

■ The role of the banking system in financial crises – a comparison between the crisis in Asia and the crisis in the Baltic countries

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The bankruptcy of the respected investment bank Lehman Brothers in September 2008 set off a wave of distrust between financial players that quickly spread around the world. Uncertainty about the creditworthiness of borrowers increased rapidly and the supply of credit dwindled. This resulted in a widespread economic downturn. One region that was hit particularly hard was Central and Eastern Europe, especially the Baltic countries. Today, almost two years later, the economies have begun to stabilise after major falls in GDP. The recovery has begun but is expected to go slowly, and many challenges still remain.

In many respects, events in the Baltic countries from the point when they joined the EU in 2004 to the start of the global financial crisis in 2008 are reminiscent of the events in several Asian countries that culminated in the Asian crisis of the late 1990s. In both of these regions, countries went through a transition from regulated economies to market economies in which the task of monetary policy became to maintain a fixed exchange rate. Both regions were also hit by a severe crisis after a long period of high economic growth, strong credit expansion, prolonged current account deficits and dramatic increases in property prices. Another common factor was that much of the capital came from abroad. Initially, this development was considered to be justified as both of the regions were expected to catch up with more developed countries. With hindsight, however, it is possible to see several signs that over-optimism took over.

¹ We would particularly like to thank Martin W Johansson, Kerstin Mitlid and Staffan Viotti for their valuable comments.

While there are many similarities between the regions, there are also major differences. One such difference is the banking system, especially with regard to ownership. In Asia, most of the lending was conducted by domestic banks which in turn funded their operations by borrowing from foreign banks. In the Baltic countries, the banking system is largely foreign-owned. The foreign banks may have contributed to the imbalances that were built up, but they may also have helped to slow down the downturn once the crisis was a fact. We will discuss this in this article. Foreign ownership may also have made it possible for the Baltic countries to opt for internal devaluation in an attempt to restore competitiveness rather than adjusting their exchange rates. Internal devaluation entails adjusting the real exchange rate by reducing wages and other components of public expenditure. However, as an internal devaluation is a long process it is also conceivable that it would lead to a more prolonged recovery.

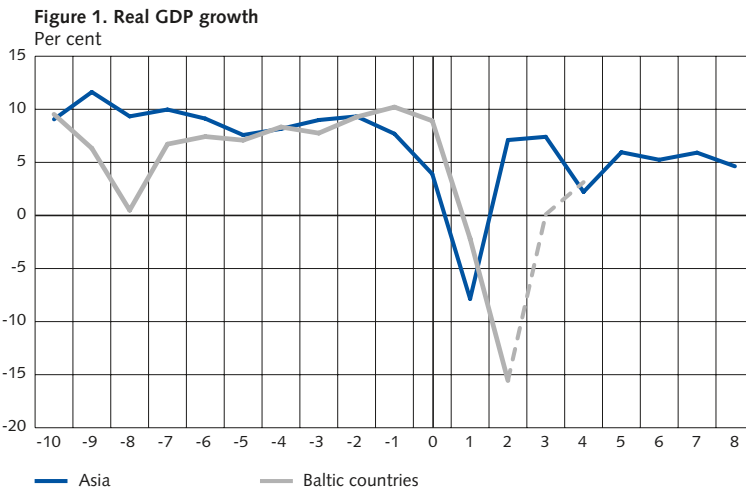
First, we describe developments in the two regions, beginning with the periods of growth. This is followed by a description of what triggered the crises and the consequences of the crises. We conclude with a discussion of the effects of the differences in the banking systems in the two regions. When speaking of the Asian emerging economies (“Asia”) in the 1990s we mean Malaysia, South Korea and Thailand. The Philippines and Indonesia are often included in this group but are excluded here as these countries are less developed than the Baltic countries and would therefore make it more difficult to compare the regions. The Baltic countries, that is Estonia, Latvia and Lithuania are often referred to as though they formed a single “Baltic region” despite the fact that they are three countries with their own specific characteristics and conditions. However, the economic upturn and the subsequent downturn in the three countries share many similarities, and the same is true of the other factors we will discuss here. Where relevant, we will discuss the countries separately.

In the graphs, the point marking the outbreak of the crisis, $t = 0$, has been set at 1997 for Asia and at 2007 for the Baltic countries. The reason for this is to make it easier for the reader to compare developments in the two regions even though there is a gap of 10 years between the two crises. It should be pointed out that the data is not of the highest quality in many cases and that data is not entirely comparable between the countries. The results should therefore be interpreted with caution.

Strong growth in the years before the crisis

Following the dissolution of the Soviet Union in the early 1990s, the Baltic countries underwent a transition from planned economies to market

economies. The financial markets were deregulated and economic growth picked up, although there was a temporary slowdown in connection with the Russian crisis in the late 1990s.² However, it was not until the Baltic countries joined the EU in 2004 and tied their currencies to the euro through ERM II in the following year, that growth really accelerated. Membership of the EU marked the start of a new era of confidence in the future with access to a larger market and the free movement of labour and capital. As a result, there was a rapid increase in the flow of capital to the Baltic countries. Domestic consumption soared from previously depressed levels, as did investment in housing. The rate of GDP growth was very high for a couple of years, at times reaching double figures, while real wages increased and living standards improved (see Figures 1 and 2). GDP per capita doubled during the 10 years that preceded the crisis. .

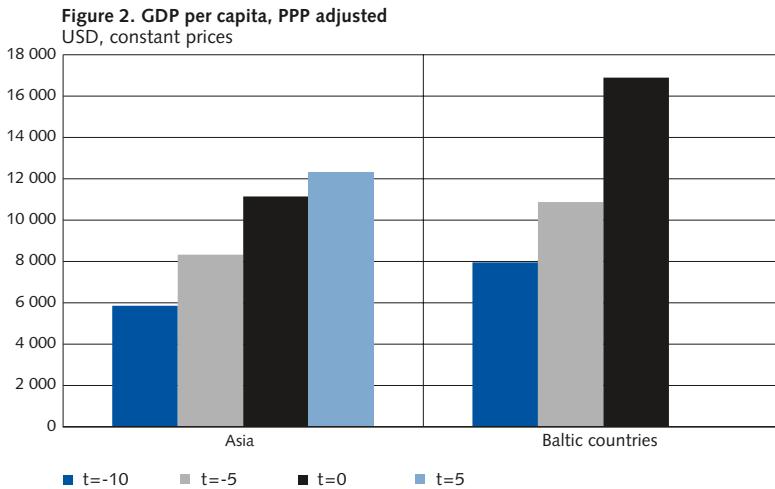


Note. Unweighted mean value.
 Note. For Asia t=0 is 1997, for the Baltic countries t=0 is 2007.
 Note. Broken lines are forecasts from Consensus Forecast, September 2010.
 Sources: IMF and Consensus Economics (Inc).

A transition similar to the one in the Baltic countries began in the late 1970s in a number of Asian countries, which during this period developed from agricultural economies into well-integrated market economies. In order to generate confidence in their currencies, most of these countries chose to tie their currencies to the US dollar, which in turn increased access to capital. Annual GDP growth reached approximately eight per

² In August 1998, the Russian stock market, money market and foreign exchange market collapsed. At the same time, Russia suspended payments on certain government securities. The crisis was triggered by a loss of confidence in the wake of the Asian crisis, but the underlying problems stemmed from the inability to manage domestic finances, political crises and an overvalued exchange rate. The Russian banking system collapsed in connection with the crisis and the country was excluded from international capital markets.

cent for several years in a row and, as in the Baltic countries, this led to a tangible increase in living standards (see Figures 1 and 2).

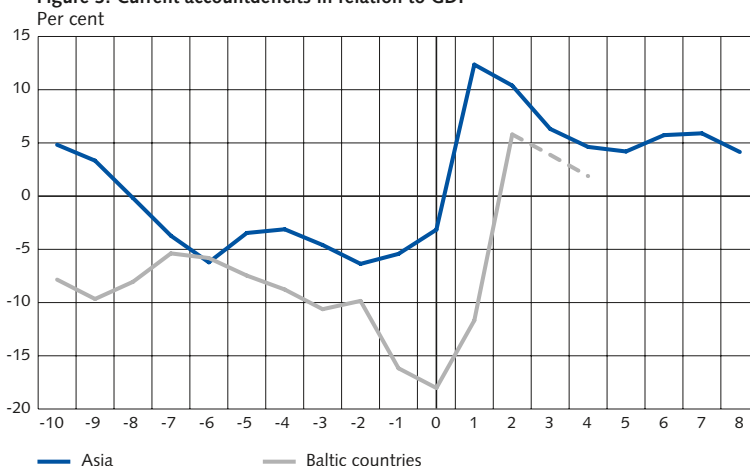


Note. Unweighted mean value.
Note. For Asia t=0 is 1997, for the Baltic countries t=0 is 2007.
Source: The World Bank.

