OESTERREICHISCHE NATIONALBANK
EUROSYSTEM

# FINANCIAL STABILITY REPORT 25

Stability and Security.

JUNE 2013

The OeNB's semiannual Financial Stability Report provides regular analyses of Austrian and international developments with an impact on financial stability. In addition, it includes studies offering in-depth insights into specific topics related to financial stability.


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# Contents



Editorial close: June 12, 2013

# Call for Applications: Visiting Research Program

The Oesterreichische Nationalbank (OeNB) invites applications from external researchers for participation in a Visiting Research Program established by the OeNB's Economic Analysis and Research Department. The purpose of this program is to enhance cooperation with members of academic and research institutions (preferably postdoc) who work in the fields of macroeconomics, international economics or financial economics and/or pursue a regional focus on Central, Eastern and Southeastern Europe.

The OeNB offers a stimulating and professional research environment in close proximity to the policymaking process. Visiting researchers are expected to collaborate with the OeNB's research staff on a prespecified topic and to participate actively in the department's internal seminars and other research activities. They will be provided with accommodation on demand and will, as a rule, have access to the department's computer resources. Their research output may be published in one of the department's publication outlets or as an OeNB Working Paper. Research visits should ideally last between three and six months, but timing is flexible.

Applications (in English) should include

- a curriculum vitae,
- a research proposal that motivates and clearly describes the envisaged research project,
- an indication of the period envisaged for the research visit, and
- information on previous scientific work.

Applications for 2014 should be e-mailed to *eva.gehringer-wasserbauer@oenb.at* by November 1, 2013.

Applicants will be notified of the jury's decision by mid-December. The following round of applications will close on May 1, 2014.

Financial stability means that the financial system – financial intermediaries, financial markets and financial infrastructures – is capable of ensuring the efficient allocation of financial resources and fulfilling its key macroeconomic functions even if financial imbalances and shocks occur. Under conditions of financial stability, economic agents have confidence in the banking system and have ready access to financial services, such as payments, lending, deposits and hedging.

# Reports

The reports were prepared jointly by the Foreign Research Division, the Economic Analysis Division and the Financial Markets Analysis and Surveillance Division, with contributions by Dominik Bernhofer, Gernot Ebner, Eleonora Endlich, Maximilian Fandl, Andreas Greiner, Maria Ilieva, Stefan Kavan, Gerald Krenn, David Liebeg, Benjamin Neudorfer, Caroline Niziolek, Stefan Schmitz, Josef Schreiner, Ralph Spitzer, Alexander Trachta, Eva Ubl, Walter Waschiczek and Tina Wittenberger.

# Management Summary

## Central Bank Action Supports Economic Outlook and Reduces Financial Tensions

The outlook for the global economy remained subdued in the first half of 2013. While GDP growth in emerging economies was slightly below expectations, economic activity has been stronger in the U.S.A. The euro area is still struggling to grow, facing its second year of economic weakness in 2013. Across euro area countries, however, growth remained quite mixed.

Strong policy signals by the ECB – such as the announcement of Outright Monetary Transactions (OMTs) – helped substantially ease financial tensions in the euro area in the review period. Tighter sovereign bond spreads in stressed economies also reflected this improvement. Fiscal and structural reforms at the Member State level and the completion of the negotiations on a financial assistance program for Cyprus contributed positively to financial stability, alongside with the progress toward a banking union. However, the financing conditions for SMEs in stressed economies have remained difficult.

Against the background of improving financial stability in the euro area and reflecting the ongoing accommodative stance of some key central banks, conditions in the financial markets in Central, Eastern and Southeastern Europe (CESEE[1]) remained broadly calm in the first half of 2013. Notable cross-country heterogeneities have persisted, however. The amount of outstanding loans to the private sector decreased in most countries in the second half of 2012. In particular, cross-border loans and domestic credit denominated in foreign currency declined, while domestic loans in local currency increased. Credit supply factors may have contributed to this reduction at least in some economies, although deteriorating macroeconomic conditions are likely to have adversely impacted on credit demand as well.

## Subdued Growth of Austrian Enterprises' and Households' Indebtedness

In the first quarter of 2013, the Austrian economy stagnated for the fourth quarter in a row. Consequently, corporate profitability lost momentum in 2012 while at the same time external financing of nonfinancial corporations was less than half the – extraordinarily high – 2011 figure. Loan growth has been on a downward trajectory since last autumn. On the one hand, this mirrored lower financing needs due to lower investment activity. On the other hand, Austrian banks have tightened their lending policies slightly because of both the costs related to their capital position as well as heightened risk concerns reflecting the economic slowdown. Despite this deceleration, the Austrian corporate sector escaped the decline in bank loans witnessed in the euro area as a whole. Additionally, bond financing by corporations remained vigorous.

Financing conditions for enterprises and households have remained favorable despite somewhat tighter terms and conditions as interest rates fell further until the first quarter of 2013, supporting firms' and households' ability to service their debt. However, an above-average share of variable rate loans also exposes the private sector to interest rate risks. Both corporate and household debt grew only modestly in

[1] *All CESEE countries as listed in this report are listed in Table A24.*

2012, but corporate debt relative to income still exceeded pre-crisis levels.

The continuously high share of foreign currency loans remains a significant risk factor for households (and the banking sector). In the first quarter of 2013, the share of household loans denominated in foreign currency had fallen by roughly 8 percentage points since 2008, but at 23%, it was still very high.

Households' financial investment remained subdued in 2012 while at the same time the low interest environment fostered a shift to short-term deposits. After the substantial (unrealized) valuation losses in their securities portfolios recorded in 2011, Austrian households registered valuation gains in 2012.

## Austrian Banking System Needs Further Strengthening

2012 turned out to be a better year for the Austrian banking system than 2011. But these improvements may not be of a lasting nature, as the rebound of profitability was mainly due to one-off effects, and asset quality is still an issue of concern. While at home, credit quality remained fairly good, at Austrian banks' CESEE subsidiaries it continued to deteriorate. Operating results were rather weak in 2012, as risk costs continued to weigh on net profits. Net interest income, which traditionally accounted for more than half of total operating income, as well as fees and commission income decreased while trading income and other operating income grew relatively strongly. Austrian banks' activities in CESEE again contributed substantially to the sector's consolidated profit. However, developments in individual CESEE countries have become increasingly heterogeneous, and the higher profitability of CESEE subsidiaries has to be seen in the context of higher risks with which business in this region is generally associated.

Although Austrian banks took further steps to restructure their balance sheets in 2012, concerns about widespread deleveraging – most notably with regard to the CESEE region – have not materialized; Austrian banks have remained committed to their CESEE business. Their exposure is still broadly diversified, with a focus on investment grade countries.

Austrian banks' capital ratios continued to improve in 2012, also due to reductions in risk-weighted assets. The tier 1 capital ratio of the Austrian banking system had risen to 11.0% by year-end 2012. The aggregate results of the stress tests conducted by the OeNB as part of the IMF Financial Sector Assessment Program (FSAP) in early 2013 reflect this improvement. But the results are again highly dispersed; in light of elevated medium-term risks and with tighter regulatory requirements about to take effect, Austrian banks need to improve their risk-bearing capacity further. Still, the leverage of the Austrian banking system continues to be below that of their international peers, whose need for capital is also higher.

The recent implementation of regulatory measures continues to show effects. Foreign currency lending in Austria has almost come to a halt, and subsidiaries have become less dependent on intragroup funding. Nevertheless, the IMF FSAP mission team in particular recommended that the Austrian authorities further strengthen the legal framework for banking supervision and financial stability.

Thanks to better market conditions since mid-2012, the performance of Austrian mutual funds, pension funds and insurance companies has substantially

improved. However, life insurance policies with guaranteed interest rates over long terms have been increasingly challenged by a sustained low-yield environment.

## Action Recommended by the OeNB

The OeNB reiterates its recommendations of the previous Financial Stability Report, calling for a strengthening of financial stability in particular by improving bank capitalization and enhancing the sustainability of bank's business models. Furthermore, banks are expected to continue to limit foreign currency lending.

# International Macroeconomic Environment:

## Central Bank Action Supports Economic Outlook and Reduces Financial Tensions in the Euro Area and in CESEE

### Advanced Economies: Reduced Downward Risks in a Still Weak Global Environment

Global economic activity remained subdued in the review period from November 2012 to May 2013 despite bold policy action to improve financial stability. While GDP growth in emerging economies was slightly below expectations, the IMF's World Economic Outlook expects the recovery in advanced economies to gradually accelerate in the second half of 2013. Whereas the euro area is still struggling to grow, economic activity has been stronger in the U.S.A. and – to a lesser extent – Japan.

In the U.S.A., private domestic demand has been the main engine of economic growth. The negative impact of progressing consolidation – linked to the fiscal cliff and the budget sequester – has been muted by a decrease in the saving ratio of U.S. households, which stabilized private consumption. While the recovery of the housing market has shown further progress, the reduction in unemployment continued to be associated with a gradual decline in the participation rate. So far, the Federal Reserve Board has dismissed calls to end its third round of quantitative easing (QE3), announced in December 2012, and continues to inject USD 85 billion per month into capital markets by buying mortgage-backed securities as well as government bonds. Moreover, in its current "forward guidance," the Fed has announced to retain its policy rate close to zero until the unemployment rate falls to a threshold of 6.5%, given that inflation rates remain close to the long-term goal of 2%.

In Japan, the newly elected government has set out plans to stimulate GDP growth by combining expansive monetary and fiscal policies with structural reforms. Surprisingly, the government embarked on an aggressive strategy to reach an inflation target of 2% within the next two years. In early April 2013 the Bank of Japan announced its plans to double the size of the monetary base, mainly by buying long-term government bonds in the secondary market via its framework of quantitative and qualitative monetary easing (QQME). While stock and bond market volatility increased and the yen depreciated sharply after the announcement of the policy shift, inflation rates have not yet reacted and remained negative so far. However, the IMF's World Economic Outlook expects both positive inflation rates and solid growth for 2013.

Expansive monetary policy supports recovery

The Swiss National Bank (SNB) has remained committed to its exchange rate ceiling of CHF 1.20 per euro. Given the credible threat of further interventions, upward pressure remained subdued in the period under review.

Financial tensions in the euro area ease despite ongoing recession

The euro area is facing its second year of economic weakness. After negative growth in 2012, the IMF's World Economic Outlook forecasts real GDP to contract by 0.5% year on year in 2013. The majority of leading indicators signals a weak recovery around the second half of 2013. While private sector deleveraging and uncertainty among businesses and investors remain elevated, the relaxation of deficit targets should help stabilize effective demand in the euro area's peripheral economies and France. Overall, growth remains quite heterogeneous across countries: Growth rates are positive in Germany and Austria, whereas the deep recessions in Spain and Italy could

be accompanied by a mild recession in France. While unemployment has continued to rise in nearly all euro area countries, inflation has slowed down considerably, mostly reflecting negative base effects in the energy and food components of the HICP.

Following the collapse of its two biggest banks, Cyprus agreed with the troika – the European Commission, the ECB, and the IMF – in March 2013 on a financial assistance program of EUR 10 billion for a period of three years. While Cyprus had initially imposed capital controls, the bail-in of unsecured deposits has not led to a new wave of capital flight in other peripheral economies. On the contrary, most euro area economies have seen an improvement in financial stability, also reflected in smaller sovereign bond yields in stressed economies. The general decline in risk aversion started with the ECB's announcement of Outright Monetary Transactions (OMTs) in late summer 2012 and reflects the progress in restoring competitiveness in peripheral economies, in restructuring the Spanish banking system and in setting up an EU-wide banking union. The European Council reached a final agreement on the single supervisory mechanism (SSM) in March 2013, giving the ECB a key role in the supervision of euro area banks in cooperation with a newly established Supervisory Council and the national supervisors. A strict separation of tasks within the ECB will ensure the independence of both monetary policy and banking supervision.

Financial market situation has stabilized

The Governing Council of the ECB cut its key interest rates by 25 basis points in early May 2013, bringing the interest rate on main refinancing operations to a historical low of 0.50%. Despite significant improvements, the transmission of monetary policy is still impaired for some countries and economic sectors. While lending conditions for large firms ameliorated in the first half of 2013, access to finance remains somewhat challenging for SMEs, particularly in countries under stress. Better funding conditions have allowed banks in the euro area to repay around 30% of outstanding longer-term central bank liquidity since late January 2013. So far, the reduction in excess liquidity has not driven money market rates upward.

## CESEE: Financial Sector Activity Subdued amid Weakening Economic Growth

Against the background of important measures taken to tackle the crisis in the euro area and reflecting the ongoing accommodative stance of some key central banks as well as a generally more positive sentiment vis-à-vis Europe, no heightened stress could be observed in CESEE financial markets during the review period from November 2012 to May 2013. After a marked downward adjustment in autumn 2012, Eurobond spreads and CDS premiums have remained broadly stable, reflecting stabilizing confidence in CESEE markets. In mid-May 2013, CDS premiums as well as Eurobond spreads stood at levels roughly comparable to those of spring 2011 – a comparatively calm period – throughout most of the region. A more notable deterioration against this benchmark could only be observed in Ukraine, Croatia, Slovenia and (to a somewhat lesser extent) Hungary, the economically weaker countries of the region. Political uncertainty and/or rating downgrades may well have played a role in this respect. Especially in Hungary and Slovenia, risk perception deteriorated markedly during Cyprus's banking turmoil in March 2013, but improved already in April. In early

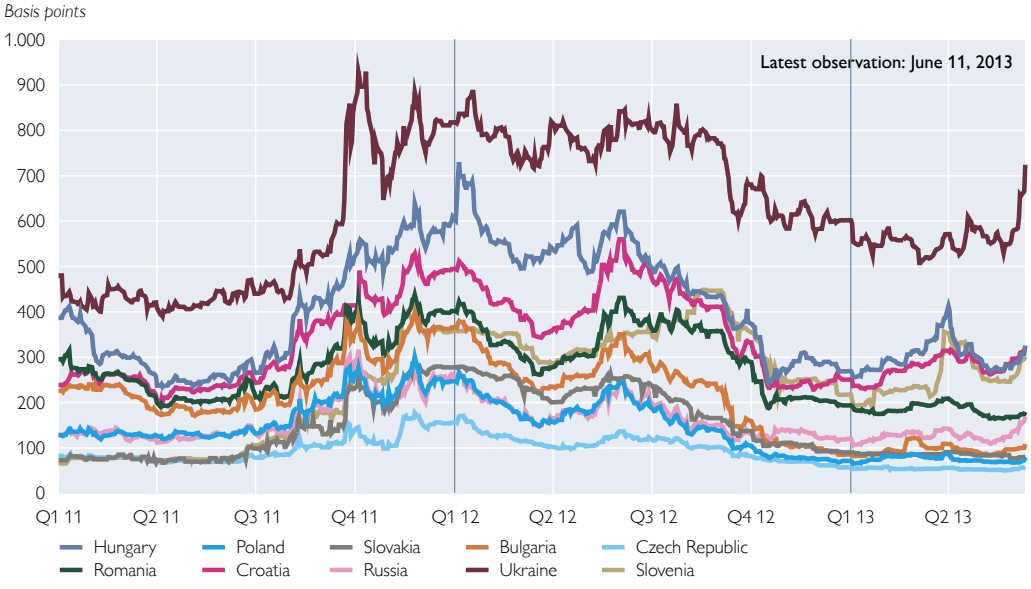
June, CDS premiums went up again in several CESEE countries amid a weakening of investor sentiment across emerging market assets. Equity prices increased throughout most of the region. More notable losses were reported only for Russia and Ukraine. Short-term interbank rates continued to be low in most of CESEE. Since October 2012 they have declined most strongly in Hungary, the Czech Republic, Poland and Romania; in the latter, rates have been decreasing after the central bank gradually reduced its tight control over money market liquidity. In the other three countries, the development was related to policy rate cuts, for which abating price pressures and a weakening economic momentum had provided room. The Hungarian central bank cut its key policy rate in ten steps by a cumulative 250 basis points from a high of 7% in August 2012 to 4.5% in May 2013; the central bank of Poland reduced its rates in six steps by a cumulative 175 basis points from 4.75% in November 2012 to 3% in May 2013; and the Czech central bank lowered its policy rate in three steps by a cumulative 70 basis points from 0.75% in June 2012 to 0.05% in November.

