Chapter 3
Early Warning Indicators for Financial Vulnerabilities

This chapter considers the principles underlying the design and implementation of early warning indicators. We argue that indicators based on quantities—especially balance sheet aggregates—are most likely to yield indicators that issue warning signals well before vulnerabilities have grown too large for policy makers to control. As shown in Chap. 2, during the first phase of global liquidity, noncore liabilities of financial intermediaries were most likely to yield timely signals—as banks were center stage in intermediating credit growth. The second phase of global liquidity pivoted on the behavior of capital markets, so the behavior of fund managers should be reflected in the indicator. When credit growth is driven by corporate bond issuance by nonfinancial borrowers, aggregate issuance by corporates would be a useful indicator. In addition, if corporate borrowers engage in "carry trades" by borrowing in foreign currency (FCY) while holding the proceeds of corporate bond issuance in local currency financial instruments and deposits, then tracking the aggregate cash holdings of corporates would also yield useful information.

3.1 Principles for Selection of Early Warning Indicators

Finding a set of early warning indicators that can signal vulnerability to financial turmoil has always been a policy priority in emerging economies. In the aftermath of the global financial crisis, however, it has also become a paramount policy goal for advanced economies. There is ample literature on early warning indicators for financial crises, well described in a recent International Monetary Fund (IMF) survey (Chamon and Crowe 2012). Crises in emerging economies during the 1990s ignited much of the work. For example, in their overview of the literature as of 1998, Kaminsky et al. (1998) catalogued 105 variables that had been used until then. But the search deepened in the aftermath of the global financial crisis.

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Here, we review the principles behind the selection of early warning indicators based on Shin (2013). The conventional approach was to distinguish between crises in emerging economies from those in advanced economies—with a different set of variables for each group. For example, emerging economy crises focus on capital flow reversals associated with "sudden stops," where variables such as external borrowings denominated in FCY take center stage. For advanced economies, housing booms and household leverage were more important. This distinction is also reflected in the work of official multilateral institutions. The IMF has added a new vulnerability exercise for advanced economies (VEA) to an existing vulnerability exercise for emerging economies (VEE), which both feed into a joint early warning exercise with the Financial Stability Board (FSB).

Although the split between emerging and advanced economies helps improve the "goodness of fit," it tends to obscure common threads underlying both types of crises. Capital flow reversals in Spain and Ireland during the Eurozone crisis mimic many features of a "sudden stop," except that private sector fund outflows have been compensated for by the inflow of official funds. However, since the Eurozone crisis occurred in a common currency area, the traditional classification of emerging market "currency crises"—where currency movements play a key role—does not fit easily in an empirical exercise.

Given the common threads that tie together apparently disparate crises, it is useful to step back from the practical imperative of maximizing goodness of fit and instead consider the conceptual underpinnings of early warning models. The guiding theme here is that the procyclicality of the financial system provides an organizing framework for selecting vulnerability indicators, especially those associated with banks and financial intermediaries more generally.

To set the stage for our study, we consider the three broad sets of indicators for early warning purposes and assess their relative likelihood of success.

i. Indicators based on market prices, such as credit default swap (CDS) spreads, implied volatility, and other price-based measures of default or distress;
ii. Gap measures of the credit-to-GDP ratio; and
iii. Banking sector liability aggregates, including monetary aggregates.

The first approach (based on market prices) seems most appropriate for obtaining indicators of concurrent market conditions. But it is less useful in identifying early warning indicators with enough lead time for meaningful remedial action. The credit-to-GDP gap measure is a distinct improvement from the first. It boasts good pedigree from the work of economists at the Bank for International Settlements (BIS). And it has been explored extensively as part of the Basel III bank capital rules. However, some authors raise questions on the real-time properties of the credit-to-GDP measure.

The third approach—based on bank liability aggregates—rests on the same principles as credit measures. To the extent measures of bank liabilities also convey information on the size of consolidated bank balance sheets, they may be useful as a measure of financial vulnerability. As a measurement exercise, the balance sheet of the entire banking sector can be measured either in terms of assets or in

terms of liabilities, which may show different dynamics from the interest rates that most research tracks. Nevertheless, bank liabilities tend to be more transparent and homogenous than bank assets. Liabilities tend to be short term—mainly in the form of deposits—and hence, their book values are close to marked-to-market values. In addition, liabilities are more easily organized into core and noncore liabilities with contrasting cyclical properties. Noncore liabilities exhibit greater procyclicality, so the ratio of noncore to core liabilities provides useful information as an early warning indicator of financial vulnerability (Hahm et al. 2013).

One consequence of the monetary approach is that any measure derived this way will need to fit the specific institutional features of the financial system, rather than being applied universally in an unthinking way. These institutional details turn out to matter quite a lot. So for example, the People's Republic of China would need to heed quite different details of its financial system than, say, the Republic of Korea, which has a more open banking sector. One of the tasks is to set out a broader conceptual framework that allows us to encompass the different cases and to lay out the principles for when indicators should be used and under what circumstances.

Along with heeding institutional differences, we also need to transcend traditional thinking behind the definitions of monetary aggregates to make the approach useful. Whereas traditional definitions of monetary aggregates exclude liabilities between financial intermediaries, liability aggregates are perhaps the most informative of them all.

