Peltonen, T. A., and Santabárbara, D. (2011). Booms and busts in China's stock market: Estimates based on fundamentals, *Applied Financial Economics*, 21(5), 287-300.
- Bouvatier, V. (2010). Hot money inflows and monetary stability in China: how the People's Bank of China took up the challenge, *Applied Economics*, 42(12), 1533-1548.
- Brunnermeier, M. K., and Pedersen, L. H. (2009). Market liquidity and funding liquidity, *Review of Financial Studies*, 22(6), 2201-2238.
- Budsayaplakorn, S., Dibooglu, S., and Mathur, I. (2010). Can macroeconomic indicators predict a currency crisis? Evidence from selected Southeast Asian countries. *Emerging Markets Finance and Trade*, 46(6), 5-21.
- Chen, Y. (2008). Chinese Economy and Excess Liquidity. *China & World Economy*, 16(5), 63-82.
- Cheung, Y. W., and Qian, X. (2009). Hoarding of International Reserves: Mrs Machlup's Wardrobe and the Joneses, *Review of International Economics*, 17(4), 824-843.

- Conway, P., Herd, R., and Chalaux, T. (2010). Reforming China's Monetary Policy Framework to Meet Domestic Objectives, *OECD Economics Department Working Papers*, No. 822.
- Cruz, M., and Kriesler, P. (2010). International reserves, effective demand and growth, *Review of Political Economy*, 22(4), 569-587.
- Cruz, M., and Walters, B. (2008). Is the accumulation of international reserves good for development? *Cambridge Journal of Economics*, 32(5), 665–681.
- Disyatat, P. (2011). The bank lending channel revisited, *Journal of Money, Credit and Banking*, 43(4), 711-734.
- Dooley, M., Folkerts-Landau, D., and Garber, P. (2003). An essay on the revived Bretton Woods System, *NBER Working paper*, No. 9971.
- Fee, W. L. (2006). International Reserve Accumulation in East Asia, *International Review of Business Research Papers*, 2(2), 72-88.
- Ferguson, N. and Schularick, M. (2007). 'Chimerica' and the global market asset boom. *International Finance*, 10(3), 215-239.
- Forssbäck, J., and Oxelheim, L. (2007). The transition to market-based monetary policy: What can China learn from the European experience? *Journal of Asian Economics*, 18(2), 257-283.
- Friedman, M. (1969). The optimum quantity of money. In M. Friedman (Eds.), *The Optimum Quantity of Money and Other Essays*, 237–60. Chicago: Aldine.
- Friedman, M, and Schwartz, A. J. (1963). *A monetary history of the United States, 1867-1960*. Princeton University Press, Princeton, N.J.
- Friedman, Milton. (1987). Quantity theory of money. In J. Eatwell, M. Milgate, & P. Newman (Eds.), *The New Palgrave: A Dictionary of Economics* (First Edit., pp. 3-20). Palgrave Macmillan.
- Fukuda, S. (2011). Nontraditional financial policies - Zero interest rates and quantitative easing. *The Japanese Economy*, 38(2), 45-78.
- Gambacorta, L. (2005). Inside the bank lending channel, *European Economic Review*, 49(7), 1737-1759.