No substantial swings in exchange rates

Looking at the currencies of the countries under review that have not yet adopted the euro and do not maintain a fixed currency peg, most currencies traded broadly stable against their reference currency from mid-November to early-May.[1] Some more pronounced exchange rate swings were observed only in Hungary and Romania. The Romanian leu appreciated somewhat against the euro, which was partly related to a reversal of earlier losses but in part also fueled by comparatively attractive interest rate conditions and an improving international perception

Chart 1

**Five-Year Credit Default Swap Premiums**




*Source: Thomson Reuters.*

[1] *With the exception of Ukraine (U.S. dollar) and Russia (basket of currencies consisting of U.S. dollar and euro at a ratio of 55% to 45%), the reference currency of these countries is the euro.*

of the country following its inclusion in the JP Morgan Global Bond Index. The Hungarian forint, by contrast, suffered from increasing uncertainty related to the appointment of a new central bank management and the suspension of IMF talks in early 2013, and lost some value against the euro. Some pressure on exchange rates could also be observed in Croatia and Ukraine. The Croatian central bank intervened in foreign exchange markets in mid-April by selling EUR 215 million (or some 0.5% of GDP) to support the kuna. This was less than the amount spent on interventions in the respective period of the previous year. In Ukraine, pressure on the hryvnia's de facto pegged exchange rate – and in turn on foreign exchange reserves – eased due to administrative measures introduced in late 2012 and declining foreign currency demand by households.

Muted credit growth throughout most of the region

The change in total outstanding loans to the private sector (domestic and cross-border loans, adjusted for exchange rate changes and measured in percent of annual GDP) was negative in most countries under observation between mid-2012 and end-2012 (most strongly so in Hungary, Slovenia and Croatia); the change was positive only in the Czech Republic, Russia and Ukraine. While in the latter the increase was driven mostly by cross-border loans, it was domestic loans to households in the Czech Republic and loans to the whole private sector in Russia that fueled the increase. In the rest of the region, it was especially cross-border loans (mainly to enterprises) and domestic credit denominated in foreign currency (both to enterprises and households) that decreased, while there was an increase in domestic local currency loans to households (Slovakia, Poland) or to enterprises (Bulgaria, Romania), except for Hungary and Slovenia, where all credit segments declined.

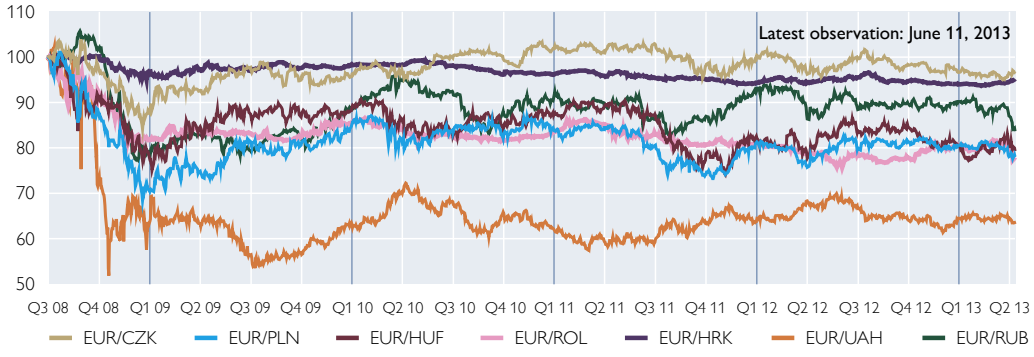
Against this background, the share of foreign currency loans to households declined in most countries, and most strongly in Ukraine (by 6.6 percentage points to 45.3% between mid-2012 and end-2012). However, ranging between 56% and 76% in December 2012, the share of foreign currency loans in total loans to the private sector remained at high levels in Hungary, Romania and Croatia.

Consolidated BIS data provide further tentative evidence on credit developments in the region. The exposure of European banking groups vis-à-vis the

Chart 2

**Exchange Rates of CESEE Currencies against the Euro**

*September 1, 2008 = 100; rise = appreciation*




*Source: Thomson Reuters.*

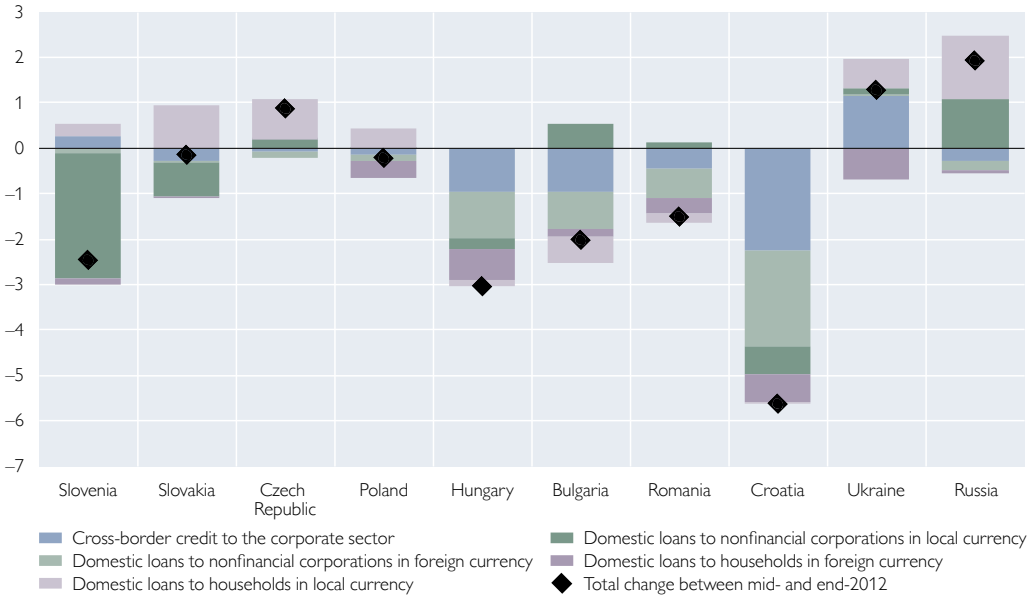
region decreased by EUR 11 billion (0.4% of annual GDP) between mid-2012 and end-2012.[2] Relative to total outstanding exposure, bank deleveraging was most pronounced in Ukraine, Hungary and Slovenia, while the decline as a percentage of annual GDP was largest in Hungary, Slovenia and Croatia. By contrast, Slovakia and Russia even recorded inflows.

These heterogeneous credit developments seem to have been influenced – at least in some countries – by factors related primarily to credit supply. At the same time, deteriorating macroeconomic conditions are very likely to have adversely impacted on credit demand in the review period. Economic growth in the region (as a weighted average) decelerated from 2.7% in the second quarter of 2012 to 0.9% in the final quarter (year on year), with four countries reporting negative annual growth in the second half of 2012. Labor markets have also remained slack. Unemployment rates have increased in nearly all CESEE countries since mid-2012 (most pronouncedly in Croatia, by 3.5 percentage points) and were in the double digits in more than half of the countries of the region in March 2013. Also, youth and long-term unemployment trended upward and employment declined in most of the countries. Real wage growth also decelerated or was even negative throughout most of the region. House prices continued to decline in all countries for which data are available. Furthermore, fiscal consolidation has been cutting into households' debt servicing capacity and has also negatively impacted consumption.

Chart 3

**Banking Sector: Domestic and Cross-Border Credit to Private Nonbanks by Sector and Currency**

*Change between mid- and end-2012 as a percentage of GDP (four-quarter rolling sum); adjusted for exchange rate changes*




*Source: ECB, Eurostat, national central banks, national statistical offices, OeNB.*

[2] *This figure does not include all loan loss provisions and is to some extent adjusted for exchange rate changes; shifts in bank ownership between Europe and the rest of the world are not taken into account.*

Businesses are reluctant to invest, given unfavorable domestic and external demand conditions, low capacity utilization rates and an uncertain economic outlook. Sentiment indicators are also far below their long-term averages, with the household sector and construction being particularly pessimistic.

Deteriorating credit quality

There is some recent tentative evidence that credit growth may start to recover in the coming months. The Emerging Market Bank Lending Conditions Survey by the Institute of International Finance, for example, shows that lending conditions in emerging Europe have been easing in late 2012 and in early 2013. Developments in the first quarter of 2013 were driven especially by easing credit standards, suggesting that the credit tightening cycle may be coming to an end. Furthermore, demand for loans started to increase in the first three months of the year, after declining in the previous two quarters.

Reduction in loan-to-deposit ratio

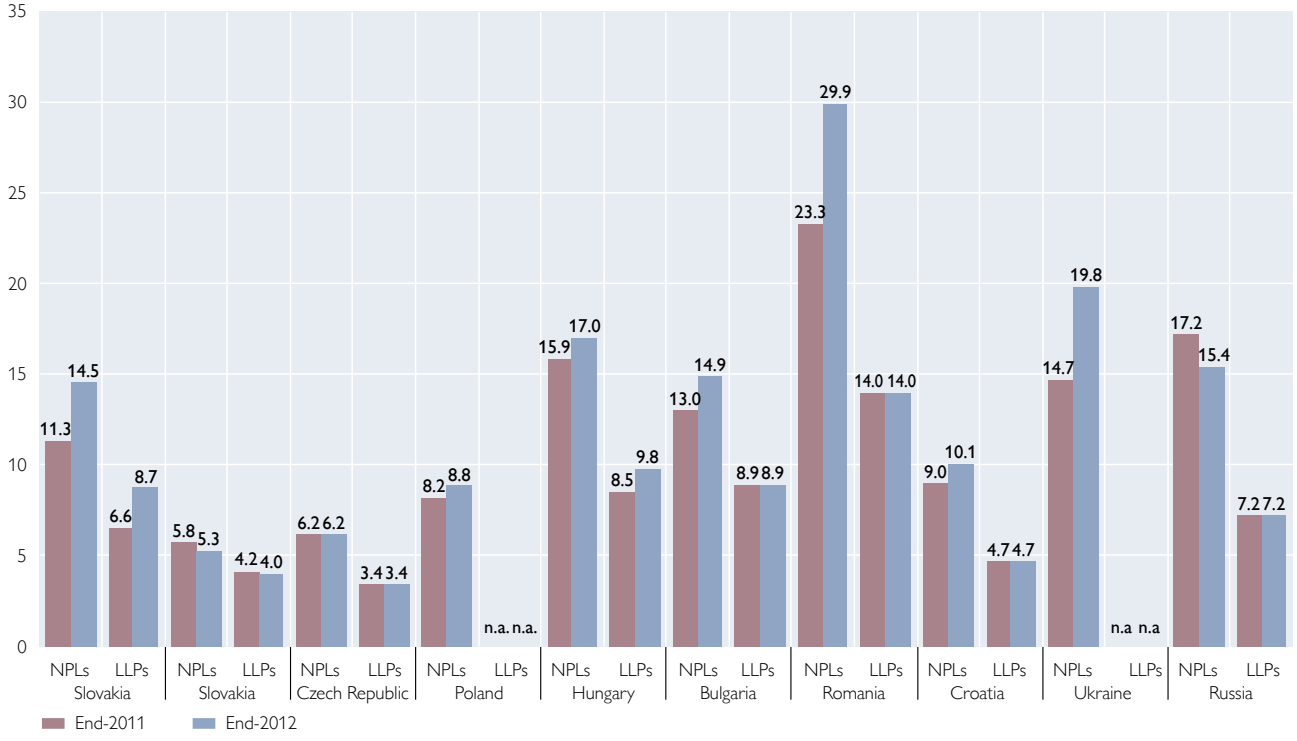
Credit quality continued to deteriorate in many CESEE countries. This development was most pronounced in Slovenia, Romania and Ukraine in 2012. Also, nonperforming loans (NPLs) increased in Poland, Hungary, Bulgaria and Croatia, which must be seen in the context of weakening economic conditions including low credit growth and the private sector's impaired credit servicing capacity. Some countries, however, also reported a slight improvement in credit quality (Slovakia and Russia).

In all the countries under review, with the exception of Slovakia and the

Chart 4

**Banking Sector: Credit Quality**

*Nonperforming loans (NPLs) and loan loss provisions (LLPs) in % of total credit at end of period*



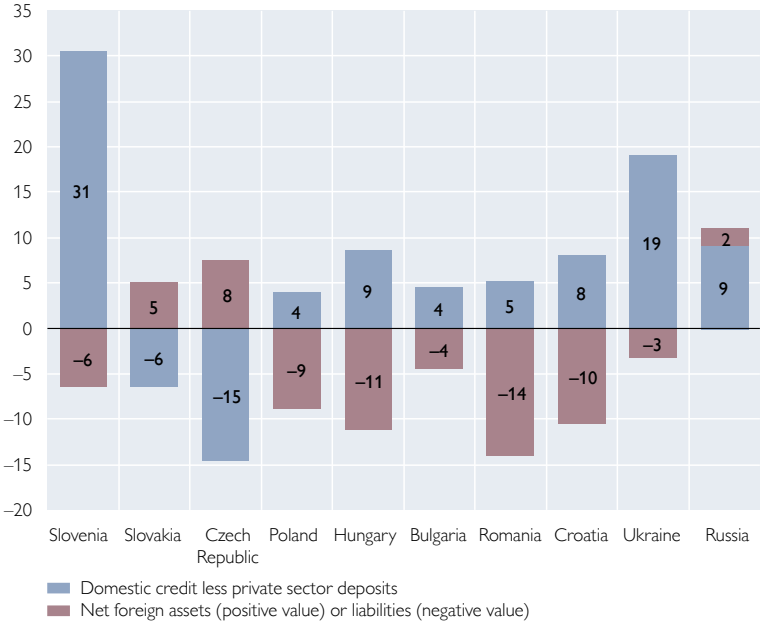

*Source: IMF, national central banks, OeNB.*

*Note: Data are not comparable between countries. NPLs include substandard, doubtful and loss loans. Poland including so-called irregular loans.*

Chart 5

**Banking Sector: Gap between Claims and Deposits and Net External Position**

*As a percentage of GDP at end-2012*




*Source: ECB, Eurostat, national central banks, national statistical offices, OeNB.*

Czech Republic, total outstanding domestic claims continued to exceed total domestic deposits (relative to GDP) in 2012. However, this funding gap had been narrowing substantially since late 2011 and continued to do so in the observation period. The gap between domestic claims and deposits contracted throughout CESEE, and particularly strongly in Slovenia, Hungary, Croatia and Ukraine. In most countries, the decline was driven by the muted growth or – in several cases – decrease in claims, while deposits increased throughout the region. In Slovenia, however, the gap remained at a comparatively high level, given a credit boom financed by foreign wholesale funding before the crisis. At the same time, banking sectors in CESEE reduced their reliance on external funding in the second half of 2012. Despite the implied improvement in banks' net external position, the banking sector continued to hold net external liabilities in most countries, which – as a percentage of GDP – were particularly high in Romania, Hungary, Croatia and Poland. Only Slovakia and the Czech Republic continued to show a surplus of domestic deposits over claims, which is also reflected in the positive net external assets registered by both countries' banking sectors. Furthermore, in both countries the surplus of domestic deposits increased and their international creditor position expanded in the review period.

Banking sector profits continued to be subdued in 2012 in most CESEE countries. Compared to the previous year, profits declined strongly in Slovakia, Slovenia, Romania and Croatia, and banking groups reported losses in Slovenia, Hungary and Romania. In Romania, banking system profitability has been in negative territory since August 2011, mainly due to large net provisioning costs as well as to weaker operating profits. In Hungary, profitability was negatively impacted by government measures to reduce outstanding foreign currency debt of households. Banks, which are already fraught with high sectoral taxes, have to carry the main burden of these measures. In Slovenia, the strong increase in loan loss provisions resulted in another year of bank losses, although the cost-to-income ratio markedly improved to a relatively low level. Somewhat higher profits were reported for the Czech Republic and Russia, and the Ukrainian banking sector managed to turn a loss in 2011 into a profit in 2012.

Banking sectors remain well capitalized

The banking sectors in CESEE remained well capitalized in 2012. Capital adequacy ratios (CARs) ranged between 11.5% in Slovenia and 20.6% in Croatia. Compared to end-2011, the CARs increased particularly strongly in Hungary (+2.7 percentage points,

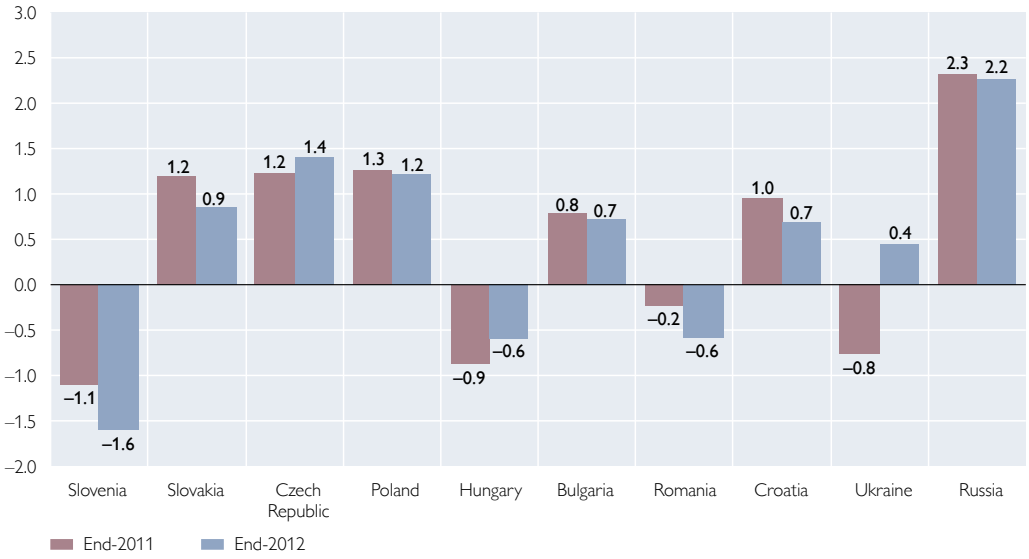
Profitability of CESEE banking sectors remains subdued

driven also by the asset side) and Slovakia (+2.3 percentage points), followed by the Czech Republic, Poland and Croatia (between +1.0 and +1.6 percentage points). By contrast, the CARs decreased in Bulgaria and Ukraine (where they are still at a relatively high level, though) as well as in Russia.