The rapid economic development in the two regions initially followed the pattern that one can expect of transition economies striving to catch up with mature economies. The expectation that incomes would be permanently higher in the future encouraged loan-financed consumption. At the same time, low wages and high marginal yields attracted foreign capital, which then funded the development of the economies. Capital inflows were also facilitated by high confidence in the fixed exchange rates as they appeared to eliminate currency risk. This in turn entailed lower risk premiums and lower loan costs. At the same time, the high rates of growth led to unrealistic expectations of ongoing growth, which also contributed to the substantial capital inflows.

However, the net inflows of capital to the Baltic countries were larger in relation to GDP than they were in the Asian countries. These substantial capital inflows were reflected in the build-up of large current account deficits in the regions, although the average deficit was much larger in the Baltic countries than in Asia (see Figure 3). At this time, the Baltic countries had the largest deficits in Europe. This was not considered remarkable, however, given that current account deficits in growth years may be justified by the countries' attempts to catch up with mature economies.

Figure 3. Current account deficits in relation to GDP



Note. Capital inflows are not included in the current account. Income and expenditure relating to investments are, however, included.

Note. Unweighted mean value.

Note. For Asia $t=0$ is 1997, for the Baltic countries $t=0$ is 2007.

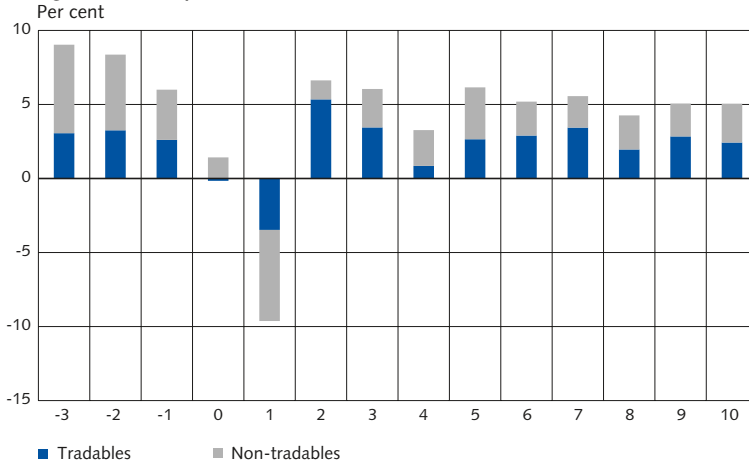
Note. Broken lines are forecasts from Consensus Forecast, September 2010.

Sources: IMF and Consensus Economics (Inc).

One problem, however, was that the strong growth that followed in the wake of the capital inflows was driven by investment in property and by consumption. A large part of the capital was thus channelled to non-tradables instead of to building up sustainable production capacity (see Figures 4 and 5). Development was also more extreme in this respect in the Baltic countries than in Asia. In Latvia, growth in non-tradables accounted for 77 to 95 per cent of total growth prior to the crisis. In Estonia and Lithuania the corresponding figure was 65 to 85 per cent. As a result, property and land prices increased dramatically during the growth years and then plummeted during the crisis.³ In Malaysia, the index for property-related shares increased by 330 per cent between 1990 and 1993, while the corresponding figure for Thailand was 500 per cent. In Estonia and Lithuania, property prices increased by approximately 120 per cent from 2005 to early 2007, which is when property prices peaked.

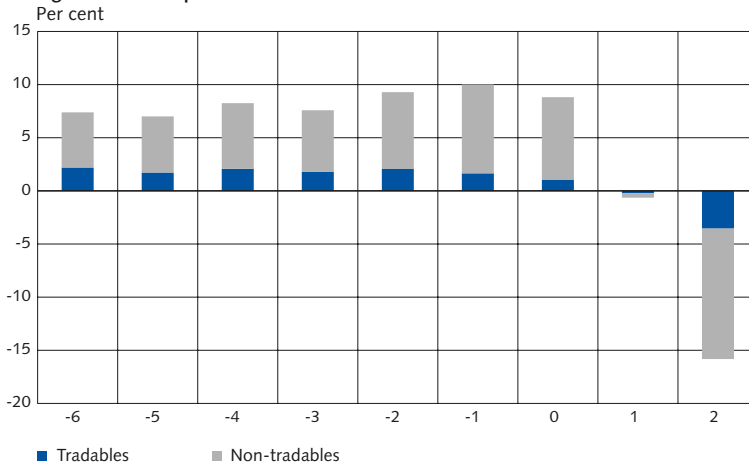
³ See Berg (1999) and Sveriges Riksbank (2007).

Figure 3. Growth per tradables and non-tradables in Asia



Note. Unweighted mean value.
 Note. Data unavailable for Malaysia.
 Note. For Asia t=0 in 1977.
 Source: Reuters EcoWin.

Figure 5. Growth per tradables and non-tradables in the Baltic countries is 1997

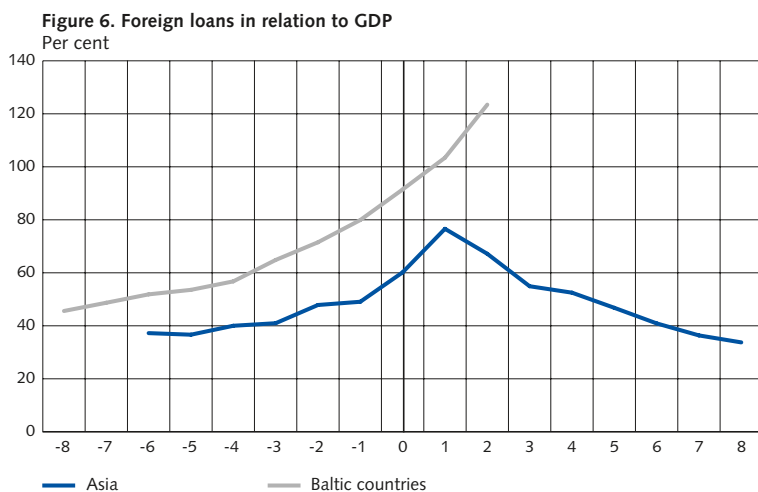


Note. Unweighted mean value.
 Note. For the Baltic countries t=0 is 2007.
 Source: Reuters EcoWin.

In the Baltic countries, an expansionary monetary policy also helped to stimulate the economy. Wages in the public sector were increased at the same time as the general tax burden was eased. Budget deficits increased in Latvia and Lithuania, despite the high level of growth. Estonia was an exception, however, as the fiscal surplus was saved in a so-called stability fund. This reduced the pressure on public finances when the crisis began.

Initially, the current account deficits in the Baltic countries were mainly funded by direct foreign investment, but in later years bank loans,

primarily from Nordic banks, predominated.⁴ This is reflected in the fact that foreign loans increased in relation to GDP (see Figure 6).



Nore. Unweighted mean value (not for South Korea)
Note. For Asia t=0 is 1997, for the Baltic countries t=0 is 2007.
Sources: Reuters EcoWin, Eurostat and IMF.

Lending to households and companies increased very rapidly – for example, borrowing by Latvian households increased by an average of 80 per cent in 2006. High inflation in combination with low interest rates meant that real interest rates were negative.

Even though lending increased from a low level, it did not take long before private debts in relation to GDP reached levels not far below the level of indebtedness in mature economies such as Sweden. A large part of the lending was also in euro – in Latvia, over 90 per cent of the loan stock was in foreign currencies.