- Ganley, J. (2004). Surplus liquidity: implications for central banks. Centre for Central Banking Studies, Bank of England, London
- Geiger, M. (2008). Instruments of monetary policy in China and their effectiveness: 1994-2006. *United Nations Conference on Trade and Development*, No. 187. New York
- Glick, R. and Hutchison, M. (2009). Navigating the trilemma: Capital flows and monetary policy in China, *Journal of Asian Economics*, 20(3), 205-224.
- Green, S. (2005). Making monetary policy work in China: A report from the money market frontline. *Stanford Center for International Development*, Working Paper No. 245.
- Gu, X. and Zhang, L. (2006). Effectiveness of China's monetary policy and reform of its foreign exchange system. *China and World Economy*, 14(5), 48-64.
- Guo, S., and Li, C. (2011). Excess liquidity, housing price booms and policy challenges in China, *China and World Economy*, 19(6), 76-91.
- Huang, Y., Wang, X., and Hua, X. (2010). What determine China's inflation? *China Economic Journal*, 3(1), 69-86.
- Jeanne, O. and Rancière, R. (2011). The Optimal Level of International Reserves for Emerging Market Countries: A New Formula and Some Applications, *Economic Journal*, 121(555), 905-930.
- Joyce, J. P., and Razo-Garcia, R. (2011). Reserves, quotas and the demand for international liquidity, *The Review of International Organizations*, 6(3), 393-413.
- Keister, T., and McAndrews, J. (2009). Why are bank holding so many excess reserves? *Federal Reserve Bank of New York Staff Report*, No. 380.
- Keynes, J. M. (1973). *The collected writings of John Maynard Keynes. Vol 14.* (Donald Moggridge, Ed.). London: Macmillan.
- Knight, J., and Wang, W. (2011). China's macroeconomic imbalances: causes and consequences, *The World Economy*, 34(9), 1476-1506.
- Koivu, T. (2008). Has the Chinese economy become more sensitive to interest rates? Studying credit demand in China, *Bank of Finland Discussion Paper*, 1/2008.

- Krippendorff, K. (2004). *Content Analysis: An introduction to its methodology*, Thousand Oaks, CA: Sage.
- Kurihara, Y. (2011). Effects of foreign reserve stock in Asian countries, *Global Business and Economics Review*, 13(1), 84-92.
- Liang, G., Lutkebohmert, E., and Xiao, Y. (2013). A multi-period bank run model for liquidity risk, *Review of Finance*. doi: 10.1093/rof/rft016.
- Liang, Y. (2007). Does foreign direct investment provide desirable development finance? The case of China, *China and World Economy*, 15(2), 104-120.
- Liu, L., and Zhang, W. (2007). A new Keynesian model for analysing monetary policy in Mainland China, *Hong Kong Monetary Authority Papers*, No. 18/2007.
- Liu, M.-H., Margaritis, D., and Tourani-Rad, A. (2009). Monetary policy and interest rate rigidity in China, *Applied Financial Economics*, 19(8), 647-657.
- Liu, X., and Wray, L. R. (2010). Excess liquidity and bank lending in China - A modern money perspective, *International Journal of Political Economy*, 39(3), 45-63.
- Ma, Guonan, Yan, X., and Liu, X. (2011). China's evolving reserve requirements. *BIS Working Papers*, No. 360.
- Makin, A. J. (2007). Does China's huge external surplus imply an undervalued renminbi? *China and World Economy*, 15(3), 89-102.
- Maswana, J.-C. (2008). China's financial development and economic growth: Exploring the contradictions, *International Research Journal of Finance and Economics*, 19, 89-101.
- McKinnon, R., (2007). Why China should keep its exchange rate pegged to the dollar: A historical perspective from Japan. *International Finance*, 10(1), 43-70.
- Mehrotra, A. N. (2008). Demand for money in transition: Evidence from China's disinflation, *International Advances in Economic Research*, 14(1), 36-47.
- Mendoza, R. U. (2004). International reserve-holding in the developing world: self insurance in a crisis-prone era? *Emerging Markets Review*, 5(1), 61-82.