Before exploring the attributes of bank liability aggregates, we first discuss the relative merits of the three approaches to early warning indicators mentioned above.

Figure 3.1 shows the CDS spreads of Bears Stearns and Lehman Brothers, with the right-hand panel giving the longer term perspective and illustrating how these spreads increased sharply with the onset of the crisis.

It is remarkable how tranquil the CDS measure was before the crisis. There was barely a ripple in the series between 2004 and 2006, when vulnerability to financial crisis was building. The left-hand panel plots the CDS series for the precrisis period between January 2004 and January 2007. It shows that CDS spreads were

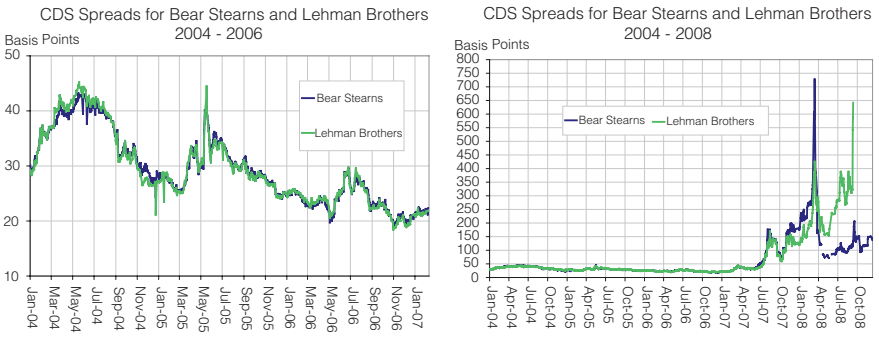

Fig. 3.1 Credit default swap (CDS) spreads for Bear Stearns and Lehman Brothers. *Note Left panel* 2004–2006, *Right panel* 2004–2008. *Source* Bankscope

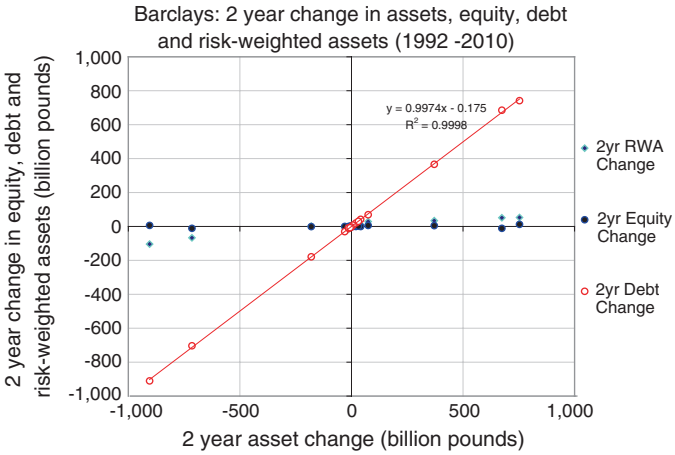

Fig. 3.2 Changes in assets versus changes in debt, equity, and risk-weighted assets of Barclays (1992–2010). *Source* Bankscope

actually falling, dipping below 20 basis points at the end of 2006. Other price-based measures, such as value-at-risk, implied volatility; structural models of default based on equity prices, among others, all paint the same picture.

The failure of price-based measures as early warning indicators can be traced to the implicit premise that market signals and decisions guided by those signals always interact in a stabilizing virtuous circle. Rather, they sometimes go astray and act together to amplify a vicious circle instead, where market signals and decisions made reinforce an existing tendency toward procyclicality.

To illustrate this, a scatter chart plots how much the change in balance sheet size of Barclays—a typical global bank—is financed through equity and how much through debt (Fig. 3.2). It also shows how risk-weighted assets changed as the balance sheet grows or shrinks.

The fact that risk-weighted assets barely increase—even as raw assets are increasing rapidly—is indicative of how measured risks (such as spreads or value-at-risk measures) move lower during lending booms. Lower measured risks and lending booms thus go together. The reverse causation also holds—the compression of risk spreads is induced by the rapid increase in credit supply chasing available credit. This two-way causation builds a feedback loop in which greater credit supply and the compression of spreads feed off one another.

This amplified procyclicality poses hard challenges for traditional thinking that puts faith in market discipline as an integral part of financial regulation—where prices are relied on to issue timely warning signals.

Indeed, market discipline was one of the three "Pillars" of Basel II. Economists associated with the Shadow Financial Regulatory Committee were influential here. Calomiris (1999) argued for rules requiring banks to maintain a minimum amount of subordinated debt, the rationale being that banks that take on excessive risk find it difficult to sell their subordinated debt. Thus, they will be forced to shrink risky

assets or issue new equity to comply with the discipline imposed by private uninsured creditors. However, the run-up to the recent crisis showed just how market risk premiums erode so as to nullify market discipline.