In Asia too, there was a dramatic increase in foreign loans in relation to GDP. However, in contrast to the situation in the Baltic countries, the involvement of foreign banks was limited and the borrowing from abroad was instead channelled through domestic banks. Some of the capital inflows also went directly to domestic companies.⁵ It was also primarily the companies that increased their borrowing, while household borrowing increased to a lesser extent. The lending to companies was marked by great optimism, which to a certain extent may have been because the bank was often part of a group and was given the task of supplying other compa-

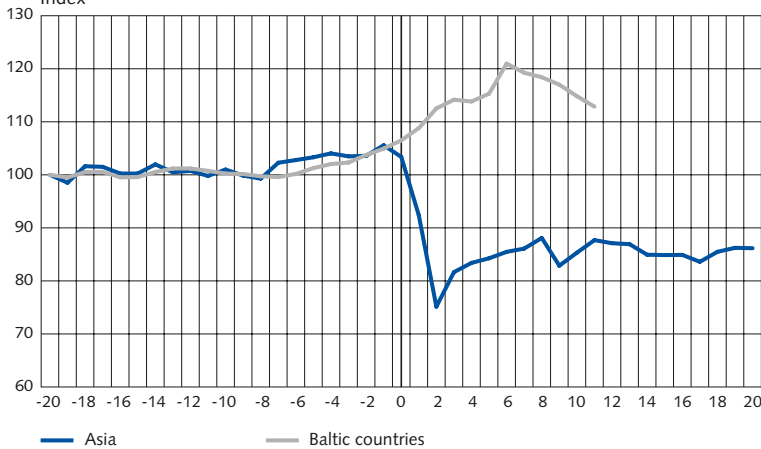
⁴ See Sveriges Riksbank, (2007).

⁵ Estimates in Radelet and Sachs (1998) show that at the end of 1996, the banks in South Korea accounted for 66 per cent of the external debts while the companies accounted for 28 per cent. In Malaysia, the banks accounted for 29 per cent and the companies for 62 per cent. In Thailand, the corresponding figures were 37 per cent and 60 per cent.

nies in the group with loans – a system that increased the risk of subjective judgments and *moral hazard*. Most of the lending was in domestic currency and, as few banks hedged themselves from currency risk, the banks or the companies that had borrowed directly from abroad ended up carrying major risks. In Thailand, the banks were required to protect themselves against currency risk, but they largely did this by providing loans in foreign currencies to domestic companies, thus transferring the currency risk to the corporate sector.⁶

Rapid economic development and the large capital inflows meant that the currencies in both regions appreciated in real terms. The average appreciation in Asia was actually moderate compared to previous experience in transition economies, but the level varied greatly from country to country. The currencies of Malaysia, Thailand and South Korea were tied to the US dollar. When the dollar appreciated significantly against the yen in 1995, the competitiveness of the Asian countries was weakened.⁷ In the Baltic countries, real exchange rates appreciated soon after the currencies were tied to the euro and competitiveness deteriorated (see Figure 7). This development was primarily driven by high wage increases and rapid price increases. In Latvia, for example, nominal wages increased by 30 per cent in the year preceding the crisis, while inflation reached almost 18 per cent. One result of this was that admission to the EMU was postponed as the countries were not complying with the price stability requirement in the Treaty of Maastricht.

Figure 7. Real effective exchange rates
Index



Note. Unweighted mean value.
Note. Quarterly data. 100 at t = -12, Q3 1994 for Asia and Q4 2004 for the Baltic countries.
Source: Bank for International Settlements (BIS).

⁶ See Eichengreen and Hausmann (1999).
⁷ See Corsetti et al. (1998).

Severe economic crisis

ASIA

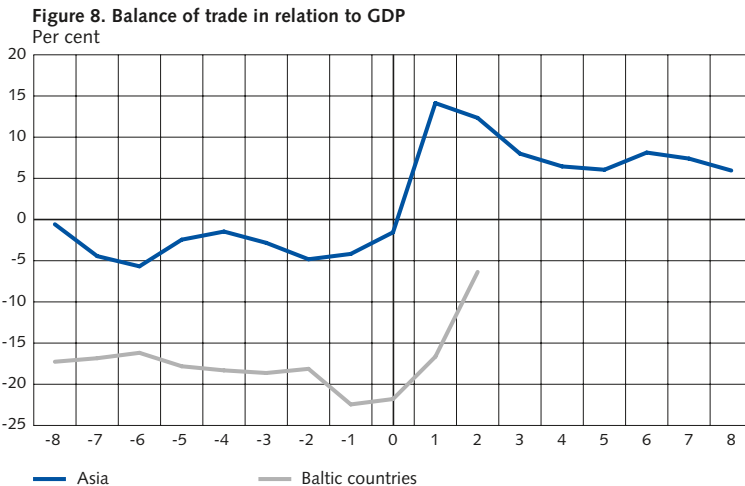
The first signs that the boom in Asia was coming to a close appeared in 1995 and 1996. At the same time, the macroeconomic imbalances in the region became increasingly apparent. The appreciation of the dollar undermined the competitiveness of the countries, as did China's advances on the export market. When growth declined at the same time, many companies in the region experienced problems. The companies also often had substantial loans and thus little chance of surviving a period of reduced profitability. In South Korea, several of the large conglomerates, so called chaebols, went bankrupt. In Thailand and Malaysia it was instead the previously thriving property sector that suffered extensive bankruptcies. The problems in the property sector had a direct impact on the banks.

As a result of these events, people began to increasingly question how much longer growth could continue in the Asian countries and the previous wave of capital inflows began to dry up. The summer of 1996 saw the first attacks on the Thai currency, the baht.⁸ At the same time as the Thai central bank defended the country's fixed exchange rate, it was forced to pump money into the country's stricken banks. It also became difficult for the central bank to defend the exchange rate using the interest rate – a higher interest rate made the situation worse for companies and banks. In early July 1997, the Thai central bank gave up and abandoned the fixed exchange rate. Malaysia was not as dependent on foreign capital as other Asian countries, but when Thailand abandoned its fixed exchange rate, confidence in the exchange-rate regimes of the other countries declined and the pressure increased. Malaysia's central bank abandoned its fixed exchange rate regime shortly after Thailand did so. In mid-October, Taiwan devalued its currency, which put further pressure on the South Korean currency. South Korea had used a large part of its reserves to support bank branches abroad that were experiencing liquidity problems. Following several attempts to defend the exchange rate, South Korea allowed the currency to float in November 1997. The devaluations marked the fact that the crisis had really arrived – capital inflows to the countries dried up completely when foreign banks decided not to renew their loans in the region. The domestic banks thus suffered an acute liquidity crisis. The devaluations also triggered a spiral in which foreign debt increased, banks and companies collapsed, asset prices plummeted and interest rates increased as a result of the reduced supply of capital. In some cases, domestic savers also withdrew their money from the banks.

⁸ See Kaminsky and Schmukler (1999).

The crisis had a huge impact on the financial sector in the respective countries, as did the rescue measures taken by the various governments. In both Thailand and South Korea, government efforts focused on closing down insolvent banks. In Thailand, 56 of a total of 91 financial institutions were forced into bankruptcy.⁹ At the same time, what remained of the financial system received substantial capital injections from the State. South Korea and Thailand received support from the IMF. The costs of these rescue measures seriously undermined public finances.

By the end of 1997, the currencies in the region had depreciated heavily. Although the weak currencies created problems for many banks and companies, they also boosted the recovery of the countries. In Asia, deficits quickly became substantial surpluses. Already one year after the outbreak of the crisis, the average current account surplus was more than 10 per cent of GDP. In contrast to the situation in the Baltic countries, the recovery in Asia took place at a time when the rest of the global economy was strong. There was a sharp increase in exports as a percentage of GDP, while imports remained at approximately the same level. After only two years, GDP had recovered to the level that prevailed at the start of the crisis and the balance of trade was in surplus (see Figure 8).



Note. Unweighted mean value.
Note. For Asia t=0 is 1997, for Baltic countries t=0 is 2007.
Source: Reuters EcoWin.