Chart 6

**Banking Sector: Profitability**

*Return on assets in %*




*Source: IMF, national central banks, OeNB.*

*Note: Data are not comparable between countries. Data are based on annual after-tax profit, except for Russia's, which are based on pretax profit.*

# Corporate and Household Sectors in Austria: Subdued Growth of Indebtedness

## Stabilization of Corporate Sector Risk Indicators

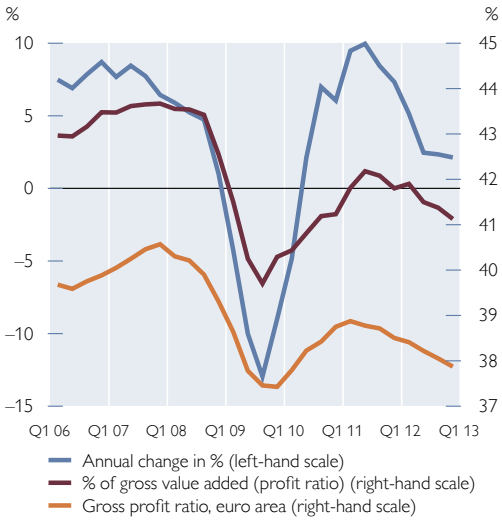
### The Austrian Economy Slows Down

Against the background of the renewed recession in the euro area, the Austrian economy performed comparatively well. Nevertheless, Austria was not able to avoid being affected by European developments and has been facing stagnation since the second quarter of 2012. In its June 2013 outlook, the OeNB expects Austrian real GDP to expand by 0.3% in 2013 and by 1.5% in 2014. The euro area crisis has exerted a drag on Austrian exports, especially goods exports into the euro area. The decline in exports was spurred above all by the recession in key export destinations. Persistent uncertainty about future sales prospects dampened gross fixed capital formation, which is particularly sensitive to cyclical developments. This holds in particular for equipment investment, while growth in housing investment remained in positive territory. Private consumption has stagnated in recent years, as the growth of Austrian households' real disposable income is subdued. As a consequence, domestic demand has not been able to sufficiently offset weak exports recently.

After surging in 2011, corporate profitability abated in 2012, reflecting the economic slowdown (see chart 7). Corporate earnings were fostered by falling raw material prices, whereas wage developments had a dampening impact on corporate profitability in 2012. Gross operating surplus was up 2.1% year on year in nominal terms but flat in real terms. In addition, the non-operational component of corporate profitability was boosted by the low interest rate level. While gross operating surplus had surpassed pre-crisis levels in nominal terms already in 2011, it has still failed to reach its pre-crisis highs in real terms as well as in relation to gross value added of the corporate sector (i.e. the gross profit ratio). The gross profit ratio even fell slightly to 41.1% in 2012. However, it was still markedly higher than the comparative value for the whole euro area.

Chart 7

**Gross Operating Surplus of Nonfinancial Corporations**




*Source: Statistics Austria.*

Four quarters of stagnation

Profit growth stalls in real terms

### Further Reduction in External Financing of the Corporate Sector

According to the financial accounts, the volume of external financing amounted to EUR 10.8 billion[1] in 2012, which was less than half the – extraordinarily high – 2011 figure. This slowdown might partly reflect high internal financing owing to still growing profits and partly lower financing needs due to

[1] *Adjusted for foreign-controlled holdings in special purpose entities.*

Tighter credit standards

reduced investment. Both debt and equity financing slowed down markedly in 2012. Debt financing, which was almost 50% lower than in the previous year, contributed almost two-thirds of the – strongly diminished – external financing, with the remaining one-third stemming from equity financing, which fell to one-third of the 2011 value.

### Rising Contribution of Bank Loans to Corporate Financing

Bank lending loses momentum

Lending by domestic banks accounted for around 30% of external financing of nonfinancial corporations in 2012, more than twice the comparable 2011 figure. However, in the second half of 2012, the growth of bank loans to the corporate sector in Austria lost momentum. According to the MFI balance sheet statistics, the annual rate of change in Austrian bank lending to nonfinancial corporations (adjusted for reclassifications, valuation changes and exchange rate effects) fell from 2.7% in nominal terms in September 2012 to 0.8% in April 2013 (see chart 8). Deflated with the GDP deflator,[2] corporate loans shrank by almost 2% year on year in real terms in the first quarter of 2013.[3] This slowing was mainly driven by lending at longer maturities (more than five years) on which loan growth had rested in the past years, while loans with a maturity of less than five years stabilized in the first months of 2013. Despite this deceleration, the Austrian corporate sector could escape the slowdown witnessed in the euro area as a whole, where the nominal growth rate has been negative since the first half of 2012.

Lending rates decrease

The slowdown was driven by both supply- and demand-side factors. Credit standards for corporate loans had been tightened slightly but continuously by the Austrian banks since the second half of 2011, according to the Austrian results of the euro area bank lending survey (BLS). The more stringent lending policies affected large firms more than small and medium-sized enterprises (SMEs). Costs related to banks' capital position as well as heightened risk concerns reflecting the economic slowdown were behind this tightening. At the same time, the banks surveyed in the BLS noted a slight decline in corporate loan demand, again primarily from large companies. This can be explained by lower funding requirements for fixed investment on the one hand; on the other, companies still relied to a considerable extent on internal sources of finance and had sizeable amounts of cash to finance their activities: Bank deposits expanded vigorously in 2012, although their growth slowed down to 1.7% year on year in April 2013.

Up to now, tighter credit standards have resulted not primarily in higher loan volumes but rather in tighter terms and conditions. Stronger risk discrimination by banks has found its expression not only in higher margins on riskier loans, but also in rising collateral requirements as well as more, or stricter, covenants, whereas a deterioration in banks' financing conditions is reflected in the tightening of the size and maturity of loans granted to enterprises.

In part, the net tightening of banks' lending terms and conditions dampened

[2] *Based on the deflator for the fourth quarter of 2012, as the value for the first quarter of 2013 was unavailable at the cutoff date.*

[3] *At the cutoff date, financial accounts data were available up to the fourth quarter of 2012. Therefore, the figures on growth contribution presented here refer to 2012. More recent developments of financing flows are discussed using data from the MFI balance sheet statistics and the securities issues statistics.*

the reduction of financing costs stemming from monetary policy easing. In response to the three ECB interest rate cuts of November 2011, December 2011 and July 2012 (by 0.25 percentage points each) and the associated decline in money market rates, corporate lending rates declined by 91 basis points between December 2011 and March 2013.[4] While interest rates fell for all loan volumes and maturities, this decrease was slightly more pronounced for short-term loans and for larger loans (with a volume of more than EUR 1 million) than for smaller ones.

On top of borrowing from domestic banks (EUR 3.7 billion), Austrian enterprises took out another EUR 1.0 billion from foreign banks in 2012. Taken together, Austrian and foreign bank lending accounted for about 43% of last year's corporate external financing.

### Bond Financing Remained Vigorous

Bonds account for almost half of external financing

According to securities issues statistics, bond issues by Austrian nonfinancial corporations increased by more than one-quarter to EUR 4.8 billion in 2012. This was equivalent to 45% of Austrian companies' external financing of that year, considerably above the average of the previous years. Thus, net new bond issuance was again higher than the total volume of new bank lending (from domestic and foreign banks) in 2012 and remained strong in the further course of the year. At an annual rate of 9.6% (according to the securities issues statistics), the expansion of corporate bonds in April 2013 markedly exceeded that of other financing instruments. While this development may be viewed as a broadening of the corporate sector's financing sources, this funding option is available only to a limited number of mostly larger companies. Moreover, a considerable part of corporate bonds in Austria is issued by corporations that are majority-owned by the public sector.

The share of variable rate bonds declined slightly in 2012, falling from 13.7% at the end of 2011 to 12.9% in March 2013, while the share of bonds issued in foreign currency fell from 9.7% to 7.2%.

Bond yields, like bank lending rates, contracted in 2012 and the first months of 2013. Their decline was even more pronounced than that of lending rates. Reflecting the increase in investors' risk appetite, yields on BBB-rated bonds dropped by 416 basis points to 3.14% between the end of 2011 and May 2013.[5] In the same period, yields on AA-rated corporate bonds declined by 223 basis points, so that the yield spread between BBB issues and top-rated euro-denominated corporate bonds narrowed from 316 to 122 basis points, the lowest value recorded since April 2011. Taking a longer perspective, BBB bond yields were about 8½ percentage points below the peak values observed at the height of the financial market turmoil in spring 2009 and about 250 basis points lower than in July 2007, before the financial crisis set in.

### Lower Recourse to Trade Credit

Trade credit declines

Trade credit accounts for a fairly large part of firms' funding sources; it contributed more than 5% to outstanding financial liabilities at the end of last year. In 2012, the net volume of trade credit by domestic companies decreased by more than two-thirds compared to 2011. As a key element of firms' working

[4] *The ECB interest rate cut of May 2013 is not yet reflected in the available interest rate data.*

[5] *Euro area figures are used here, as no time series is available for yields on Austrian corporate bonds.*

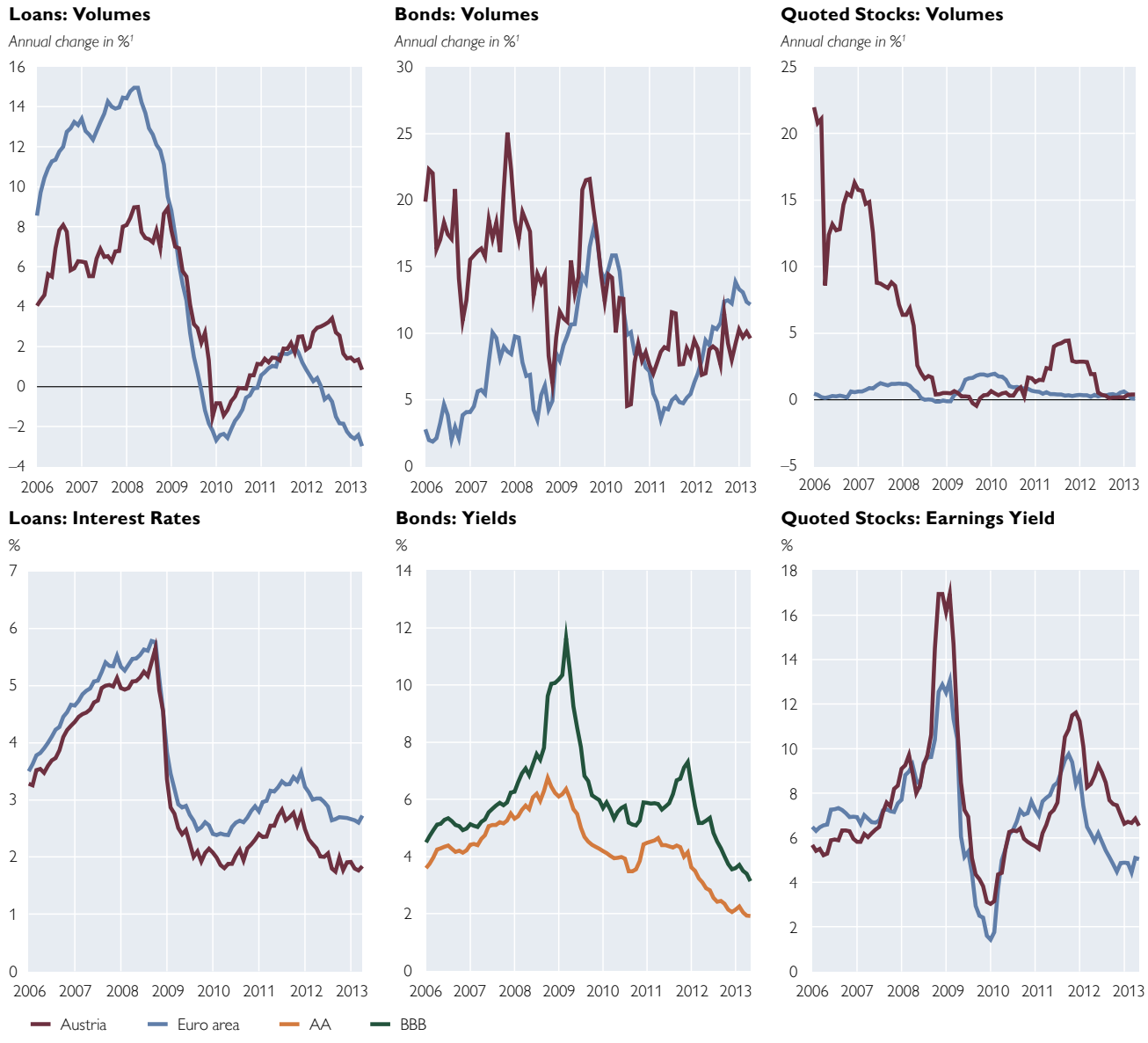
capital, trade credit closely depends on economic activity while at the same time – given its relatively informal form and comparatively high cost – increased recourse to trade finance might be correlated with financial distress, possibly along with restricted access to other forms of finance. Thus, the low use of trade credit may also be an indication that while bank credit standards were tightened in 2012, they were not so restrictive as to drive firms into alternative sources of finance.

### Equity Position Increased Slightly

Almost 40% of the external financing of nonfinancial corporations came in the form of equity. Relative to the corporate

Chart 8

**Key Elements of Nonfinancial Corporations' Financing: Volumes and Conditions**




*Source: OeNB, ECB, Thomson Reuters, Wiener Börse AG.*

*[1] Adjusted for reclassifications, changes in valuation and exchange rate effects.*

sector's total liabilities, its equity position (i.e. the proportion of shares in total liabilities) rose slightly from 42.7% to 43.0% in 2012.

Financing via listed stocks continued to be affected by the crisis and accounted for just 2% of external financing in 2012. There were no new listings in 2012, and only one new listing in 2013 up to the cutoff date for data. Additionally, there were a few capital increases. Including a few small delistings, the net issuance of capital on the stock exchange amounted to EUR 0.2 billion in 2012. Another EUR 0.1 billion was issued in the first four months of 2013, according to securities issues statistics. Other equity (unquoted shares and other equity instruments), mostly from foreign strategic investors, also decreased in 2012 (to EUR 2.9 billion).

The earnings yield (i.e. the inverse of the price-to-earnings ratio) of the ATX, which can be used as an indicator of the cost of raising capital on the Austrian stock market, dropped from 11.6% in December 2011 to 6.5 in May 2013. But as there were virtually no new issues in 2012 and 2013, this was a purely notional figure.

## Companies' Debt Servicing Capacity Is Stable

Mirroring the reduction in external financing, the annual expansion rate of corporate debt (in terms of total loans and bonds) decelerated further to 2.3% in 2012. In net terms, enterprises substituted short-term for long-term funding. The growth of long-term financing instruments, which account for more than 80% of outstanding debt, decreased while short-term financing even diminished in absolute terms. However, although the growth rate of corporate debt was well below the long-term average, it was slightly ahead of the subdued earnings growth rate so that the ratio of corporate debt to gross operating surplus rose slightly – by less than 1 percentage point – to 485%, implying a virtually unchanged sustainability of corporate debt (see chart 9). Hence, the ratio of corporate debt to gross operating surplus remained above its pre-crisis levels. It was lower than in the euro area, however. As debt growth remained somewhat below the increase of equity financing, the debt-to-equity ratio came down slightly in 2012 to reach 117% at the end of 2012. Contrary to the debt-to-income ratio, the debt-to-equity ratio is considerably higher in Austria than in the euro area, which highlights the importance of debt financing in Austria.

Stock market financing remains affected by the crisis

Low interest rates continued to support firms' ability to service their debt. In 2012, the fraction of corporate earnings (gross operating surplus) that had to be spent on interest payments for bank loans declined further. This decline was bolstered by the above-average share of variable rate loans in Austria. For this reason, Austrian companies currently have lower interest expenses than their euro area peers, but at the same time their exposure to interest rate risk is considerably higher. Thus, even though corporate sector debt – and thus the sector's exposure to interest rate risk – increased only moderately in the past two years, a rise in interest rates might create a noticeable burden, especially for highly indebted companies.