Larry Summers's quip (Summers 1985) that finance researchers need to show that "two-quart bottles of ketchup invariably sell for twice as much as one-quart bottle of ketchup" is related to the reason why price-based measures of early warning indicators will likely fail. Absence of arbitrage means that prices at a point in time are consistent, but they are liable to flip into distress mode (again, fully consistent across assets) with the onset of a crisis. If the task is to give prior warning of the onset of a crisis, price-based measures have little to say.

As the start of a crisis is often accompanied by a panicked run to the exits, the switch from a benign environment to a hostile one can be precipitous indeed. Global games literature illustrates how the transition into financial distress—the "tipping point"—is associated with self-reinforcing effects between individual constraints and market outcomes; how the onset of a crisis is triggered by apparently small changes in underlying fundamentals. Outwardly, the switch into crisis is almost self-fulfilling. Goldstein (2010) discusses how empirical research should take account of tipping points and shows how the global games framework (Morris and Shin 1998, 2001, 2008) is useful in a modeling exercise.

Market prices have been useful for early warning exercises precisely when the market price of risk is too low, rather than too high. Thus, it is when asset prices are too high relative to some benchmark that warnings are appropriate.

In their 2005 paper on the US housing market, Himmelberg et al. (2005) argued that a high price-to-rent ratio or high price-to-income ratio need not predicate a housing bubble—as discount rates implied by low long-term interest rates had also fallen. But as discount rates are prices, the combination of low discount rates and high housing prices is arguably the kind of point-in-time consistency in prices that Summers (1985) had in mind.

Under Basel III, the ratio of credit to GDP takes a central role as the basis for the countercyclical capital buffer. As shown by Borio and Lowe (2002, 2004), this ratio is useful as an indicator of the stage of the financial cycle. To the extent procyclicality drives financial vulnerability, detecting excessive credit growth is central. Normalizing credit to some underlying fundamental measure such as GDP—and detecting deviations from trend—would be one way to operationalize the notion of excessive credit growth.

However, although a credit boom is clear with hindsight, there are several challenges in using the deviation from trend of credit-to-GDP ratios as an early warning indicator in real time.

The first is the difficulty of estimating the trend that serves as benchmark for what is considered "excessive" growth. The difficulty is not unique to the credit-to-GDP ratio—it is shared by other macroeconomic time series. Edge and Meisenzahl (2011) find that ex post revisions to the credit-to-GDP ratio gap in real time are sizable for the US and as large as the gap itself. The source of the ex post revisions is not the revision of underlying data, but rather from the revision of the estimated trend measured in real time.

The second difficulty is that credit growth and GDP dance to somewhat different tunes over the cycle, so that the ratio of the two may sometimes issue misleading signals. Bank lending in particular may be influenced by preexisting contractual commitments, such as lines of credit, which are drawn down during a crisis. Ivashina and Scharfstein (2010) document the impact of lines of credit on credit growth during the recent crisis. Therefore, lending may continue to increase for some time after the onset of the crisis.

Repullo and Saurina (2011) show the credit-to-GDP ratio for the UK and its Hodrick–Prescott (HP)-filtered trend (Fig. 3.3). The HP filter parameter is set at $\lambda = 400{,}000$ as recommended by the Basel Committee, which effectively means a linear trend. The bottom panel shows the credit-to-GDP ratio "gap" between the credit-to-GDP ratio and the trend.