THE BALTIC COUNTRIES

In the Baltic countries, the banks began to gradually restrict their lending in 2007. This was one of the factors that led to a decline in domestic

⁹ See Corsetti et al. (1998).

demand, and the first signs that economic growth was beginning to slow down appeared in late 2007. However, the economic collapse did not come until almost a year later after Lehman Brothers filed for bankruptcy. The appetite for risk declined all over the world and development in the Baltic countries was increasingly regarded as being unsustainable. When the global economy then went into recession, exports from the Baltic countries also fell. The Baltic countries were thus unable to switch to export-driven growth when domestic demand declined. In 2009, GDP fell by 14 per cent in Estonia, 18 per cent in Latvia and 15 per cent in Lithuania. This represented a fall to the GDP levels of 2005. The entire increase achieved during the period of economic boom was thus cancelled out. Property prices also fell: from the peak in early 2007 to the trough just over two years later, nominal prices fell by between 50 and 70 per cent in the three countries.¹⁰ Nevertheless, the current account soon showed a surplus because imports fell more than exports. However, the trade balance in the Baltic countries is still negative, despite the fact that three years have passed since the downturn in the region began. In Asia, the balance of trade showed a surplus approximately one year after the crisis. Unemployment increased rapidly in all three countries and the credit-worthiness of the borrowers also deteriorated rapidly. The banks' lending declined and their loan losses increased. Major losses and an outflow of foreign deposits led to the largest domestic bank in Latvia, Parex Banka, being taken over by the State. Pressure on the currencies also increased, particularly in Latvia where the central bank was forced to purchase large quantities of lats in order to support the currency. Speculation about whether the country would devalue and the growing budget deficit finally forced the Latvian government to apply for financial support from the International Monetary Fund (IMF) and the EU, which was granted in December 2008.

Instead of writing down the value of the currency, the authorities in all of the three Baltic countries decided to implement internal devaluations, that is to reduce wages and other public expenditure. The intention was to halt the runaway deficits in the national budgets and to restore competitiveness. However, as the currencies were still tied to the euro the countries initially continued to lose competitiveness as the euro was strengthened when investors went looking for more secure investments. At the same time, exports from countries outside the eurozone increased when the currencies depreciated. It was, therefore, not until the second half of 2009 that the internal devaluations began to have the desired effects on the real exchange rates.

¹⁰ Refers to average nominal square-metre prices for apartments. Definitions may vary from country to country and comparisons should therefore be made with caution. Sources: Latvijas Banka and Lietuvos bankas.

The recession in the Baltic countries has now bottomed out and the recovery has begun. Exports have increased again and there are also signs that imports are beginning to recover.

Despite this, however, and despite the many similarities with the situation in the Asian countries, several factors indicate that the recovery will be slower and more prolonged in the Baltic countries.

First, domestic demand is expected to be weak for a long time to come.

Both the households and the companies need to amortise their large debts, which will reduce the scope for consumption and investment.

The internal devaluations will also have a dampening effect on domestic demand. Studies show that in Hong Kong, for example, it took six years before real consumption returned to the level that prevailed before the Asian crisis. Real investment, on the other hand, is still lower than it was before the crisis.¹¹ This may indicate what can be expected in the Baltic countries in the period ahead.

The crisis in the Baltic countries was triggered by the rapid decline in international demand when the global financial crisis began. The fact that the global economy as a whole is in recession is highly unusual, and has not happened in the modern era.¹² In contrast to the situation in Asia, the Baltic countries could thus not rely on strong demand abroad when domestic demand collapsed. Studies also show that recessions that coincide with financial crises, or with recessions in several other countries, tend to be more prolonged.¹³ Crises associated with major falls in property prices also tend to last longer.¹⁴ Although the global economy has begun to improve the recovery is still fragile, partly because the European debt crisis is casting a shadow over the future growth of the eurozone. This is creating uncertainty about the future development of the exports of the Baltic countries. In addition, the Baltic countries have chosen to strengthen their competitiveness by implementing internal devaluations. This has led to a slower adjustment process than in the Asian countries where the substantial currency depreciations immediately strengthened competitiveness and exports.

Another factor that indicates that the recovery in the Baltic countries may take longer than in Asia is that the imbalances in the Baltic countries appear to have been much greater when the crisis began. The current account deficits and the capital inflows from abroad were larger than in Asia. Growth in the Baltic countries was also dominated to an even greater extent by non-tradables.¹⁵ A sustainable, export-led recovery requires investment in the tradables sector.

¹¹ See IMF (2010).

¹² See for example Sveriges Riksbank, (2009a).

¹³ See IMF (2009a).

¹⁴ See IMF (2009b).

¹⁵ National statistics agencies

However, the internal devaluations may facilitate this structural transformation as lower costs may attract foreign companies to once again establish operations in the Baltic countries. Similarly, the fact that Estonia will join the EMU in January 2011 may contribute to this, as the risk of devaluation will then be entirely eliminated.

What role have foreign banks played?

Both crises were preceded by rapid credit growth. In Asia, as mentioned above, foreign banks had only a limited presence before the crisis began. In 1996, foreign banks controlled less than 4 per cent of the assets in Thailand. The corresponding figure in South Korea was 6 per cent. Malaysia was different in this respect in that it permitted foreign banks to have wholly-owned subsidiaries in the country, and the percentage of assets owned by foreign banks was therefore higher than in the other two crisis-afflicted countries at over 22 per cent.¹⁶ The limited presence of foreign banks in Asia was mainly due to a long tradition of strict regulation of the access and operations of foreign banks. Although, under the letter of the law, foreign banks were permitted in certain cases, in reality they were prevented from establishing operations in these countries. In Thailand, for example, no new banks licences for foreign banks had been issued in the 20 years before the outbreak of the crisis. The stock markets and bond markets in the region were also relatively undeveloped, which increased the importance of the domestic banks for the supply of capital. Nevertheless, the foreign banks came to have a major impact on the economies through their lending to domestic banks in the region.

Following the devaluations, confidence in the Asian economies evaporated and the domestic banks found it increasingly difficult to fund their operations. Capital inflows to the region dried up rapidly, and even became negative. It was overwhelmingly loans from foreign banks that dried up, while direct investment, which anyway constituted a very small part of the total capital inflows, was practically unaffected by the crisis (see Figure 6).¹⁷ The already considerable downturn in economic activity was also reinforced by the dramatic fall in the banks' capital as a result of substantial loan losses.

The Asian crisis gave rise to an extensive restructuring of the banking system. One of the consequences of this was an increase in the presence of foreign banks in the region as the authorities sold parts of the domestic banks, or even entire banks, to foreign investors.

In the Baltic countries, the modern commercial banking system began

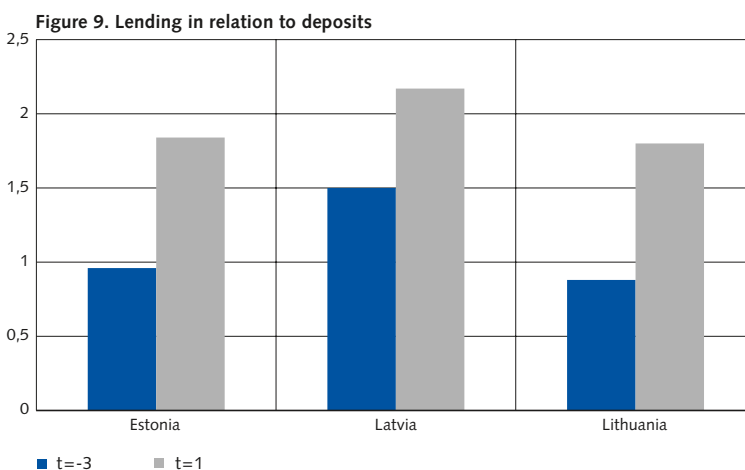
¹⁶ See Montgomery (2003).

¹⁷ See Radelet and Sachs (1998).

to take shape during the structural transformation that took place when the countries became independent in the early 1990s. Domestic banks such as Hansabank and Parex were among the first to set up business at this time. In the later 1990s, the Swedish banks Swedbank and SEB were among the first foreign banks to establish operations on the new market and did so by acquiring holdings in market-leading domestic banks. By means of gradual takeovers, the Swedish banks became majority shareholders in 2005 and the Baltic banks became subsidiaries in the respective bank groups. These subsidiaries also adopted the name of their parent bank as a sign of the Swedish banks' long-term commitment in the Baltic countries. It was around this time that expansion really accelerated in the region and the Baltic subsidiaries accounted for an increasing share of the bank groups' operating profits and lending. This share also continued to increase steadily until the financial crisis began.¹⁸

Today, the Swedish and other Nordic banks dominate banking operations in the Baltic countries to a varying extent. In Estonia, 95 per cent of the lending comes from Nordic banks, of which 80 per cent from Swedish banks. In contrast to the situation of the Asian countries at the time of the crisis there, this means that domestically-owned banks are practically non-existent. In Latvia and Lithuania, foreign banks are not as dominant and the domestic banks have significant market shares.