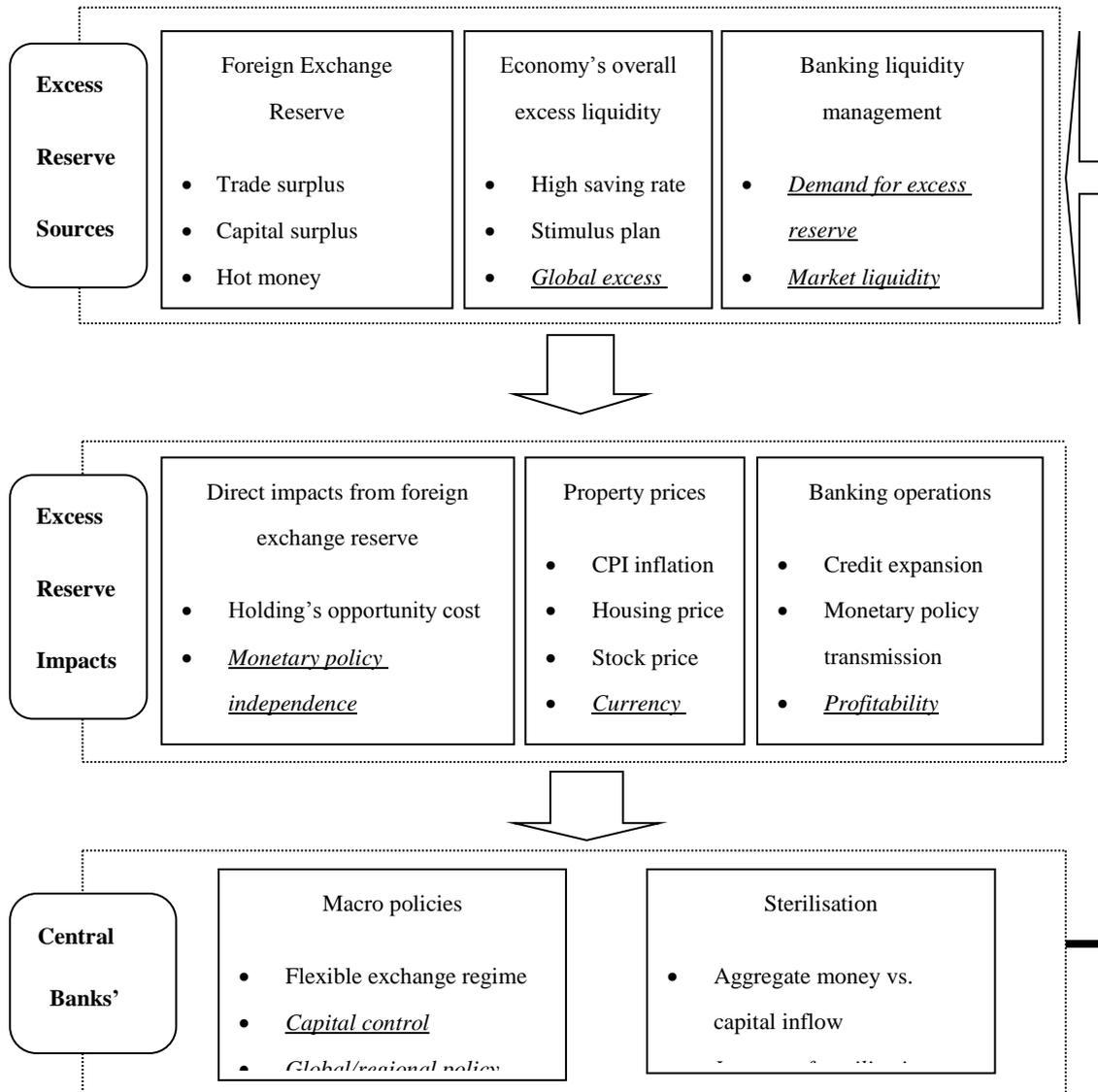
- Mendoza, R. U. (2010). Was the Asian crisis a wake-up call? Foreign reserves as self-protection, *Journal of Asian Economics*, 21(1), 1-19.
- Moore, B. (1988). *Horizontalists and Verticalists: The macroeconomics of credit money*. Cambridge: Cambridge University Press.
- Morris, S., and Shin, H. S. (2009). Illiquidity component of credit risk. Princeton University Working Paper.
- Nguyen, V. H. T., and Boateng, A. (2013). The Impact of Excess Reserves beyond Precautionary Levels on Bank Lending Channels in China, *Journal of International Financial Markets, Institutions and Money*, 26(C), 358-377.
- Nguyen, V. H. T., and Boateng, A. (2015). An analysis of involuntary excess reserves, monetary policy and risk-taking behaviour of Chinese Banks. *International Review of Financial Analysis*, 37, 63-72.
- Nguyen, V. H. T., Boateng, A., and Newton, D. (2015). Involuntary excess reserves, the reserve requirements and credit rationing in China. *Applied Economics*, 47(14), 1424-1437.
- Nor, E., Azali, M., and Law, S. H. (2011). International Reserves, Current Account Imbalance and Short Term External Debt: A Comparative Study. *International Journal of Economics and Finance*, 3(4), 83-94.
- Orphanides, A., and Porter, R. (2000). P* revisited: Money-based inflation forecasts with a changing equilibrium velocity, *Journal of Economics and Business*, 52, 87-100.
- Ouyang, A. Y., Rajan, R. S., and Willett, T. D. (2010). China as a reserve sink: The evidence from offset and sterilisation coefficients, *Journal of International Money and Finance*, 29(5), 951-972.
- Park, D., and Estrada, G. E. B. (2010). Does developing Asia have too much foreign exchange reserves? An empirical examination, *The Journal of The Korean Economy*, 11(1), 103-128.
- Pontines, V., and Rajan, R. S. (2011). Foreign exchange market intervention and reserve accumulation in emerging Asia: Is there evidence of fear of appreciation? *Economics Letters*. 111(3), 252–255.