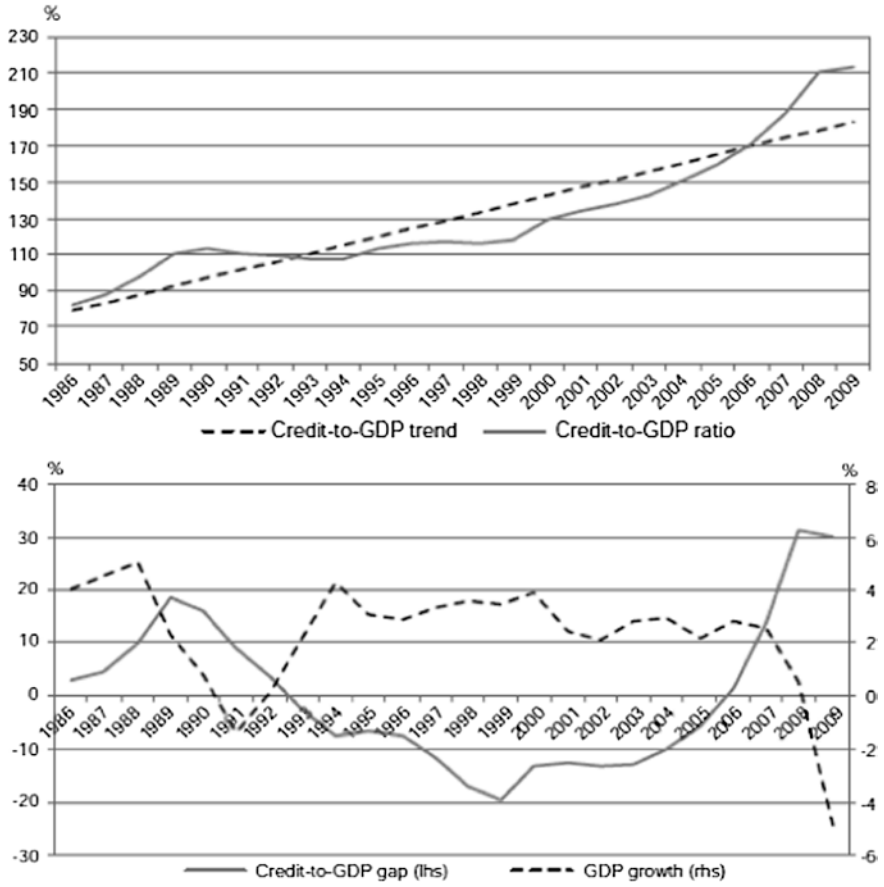

Fig. 3.3 Credit-to-GDP ratio and GDP growth—UK. *GDP* gross domestic product. *Note Top panel* shows UK credit-to-GDP ratio and its time trend (HP filter $\lambda = 40{,}000$), *bottom panel* shows credit-to-GDP gap and GDP growth. *Source* Repullo and Saurina (2011)

From the bottom panel, we note the gap measure is large even as GDP growth is falling sharply during the crisis. Thus, the ratio of the two gives a misleadingly large credit-to-GDP ratio during the crisis.

Basel III discussions give much prominence to the credit-to-GDP gap measure (BCBS 2009, 2010). To the extent the Basel rules are expected to be applied uniformly (or at least consistently), finding common thresholds for the credit-to-GDP ratio would be a basic requirement if Basel III is to apply uniformly to all Basel Committee member countries.

3.2 Core and Noncore Liabilities

In addressing financial system procyclicality, it is useful to distinguish between banks' core and noncore liabilities. Core liabilities are the funds banks draw on during normal times and are sourced (in the main) domestically. What constitutes core funding depends on the context and the economy in question, but retail household deposits would be a good first conjecture in defining core liabilities.

When bank assets grow rapidly, the core funding available will likely be insufficient to finance the rapid credit growth. This is because retail deposits grow in line with the aggregate wealth of households. In a lending boom, when credit is growing very rapidly, the pool of retail deposits will likely be insufficient to fund growth in bank credit. Other sources must be tapped. The state of the financial cycle is thus reflected in the composition of bank liabilities.

Banks' procyclical behavior has consequences for capital flows. Banks are intermediaries that borrow in order to lend, and they must raise funding in order to lend to their borrowers. When credit is expanding rapidly, outstripping the pool of available retail deposits, the bank will turn to other sources of funding to support credit growth, typically from other banks operating as wholesale lenders in the capital market. Here, there are close parallels between currency crises and credit crises. The link comes from the fact that the procyclical behavior of banks fueling the credit boom is financed through capital inflows entering via the banking sector. Indeed, one of the key results of our empirical investigation below is that the most consistently reliable indicator of vulnerability for both currency and credit crises is a high level of foreign bank liabilities.

By addressing the up-phase of the financial cycle—and the potential for the compression of risk premiums during lending booms—our approach differs from models of leverage constraints or collateral constraints that bind only during the downturn. In these models, lending is always below the first best. As well as the downturn, our focus is on the up-phase of the cycle when risk premiums become compressed, leaving the economy vulnerable to a potential reversal.

Figure 3.4 is a schematic illustration of the buildup of vulnerabilities associated with the growth of noncore liabilities. The bottom panel is the banking sector before a credit boom, while the top panel illustrates the system after the boom. As traditional deposit funding does not keep up with credit growth, the banking

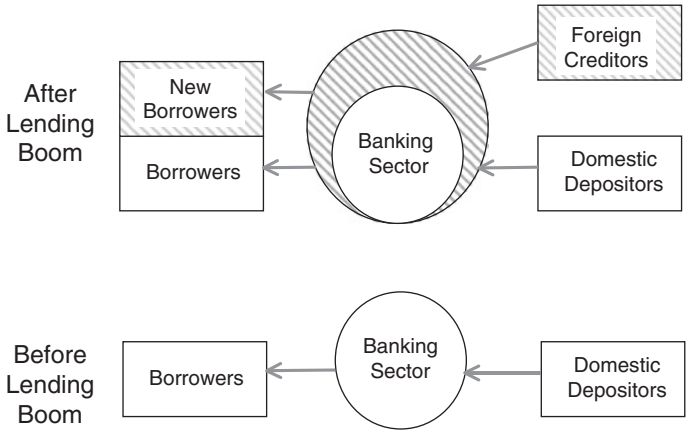

Fig. 3.4 Lending boom financed by noncore liabilities. *Note* Increased lending during a credit boom is financed by noncore liabilities. *Source* Authors' illustration

sector's expansion is funded by noncore liabilities (in this case, from foreign creditors), building vulnerabilities to foreign creditor deleveraging.

Two features distinguish noncore liabilities. First, they include claims held by intermediaries on other intermediaries. And second, they include liabilities to foreign creditors, who are typically global banks, and hence also intermediaries, if foreign ones. Even for liabilities to domestic creditors, if the creditor is another intermediary, the claim tends to be short term. The distinction between core and noncore liabilities becomes meaningful once there are differences in the empirical properties of the two types of liabilities.