Initially, the funding of the Swedish subsidiaries in the Baltic countries largely took the form of deposits from the public but, as the demand for loans increased, an increasing share of the lending was funded using loans in euro from the parent banks. The rapid expansion of credit was



Note. Defined as lending to the public in relation to total deposits in the bank sector.
Sources: National central banks.

¹⁸ Nordea also has operations in the Baltic countries but these account for only a small part of the bank's total lending.

reflected by the fact that lending to households and companies increased dramatically in relation to deposits (see Figure 9).

In turn, the parent banks mainly funded their activities by borrowing euros on the international capital markets at very low interest rates. These could then be lent directly to the Baltic subsidiaries. As a result of the fixed exchange rates and the expectations that the countries would soon become members of the EMU, the currency risk was regarded as practically non-existent, which meant that the parent banks probably did not compensate for this. The Baltic subsidiaries were therefore able to access inexpensive funding despite the high risk. Overconfidence in the economies of the Baltic countries also meant that euro rates could be kept low for the customers despite the fact that the borrowers' incomes were in domestic currencies.

In relation to GDP, capital inflows were larger in the Baltic countries than in Asia. This could be seen in the ratio of foreign loans to GDP and in the proportion of short-term foreign loans in relation to the international reserves. However, despite great pressure on the reserves, particularly in Latvia, the central banks managed to maintain the fixed exchange rate.

One reason why foreign loans increased so much in the Baltic region before the crisis may be that the lending was from parent banks to their subsidiaries, which increases the risk of subjective judgments. Furthermore, the explicit objective of the banks was to gain market shares in the region. These could be factors that partly explain why the current account deficits grew so large in the Baltic countries. However, although the high level of lending may have contributed to the severe crisis that subsequently broke out, the presence of foreign banks may also have been a stabilising factor that meant that the fluctuations in capital flows were not as extensive as in Asia.

The Baltic subsidiaries did not suffer a liquidity crisis when the financial crisis began as they were largely able to rely on loans from their parent banks. The exposures of the Swedish parents to their Baltic subsidiaries actually decreased somewhat in connection with the crisis and the subsequent recession. But the parent banks nevertheless continued to supply their subsidiaries with loans to a great extent. Significant remaining exposures to the subsidiaries probably acted as incentives for this, and not extending the loans would have entailed major losses over and above the equity involved. A decision to not extend the loans would also have aggravated the economic downturn. The banks' reputations were at stake: they would probably have had to pay a price in terms of a loss of confidence if they had withdrawn from what was regarded as a domestic market.

The Swedish banks also strengthened the capital base of their subsidiaries, which made it possible to avoid a bank crisis despite substantial loan losses. The fact that government measures were not required to rescue systemically-important banks also meant that there was no need to burden public finances with the costs of an extensive bank crisis, as was the case in Asia. In Latvia, however, the government was forced to capitalise the domestic bank Parex.

The fact that it was possible to secure a large part of the capital inflows meant that the pressure on the Baltic currencies was lower than the pressure on the Asian currencies. Devaluation could therefore be avoided even though the pressure, above all on the Latvian lat, was very high at times. Maintaining the fixed exchange rate was thus in the banks' interests too as debts and loan losses would have increased very rapidly in the event of a devaluation.

Conclusion

Financial crises often follow a similar pattern and are often preceded by similar developments. This is demonstrated not least by the Asian crisis in the late 1990s and the crisis in the Baltic countries 10 years later. One similarity between the two regions was the great dependence on foreign, often short-term capital that was channelled to investment in non-tradables. The capital inflows were supported by fixed exchange rates that generated confidence in the currencies. With hindsight, it can be said that several of the similarities between the regions were signs of imbalances. It is also possible that the major presence of foreign banks contributed to the imbalances becoming much more substantial in the Baltic countries than they did in Asia.

Once the crisis arrived, however, it may be said that the Baltic countries benefited from the predominant position of the foreign banks as the capital fluctuations were not as dramatic as those in Asia. Withdrawing would have led to even greater losses for the banks than had so far been the case. In this respect, the high foreign debt of the Baltic countries did not become a problem to the extent it did in Asia. However, although the subsidiaries did not suffer a shortage of liquidity, the Swedish parent banks were punished for the high loan and devaluation risks in the Baltic countries. Funding costs increased and it became difficult to find funding at longer maturities, above all in foreign currencies. Financial institutions without direct exposures to the Baltic countries were also affected. This meant that Swedish authorities were forced to take measures to ease the funding situation of the banks. The Riksbank supplied the liquidity required and the Swedish National Debt Office introduced a government

guarantee programme for borrowing and a capital injection programme for solvent banks. This made it easier for the Swedish banks to meet their commitments in the Baltic countries which consequently, in contrast to the countries in Asia, were able to avoid a bank and currency crisis. The presence of the Swedish banks thus had a stabilising effect on the Baltic countries but, due to the integrated financial system, financial stability in Sweden was affected instead.

Several lessons can be learned from the crisis in the Baltic countries. One is that there are risks associated with a high level of borrowing in foreign currencies when the borrowers' incomes are mainly in domestic currencies. History is full of examples where this has led to major loan losses at banks in connection with devaluation.¹⁹ This is also demonstrated by events during the Asian crisis.

In the Baltic countries, this major credit risk became in turn a funding risk for the foreign parent banks and, ultimately, a cost for the authorities in the home countries of the parent banks when these banks found it difficult to borrow on the capital markets.

An important lesson to be drawn from the comparison between the crises is that the ownership structure in the banking system may be of decisive importance. If the countries in Asia had experienced such a severe economic downturn as the Baltic countries, the capital inflows would probably have dried up completely. The ownership structure in the Baltic countries led to a different outcome in which the capital stayed in the region, thus acting as a shock absorber when the economies crashed. It also made it possible for the authorities to opt for internal devaluation rather than devaluation of the exchange rate, although at the cost of a slower recovery.

¹⁹ See for example Sveriges Riksbank (2009b).

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■ Why banks prefer leverage?

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Introduction

The aim of this article is to study the implications of the new banking regulations for banks. We restrict our analysis to capital regulation. Even though the new banking regulations entail much more than updated capital regulation, increasing the quality and amount of equity in banks lies at the heart of the new regulations.

We start with a brief overview of the actual capital structure in banks. We then proceed with a detailed and structured discussion of why banks prefer debt as compared to equity. The benefits of debt are used to identify and quantify the effects of the capital regulation on banks.

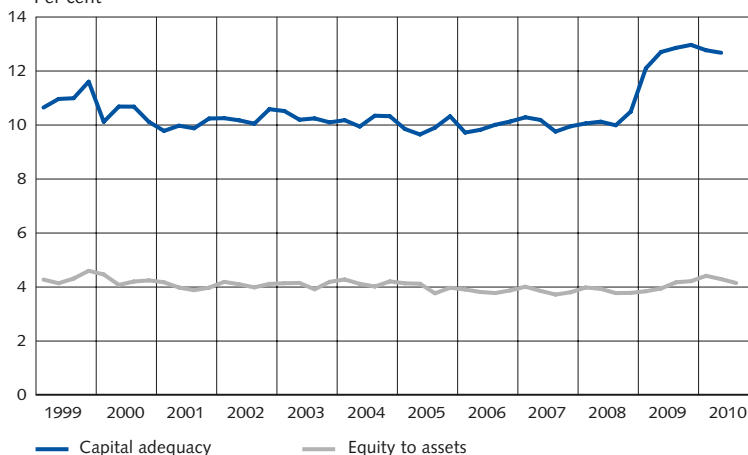
Capital structure in the banking sector

Before turning to the implications of the new capital regulation for banks, it may be useful to take a quick look at the capital structure in banks. Banks have historically had a high share of leverage in their capital structure. On average, Swedish banks have had equity-to-asset ratios close to 4% (see Figure 1).² This means that a bank loan of 100 units has on average been financed by 96 units of debt and 4 units of equity, implying a ratio of debt to capital equal to 24. Note also that the capital adequacy ratio, defined as the regulatory capital divided by risk-weighted assets, has been around 10%, that is 2 percentage points higher than the regulatory minimum. Without this voluntary buffer, the leverage ratio could have been even higher.