Variable rate loans imply interest rate risk

Debt ratio increases slightly

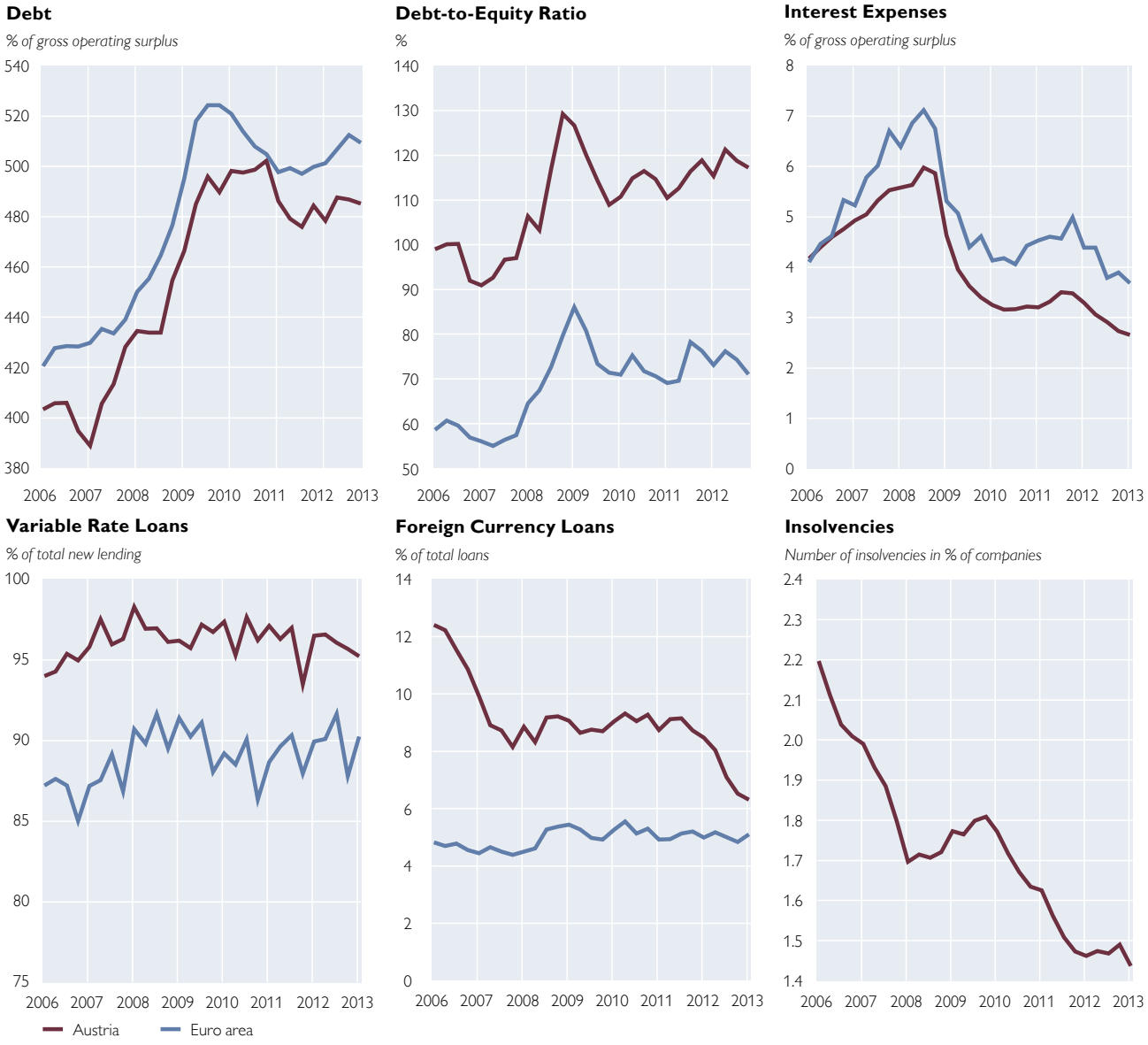
The share of foreign currency loans declined by roughly two percentage points to 6.5% over the past year, and thus was only less than 2 percentage points higher than in the euro area at the end of 2012.

The number of corporate insolvencies, which had increased relatively little during the crisis, remained small until the first quarter of 2013. In the

Insolvencies remain low

Chart 9

**Risk Indicators for Nonfinancial Corporations**




Source: OeNB, ECB, Eurostat, KSV 1870.

first quarter of 2013, it was 0.2% lower than the comparable 2012 figure (based on a moving four-quarter sum to account for seasonality); it also dropped markedly in relation to the number of existing companies. On the one hand, this development may be due to the rather slow rise in debt financing and the low interest rate level (which makes debt servicing easier even for highly indebted companies). On the other hand, it can also be attributed to the fact that insolvencies usually lag cyclical movements.

## Households' Foreign Currency Debt Remains a Concern

### Low Growth of Real Income

In 2012, households' real disposable household income grew by a mere 0.7% in real terms. Despite relatively high

wage settlements and strong employment growth, quarter-on-quarter growth was even negative in the second and third quarters. High inflation and negative wage drift resulting from an increase in part-time jobs and a structural shift to low-wage jobs acted as a drag on incomes. Moreover, the saving ratio increased from 7.4% in 2011 to 7.7% in 2012. The low interest rate environment may have reduced the attractiveness of saving and property income – the portion of disposable income people are more likely to save than labor income – developed better than in the preceding years.

## Household Financial Investment Increases for the First Time since the Beginning of the Crisis

After having fallen for four consecutive years, financial investment by households[6] rebounded slightly in 2012, and, at EUR 9.3 billion, was 5.9% higher than in 2011 (see chart 10). However, it was still only half as high as the pre-crisis peak value recorded in 2007.

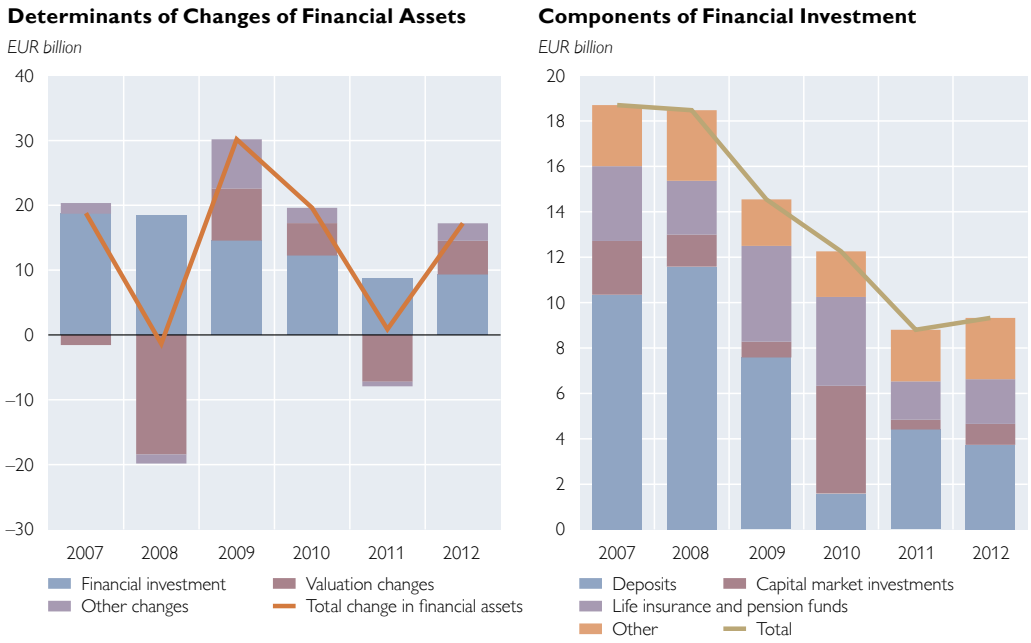
Slow deposit growth

At EUR 3.7 billion, investment in bank deposits was almost 15% lower than in 2011; it accounted for 40% of financial investment in 2012. Large inflows into overnight deposits were recorded, whereas the volume of deposits with longer maturities declined in absolute terms in 2012. Broken down by types of deposit, demand and time deposits grew while savings accounts registered a net decrease, even including capitalized interest. Deposits at building and loan associations represented the only exception: They augmented by 3.6% in 2012 on the back of the comparatively attractive interest rates for building loan contracts. The ongoing shift in the maturity structure suggests that households have a high preference

Saving ratio still low

Chart 10

**Changes in Households' Financial Assets**




Source: OeNB.

[6] *Nonprofit institutions serving households are not included here.*

for liquidity and may also be connected to moderate opportunity cost resulting from low interest rates.

Capital market investment turns positive in 2012

About 10% of households' financial investment went into capital market assets in 2012. Amounting to EUR 0.9 billion, it was twice as high as in 2011. This renewed interest in capital market investment reflected both the low interest paid on deposits as well as the recovery of share prices in the course of 2012. Austrian households increased their holdings of mutual fund shares as well as debt securities while there was a slight net outflow of direct holdings of equities.

Life insurance investment has a stabilizing effect

As in the preceding years, investment in life insurance and pension funds had a stabilizing effect on financial investment in 2012. Attracting net investments of EUR 2.5 billion, holdings of these investment instruments were roughly one-quarter higher than last year and accounted for around 27% of total financial investment in 2012. A large share of inflows into these instruments was not the result of current investment decisions, but – given the long maturities and commitment periods – reflected past decisions. Demand for funded pension instruments is a key factor in this context. Moreover, life insurance policies are often used as repayment vehicles for foreign currency bullet loans.

Foreign currency loans decline further

Considerable unrealized valuation gains

After the substantial (unrealized) valuation losses in their securities portfolios in 2011, Austrian households registered (equally unrealized) valuation gains in 2012. Coming to EUR 5.2 billion, these gains were equivalent to 5.5% of their securities holdings. Quoted stocks, debt securities and mutual fund shares in the portfolios of Austrian households all registered (unrealized) valuation gains of roughly the same dimension. Taking financial investment, valuation gains and other changes together, financial assets rose by EUR 17.2 billion in 2012.

### Subdued Lending Growth in the First Four Months of 2013

Growth of bank lending to households was subdued in the first months of 2013. As can be seen in chart 11, for almost two years, annual growth rates contracted continually and in April 2013, bank loans to households (adjusted for reclassifications, valuation changes and exchange rate effects) increased by a mere 0.2% in nominal terms, implying a considerable fall in real terms.

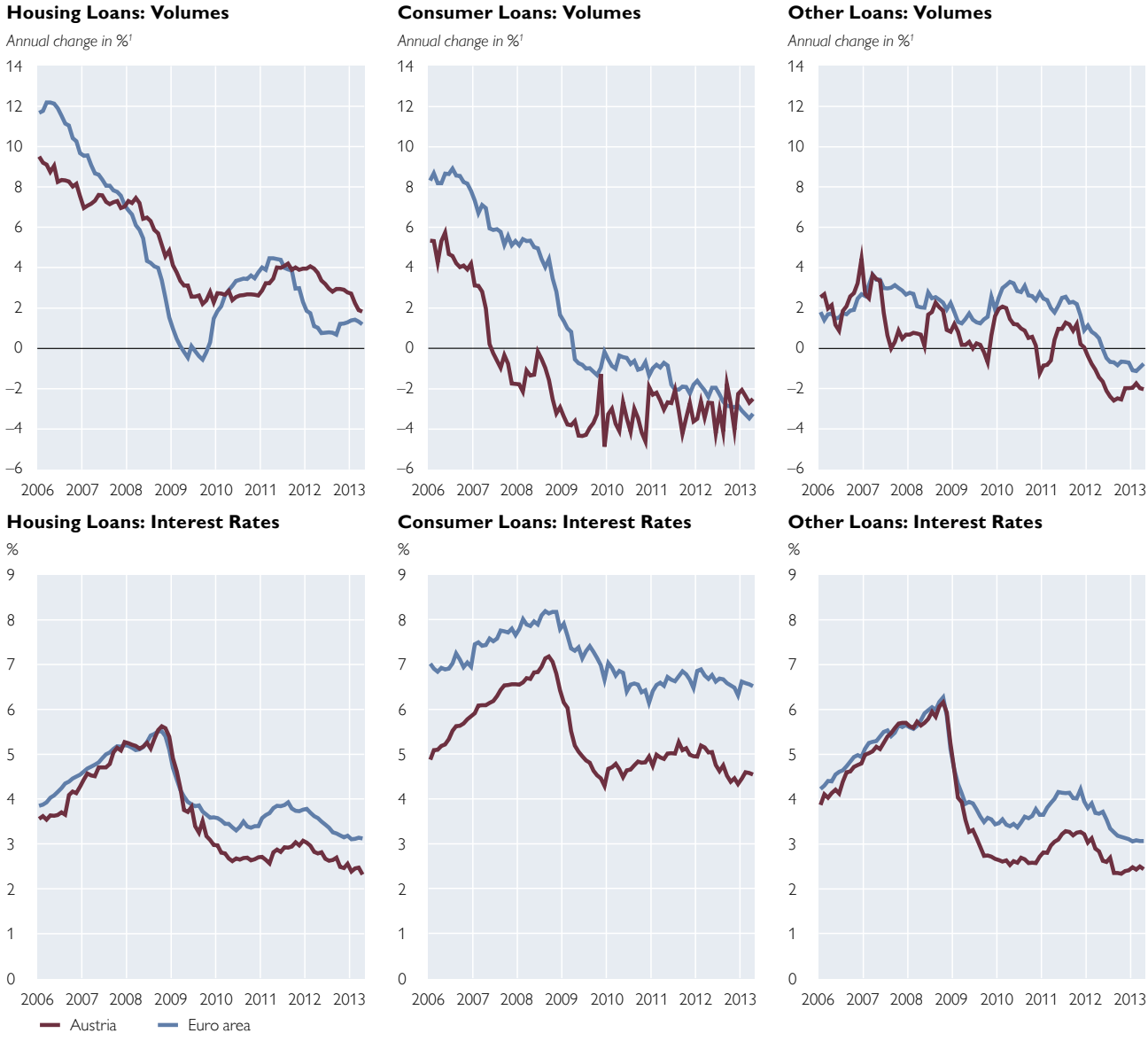
A breakdown by currencies shows that euro-denominated loans continued to expand unabatedly (April 2013: 6.4%), while foreign currency loans were cut markedly – in April 2013, they had fallen by 16.3% year on year. This considerable reduction highlights the effectiveness of the Austrian Financial Market Authority's minimum standards for granting and managing foreign currency loans, which aim at substantially limiting new foreign currency lending to households.[7]

Broken down by loan purpose, the slowdown in loan growth was mainly driven by a decline in consumer loans (–2.5% in April 2013 against the previous year) and other loans (–2.0%). Housing loans still grew by 1.8% year-on year, although their expansion rate also decreased in the course of 2012 and 2013. The favorable financing

[7] *In January 2013, the Austrian Financial Market Authority (FMA) published a new version of its Minimum Standards for the Risk Management and Granting of Foreign Currency Loans and Loans with Repayment Vehicles. Prepared in cooperation with the OeNB, the new version specifies more stringent guidelines for dealing with foreign currency loans (see also the section "Slight Credit Growth in Austria, Increased Local Funding in CESEE").*

Chart 11

**MFI Loans to Households: Volumes and Conditions**




*Source: OeNB, ECB.*

*[1] Adjusted for reclassifications, valuation changes and exchange rate effects.*

conditions probably still supported the dynamics of housing loans, and households might have needed more funding to purchase real estate, as housing prices have been on the rise in Austria (+16% year on year in Vienna and +11% in Austria excluding Vienna in 2012). Other housing market indicators, however, pointed to a downturn in credit demand. Although no current data on newly completed housing projects are available, the falling number of residential building permits (–8.4% year on year in the first three quarters of 2012) suggests a reduction in construction activity.