Where the line between core and noncore liabilities lies depends very much on the financial system in question, its degree of openness, and stage of financial market and institutional development. For a developed financial system, as in the US or western Europe, the distinction between core and noncore liabilities seems reasonably well captured by the distinction between deposit versus nondeposit funding. Figure 3.5, taken from Shin (2009), shows the composition of the liabilities of Northern Rock, the UK bank whose failure in 2007 heralded the global financial crisis.

In the 9 years from 1998 to 2007, Northern Rock's lending increased 6.5 times. This increase in lending far outstripped funds raised through retail deposits, with the rest of the funding gap filled by wholesale funding.

The Northern Rock case illustrates a general lesson—that during a credit boom, the rapid increase in bank lending outstrips the core deposit funding available to a bank. As the boom progresses, the bank resorts to alternative, noncore liabilities to finance lending. Therefore, the proportion of noncore bank liabilities serves as a useful indicator of the stage of the financial cycle and the degree of vulnerability of the banking system to a downturn in that cycle.

For emerging or developing economies, including those in Asia, more thought is needed to find a useful classification system between core and noncore

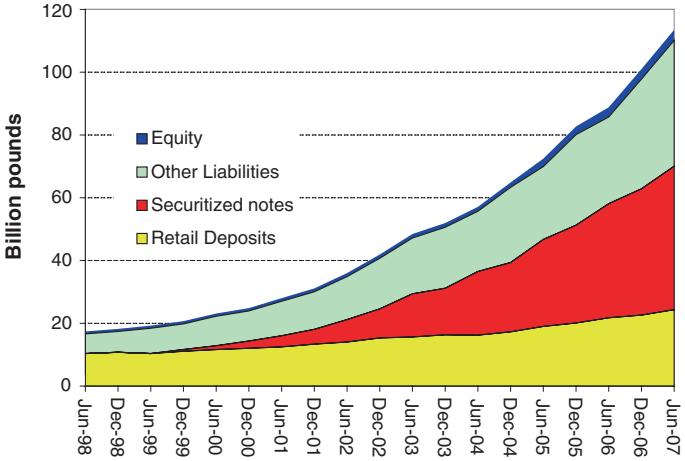

Fig. 3.5 Northern Rock liabilities (1998–2007). *Source* Northern Rock, annual and interim reports, 1998–2007

liabilities. In an open emerging economy where the banking system is open to funding from global banks, rapid increases in noncore bank liabilities show up as capital inflows through increased foreign exchange-denominated banking liabilities. For this reason, foreign exchange-denominated banking liabilities can be expected to play a key role in diagnosing potential financial instability.

For the Republic of Korea, Shin and Shin (2010) proposed a definition of noncore liabilities as the sum of (i) foreign exchange-denominated bank liabilities; (ii) bank debt securities; (iii) promissory notes; (iv) repos; and (v) certificates of deposit (CDs). This measure of noncore liabilities is an approximation of "true" noncore liabilities defined in our accounting framework above, as the classification remains based on financial instruments rather than actual potential claims. For instance, bank debt securities such as debentures and CDs can be held by households, which must be excluded from noncore liabilities.

Figure 3.6 illustrates the situation in the Republic of Korea. The right panel plots six categories of noncore bank liabilities taken from Shin and Shin (2010). It is notable how the first peak in noncore liabilities coincides with the 1997 crisis. After a lull in the early 2000s, noncore liabilities increased rapidly in the run-up to the 2008/2009 crisis.

The left panel plots noncore liabilities as a fraction of broad money (M2) and highlights the highly procyclical nature of noncore liabilities. There is much variation in the ratio of noncore liabilities to M2, ranging from around 15 % of M2 to a peak of 50 % following the bankruptcy of Lehman Brothers, the height of the 2008 global financial crisis.

The pronounced procyclicality of the noncore liability series for the Republic of Korea should not come as a surprise given what we know (from Chap. 2) about how banks manage their balance sheets and the perverse nature of demand and

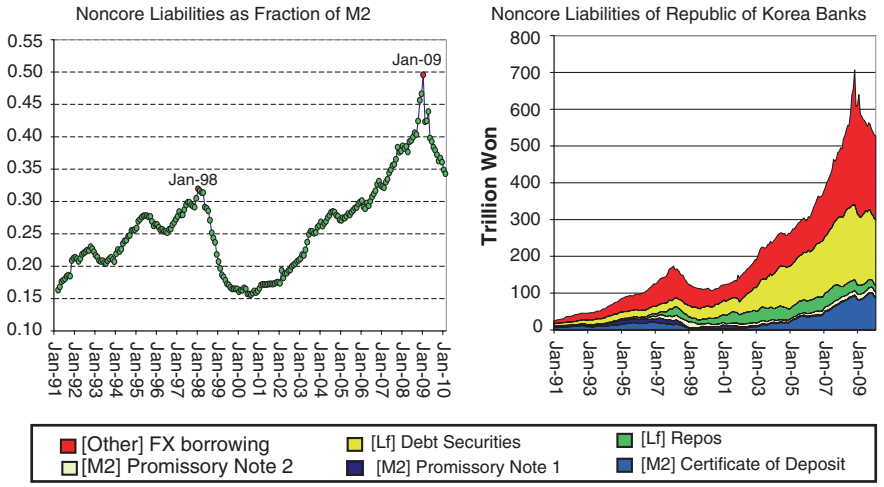

Fig. 3.6 Noncore liabilities of banks—Republic of Korea. *Note Right panel* plots six categories of noncore liabilities of Korean banks measured in Korean won. *Left Panel* plots noncore series as a fraction of broad money (M2). *Source* Bank of Korea and Shin and Shin (2010)