- Qin, D., Quising, P., He, X., and Liu, S. (2005). Modeling monetary transmission and policy in China. *Journal of Policy Modeling*, 27, 157-175.
- Rodrik, D. (2006). The social costs of foreign exchange reserves. Paper presented at the American Economic Association meeting, January 2006, Boston.
- Roubini, N. (2007). Why China should abandon its Dollar Peg. *International Finance*, 10(1), 71-89.
- Rüffer, R., and Stracca, L. (2006). What is global excess liquidity, and does it matter? ECB working paper, No. 696.
- Steiner, A. (2013). How central banks prepare for financial crises – An empirical analysis of the effects of crises and globalisation on international reserves. *Journal of International Money and Finance*, 33(C), 208–234.
- Stiglitz, J. E., and Weiss, A. (1981). Credit rationing in markets with imperfect information. *The American Economic Review*, 71(3), 393-410.
- Stiglitz, J. E., and Weiss, A. (1992). Asymmetric information in credit markets and its implications for macro-economics, *Oxford Economic Papers*, 44(4), 694-724.
- Sula, O. (2011). Demand for international reserves in developing nations: A quantile regression approach, *Journal of International Money and Finance*, 30(5), 764–777.
- Sun, L., Ford, J. L., and Dickinson, D. G. (2010). Bank loans and the effects of monetary policy in China: VAR/VECM approach, *China Economic Review*, 21(1), 65-97.
- Thakor, A. V. (1996). Capital requirements, monetary policy, and aggregate bank lending: Theory and empirical evidence, *The Journal of Finance*, 51(1), 279-324.
- Tsiang, S. C. (1956). Liquidity preference and loanable funds theories, multiplier and velocity analysis: A synthesis, *American Economic Review*, 46(4), 539-564.
- Vives, X. (2006). Banking and Regulation in Emerging Markets: The Role of External Discipline, *World Bank Research Observer*, 21(2), 179-206.
- Wan, L. F., and Chee, Y. L. (2009). Macroeconomic considerations in regional reserve pooling, *Applied Financial Economics*, 19(14), 1143–1157.

- Wang, Yuanlong. (2006). Rethinking fast growth in China's foreign exchange reserves, *China and World Economy*, 14(2), 56-66.
- Wang, Yongzhong. (2010). Effectiveness of capital controls and sterilisations in China, *China and World Economy*, 18(3), 106-124.
- Wei, X., Pan, S., Yang, S., Zhang, M., and Chen, M. (2008). Liquidity management of the participants in Chinese Real Time Gross Settlement Systems, *Available at SSRN: <http://ssrn.com/abstract=1097533>*.
- Yang, J. (2010). Expectation, excess liquidity and inflation dynamics in China, *Frontiers of Economics in China*, 5(3), 412-429.
- Yu, Y. (2008). The new challenges of inflation and external imbalances facing China, *Asian Economic Papers*, 7(2), 34-50.
- Zhang, C. (2009). Excess Liquidity, Inflation and the Yuan Appreciation: What Can China Learn from Recent History? *The World Economy*, 32(7), 998-1018.
- Zhang, C., and Pang, H. (2008). Excess liquidity and inflation dynamics in China: 1997-2007. *China and World Economy*, 16(4), 1-15.
- Zheng, Y. and Yi, J. (2007). China's rapid accumulation of foreign exchange reserves and its policy implications. *China and World Economy*, 15(1), 14-25.