¹ Contact address: reimo.juks@riksbank.se. The author would like to thank Ferre De Graeve, Göran Lind, Kerstin Miltid, Olof Sandstedt, Albina Soultanaeva and Karl Walentin for helpful comments. The author is especially thankful to Staffan Viotti for his support and advice on the structure of the article.

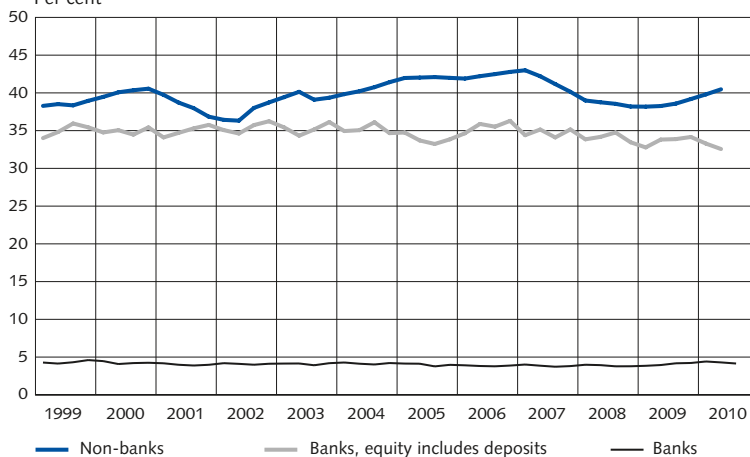
² Swedish banks are rather representative even for international banks. This ratio is similar for UK and US banks (see Haldane et al. 2009). Note also that the share of equity financing in banks have not always been that low. For instance, in 1880s banks in the US and UK had capital ratios equal to 24% and 16%, respectively (see Haldane et al. 2009).

Figure 1. Capital adequacy and equity-to-asset ratios in Swedish banks
Per cent



An even more suggestive picture appears when one compares capital structures in banks with those in non-banks (see Figure 2). On average, non-banks have equity-to-capital ratios close to 40%. This means that banks use a leverage ratio that is 16 times the one used in non-banks. One might argue that the leverage ratio in banks is high due to deposits. This is, however, incorrect: even after excluding deposits from the amount of debt, banks tend to be more leveraged than non-banks.

Figure 2. Equity-to-asset ratio in Swedish banks compared to non-banks
Per cent



Benefits of debt

Given the high leverage ratios in banks, it is natural to ask what the benefits of leverage are compared to equity financing in banks. Below we first

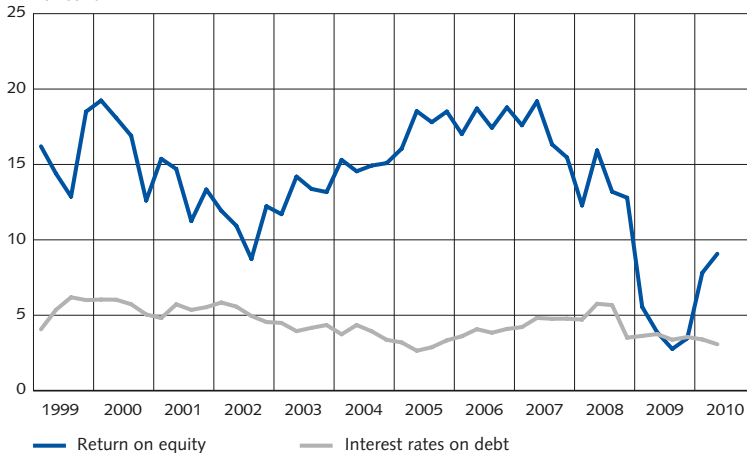
list and discuss the popular arguments made in favour of debt as compared to equity financing in banks. We then proceed with more structured arguments.

DEBT IS CHEAPER THAN EQUITY

A popular argument raised in favour of debt is that debt is cheaper than equity: the interest rates on debt are usually much lower than the required rates of return on equity. When one looks at the historical data, the cost of equity (measured in ROE) has been on average 9-10 percentage points higher than the cost of debt for the Swedish banks (see Figure 3).

A major problem with this argument is that it completely ignores the reasons why some rates of return are higher than others. When debt holders calculate their required rates of return, they take into account risks related to their investments. So do the equity holders. Therefore, the only reason why the equity holders demand a higher rate of return is because their claim is riskier than that of the debt holders.

Figure 3. Cost of equity and debt for Swedish banks
Per cent



But what is it that makes equity holders bear more risk compared to debt holders? To understand this, it is useful to think about equity holders as well as debt holders as a group of investors who together own an entity. This group of investors is entitled to the total cash flow that is generated by the entity. The risk that this group of investors must bear is determined by the magnitude and nature of this total cash flow. Entities that generate a low and uncertain cash flow are clearly more risky and hence less valuable than entities that generate a high and certain cash flow.

Importantly, this total level of risk has nothing to do with the way investors, as a group, share this risk among each other. If the entire entity were only financed by one investor, the total risk would be borne solely by that investor and the required rate of return would reflect the total risk. If the entire entity were financed by more than one investor, the total risk would still be the same, but it would be shared among many investors. The rules that determine how this risk is shared among various investors also determine the riskiness of every individual claim.

In the light of this discussion it is clear that the capital structure only determines how the total risk is borne by different claimants. Debt is a claim that is designed so that in general it assumes a very limited share of the total risk compared to equity. Thus, as banks increase the share of relatively safe leverage in their capital structure, they effectively shift a larger fraction of total risk to the equity holders. Even if a bank uses more “cheaper” forms of financing, their total financing costs will not decrease because the total risk has not changed.

The reasoning above is a simplified version of a very famous theorem in finance, called the Modigliani-Miller theorem. For more detailed information about this theorem, please see the Appendix.

DEBT HELPS TO MAXIMIZE ROE

Another popular argument raised in favour of debt stipulates that debt as opposed to equity is an essential part of the banks’ business because it helps to increase shareholder value via a higher return on equity, ROE.

This argument has two parts: (i) the relationship between leverage and ROE, and (ii) the relationship between ROE and shareholder value.

The first part of the claim is true only under certain special circumstances. ROE can be rewritten in terms of return on assets, ROA³:

$$ROE = \frac{ROA \cdot A - r \cdot D}{E} = ROA + \frac{D}{E} (ROA - r)$$

From this equation it follows that an increase in leverage ratio⁴, D/E , can increase ROE only if ROA is higher than the after-tax interest rate on debt, r . Therefore, higher leverage increases ROE in good times, but decreases ROE in bad times.

Of course, banks expect the return on assets to be on average higher than their interest rate on debt. Thus, it is true that a higher leverage ratio leads to a higher *expected* ROE. This leads to the second part of the

³ Return on assets, ROA, is defined so that it does not depend on the capital structure. This means the net income ignores the interest payments. This way of presenting ROE is taken from Admati et al. 2010.

⁴ Note that the amount of total assets is kept fixed.

claim: would shareholders prefer higher or lower *expected* ROE provided that the change in ROE comes from the pure changes in the capital structure?

Recall from the previous section that required rates of return are determined by the underlying risks. As the leverage increases, two things happen simultaneously: the expected ROE increases, but the share of total risk which is borne by the equity holders also increases. In the end, these effects balance each other so that the shareholder value remains unaffected. For an illustrative example, see the Appendix.

DEBT PROVIDES A TAX SHIELD

A relatively uncontroversial benefit of debt is related to taxes. The claim is that debt is preferable to equity because interest rate expenses can be deducted from the taxable income while dividends are not tax deductible.

The issue of taxes has two sides: the magnitude of benefits and the distribution of benefits.

As for the magnitude, Table 1 illustrates the tax effects stemming from increased equity financing on the total cost of financing. As banks substitute tax-favoured debt with equity, banks lose value due to the reduced tax shield. Taking the average interest rate on debt to be 7% and the tax rate on profits to be 30%, the changes in the weighted average cost of financing due to taxes are relatively modest. In an extreme case, banks that increase their equity-to-asset ratio by 10 percentage points (say from 4% to 14%), would experience an increased cost of funding by 21 basis points. This cost would fall by half if we were to use a more realistic 3.5% interest rate on debt.

It is important to note that the calculation presented above is likely to over- rather than underestimate the tax shield. It ignores the fact that banks have other opportunities to shield taxes, and that banks do not always have positive profits.