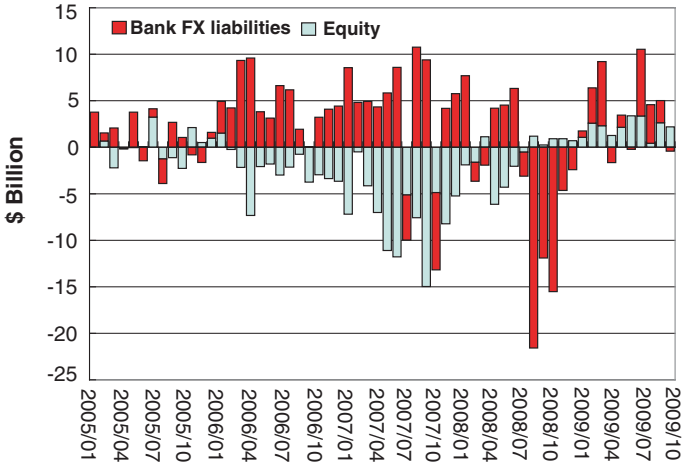

Fig. 3.7 Net capital flows of equity and banking sector. *Source* Shin and Shin (2010)

supply responses to asset price changes and shifts in measured risk. During a credit boom, when measured risks are low and funding from global banks are easy to come by, we would expect to see strong credit growth fueled by capital inflows into the banking sector, often in foreign exchange.

Figure 3.7 shows how capital flows associated with FCY bank liabilities played a key role in the foreign exchange liquidity crisis of 2008 in the Republic of Korea. The figure plots and compares capital inflows and outflows for equities and banks.

During the crisis period in 2008, the equity sector (in light bars) actually received net inflows. Contrary to the common misperception that foreign investors fleeing the Korean stock market were behind the capital outflows (perpetuated by television broadcasts after turbulent trading), net flows in the equity sector were positive immediately after the crisis hit.

There are good reasons why equity markets should see net positive flows during a crisis. Equity outflows are mitigated two ways. During a crisis, not only do stock prices fall sharply, but there is a steep local currency depreciation relative to the US dollar. For both reasons, foreign investors suffer a "double whammy" if they withdraw. Provided the exchange rate is allowed to adjust, equity outflows will not be the main culprit in draining FCY reserves. When Korean investors have equity investments abroad, repatriation flows back will outweigh outflows from foreign investors.

However, the banking sector is different for three reasons. First, FCY liabilities have a face value that must be met in full. Second, the face value is in FCY. And third, the dynamics of deleveraging sets off amplifying effects through price changes and shifts in measured risk.

For all three reasons, bank deleveraging is associated with precipitous capital outflows. Unlike long-term investors such as pension funds, mutual funds, and life insurance companies, leveraged institutions are vulnerable to the erosion of capital and hence substantially adjust their assets even when small shocks strike. The feedback loop generated by these reactions to price changes amplifies the shock.

As Fig. 3.7 shows, the banking sector in the Republic of Korea saw very substantial capital outflows in the aftermath of the crisis. In the three months after the Lehman bankruptcy, banking sector outflows reached $49 billion, which more than accounts for the decrease in the Republic of Korea's foreign exchange reserves—from over $240 billion before the Lehman crisis to $200 billion by the end of 2008. Bank deleveraging and the associated amplification effects figure prominently in emerging economy financial crises.

The sequencing of reforms matters as well. If liberalization of nonfinancial corporate funding proceeds ahead of bank liberalization—as was the case in Japan during the 1980s—it becomes profitable for large manufacturers to recycle liquidity and act as de facto financial intermediaries. They do this by raising funds in capital markets through securities and then depositing the funds in bank time deposits. This can dramatically increase the financial assets of nonfinancial corporations, along with their financial liabilities (Hattori et al. 2009). Figure 3.8 illustrates the change in financial structure that this liquidity recycling entails. When nonfinancial firms act as de facto financial intermediaries, M2 will rise rapidly due to increasing deposit claims on banks. Meanwhile, banks themselves will be under increasing pressure to find new borrowers—as one of their traditional customers (manufacturing firms) no longer needs funding. Instead, banks and manufacturing firms undergo a role reversal, with firms making deposits with banks rather than seeking loans.