(Insert Appendix A here please)

Figure 1 – Content-Analysis-Based Framework on the Banking Excess Reserves in Emerging Countries.



Note:

1. The arrows indicate the causal connections between topics. The themes in italic and underlined represent unexplored or significantly under-researched issues.

2. Source: Authors' compilation.

Table 1: Research on Excess Reserves in Emerging Economies:
Number of Journal Articles.

Journal title	Subtotal
Applied Economics	2
Applied Economics Letters	1
Applied Financial Economics	2
Asian Economic Papers	1
Cambridge Journal of Economics	1
China and World Economy	9
China Economic Journal	1
Economics Letters	1
Emerging Markets Review	1
Frontiers of Economics in China	1
Global Business and Economics Review	1
International Advances in Economic Research	1
International Finance	1
International Journal of Economics and Finance	1
International Journal of Political Economy	1
International Research Journal of Finance and Economics	1
International Review of Business Research Papers	1
International Review of Financial Analysis	1
Journal of Asian Economics	3
Journal of Banking and Finance	1
Journal of Financial Economics	1
Journal of International Financial Markets, Institutions & Money	1
Journal of International Money and Finance	3
Journal of the Korean Economy	1
Open Economic Review	1
Review of International Economics	2
Review of International Organizations	1
Economic Journal	1
The World Economy	3
Total	46

Source: Authors' compilation based on literature search

Appendix 1 – Summary of Sample Articles

Author - (Year)	Journal Title	Theoretical perspective	Arguments/findings	Methodology
Excess Reserve Sources				
Bird and Rajan (2003)	The World Economy	Precautionary view	- Emerging countries hold large reserves above fundamental levels.	Conceptual framework
Mendoza (2004)	Emerging Markets Review	Precautionary view	- Self-insurance against crisis is the primary motive for holding international reserves in developing countries.	Empirical econometrics 1985-1996
Fee (2006)	International Review of Business Research Papers	Mercantilist view	- The signs for the coefficients of trade openness, reserve-import ratio and short term indebtedness are negative to reserves in Asean+3 countries. These results must be interpreted with caution.	Empirical econometrics 1980-2003
Aizenman and Lee (2007)	Open Economies Review	Precautionary view and mercantilist view	- PBOC's foreign reserves are desired for self-insurance against future sudden stops of capital inflows.	Empirical econometrics 1980-2000
Ferguson and Schularick (2007)	International Finance	Mercantilist view and Quantity view	- The Chinese 'savings glut' is a function of surging corporate profits in China due to increasing exchange rate undervaluation. - Reserve accumulation facilitates export growth by preventing currency appreciation.	Conceptual framework
Zheng and Yi (2007)	China and World Economy	Quantity view	- Foreign reserves are beyond import payment obligations and foreign debts in China.	Conceptual framework