Financing conditions remain favorable

Loan conditions remained favorable. Interest rates for short-term loans (up to one year) stood at 2.73% in April

Household debt rises moderately

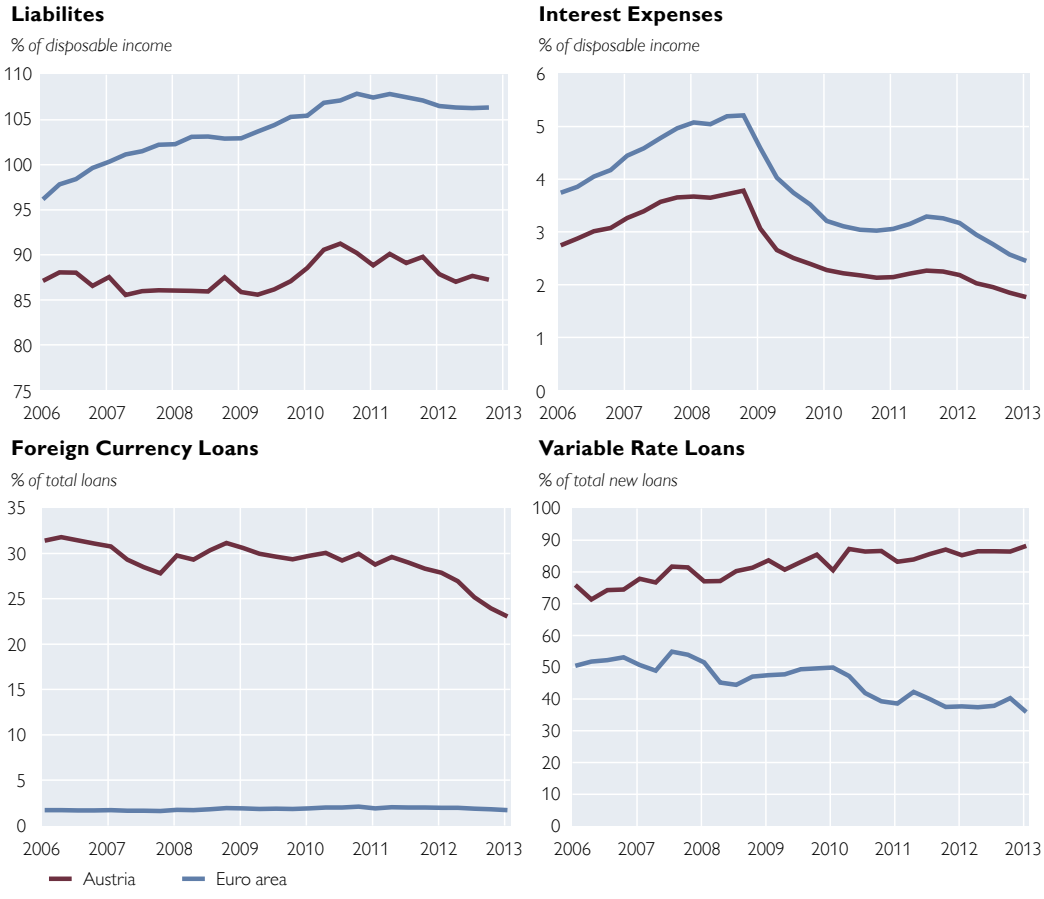
2013, 0.81 percentage points below their October 2011 level, reflecting the key interest rate cuts of November 2011, December 2011 and July 2012 (the available data do not reflect the May 2013 rate cut yet) and the associated decline in money market rates. Looking at data across the entire maturity band, interest rates on new housing loans stood at 2.31% in April 2013, which was 0.72 percentage points lower than the value recorded in October 2011. In the same period, interest rates on consumer loans dropped by 0.59 percentage points to 4.55%. As a result, interest rates were 2.9 percentage points (housing loans) and 2.7 percentage points (consumer loans) below their pre-crisis levels.

### Households' Currency and Interest Rate Risks

By international comparison, indebtedness of Austrian households is rather low and remained relatively stable during the crisis. At end-2012, total household liabilities stood at EUR 168.6 billion according to financial accounts data, up by a mere 0.6% in nominal terms from a year earlier. As a percentage of net disposable income, household debt amounted to 87.2%

Chart 12

**Household Risk Indicators**




*Source: OeNB, Statistics Austria, ECB, Eurostat.*

*Note: Figures for the euro area reperesent only the interest rate expense on euro-denominated loans.*

(–2.5 percentage points from end-2011; see chart 12). The debt ratio of households in Austria thus continued to be lower than in the euro area as a whole (106% in the fourth quarter of 2012).

Given the combination of moderate debt growth and low interest rates, household interest expenses remained subdued and even declined again somewhat in 2012 and the first quarter of 2013 on the back of the reduction of interest rates for bank loans. Interest expenses amounted to 1.8% of disposable income in the first quarter of 2013, about 2 percentage points less than in 2008, before interest rates began to fall. One factor that accelerated this decline was the high share of variable rate loans: In the first quarter of 2013, 88.2% of new loans were granted with an initial rate fixation period of up to one year, which is a very high share by international comparison. Therefore, when the ECB lowered its key interest rates during the crisis, lending rates in Austria were reduced at a faster rate than those in the euro area; in addition, retail rates in Austria have generally been below euro area rates in recent years. Moreover, loan quality may have also played a role, given the comparatively modest indebtedness of Austrian households.

Share of foreign currency loans falls rapidly

Another risk factor for the financial position of Austrian households is the sustained high proportion of foreign currency loans in total loans. In the first quarter of 2013, 23.0% of the total loan volume to Austrian households was still denominated in foreign currency. This ratio has fallen by roughly 8 percentage points since 2008. The appreciation of the Swiss franc came to a halt in September 2011, when the Swiss National Bank set a maximum exchange rate of CHF 1.20 to the euro. However, as was shown in a recent study for this publication,[8] households with foreign currency debt on average have higher income and housing wealth and are thus endowed with a higher risk buffer.

Interest expenses decrease further

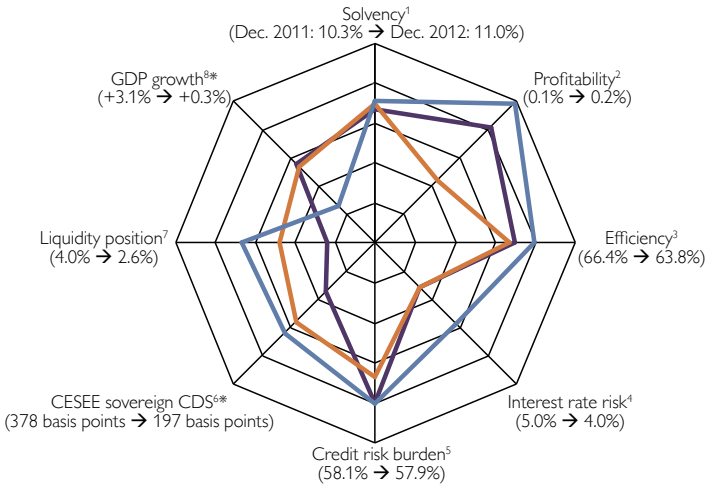
[8] *Albacete, N., P. Fessler and M. Schürz. 2012b. Risk Buffer Profiles of Foreign Currency Mortgage Holders. Financial Stability Report 23, OeNB 2012.*

# Austrian Financial Intermediaries: Further Strengthening of Financial System Is Needed for Sustainable Recovery

Financial conditions have improved since the publication of the previous Financial Stability Report in December 2012. Both financial stress and volatility on international markets declined thanks to further European policy commitments and renewed monetary stimulus, which helped drive down market and funding risks. Nevertheless, further efforts to strengthen financial institutions, and in particular banks, are central to ensure a sustainable recovery across Europe. This is all the more important as near-term economic prospects in the euro area remain weak.

Chart 13

**Key Indicators for the Austrian Banking System**




*Source: OeNB.*

[1] *Tier 1 ratio.*
[2] *Return on assets after taxes.*
[3] *Cost-to-income ratio.*
[4] *200 basis point interest rate shock (loss of eligible capital).*
[5] *Credit risk provisions in % of operating result.*
[6] *Exposure-weighted sovereign CDS spread.*
[7] *Cumulative 12-month funding deficit in % of total assets.*
[8] *Real GDP growth per annum.*

** Most recent value available at the cutoff date. ** Effects related to capital measures of several banks.*

*Note: Consolidated figures, largely scaled on the basis of historical data.* ***The closer the data points fall to the center, the better the ratios and the lower the risks are.***

The performance of the Austrian banking system reflects the recent uptrend amid an uncertain outlook. 2012 turned out to be better than the year before: many key indicators presented in the financial stability diagram (chart 13) have improved, but these developments may not be of a lasting nature. The increase in overall profitability, for example, was driven in large parts by one-off effects at several bigger institutions. In the remainder of 2013, the contracting economic activity and the low-yield environment might weigh on banks' profits, thus posing additional challenges to Austrian financial intermediaries. Low yields, in particular, could become an issue for life insurers, which have to meet long-term interest rate guarantees. Besides, historically low yields on government bonds have whetted the appetite for risk and have revived a more aggressive search for yield. Also, low interest rates and inflationary fears among investors are driving real estate markets in some countries, including Austria.

Much has been done to improve financial regulation in Europe, with initiatives generally strengthening the ability to deal with the ongoing crisis and offering further means and flexibility to act in the future. But there is still a long way to go. First, missing pillars of the European banking union have yet to be agreed, e.g. an effective European resolution regime that allows for the orderly exit of unviable banks. Such a regime should also include cross-border agreements for winding down internationally active banks. Second, the pillars that have already been agreed require speedy implementation to put the tools in the hands of regulators and supervisors as well as to prevent

regulatory uncertainty for market participants. As a case in point, sustained operational progress toward an effective single supervisory mechanism (SSM) is essential.

In view of the current economic difficulties and new regulatory measures, there have been worries that banks might restrict lending to the real economy, in the case of Austrian banks most prominently with regard to the CESEE region. However, concerns about widespread deleveraging have not materialized. On the contrary, local funding has improved in line with supervisors' expectations, and with the exception of a few particularly stricken countries, total credit to the real economy has increased. Moreover, a gradual reduction in leverage is a welcome development from the perspective of financial stability. An important component of adapting banks' balance sheets to a post-crisis environment, such a process should – provided it is undertaken carefully – result in positive externalities. Clearly, both its scale and pace require close monitoring, particularly given its potential impact on the supply of credit to the real economy.

Not least because of the importance of Austrian banks in the CESEE region, Austria has been included in the list of 25 globally systemic banking systems by the IMF. As a consequence, Austria was subject to a periodical Financial Sector Assessment Program (FSAP) at the beginning of 2013, an important external assessment of strengths and weaknesses of the Austrian financial system. The resulting recommendations will be discussed with all relevant authorities, and will contribute to making the Austrian financial market more resilient.

Box 1

### Main Results of the IMF's Austrian Financial Sector Assessment Program 2013

*The preliminary financial stability assessment of Austria under the FSAP 2013[1] is broadly in line with the assessment of the OeNB as presented in this issue and previous issues of the Financial Stability Report. The IMF mission team recognized the following strengths of the Austrian financial system: Austrian banks' improving capital position and their diversified business models, limited reliance on wholesale funding, small sovereign exposures and stable domestic asset quality. In the short term, sources of concern are the low domestic profitability, bank asset quality in the CESEE region and the legacy foreign-currency loan portfolios. In the medium term, the risk of large outward cross-border spillovers to the CESEE region appears contained and Austrian banks should also be able to comply with the Basel III transitional arrangements without major difficulty. Nevertheless, Austrian banks should further strengthen their capital positions in light of higher market expectations, irrespective of the results of the FSAP stress tests (see section "Stress Tests Highlight the Downsides of the Challenging Environment").*

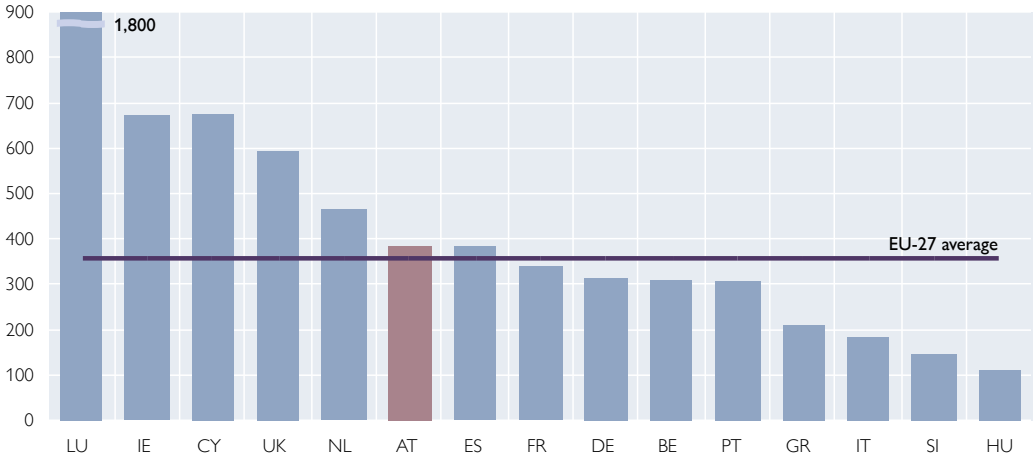
*The FSAP also identified several areas for improvement, in particular with regard to the legal framework for banking supervision and financial stability. A case in point is the institutional framework for macroprudential policy, which, according to both the IMF and the OeNB, needs to be strengthened, e.g. by establishing a full-fledged framework and considering a broad macroprudential toolkit. In addition, the IMF delegation also proposed to reform the Austrian deposit guarantee system with the aim of creating a single public ex ante funded system. Further areas for improvement concern the expansion of early intervention tools for troubled banks, the creation of a framework for orderly bank resolution and several issues related to effective banking and insurance supervision. The final results of the Austrian FSAP 2013 are scheduled to be published in the second half of 2013.*

[1] *The final report of the Austrian FSAP 2013 is scheduled to be published by the IMF in fall 2013 once the results have been integrated into Article IV surveillance and discussed by the IMF Executive Board.*

Chart 14

**Banking System Size**

*Total assets to GDP in %*




*Source: ECB (data as at June 2012), Eurostat, Swiss National Bank.*

*Note: Not all countries are represented in the chart.*

## Difficult Environment for Austrian Banks Persists

### Size of Austrian Banking System Is Stagnating

*Consolidation trends in the Austrian banking market remained muted in 2012. Income-based flexibility seems limited, so cost-side optimizations have to be continued.* Austria has a fragmented banking market characterized by a large number of banks. High competition and traditionally low interest margins in the domestic market are forcing banks to cut down on costs, as revenue-side measures are limited. In 2012, the total number of banks was reduced by 15 to 809. The number of bank employees declined slightly to approximately 79,100. This trend is expected to continue in 2013 following the announcement of further branch closures.

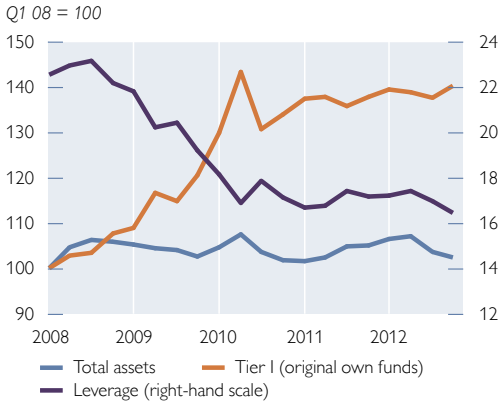
*The size of the Austrian banking system remained almost unchanged in 2012 at around 380% of GDP, slightly above the weighted average for the EU-27 (illustrated in chart 14).* Total assets of the consolidated Austrian banking system stagnated in the year 2012 at approximately EUR 1,164 billion (chart 15).

*Austrian banks remain committed to the CESEE region. The exposure of majority Austrian-owned domestic banks remained largely flat at around EUR 210 billion as at year-end 2012.*[1] The exposure to CESEE is relatively high, but broadly diversified, with more than half of it concerning investment-grade countries. Developments in the various CESEE countries have recently been diverging. Reductions in exposure in some countries are in essence outweighed by expansions in other countries. Nevertheless, the market share of Austrian banks in CESEE declined slightly in 2012 to around 11%, which was, among other things, due to a sale of operations in Kazakhstan and Kyrgyzstan.

[1] *Austrian banks' total CESEE exposure ran to approximately EUR 320 billion.*

Chart 15

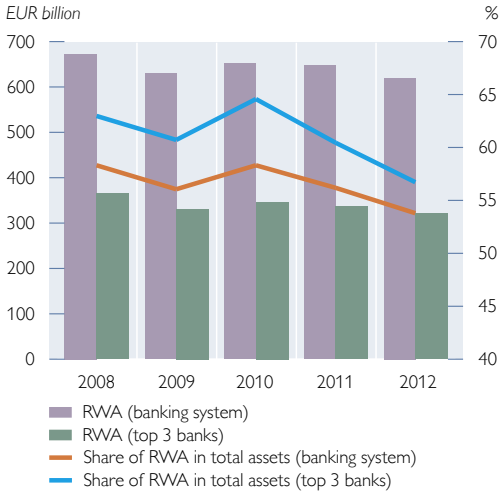
**Leverage of the Austrian Banking System**




*Source: OeNB, consolidated data.*

Chart 16

**Risk-Weighted Assets (RWA) of Austrian Banks**




*Source: OeNB.*

## Capital Ratios Continued to Increase in 2012

*The tier 1 ratio of the Austrian banking system continued to improve in 2012, partly due to reductions in risk-weighted assets (RWA).* After its low in the second quarter of 2008, the aggregate tier 1 capital ratio (capital adequacy ratio) of all Austrian banks rose steadily and reached 11.0% (14.2%) at end-2012. The increase of the aggregate tier 1 capital ratio can be mainly attributed to two effects. First, the volume of eligible tier 1 capital has risen by more than one-third since 2008, reflecting capital increases (private placements, capital injections from the parent group, retained earnings and other measures) as well as government measures under the bank stabilization package worth EUR 9.4 billion (or about half of the increase in eligible tier 1 capital). Second, in a direct response to the financial crisis, banks were reducing their RWA until the fourth quarter of 2009 (see chart 16), inter alia by streamlining their balance sheets and cutting off-balance sheet activities. While there was a slight increase in RWA in 2010, the trend of RWA reductions has continued ever since: RWA shrank by 4.3% in 2012, with reductions being more pronounced for Austria's top 3 banks than for the rest of the banking sector.