When this happens, the distinction between core and noncore bank liabilities does not neatly coincide with the distinction between deposit and nondeposit

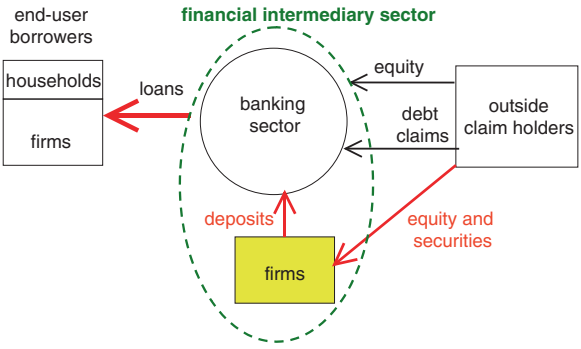

Fig. 3.8 Structural changes in financial intermediation. *Source* Authors' illustration

liabilities. In many developing economies at an early stage of financial development, or in those generally closed to the global banking system, the principle behind the distinction is better expressed as the distinction between retail household deposits and the wholesale deposits of nonfinancial companies.

In practice, however, classifying core and noncore liabilities is not so clear-cut. For small- and medium-sized enterprises (SMEs) with an owner-manager, bank deposits can be seen as household deposits. On the other hand, a firm could have access to market finance and the ability to issue bonds—depositing the proceeds in banks. This is what happened in Japan in the 1980s, for instance. This latter case should not be counted as a core liability as the creditor firm is acting like an intermediary borrowing from financial markets to lend to banks.

Thus, what is considered core or noncore will depend on an economy's financial system and its institutions. For economies with banks operating in developed, open capital markets, noncore funding will typically take the form of wholesale bank funding from capital markets, sometimes denominated in FCY. However, if the economy has a closed capital account with banks prevented from accessing foreign capital market funding, then what is considered noncore funding could be quite different.

A comparison between the PRC and the Republic of Korea helps illustrate this point. Figure 3.9 plots the monthly growth rates of various banking sector liability aggregates for the Republic of Korea (left panel) and the PRC (right panel). The growth rates have been filtered through an HP filter at business cycle frequency. The HP filter is used here with hindsight to highlight differences in time series patterns, as opposed to the real-time, trend-finding exercise under Basel III.

In the Republic of Korea, banks have access to capital markets, either directly or through the foreign bank branches operating in the economy. For this reason, the most procyclical components of bank liability aggregates are those associated with wholesale funding, especially the series for FCY-denominated bank liabilities. The other noncore liabilities are bank debentures, repos, and other nondeposit items such as promissory notes (Shin and Shin 2010). Before the 1997/1998 Asian financial crisis and the global financial crisis, noncore liabilities grew rapidly, only to crash when each crisis begins. In contrast, the growth of M2, reflecting household and corporate deposits, varies much less over the cycle.

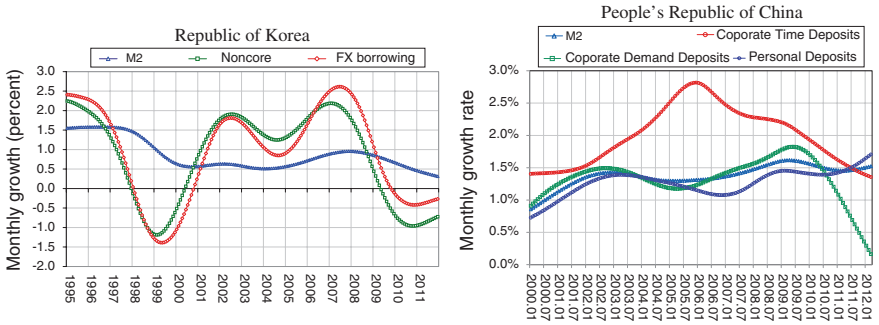

Fig. 3.9 Monthly growth rates of HP-filtered bank liability aggregates—People's Republic of China, Republic of Korea. *Source* Bank of Korea and People's Bank of China

The right panel of Fig. 3.9 shows that in the PRC, the M2 subcomponents exhibit considerable variation in time series properties. For an economy such as the PRC, where banks are prevented from accessing international capital markets, applying the same core and noncore liability classifications as in the Republic of Korea would be inappropriate.

More thought is needed on how financial conditions are transmitted across PRC's border. As mentioned above, just as water finds cracks to flow through, even a closed financial system is not entirely immune to global financial conditions. This is especially true for a highly trade-dependent economy such as the PRC. If banks are prevented from accessing international capital markets, then nonfinancial firms will act as conduit for transmitting financial conditions.

Similar to Fig. 2.16, Fig. 3.10 depicts the activities of a PRC nonfinancial firm with operations outside the country: one that borrows in US dollars from an international bank in Hong Kong, China, and posts renminbi deposits as collateral. The transaction would be akin to a currency swap, except that the settlement price is

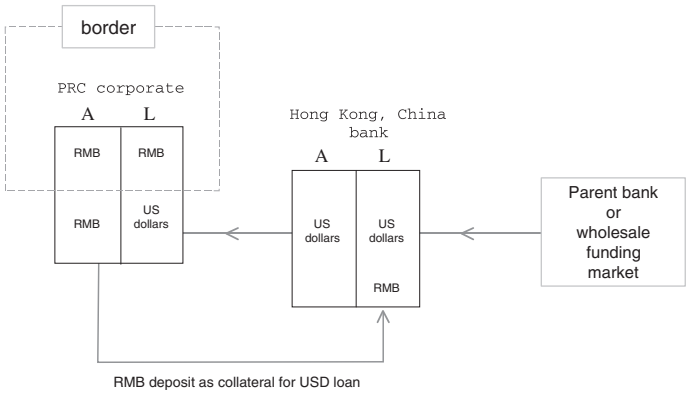

Fig. 3.10 Borrowing relationship structure among nonfinancial corporates in the People's Republic of China. *A* assets; *L* liabilities, *Source* Authors' illustration