Chen (2008)	China and World Economy	Quantity view	- High saving rates and twin surplus are the main sources of excess liquidity in China.	Conceptual framework
Yu (2008)	Asian Economic Papers	Quantity view	- Money is excessively supplied from the twin surpluses. The fall in demand deposits also lead to excess liquidity in China.	Conceptual framework
Cheung and Qian (2009)	Review of International Economics	Precautionary view	- Financial openness has a positive effect on reserve holding in Asian countries.	Empirical econometrics 1980-2004
Liu and Wray (2010)	International Journal of Political Economy	Endogenous money	- There is no unplanned money as it is endogenous to business cycle, and hence, there is no excess liquidity.	Conceptual framework
Mendoza (2010)	Journal of Asian Economics	Precautionary view	- Countries prone to sudden stops in capital inflows tend to adjust their policies towards higher reserve holding.	Empirical econometrics 1970-2005
Park and Estrada (2010)	The Journal of The Korean Economy	Precautionary view and mercantilist view	- Emerging Asian countries hold excess foreign exchange reserves beyond fundamental levels.	Empirical econometrics 1990-2007
Bahmani-Oskooee and Hegerty (2011)	Applied Economics Letters	Mercantilist view	- International reserve holding has a positive relationship with volatility of the nominal effective exchange rate in OECD countries.	Empirical econometrics 1973-2007
Jeanne and Rancière (2011)	Economic Journal	Precautionary view	- The buildup of reserves in emerging market Asia can be explained precautionary motive against a large anticipated output cost of sudden stops and a high	Empirical econometrics 1980-2004

			level of risk aversion	
Joyce and Razo-Garcia (2011)	The Review of International Organizations	Precautionary view	- Reserves in emerging countries have been inversely related to their IMF quotas.	Empirical econometrics 1970-2006
Knight and Wang (2011)	The World Economy	Quantity view	- High saving rates and twin surpluses are the main sources of excess liquidity in China.	Conceptual framework
Nor et al. (2011)	International Journal of Economics and Finance	Precautionary view and mercantilist view	- Emerging countries take a precautionary and mercantilist action by holding international reserves against short term capital flow reversals and volatility in export receipts.	Empirical econometrics 1970-2005
Pontines and Rajan (2011)	Economics Letters	Mercantilist view	- Emerging economies desire exchange rate management with a strong bias towards preventing appreciations than depreciations.	Empirical econometrics 2000-2009
Sula (2011)	Journal of International Money and Finance	Precautionary view and mercantilist view	- Trade openness and increased volatility of external disturbances increase the need for reserves in developing countries.	Empirical econometrics 1980-2007
Steiner (2013)	Journal of International Money and Finance	Precautionary view	- Currency crises induce a permanent increase of international reserves in both developed and emerging countries.	Empirical econometrics 1970-2010
Excess Reserve Impacts				
Forssbäck and Oxelheim (2007)	Journal of Asian Economics	Quantity view	- Excess liquidity leads to ineffective monetary policy transmission in China.	Conceptual framework

Liang (2007)	China and World Economy	Quantity view	- Capital inflows represent losses as the cost of obtaining foreign capital is greater than the yield earned on foreign government bonds in China.	Conceptual framework
Maswana (2008)	International Research Journal of Finance and Economics	Adaptive efficiency	- Adaptive efficiency is needed since the aim of financial institutions is to improve a given situation according to developmental goals and not to maximize any optimal profit or financial return in China.	Conceptual framework
Mehrotra (2008)	International Advances in Economic Research	Quantity view	- Excess liquidity leads to both higher output and consumer price inflation in China.	Empirical econometrics 1999-2005
Zhang and Pang (2008)	China and World Economy	Quantity view	- Excess liquidity has imposed significant pressure on inflation in China.	Empirical econometrics 1997-2007
Zhang (2009)	The World Economy	Quantity view	- Excess liquidity is a significant driver of price inflation in China.	Empirical econometrics 1998-2007
Agenor and Aynaoui (2010)	Journal of Banking and Finance	Quantity view	- Involuntary excess reserves make commercial banks less responsive to monetary policies.	Conceptual framework
Bouvatier (2010)	Applied Economics	Quantity view	- Real international reserve has negative relationship with real domestic credit was negative in China. - Open market operations and reserve requirements fail to completely drain the liquidity. The upsurge in international reserves has led to excess liquidity.	Empirical econometrics 1997-2006