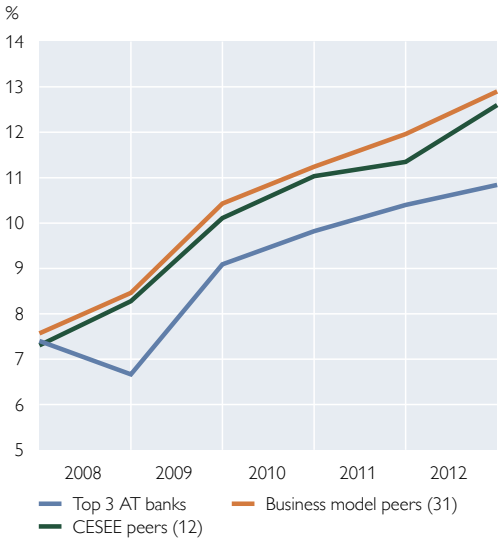
Leverage of large Austrian banks below European average

*By international comparison, Austrian banks still have a rather high ratio of RWA to total assets, reflecting low leverage.* The leverage of large Austrian banks is considerably lower than that of their peer groups (16.1 for the top 3 banks versus 22.8 for European peers and 28.6 for CESEE peers). As the leverage ratio is independent of banks' internal models and/or changes in external ratings and, therefore, of the credit cycle, it constitutes a stable (long-term), alternate indicator for financial stability. However, the aggregate tier 1 capital ratio of Austria's top 3 banks indicates that they are less adequately capitalized than their international peers.[2] Even though the top 3 banks have continually improved their tier 1

[2] *The two peer groups analyzed here consist of, first, 12 European banks with relevant CESEE exposure and, second, of 31 European banks with similar business models.*

Chart 17

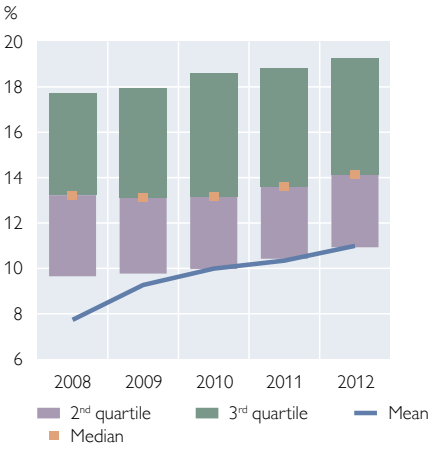
**Tier 1 Ratio of Large Austrian Banks Compared with European Peers**




*Source: OeNB, Bankscope.*

Chart 18

**Aggregate Tier 1 Ratio of Austrian Banks**




*Source: OeNB.*

capital ratios in recent years, chart 17 shows that the gap to their peer group's ratios widened from 1.0 percentage point in 2009 to 1.8 percentage points by end-2012.[3] The three banks will therefore have to strengthen their capital base further, as a substantial amount of government participation capital subscribed under the bank support package will have to be replaced by private funds by 2017.

*The distribution of capital ratios among Austrian banks highlights the fact that the capitalization of local and regional banks is more solid than that of large banks.* At the end of the second quarter of 2012, the median tier 1 capital ratio of all Austrian banks stood at 14.1% and thus above the aggregate mean (see chart 18). The higher median ratio essentially reflects the high number of local and regional banks with above-average capitalization that operate in Austria alongside the few large banks which dominate the industry.

The allocation of banks' capital within the Austrian banking system mirrors the importance of their CESEE business. Roughly one-third of Austrian credit institutions' consolidated capital is located at CESEE subsidiaries. For the biggest banks, this relation is even more pronounced. This can of course also be explained by the fact that several countries concerned have higher capital requirements than Austria.

[3] *Figures relate to the 12 banks with relevant CESEE exposure.*

Box 2

## Implications of Basel III for Austrian Banks

*The Capital Requirements Regulation (CRR) and Capital Requirements Directive IV (CRD IV), which transpose Basel III (mainly the new capital and liquidity framework) into European law will enter into force on January 1, 2014. The new capital framework will increase both the quantity and quality of banks' own funds. The new minimum capital requirements (which will be fully applicable as of January 1, 2015, following a phasing-in period) specify a common equity tier 1 capital ratio of 4.5% (for capital of the highest quality, e.g. shares); a tier 1 capital ratio of 6% (1.5% of which may be made up of additional tier 1 capital, e.g. hybrid capital); a total capital ratio of 8% (2% of which may be made up of tier 2 capital, e.g. subordinated bonds). On top of that, banks are required to hold a capital conservation buffer of 2.5% and may have to hold a (1) countercyclical buffer, (2) a systemic risk buffer and (3) a buffer for other systemically important credit institutions (capped at 2%). The CRD IV also introduces a buffer for globally systemically important credit institutions in accordance with the framework established by the Financial Stability Board (FSB). Currently, however, no banking group headquartered in Austria is defined as a globally systemically important institution. All these capital buffers have to be met with capital of the highest quality (common equity tier 1 capital). The full range of new capital requirements (stricter qualitative criteria for own funds instruments) will only enter into force after a transitional period for own funds instruments which will no longer be eligible after January 1, 2022, and after the phasing-in of new deduction requirements for own funds (until January 1, 2016).*

*The Austrian banking sector has already started to enhance its capital structure. However, banks still have additional capital needs. The Austrian banking sector is estimated to need additional own funds of between EUR 3 billion and EUR 8 billion until January 1, 2022, to be compliant with the new minimum capital ratios. This figure is made up of EUR 1 billion of common equity tier 1 capital, EUR 2 billion of additional tier 1 capital and a maximum of EUR 5 billion of tier 2 capital.[1] The amount of additional tier 2 capital needed depends on the individual features of the tier 2 capital instruments. Especially the frequent incentives to redeem capital instruments (e.g. step-up clauses stipulating an increase of coupon payments if the instruments are not called on a specified date) impair the eligibility of these instruments as tier 2 capital.*

*The main challenge for the Austrian banking sector remains the replacement of state aid instruments (i.e. participation capital) to the amount of EUR 5.15 billion by 2017, when state aid instruments other than common equity tier 1 capital will no longer be eligible under the CRR. Although the common equity tier 1 capital necessary to fulfill minimum requirements has meanwhile gone down to about EUR 1 billion, the Austrian supervisory authority as well as markets will expect large and internationally active Austrian banks to hold buffers well above these minimum requirements.*

*Another important innovation under Basel III is the introduction of a harmonized quantitative liquidity regulation. Its core component is the Liquidity Coverage Ratio (LCR).[2] Compliance with this minimum ratio will improve the risk-bearing capacity of Austrian banks, thereby decreasing the frequency and severity of banking crises and enhancing the stability of credit supply to the real economy (especially to SMEs). Harmonized liquidity regulation enables the competent authorities to more effectively supervise the adequacy of cross-border banking groups' liquidity risk management. The LCR will be phased in from 2015 onward; in the first year, banks will have to cover only 60% of their net cash outflows over 30 days by high-quality liquid assets. By 2018, at the latest, banks will have to reach 100% coverage. From a financial stability perspective, an accelerated adjustment process is advisable. Also, the market expects banks to cover 100% of their stressed net cash outflows by assets of (extremely) high credit quality and (extremely) high liquidity.*

[1] *The calculation is based on data as at the fourth quarter of 2012 under the following assumption: minimum capital plus capital conservation buffer required for the common equity tier 1 ratio of 7%, additional tier 1 capital ratio of 1.5% and tier 2 capital ratio of 2%; no retained earnings or capital increases for the period until 2022 have been taken into account.*

[2] *The LCR is defined as the ratio of high-quality liquid assets (HQLA) over stressed net cash outflows over 30 days. See Basel Committee of Banking Supervision. 2013. Basel III: The Liquidity Coverage Ratio and liquidity risk monitoring tools. Basel. http://www.bis.org/publ/bcbs238.pdf.*

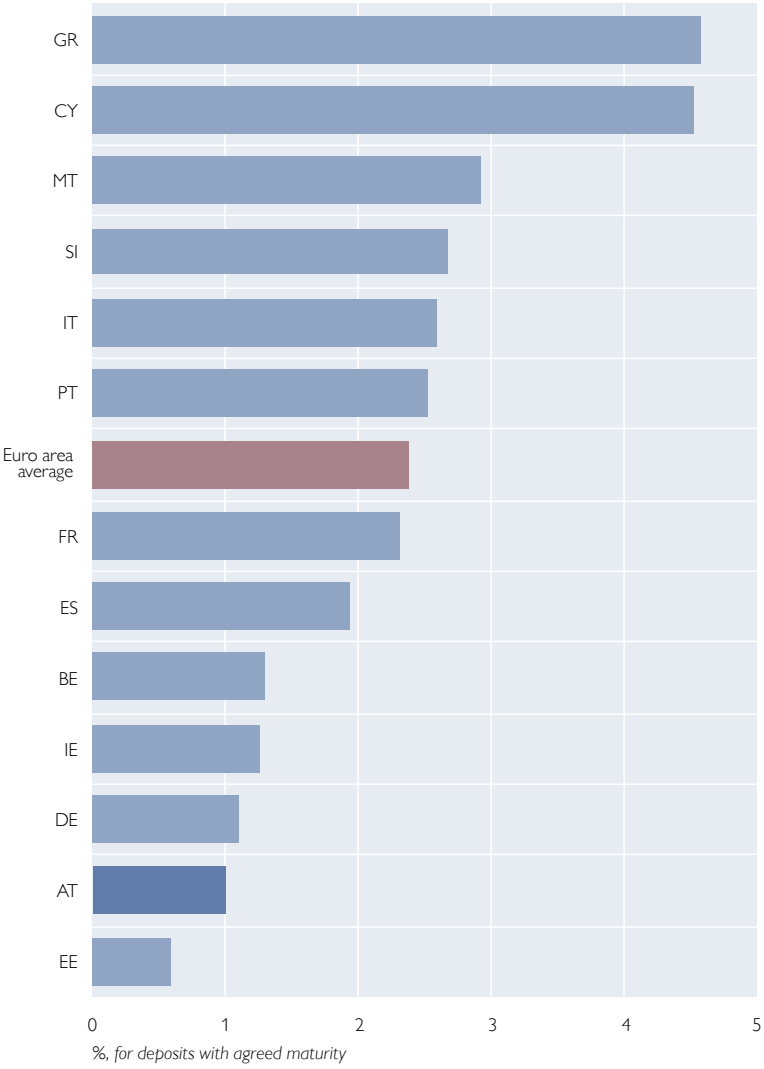
### Liquidity Situation Shows Signs of Further Improvement

Robust liquidity situation of Austrian banks

*At the EU level, banks' liquidity situation has remained stable yet fragile during the past six months.* The first quarter of 2013 showed weak debt issuances throughout the EU-27. In the first three months they accumulated to EUR 97 billion, which is far below the seven-year average of EUR 187 billion for the first quarter.[4] Nevertheless, funding pressure has not become an imminent problem yet. Banks, especially in the euro area periphery, benefit from the provision of extensive central bank liquidity. Moreover, banks have increased their deposit base during the last couple of months. Partial deleveraging for certain asset categories and an increasing tendency of nonfinancial corporates with market access to tap debt markets also reduce structural refinancing pressures.

Chart 19

**Annualized Interest Rate on Household Deposits**




Source: ECB.

*The use of early repayment signals a relaxation of the refinancing situation.* A number of EU banks – mainly from euro area core countries – made use of the early repayment option for the two longer-term refinancing operations (LTROs) two years ahead of the original three-year maturity. Nevertheless, the ongoing bail-in discussion and events like the crisis in Cyprus will most likely affect the pricing and availability of bank funding in the medium term.

*Austrian banks reduced their participation in the ECB's open market operations by more than 56% in the first quarter of 2013.* The total volume of allotments to Austrian banks equals 0.7% of the ECB's total allotted volume, well below the proportionate share of Austrian banks in the European banking system[5] (3.8%). The cumulated net funding gap of the 30 largest Austrian banks (12 months without money market operations) increased from EUR 34 billion in September 2012 to EUR 41 billion by mid-April 2013. This figure, however, is in line with the long-term average. The net position of planned debt issuances in relation to repayable debt has improved slightly. It remains

[4] *Figures are based on a recent study of April 2013, conducted by Bank of America Merrill Lynch; source: Bloomberg.*

[5] *As measured by consolidated total assets.*

positive for instruments with maturities of up to one month but remains clearly negative over a 12-month horizon. The counterbalancing capacity (12 months without unsecured money market operations and foreign exchange swaps) remained stable at EUR 100 billion (April 2013).

*As regards foreign currency funding, banks narrowed their liquidity gaps in U.S. dollar- and Swiss franc-denominated funding.* However, some banks lag in the adjustment process and still rely excessively on short-term foreign exchange swaps. As some legacy positions in U.S. dollar and Swiss franc are difficult to unwind, some banks should increase the levels of their liquidity buffers, lengthen funding tenors and diversify funding instruments and counterparties.

## Austrian Banks Show Higher Resilience in Their Funding

A low-interest environment fosters a deposit shift in Austria. Domestic deposit rates are well below the euro area average. As to deposit rates for new business in Europe (chart 19), strong heterogeneity in early 2013 indicates that banks in euro area periphery countries have to offer far higher interest rates to acquire new business than, for example, Austrian banks, which were able to reduce their funding costs. At the same time, expectations of persistently low interest rates reduced the momentum of deposit growth in Austria in 2012. While growth in 2011 was nearly 5%, the figure went down to some 1.6% in 2012, and this downward trend continued in early 2013. At end-2012, Austrian banks held EUR 354 billion in customer deposits, of which approximately 16% came from foreign depositors – mostly from Germany. Moreover, a shift in deposits became evident. While demand deposits were still growing strongly in terms of volume, savings deposits and term deposits stagnated or declined.

Customer funding gap closed

*The customer funding gap at Austrian banks' subsidiaries in CESEE was closed on aggregate as loans stagnated and deposits continued to grow strongly.*

In 2012, deposits at Austrian subsidiaries in CESEE increased by 6.2% to EUR 172.1 billion. Deposit growth was driven by subsidiaries in Poland[6], the Czech Republic and also Hungary. On aggregate, all CESEE subsidiaries were able to close their funding gap for the first time since 2006 (chart 20). The increase in local customer deposits and the associated improvement in the loan-to-deposit ratio of Austrian banks' CESEE subsidiaries (which shrank to 99.4% by December 2012) are favorable developments from a supervisory perspective and correspond with the objective of strengthening the local stable funding base as laid down in the sustainability package developed by the

Chart 20

**Customer Funding Gaps at CESEE Subsidiaries of Austrian Banks**


Source: OeNB.

[6] *Deposit growth in Poland was, inter alia, attributable to the acquisition of a Polish subsidiary.*

OeNB and the FMA. Subsidiaries that continue to show imbalances in this area should therefore actively seek to improve their local funding. In the first quarter of 2013, deposit growth somewhat lost momentum.