A completely separate issue is whether this lost tax shield is a legitimate cost to banks from the social point of view. Banks might indeed gain from this subsidy, but since this subsidy comes at the expense of the lost government revenue, this is just a wealth transfer from the government to banks and not a true cost to society. Therefore, even though the reduced tax shield might lead to an increased cost to the banks, the tax argument cannot be used against capital regulation.

DEBT HAS GOVERNMENT GUARANTEES

The most prominent explanation of why banks use so much leverage compared to equity is based on government guarantees.

To make the argument clear, let us first ask an intriguing question: what hinders non-banks from taking up as much leverage as banks do? Arguably, they also face a positive gap between the cost of equity and debt, want to make use of valuable tax shields and might also wish to cheer up their shareholders by maximizing the expected ROE.

One of the reasons why non-banks do not use a high leverage ratio is related to financial distress. The costs of financial distress are usually associated with the costs of default, such as various legal fees and the value lost during liquidation in the bankruptcy process. But financial distress can be very costly even if there is no actual default or bankruptcy. A highly levered firm is risky for various stakeholders. As a result, a levered firm finds it more difficult to sell its products, get inputs from suppliers and attract employees than an unlevered firm.

In addition to financial distress, there are two other reasons why non-banks do not use a high leverage ratio. The first is the so-called risk-shifting problem. As leverage increases, managers that act in the interests of shareholders have strong incentives to invest in projects that actually tend to decrease the total value of the firm. The reason why managers undertake these projects is that the equity owners pocket most of the gains in the event of success, while the losses in the event of failure are borne mainly by debt holders. Any actual benefit of risk-shifting for shareholders is, however, only illusory. In a rational world, debt holders will foresee the potential for risk-shifting and will demand an ex ante compensation for it. Ultimately, it is the shareholders who bear the full cost of risk-shifting.

The other reason is the so-called debt overhang problem. In the presence of a large, risky debt, firms might be unable to finance projects that would actually increase their total value. The reason is that most of the investment gains would go to the existing investors, especially to the debt holders, leaving the new investors without a required rate of return.

The costs of financial distress together with the problems of risk-shifting and debt overhang are the main reasons why the owners of non-banks are reluctant to make full use of the tax and other benefits of debt mentioned in the previous section. For banks, these leverage costs must be significantly smaller to justify an extremely high leverage ratio.

It is hard to see why these costs would be smaller for banks given the traditional maturity mismatch and hard-to-value assets in the banking sector. History has illustrated that even the slightest misperception of the bank's profitability might trigger a run on a highly levered bank. Given the illiquid nature of bank loans, such a run would be extremely costly and would probably lead to bankruptcy. Therefore, these costs usually tend to be larger rather than smaller for banks.

The reason why banks do lever up despite the seemingly high costs of leverage has to do with government guarantees. Banks, unlike non-banks, play a central role in the functioning of the entire economy. A crisis in the banking sector is likely to cause a crisis in the real economy, leading to various social-economic problems. A government cannot therefore refuse to bail out systemically-important banks. This means that governments provide explicit and implicit guarantees for banks' creditors who in turn will require a lower rate of return.⁵

Profit-oriented banks will exploit the implicit guarantees in two ways. First, they will increase the proportion of financing covered by these implicit guarantees. Secondly, they will also engage in risk-shifting activities. When extremely risky loans succeed, the banks' equity owners will pocket the gain; when they fail, the costs to equity owners will be limited to the amount of equity. It is the government who would step in to save the bank creditors, eliminating or reducing the usual market discipline of bank creditors.

How realistic is this argument of risk-shifting and government guarantees? Would not the government take steps to prevent this? Indeed, the problem of risk-shifting is nothing new to the regulators. The real challenge, however, has been to deal with it. As illustrated by the recent crisis, banks tend to find various ways to circumvent the regulations. Excessive reliance on short-term debt as well as securitize-and-buy-back types of arrangement are good examples of how banks got around the regulations. In the first case, the costs of refinancing risks were effectively transferred to the government and in the second case, larger risks could be undertaken without contributing enough equity.

One of the aims of the new banking regulations is to prevent banks from shifting various risks to the government.⁶ By demanding more and better-quality equity, the new capital regulation limit banks' ability to rely excessively on subsidized debt. Even though the reduction of subsidized debt in the banking sector increases costs to banks, it is not a cost from the social point of view. These government guarantees can be viewed in exactly the same way as the tax benefits associated with debt.

How large are the increased costs to banks from the reduction of subsidized debt? This clearly depends on the magnitude of government subsidy in bank debt. One way to calculate this subsidy is to use a capital asset pricing model (CAPM) that relates the required rate of return to the

⁵ By and large, all forms of financing sources have a certain degree of explicit and implicit guarantees. These guarantees are likely to be largest for more senior claims such as deposits and secured funding and lowest for more junior claims, just above the common equity.

⁶ The overarching goal of any regulation should be to increase general welfare. By limiting banks' ability to risk-shift, welfare is increased not only due to the lower probability of a financial crisis, but also due to limiting the resources devoted to projects that have negative net present value.

magnitude (measured as beta) and price of the risk (measured as risk premium). The discount in this framework would depend on two parameters: (i) a fall in the magnitude of risk in debt due to government guarantees and (ii) the magnitude of risk premium.

In the example presented in Table 1, an average investor in bank debt will require an interest rate that is 100 basis points lower due to the government guarantees.⁷ This result can be obtained from the realistic parameter values: bank debt has the true beta of 0.25, the debt, given that there are government guarantees, is risk free and the risk premium is 4%.

Are these effects large or small? To interpret the results correctly note that the equity-to-asset ratio rather than the capital adequacy ratio is used in the Table below. To obtain the changes in the capital adequacy ratio, the increase in the equity-to-asset ratio must be multiplied by the ratio of total assets to risk-weighted assets. For Swedish banks, this ratio was 2.5 in 2009. Therefore, an increase of 2 percentage points in the equity-to-asset ratio translates into an increase of 5 percentage points in the capital adequacy ratio, which is well above the new Basel standards. This means that the increased cost of financing to banks due to the capital regulations would be no more than 6-7 basis points.

Table 1. The increased costs of financing due to taxes and government guarantees

Changes in the cost of financing in basis points			
Increase in E/A	Tax effects	Guarantees	Guarantees and tax
2%	4.2	2.0	6.2
4%	8.4	4.0	12.4
6%	12.6	6.0	18.6
8%	16.8	8.0	24.8
10%	21.0	10.0	31.0

Notes: Interest rate on debt is 7%, tax rate is 30% and the government implicit guarantee to debt is 1%. The cost of financing is measured as the weighted average cost of capital, E/A is a proportion of equity in the financing structure

OTHER CONSIDERATIONS

In addition to the benefits of debt discussed previously, there are other arguments why debt might be preferable to equity. These include the disciplining role of debt, information sensitivity and the amount of equity capital in the economy. Even though none of these arguments can explain why banks prefer more leverage than non-banks, they do suggest some additional sources of costs to banks due to the new regulations.

Leverage as opposed to equity is considered as an important disciplining device for managers. This claim is based on the understanding

⁷ An alternative method of calculating this discount is to use credit ratings that separate government guarantees from the banks' internal financial strength. This method would give a discount of between 100-150 basis points.

that debt is a hard claim: it can force firms to bankruptcy, while equity cannot. Since bankruptcy is costly for managers, managers of leveraged firms have more incentives to act in the best interests of the owners. The weakness of this argument is that debt is a very crude disciplining device. Provided that other disciplining mechanisms are available to shareholders, such as compensation packages and the board of directors, it is not really clear why debt should play this role.

Another reason why debt might be preferable is based on asymmetric information. The new banking regulation might force banks to raise additional equity with the help of new rather than old investors. Due to asymmetric information problems, new investors are likely to require a premium over and above the risk-premium. Importantly, this discount is smaller for debt since debt is a safer claim than equity. This is a valid argument, but the effects are hard to quantify. Furthermore, with a relatively long transition period, banks can increase their equity with retained earnings which would eliminate these costs entirely.

The limited size of equity capital in aggregate is also sometimes mentioned as a reason why increasing equity financing might be costly. The claim is that the equity markets might be unable to accommodate massive equity issues by banks, unless significant discounts were offered.