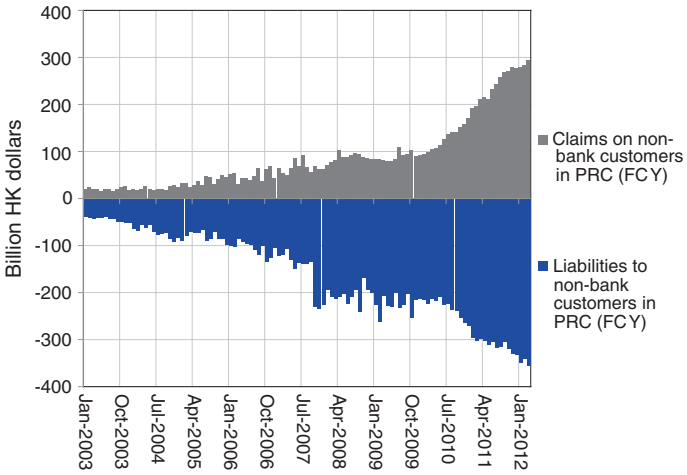

Fig. 3.11 Claims and liabilities of banks in Hong Kong, China, to nonbank customers in the People's Republic of China. *PRC* People's Republic of China, *FCY* foreign currency. *Source* Hong Kong Monetary Authority

decided at the outset. As mentioned earlier, the transactions instead resemble the operation of the old London Eurodollar market in the 1960s and 1970s. For the PRC firm, the purpose of having US dollar liabilities and holding the proceeds in renminbi may be to hedge export receivables or simply to speculate on renminbi appreciation.

Figure 3.11 provides the evidence for the transactions depicted in Fig. 3.9, plotting the FCY claims and liabilities of banks in Hong Kong, China, to customers in the PRC. In this case, the FCY would be (mainly) US dollars for assets and (mainly) renminbi for liabilities. Both have risen dramatically in recent years, reflecting the rapidly rising amount of US dollar funding available to nonfinancial corporates.

The procyclical pattern in corporate deposits visible in the right panel in Fig. 3.9 may be due to these activities among nonfinancial corporates. In addition, they may also explain why the PRC has seen dollar shortages when global funding markets deteriorated due to the Eurozone crisis. Then, the renminbi was under pressure and depreciated against the US dollar. Although the PRC banking system is largely closed, global activities of its nonfinancial firms are reflected in the corporate deposits within M2, when these firms hold the proceeds of US dollar liabilities in their PRC accounts.

Figure 3.12 illustrates the growth in the component of PRC money stock coming from corporate deposits rather than households. The left panel shows the time trend in personal deposits and corporate deposits, while the right panel shows the ratio of corporate to personal deposits. In recent years, there was an increase in the proportion of corporate deposits, which is consistent with the operations of PRC corporates.

The excess liquidity generated by nonfinancial corporate activity in the PRC is an important element of the credit boom. It is reminiscent of the lending boom

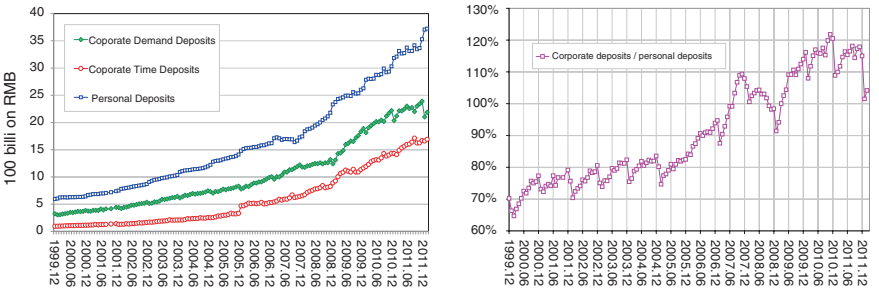

Fig. 3.12 Components of the monetary aggregates—People's Republic of China. *Source* People's Bank of China

in Japan in the 1980s following the financial liberalization that allowed Japanese companies to access global capital markets. Both in Japan in the 1980s and in the PRC more recently, monetary aggregates, especially corporate deposits, played the role of noncore liabilities in the way FCY borrowing by Korean banks played the role of noncore liabilities in the Republic of Korea. The point of contact between FCY liabilities in the Republic of Korea and the corporate deposits in the PRC is that both are bank liabilities.

This points to a broader theme of financialization of nonfinancial companies, where these firms take on attributes of financial firms by increasing the size of their balance sheets relative to their sales-generating activities. As a consequence, they help amplify financial cycles. Therefore, as monetary policy moves from the role of banks to the functioning of bond markets and the availability of credit to borrowers from long-term investors—such as asset managers acting on behalf of pension funds and insurance companies—the role of nonfinancial firms takes on increased significance.

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