Box 3

**Findings of the Monitoring Exercise with Regard to the Sustainability Package**

*The sustainability package[1] (released in March 2012) stipulates that the stock and flow loan-to-local stable funding ratios (LLSFRs) at the subsidiaries of Austria's three largest banks[2] and the risk-adequate pricing of intragroup liquidity transfers to subsidiaries be monitored. These measures are based on the Austrian supervisors' experience that banking subsidiaries that entered the recent financial crisis with high (i.e. above 110% stock) LLSFRs were significantly more likely to exhibit higher loan loss provisioning rates than other banking subsidiaries that had been following a more conservative and balanced business and growth model. Therefore, banking subsidiaries with stock LLSFRs of above 110% are considered to be "exposed," and starting with data from end-2011, the sustainability of their new business has been monitored closely. The latest available data are of end-2012, which means that first conclusions can be drawn with regard to the sustainability of the monitored subsidiaries' business models over the year 2012.*

*At end-2012, most monitored subsidiaries (28 out of 39) were not considered to be exposed, since their stock LLSFRs were below 110%, and all but one subsidiary found to be above the early warning threshold exhibited welcome trends in their new business. These findings are updated quarterly and shared and discussed with the banks concerned and their host and home supervisors. Besides these results, the sustainability monitoring also focuses on intragroup liquidity transfer volumes and the fund transfer pricing (FTP) models applied to them. Analyzing these data is an ongoing supervisory task and helps assess the adequacy of banks' internal risk and pricing models.*

[1] *FMA and OeNB. 2012. Supervisory guidance on the strengthening of the sustainability of the business models of large internationally active Austrian banks.*

[2] *Erste Group Bank, Raiffeisen Zentralbank and UniCredit Bank Austria.*

## Slight Credit Growth in Austria, Increased Local Funding in CESEE

Share of foreign currency loans in total loans decreasing rapidly

*Loan growth in Austria is leveling off, but there are no signs of a credit crunch. Housing and home improvement loans are outpacing the general trend.* Credit growth in Austria weakened as the year 2012 progressed. This trend also continued in early 2013. However, a credit crunch did not materialize. The decline in loan growth rates was mainly driven by a decline in demand as corporations, for example, are well capitalized and are holding back on investments. By March 2013, the volume of loans to domestic nonbanks amounted to EUR 329 billion, up 0.2% against the previous year. Loans for housing and home improvements continued to outpace the general development by increasing by 4.9% in 2012. In contrast, foreign currency loans dwindled.

*The supervisory measures targeting foreign currency loans (FCLs) and repayment vehicle (RPV) loans to households in Austria continued to be successful.* Supervisory efforts, stepped up since October 2008, have proved effective. The outstanding amounts of FCLs to households have declined steadily. The total FCL volume amounted to EUR 31 billion in March 2013, down by 37% or EUR 15 billion against October 2008 on a foreign currency-adjusted basis[7];

[7] *Not adjusted for foreign exchange effects, the volume of outstanding foreign currency loans decreased by just EUR 8 billion or 21% as a consequence of the strong appreciation of the Swiss franc.*

FCLs accounted for a share of 23% in total loans to households. The decline of FCLs was compensated for by developments in euro-denominated loans. The total amount of FCLs to domestic nonbank borrowers added up to EUR 46 billion in March 2013, equaling 14% of total loans.

*New lending standards for FCLs address ESRB recommendations and Austrian supervisory experience.* At the beginning of 2013, the FMA issued new "Minimum Standards for the Risk Management and Granting of Foreign Currency Loans and Loans with Repayment Vehicles," integrating the 2003 Minimum Standards and the 2010 Extension of the Minimum Standards and reflecting the ESRB's 2011 recommendations on foreign currency lending as well as the additional experience Austrian supervisory authorities had gathered over the past years. The new FMA Minimum Standards target both domestic and foreign exposures and introduce the principle of reciprocity, which means that rules targeting foreign currency lending abroad have to be adhered to not only by Austrian banks' subsidiaries in CESEE but also in Austrian banks' cross-border activities as such.

*The legacy of past exuberances will remain a challenge for financial stability in Austria for the coming years.* While domestic FCLs declined rapidly over the past years, the legacy of the boom observed in the last decade will continue to be a challenge. This is most importantly due to the fact that the majority of FCLs are designed as bullet loans with an RPV as repayment instrument. This exposes such loans not only to foreign exchange risks but also to asset price risks. As per 2012, 73% of outstanding FCLs to Austrian households were RPV loans. Another 7% were bullet loans without an attached RPV. Accordingly, FCLs had a longer term to maturity than euro-denominated loans: 84% of FCLs to households had a maturity of more than five years, while this was the case for only 51% of euro-denominated loans.

Austrian banks' CESEE subsidiaries report currently flat loan growth

*The overall credit volume of Austrian banks' CESEE subsidiaries has remained rather stable throughout the past year.* The 66 fully consolidated CESEE subsidiaries of Austrian banks reported EUR 276 billion of total assets as at end-2012, which corresponds to an annual decrease of 0.5%. The drop is mainly due to the sale of subsidiaries in Kazakhstan and Kyrgyzstan. The loan volume remained essentially unchanged year on year, totaling EUR 171 billion (–0.1%). The total volume of direct cross-border lending of all Austrian banks to CESEE decreased slightly by 0.5% over the same period and amounted to EUR 51 billion in December 2012.

*Significant decrease in foreign currency-denominated loans in direct and cross-border lending in CESEE.* The total loan volume of the CESEE subsidiaries of the Austrian top 6 credit institutions increased by 1.6% year on year at end-2012. At the same time, loans denominated in foreign currency decreased by 5.8% to EUR 79 billion (taking

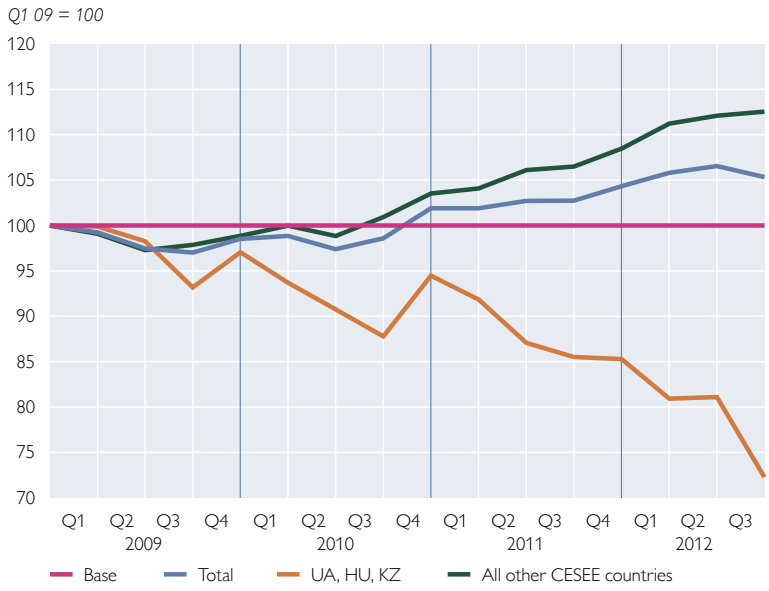
Chart 21

**Share of Foreign Currency Loans at Austrian Subsidiaries in CESEE**


*Source: OeNB.*

Chart 22

**Development of Austrian Banks' CESEE Exposures, 2009–2012[1]**




*Source: OeNB.*

[1] *Adjusted for exchange rate effects.*

Sustained commitment of Austrian banks to CESEE

exchange rate effects into account). Thus, the aggregated share of foreign currency loans in the overall loan portfolio of said CESEE subsidiaries decreased to 43.6% in December 2012. The euro is still the most important foreign currency in their loan portfolios, accounting for more than half of all FCLs, while Swiss franc- and U.S. dollar-denominated loans decreased to 18.1%. The U.S. dollar continues to play a significant role especially in the CIS region, where it takes up a share of approximately 90% of all foreign currency loans. The total volume of direct cross-border foreign currency loans granted by Austrian banks to borrowers in the CESEE region further decreased by 2.1% to EUR 37.7 billion in December 2012.

*Austrian banks reduced their leasing portfolio in CESEE in total, but foreign currency leasing increased owing to one-off effects.* The overall volume of leasing to households and nonfinancial corporations by the top 6 Austrian banks in CESEE decreased by 2.4% year on year, to EUR 12.7 billion, the vast majority of which was contracted with nonfinancial corporations. Foreign currency-denominated leasing contracts recorded an increase mainly in the first half of 2012 as the portfolio of a major Austrian bank was restructured. Their total volume came to EUR 5.4 billion in December 2012.

*In 2012, Austrian banks took further steps to restructure their balance sheets, but concerns about widespread deleveraging – most prominently with regard to the CESEE region – were not confirmed.* The figures presented in the sections above show that Austrian banks' subsidiaries in CESEE continued to support growth while safeguarding against rising local vulnerabilities. Austrian banking groups[8] remained committed to the CESEE region, and Austrian banks' business models are consistent with the spirit of the Vienna Initiative 2. Going forward, the OeNB continues to support the objectives and principles of the Vienna Initiative 2 and commends an ongoing dialogue, taking into account both home and host country perspectives.

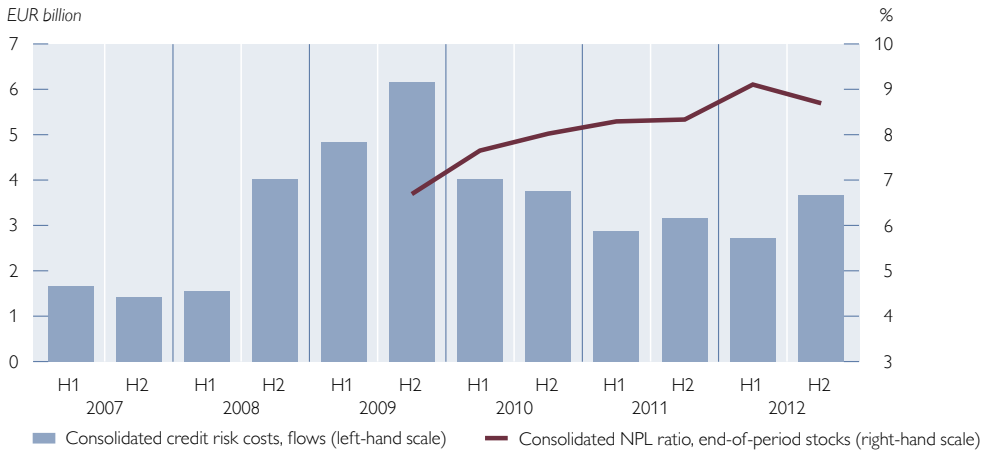
*Since the height of the CESEE market turmoil in early 2009, Austrian banks' exposure to the region has increased.* When taking exchange rate effects into account, the increase amounted to approximately 5%.[9] However, this development is not uniform across the countries in which Austrian banks have

[8] *All banks with an Austrian banking license, irrespective of whether they are majority Austrian- or foreign-owned, including their respective CESEE subsidiaries.*

[9] *Reported exposure is distorted by movements in exchange rate effects. Even if real loan volumes were constant, figures reported in euro would grow or shrink as exchange rates fluctuate. In order to monitor the development of exposures, such effects need to be neutralized, as shown in chart 22.*

Chart 23

**Consolidated Credit Risk Costs and NPL Ratios of Austrian Banks**




*Source: OeNB.*

substantial exposures, as chart 22 illustrates.

*While total exposure is on a long-term upward trend, it went down in late 2012, which was mainly attributable to the sale of subsidiaries in Kazakhstan and Kyrgyzstan.* This also explains the sharp decline in Austrian banks' exposure to the country aggregate of Ukraine, Kazakhstan and Hungary. In total, Austrian banks' exposure shrank by approximately 28% in countries with a difficult economic (policy) and/or regulatory environment. Exposure reductions in those countries were more than offset by an aggregate increase of exposure by 13% in other CESEE countries[10].

## Deterioration of Credit Quality in CESEE Slowed Down

*The asset quality of Austrian banks remains an issue of concern. While credit quality remained fairly benign in the domestic market, it continued to deteriorate at Austrian banks' CESEE subsidiaries.* On a consolidated basis, net provisioning by Austrian banks increased during 2012 by around EUR 400 million against the preceding year. This development was mainly driven by banks that had already experienced problems in the past but to a certain extent also by some medium-sized Austrian banks. The decline in the share of nonperforming loans (NPLs) to total loans observed in late 2012 was triggered by the above-mentioned sale of subsidiaries. Overall, however, the share of NPLs in total loans increased to 8.7% year on year by end-2012.

Sustained high level of nonperforming loans in CESEE

*The credit quality of foreign currency loans in CESEE continued to be lower than that of local currency loans.* According to an OeNB survey[11], the overall NPL ratio of Austrian banks' CESEE subsidiaries decreased slightly from 15.8% in June 2012, to 14.7% in December 2012,

[10] *Of the countries in which Austrian banks record a substantial exposure, reductions in reported (i.e. unadjusted) exposure were largest in Kazakhstan (–94% since Q1 09 due to the sale of operations), Ukraine (–25%) and Hungary (–16%), reflecting economic difficulties as well as elevated levels of political risk. Exposures to other countries, by contrast, grew substantially, with Poland (+47%), the Czech Republic (+29%), Slovakia (+16%) and Russia (+24% since Q1 09) featuring most prominently.*

[11] *The survey is conducted semiannually and includes the top 6 Austrian banking groups.*

while the NPL ratio of foreign currency loans decreased from 19.7% to 19.0% over the same period. The decline, however, can again be attributed to the sale of subsidiaries in Kazakhstan and Kyrgyzstan. Moreover, country-specific differences remained high, reflecting the heterogeneous economic development of the CESEE region as well as different definitions of nonperforming loans. The NPL ratio remained below 10% and even decreased in some of the most important host countries of Austrian banks (e.g. the Czech Republic, Russia and Slovakia), while it reached levels close to or above 20% in many southern European countries (e.g. Bosnia and Herzegovina, Croatia, Romania and Serbia). The NPL ratio exceeded 40% in two CESEE countries where the exposure of Austrian banks, however, is of rather minor importance.

Stable provisioning in banks' domestic business

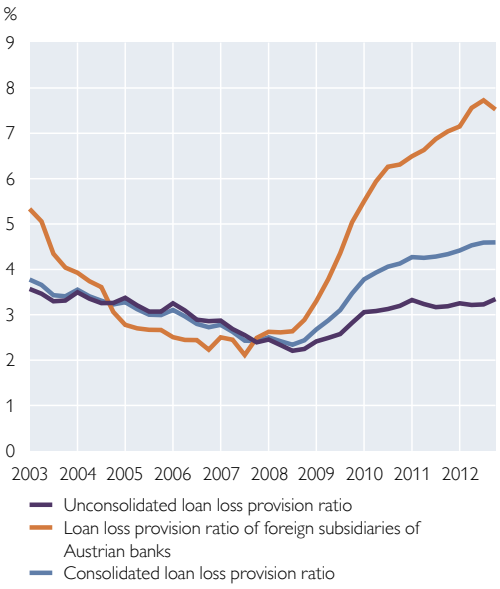
*Even though Austrian banks experienced an ongoing deterioration in their loan portfolios, they managed to increase their coverage ratios.* The coverage of NPLs by loan loss provisions and collateral improved over the recent years, with the NPL coverage ratio I[12] increasing to 47.6% in December 2012, up from 44.3% in June 2012. Due to the high share of mortgage loans in total loans in the CESEE region, the NPL coverage ratio II[13] was significantly higher, amounting to 67.4% in December 2012 (68.2% in June 2012). In December 2012, the coverage ratios for foreign currency loans in CESEE stood at 42.9% and 68.4%, respectively, compared to 40.4% and 68.5% in the previous period. In light of the uncertain economic prospects discussed before, Austrian banks' subsidiaries are called upon to further increase coverage ratios.

*Just as NPLs were reduced, the loan loss provision (LLP) ratio of Austrian banks' foreign subsidiaries declined, albeit not by the same extent.* Within CESEE, the NMS-2007 posted the largest increase in the LLP ratio during the second half of 2012 (+1.7 percentage points) as well as the highest LLP ratio level (12.3% at year-end). The CIS countries experienced the opposite development: their LLP ratio dropped by 2.7 percentage points to a slightly above-average level of 7.7%.

*In Austria, loan loss provision ratios were stable in 2012.* In the domestic market, the LLP ratio[14] increased

Chart 24

**Loan Loss Provisions of Austrian Banks**




*Source: OeNB.*

*Note: All ratios refer to nonbank loans (end-of-period stocks).*

[12] *Coverage ratio I is defined as the ratio of loan loss provisions on NPLs to NPLs.*

[13] *In addition to the loan loss provisions, coverage ratio II includes eligible collateral on NPLs according to Basel II in the numerator.*

[14] *Stock of specific loan loss provisions for claims on nonbanks as a share of total outstanding claims on nonbanks (unconsolidated data).*

slightly to 3.3% at end-2012. Despite having recorded the highest starting level so far in 2011, the Volksbanken credit cooperatives also registered the largest increase in LLP ratios of 5.4% in total. At the same time, building societies and state mortgage banks were able to reduce their respective ratios slightly. Combining domestic and foreign provisioning data yields a consolidated loan loss provision ratio for nonbank lending that stayed almost flat over the second half of 2012 (and came to 6.6% at year-end).

*Asset quality assessment remains one of the most important issues for Austrian supervisors. Work toward a harmonized EU approach is welcome, as it fosters comparability.* In the wake of the financial crisis triggered by the default of Lehman Brothers, international regulatory bodies have focused their interest on asset quality assessment in general and on loan forbearance in particular. Austrian authorities contribute to this work at the European level. A crucial element of these efforts will be to assess whether banks have been overly lenient with respect to doubtful loans by classifying them as renegotiated or restructured instead of nonperforming, thus understating the need for risk provisioning. Overall, there are still inconsistencies and uncertainties, especially with respect to the definition of NPLs across various countries as well as to the valuation of collateral. The OeNB therefore supports the EBA recommendation to national supervisory authorities to conduct asset quality reviews[15] and related work on the introduction of the SSM.