Huang et al. (2010)	China Economic Journal	Quantity view	- Excess liquidity and output gap are the most important factors explaining the variance of CPI inflation in China.	Empirical econometrics 1997-2009
Yang (2010)	Frontiers of Economics in China	Quantity view	- The elasticity of inflation to excess liquidity is approximately unit, which reveals that the quasi-money is the main force behind inflation in China.	Empirical econometrics 1992-2007
Bondt et al. (2011)	Applied Financial Economics	Quantity view	- Periods with loose monetary policy, reflected in low deposit rates and ample liquidity conditions, have been associated with unwelcome stock price booms in China.	Empirical econometrics 1999-2009
Guo and Li (2011)	China and World Economy	Quantity view	- Excess liquidity has larger impact on housing prices than CPI in China.	Empirical econometrics 1998-2010
Acharya and Naqvi (2012)	Journal of Financial Economics	Quantity view	- Excess liquidity induces risk-taking behaviours of banks	Conceptual framework
Nguyen and Boateng (2013)	Journal of International Financial Markets, Institutions & Money	Quantity view	- Banks with larger involuntary excess reserves are less responsive to monetary policy interest rate in China. - In the presence of involuntary excess reserves, liquid banks are more responsive to monetary policy interest rate shocks.	Empirical econometrics 2000-2011
Nguyen and Boateng (2015)	International Review of Financial Analysis	Quantity view	- Involuntary excess reserves lead to more aggressive risk-taking of commercial banks in China. - Banks with larger involuntary excess reserves tend to reduce risk-taking	Empirical econometrics 2000-2011

			more rapidly under the tightening monetary policy regime.	
The PBOC's Response				
Gu and Zhang (2006)	China and World Economy	Quantity view	- Stricter capital control softens revaluation pressure, restrains speculative attacks, reduces external imbalances, and permits a balance of payment surplus to be sustained for a longer time in China.	Conceptual framework
Wang (2006)	China and World Economy	Quantity view	- Sustained high growth of China's foreign exchange reserves carries tremendous risks as the security of foreign exchange reserves affects a country's financial safety.	Conceptual framework
Makin (2007)	China and World Economy	Quantity view	- China's persistently large surpluses imply a significantly undervalued RMB.	Conceptual framework
Cruz and Walters (2008)	Cambridge Journal of Economics	Precautionary view	- Central banks should rely on capital control and restriction on currency convertibility instead of reserve accumulation to mitigate speculative attacks.	Conceptual framework
Aizenman and Glick (2009)	Review of International Economics	Quantity view	- The greater accumulation of foreign reserves has been associated with a greater intensity of sterilisation by developing countries in Asia and Latin America.	Empirical econometrics 1984-2007

Glick and Hutchison (2009)	Journal of Asian Economics	Quantity view	<ul style="list-style-type: none"> - Chinese sterilisation is incomplete. - The accumulation of foreign exchange reserves leads to high inflation rate given the ineffectiveness of sterilisation. 	Empirical econometrics 1998-2007
Wan and Chee (2009)	Applied Financial Economics	Precautionary view	<ul style="list-style-type: none"> - Regional excess currency reserve pooling will provide a workable framework to prevent future currency attacks and better utilization of reserves for regional investment and trade. 	Conceptual framework
Ouyang et al. (2010)	Journal of International Money and Finance	Quantity view	<ul style="list-style-type: none"> - China has been able to sterilise around 90% of capital inflows. 	Empirical econometrics 2000-2008
Wang (2010)	China and World Economy	Quantity view	<ul style="list-style-type: none"> - The effectiveness of China's sterilisation is almost perfect in terms of the monetary base, but not in terms of M2. 	Empirical econometrics 1999-2009
Kurihara (2011)	Global Business and Economics Review	Quantity view	<ul style="list-style-type: none"> - China has successfully completed sterilisation and capital mobility 	Empirical econometrics 1999-2008
Nguyen et al. (2015)	Applied Economics	Quantity view	<ul style="list-style-type: none"> - Chinese banks with positive involuntary excess reserves one period after a reserve requirement shock experience a significantly increased credit supply in response to an increase in reserve requirement ratio. 	Empirical econometrics 2000-2011