While this is a legitimate concern, there are two conditions that must be fulfilled to make this effect substantial. The first condition is that professional investors, such as hedge funds, cannot arbitrage away factors that are unrelated to the fundamentals. One would think that in the presence of excess returns in the equity markets, professional investors would make use of these advantages until these excess returns are eliminated. The second condition is that non-banks themselves would not act as arbitrageurs by substituting equity with debt. For instance, if equity becomes relatively more expensive compared to debt, firms could add value by buying back some of their equity and issuing debt instead.

It is hard to see why these two conditions would hold in the current situation. There might be substantial limits to arbitrage in times of crisis, but not in normal times. Furthermore, it is hard to argue that there is or has been a shortage of risk capital. If at all, the argument is usually made in the opposite direction by claiming that the amount of capital has been too excessive to find risky investment opportunities.

Concluding remarks

We argue that the costs of the capital regulation for banks stem from taxes and government guarantees. Other costs related to various imperfections in the capital market might also arise, but are less likely. Reduced

tax shields and government guarantees are private costs to banks, but do not represent costs from the social point of view. All in all, the analysis indicates that the social as well as the private costs of equity financing in banks are small. Provided that there are substantial benefits from the higher equity financing in terms of the lower probability and costs of future financial crises, this implies a strong case for the higher capital requirements for banks.

Appendix: Modigliani-Miller theorem

The Modigliani-Miller theorem (1958) is perhaps the most important theorem in finance. Using non-arbitrage conditions, Modigliani and Miller (MM) showed that the value of the firm is not affected by its financing policy. The direct implication of this result is that various capital structure decisions, such as the proportion of equity in relation to the proportion of debt or the mix between short-term and long-term debt, are irrelevant under some conditions.

An easy way to understand the irrelevance theorem is to think in terms of risk and return. Since it is the asset side that determines the riskiness of the firm, the total cost of financing must be determined by the nature of total assets. The way a capital structure divides this risk between different investors should therefore have no consequences for the total value of the firm.

Like any theorem in science, the results of the MM theorem are obtained under some restrictive assumptions. Even though some of these assumptions are clearly at odds with reality, the MM theorem is an extremely powerful tool in understanding reality. The reason is that it presents a useful starting point for analysing any financing decision. The MM theorem pushes the analysis in the right direction: knowing the circumstance under which the financing decisions do not matter also tells us the circumstance under which they might matter.

There are two assumptions behind MM.⁸ The first is the so-called “**perfect markets**” assumption, which means that equity or debt issuances are fairly priced. The second is the so-called “**exogenous total cash flow**” assumption, which means that the total cash flow to all the firm’s claimants is unaffected by the firm’s financing choices. Both of these assumptions might fail under certain circumstances, breaking the irrelevance theorem.

The **perfect market** assumption is satisfied if markets are complete (i.e. any claim can be replicated), competitive and strong-form efficient, that is, all the private and public information is reflected in prices.

⁸ See Titman (2002) for a similar way of dividing the assumptions.

It is the last assumption that fails most often in real life. Managers usually know more about the underlying investment opportunities than outsiders, which introduces a wedge between external and internal financing (e.g. retained earnings). This in turn means that the value-maximizing firms tend to follow a pecking order. They rely first on internal sources, then on safe debt, risky debt and finally equity, which is the most information-sensitive claim.

The fact that markets are not strong-form efficient gives rise to the demand side for capital, as explained previously. However, the supply of investors' capital has so far played no role. If markets are complete and competitive, the supply of investors' capital is perfectly elastic at a price that reflects the fundamental value of future cash flows. This renders no role for investors' tastes and market timing.

However, even market completeness and competitiveness might be questioned in real life. It is well known that markets can be hot and cold, especially for junior claims such as equity and junk bonds. It is also clear that markets are not necessarily complete. Investors cannot necessarily undo all the financing choices of the firm to obtain their desired pattern of cash flows.

The **exogenous cash flow** assumption is satisfied if there is no asymmetric tax treatment, no cost of financial distress, no transaction or agency costs. All these assumptions are likely to fail in real life.

Taxes usually make debt financing cheaper than equity financing. Since interest rate payments are tax deductible while dividend payments are not, the total cash flows to all investors are no longer independent of the capital structure.

Debt has the potential to increase the total cash flows also in the absence of taxes. Leverage is considered as a disciplining device for managers. Since debt can force firms to bankruptcy, which is costly for managers, managers of leveraged firms have more incentives to act in the best interests of the firms' investors.

But debt can also reduce total cash flows. A highly-levered firm is likely to be perceived as risky by various stakeholders. As a result, it will find it more difficult to sell its products, get inputs from suppliers and attract employees than it would with a lower level of leverage. A high level of risky debt also leads to conflicts of interest between shareholders and debt holders, which also reduces the firm's value.

A stylized example

An entrepreneur has an investment project, which requires 1 unit of investment capital today. The cash flow that the project generates in the next

period depends on the state of the economy: 3.15 units in a state of boom and 1.05 units in a state of bust. The states occur with equal probabilities. The risk-free interest rate is 5%. The investment of 1 unit to the stock market index would generate 2.8 units in a state of boom and 0 units in a state of bust. These assumptions are summarized in the table below.

	BOOM	BUST	Expected
Cash flow to firm	3.15	1.05	2.1
Cash flow from stock market	2.8	0	1.4
Return	180%	-100%	40%
Investment needed	1		
Risk-free interest rate	5%		

How should the entrepreneur finance the project to maximize the value to himself? Let us consider two options: pure equity financing and pure debt financing.

Equity financing

The entrepreneur could sell a stake in the firm to outside investors. Since the funds required to undertake the investment project are equal to 1 unit, the stake sold to the new equity holders must be worth 1 unit. In order to calculate the percentage of the firm that must be sold to the outside investors, we must know the value of the entire firm which is given by the magnitude and nature of the cash flows. How much would any person be willing to pay today to obtain the cash flow in the next period as outlined above?

PRICING BY ARBITRAGE

One way to obtain the value of the cash flows generated by the firm is to replicate the firm's cash flows using the portfolio of stocks and risk-free bonds. An investment of A units in stocks and B units in bonds today would generate $2.8*A + 1.05*B$ in the boom and $1.05*B$ in the bust. To replicate the firm's cash flows, A and B must be 0.75 and 1 respectively (see the Table below). Two assets that have exactly the same cash flows must

REPLICATING PORTFOLIO	BOOM	BUST
Invest in stocks A	$A*2.8$	0
Invest in risk-free bonds B	$B*1.05$	$B*1.05$
Replication portfolio	$A*2.8+B*1.05$	$B*1.05$
Value if $A=0.75$ and $B=1$	3.15	1.05
Cash flow to be replicated	3.15	1.05

also have exactly the same value on an arbitrage-free market. Therefore, the value of the firm's cash flows is $0.75+1=1.75$.

Given the total value of the firm, it is easy to calculate the fraction that must be sold to the outside investors. This fraction is equal to $1/1.75$ or approximately 57.1%. The expected cash flow to new investors is 1.2 units, implying a rate of return equal to 20%. The expected cash flow and value to the entrepreneur are 0.9 and 0.75 units, respectively.

DEBT FINANCING

Alternatively, the entrepreneur could borrow all the money from the debt markets. The debt would be risk-free since the cash flows in all the states from the firm would be enough to make the debt payments. The cash flows to the entrepreneur would be as presented in the Table below. Note that the entrepreneur now obtains much higher expected cash flows than before with the equity financing (1.05 compared with 0.9), but the variation in the cash flows has also increased.

PURE EQUITY	BOOM	BUST	Expected
Cash flow to firm	3.15	1.05	2.10
New investors (57.1%)	1.80	0.60	1.20
Entrepreneur (42.9%)	1.35	0.45	0.90
DEBT FINANCING			
Cash flow to firm	3.15	1.05	2.10
Debt payment	1.05	1.05	1.05
Cash flow to entrepreneur	2.10	0.00	1.05

To find out how the entrepreneur values these cash flows, we can use the same replicating portfolio and non-arbitrage technique as before. It can be easily shown that the cash flows to the entrepreneur in the case of debt financing can be replicated by the investment to stocks equal to 0.75.

We can conclude that the value of the cash flows to the entrepreneur does not depend on whether debt or outside equity is used to finance the project. The result can easily be generalized to any combination of debt and equity financing, including risky debt. Note also that no specific asset-pricing model was needed to obtain this result.

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