## Rebound in Profitability of Austrian Banks

*Risk costs continue to weigh on the profitability of the Austrian banking system.* Uncertainties about the sustainability of public indebtedness in some euro area countries, regulatory developments at the EU level, low interest rates, blurred economic growth prospects as well as the implementation of different economic policy measures in individual CESEE countries affected the profitability of Austrian banks.

Forbearance risks and asset quality need to be monitored closely

*Austrian banks' profitability rose in 2012, mainly on account of one-off effects and banks' activities in CESEE.* The consolidated profitability of Austrian banks increased in 2012. Net profits after taxes rebounded to EUR 3 billion, which is more than three times higher than in 2011. The return on assets (RoA) was 0.2 percentage points higher and amounted to 0.3% (chart 25). However, the 2012 results should be interpreted with caution, as they were driven by hybrid capital repurchases and similar one-off measures. Without taking into account these extraordinary effects, the RoA would have stood at 0.2% – still an improvement, albeit less significant.

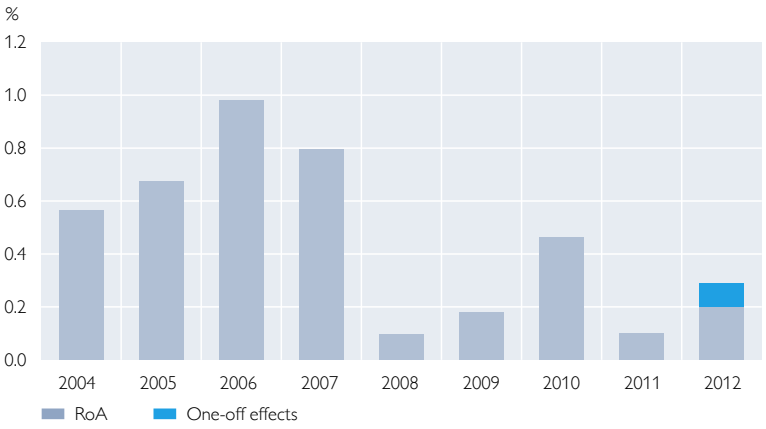
Weak operating results outweighed by repurchases in hybrid capital instruments

*Austrian banks' operating results were rather weak in 2012, and risk costs constitute a burden on net profits.* Banks' net interest income, which has traditionally accounted for more than half of total operating income, as well as income on fees and commissions decreased by 5.7% and 4.3% year on year, respectively. By contrast, trading income and other operating income grew relatively strongly. Provisions for covering credit risk in Austrian banks' loan portfolios

[15] *See EBA press release dated May 16, 2013.*

Chart 25

**Consolidated Return on Assets of Austrian Banks**




*Source: OeNB.*

More profitable CESEE subsidiaries tend to have lower LLP ratios

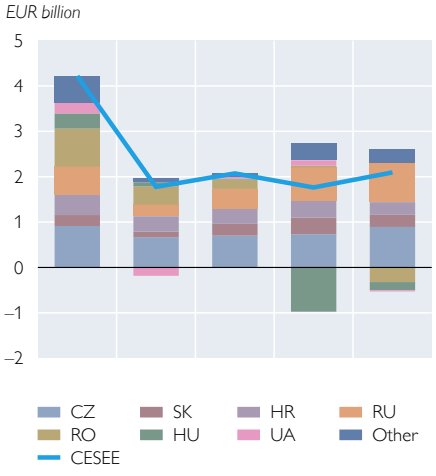
increased by 6.0% in 2012 and depressed results by EUR 6.4 billion. These provisions still remain a substantial factor that drags on banks' overall profitability, although they tend to be lower than in previous years.

*Austrian banks' subsidiaries in CESEE contributed substantially to the consolidated profitability of the Austrian banking sector. Their respective contributions were increasingly heterogeneous across countries, however.* Net profit after taxes increased by nearly 19% to EUR 2.1 billion. Compared to 2011, the average RoA of Austrian banks' subsidiaries in CESEE increased to 0.8%. However, their higher profitability needs to be interpreted with some caution, as banks' business in CESEE is generally associated with higher risks, which imply higher expected returns for banks' operations. Moreover, developments have become increasingly heterogeneous across countries – a fact that is mirrored in the performance of Austrian banks' CESEE subsidiaries (chart 26).

While operations remained profitable in the Czech Republic, Slovakia or Russia over the past couple of years, banks' profitability in other CESEE countries (e.g. Hungary or Romania) decreased or even turned negative. The key drivers behind this development were mainly the deterioration in credit quality but also reduced net interest income and policy measures in certain CESEE countries. While the diversification effect across the region has paid off for the top 3 Austrian banks so far, any unexpected problems e.g. in the Czech Republic or Russia would expose Austrian banks to substantial pressure on their consolidated profitability.

Chart 26

**Net Profit of Austrian Subsidiaries in CESEE**

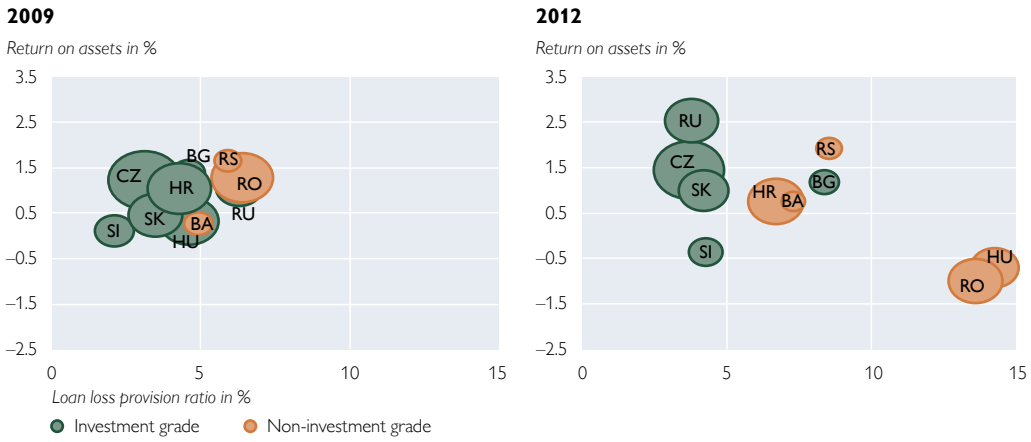



*Source: OeNB.*

*Profitability on Austrian business remains low. As a first line of defense, banks should seek further cost-cutting measures and look at ways to achieve higher margins as their margins are currently among the lowest in the euro area.* Austrian banks' domestic profitability is still suffering from structural weaknesses. Operating profits slipped by nearly 8% in 2012, driven by weaker net interest income and stagnating income from fees and commissions. At the same time, operating expenses climbed by more than 4%. Due to lower provisioning, net profits went up to EUR 3.2 billion, resulting in an unconsolidated RoA of

Chart 27

**Profitability and Loan Loss Provisions of Austrian Banks' CESEE Subsidiaries**




*Source: OeNB, S&P.*

*Note: The size of the data points reflects the total exposure of Austrian banks to the respective country.*

0.3%. As revenue-side measures are limited in the current environment, Austrian banks should seek to reduce costs in order to increase profitability. Higher profitability is of utmost importance not least for internal capital generation, as particularly the largest Austrian banks still lag behind their peers in terms of capital position.[16]

## Stress Tests Highlight the Downsides of the Challenging Environment

*The heterogeneous results of recent OeNB stress tests persist in an exercise conducted for the Financial Sector Assessment Program in line with international best practice.*[17] The most extensive stress testing exercise in years yielded similar results as previous risk assessments. Aggregate figures – mainly driven by improving risk-bearing capacity, particularly at the first-tier banks – continue to improve, while known problem banks and a number of smaller institutions struggle under scenarios based on severe assumptions.

Current stress tests conducted jointly with the IMF

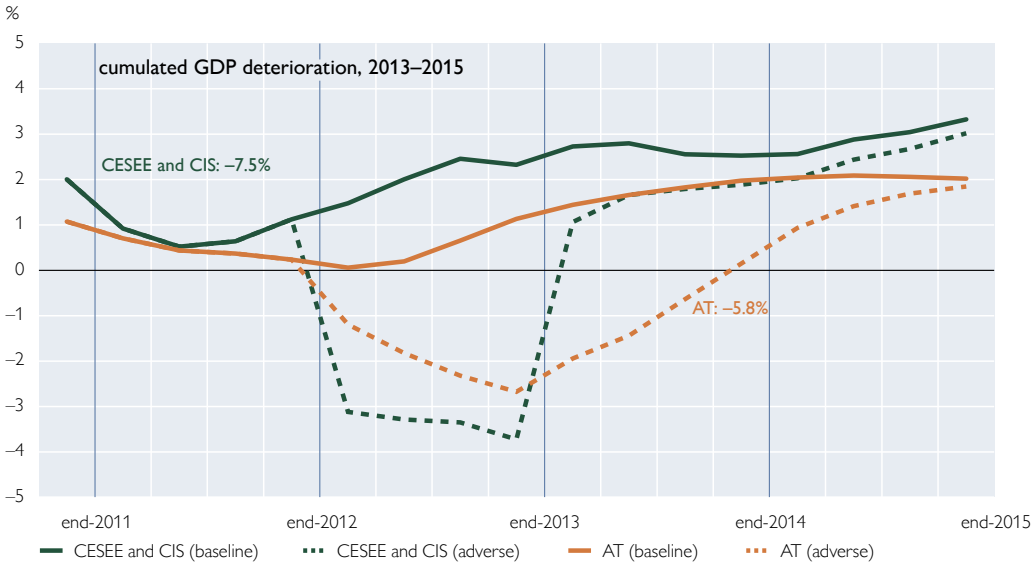
While the next Financial Stability Report will specifically cover the depth of the stress test, the focus in this issue remains on the baseline scenario and the most severe scenario of the macroeconomic stress test. As usual, the baseline scenario draws on the current macroeconomic outlook. The current adverse scenario, however, was broadly based on statistical criteria common in recent European FSAPs. Despite substantial progress in solving the European debt crisis, this scenario assumes major drawbacks paired with a sudden drop in confidence in the U.S.A. due to protracted fiscal problems, which hurts both consumption and investment globally. Contrary to other recent OeNB stress tests, both the baseline and the adverse scenario are based on a three-year horizon; in the adverse scenario growth resumes during the third year. While this leads to greater cumulated GDP growth (but also higher cumulated credit risk losses for banks) under both scenarios, shocks to GDP under

[16] *See chart 17 for a comparison with international peer groups and section "Rating Agencies Believe in Further Capital Increases" for an assessment of rating agencies.*

[17] *See box 1 for further details on the IMF FSAP 2013.*

Chart 28

**GDP Growth under the Baseline and the Adverse Scenario, 2013–2015**




*Source: OeNB.*

the current adverse scenario are comparable to the adverse scenario published last year (see chart 28).

Until the introduction of Basel III via the CRR/CRD IV[18], the core tier 1 (CT1) ratio, which was also used in the EU-wide stress test, remains the risk-bearing capacity measure of choice. Chart 29 shows that in the current OeNB stress test, the aggregate Austrian banking system started into 2013 with a CT1 ratio of 10.6% (whereas the starting point for the spring 2012 stress test was 9.9%) and, in the baseline scenario, managed to improve this ratio to 11.7% by end-2015 (10.5% according to the spring 2012 stress test, which had a two-year horizon). In the adverse scenario, the CT1 ratio went down to 8.9% (8.5%) by end-2015. This rather benign aggregate outcome masks the significant dispersion of results the OeNB observes among the approximately 600 consolidated Austrian banks. Besides the known problem banks, banks with low initial capitalization ratios and low historical profitability perform poorly. In light of the continued struggle to generate operating income[19], this phenomenon increased compared with previous years.

Top 3 results reflect higher earnings potential as well as higher risk

The top 3 banks'[20] CT1 also stood at 10.5% at end-2012. Under the baseline scenario, they outperform the banking system as a whole by improving to an aggregate CT1 ratio of 13.2% at end-2015, which reflects mainly the higher earnings potential of their cross-border portfolios and the reduced risk weighting under the IRB approach. At the same time, the riskiness of these profitable portfolios hits the top 3 under

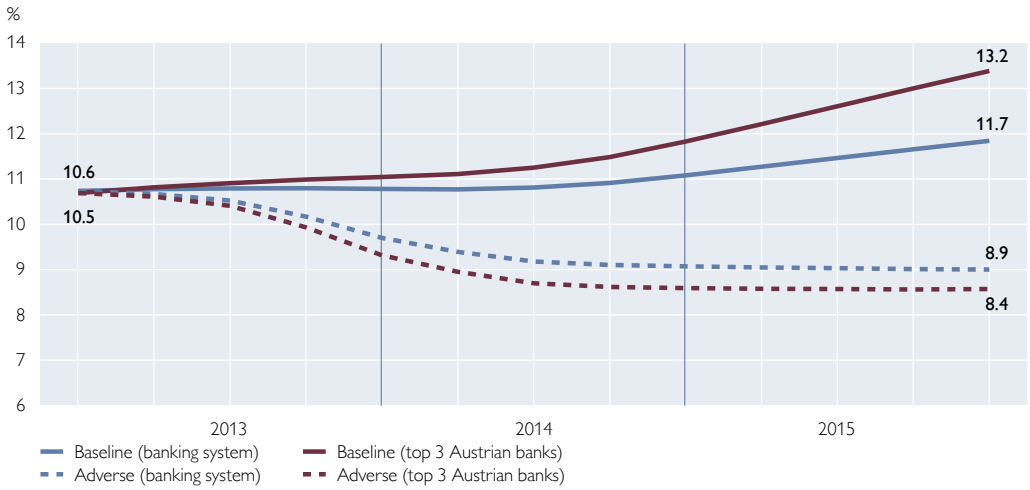
[18] *See box 2 for further details on the new Capital Requirements Regulation/Directive.*

[19] *See section "Rebound in Profitability of Austrian Banks" for an analysis of recent developments of operating income.*

[20] *UniCredit Bank Austria, Erste Bank Group, and Raiffeisen Zentralbank. The OeNB switched from the top 5 aggregate in 2012 to the top 3 to reflect the difference in risk – in particular with regard to the CESEE and CIS portfolios – of Austria's largest banks.*

Chart 29

**EBA Core Tier 1 Ratio under the Baseline and the Adverse Scenario, 2013–2015**




*Source: OeNB.*

the adverse scenario, reducing their CT1 ratio to 8.4%. On the one hand, this result shows material improvements over previous years, not least because of the higher capital ratios that serve as the starting point for the stress test. On the other hand, the top 3 banks operate in testing markets in testing times with significant downside risks beyond the scope of the macroeconomic stress test. Given that international peers with similar portfolios hold more capital and move more swiftly to improve their risk-bearing capacity,[21] the top 3 will need to continue to improve their capital position as well.

Overall, the stress test results calculated by the OeNB as part of the FSAP reflect the current juncture at which the Austrian banking system finds itself. Headline figures improve in line with international trends, but pockets of vulnerabilities in individual institutions as well as significant downside risks for the aggregate system persist. Amid the challenging European economic environment and the associated risks, Austrian banks should respond to the outside pressure emanating from regulators, supervisors, investors and rating agencies alike to improve their risk-bearing capacity.

### Rating Agencies Believe in Further Capital Increases

*Given the positive financial market conditions, the prices of listed Austrian financial institutions went up further.* The price-to-book ratios of quoted Austrian banks continued to be subdued but still exceeded those of their European peers. Market surveillance points to the fragile operating environment for Austrian banks in Austria and in CESEE, although the CESEE economies are expected to grow at a faster pace than the economies in western Europe. The profitability outlook for Austrian banks is deemed subdued as a result of low domestic (interest) margins and the expectation that loan loss provisions will remain elevated in CESEE for some time to come.

[21] *See section "Capital Ratios Continued to Increase in 2012" for details on recent European trends in banks' capitalization.*

*The below-average capitalization of internationally active Austrian banks is seen as one of their key weaknesses although improvements in capitalization have been noted since 2007.* Higher capitalization of Austrian banks is warranted as banks' ratings benefit from high government support. Therefore, current market surveillance still comes to a positive market assessment and finds evidence for the need and the opportunity to strengthen capitalization. If the market environment is indeed favorable, banks should – in the OeNB's view – make the necessary moves and step up their capitalization.

### ESRB Recommendations Gain Importance as Macroprudential Policy Tools

*The European Systemic Risk Board (ESRB) has so far issued six recommendations on financial stability issues. These recommendations and the underlying analyses are important in fostering a common understanding of major risks in EU financial markets and appropriate means to tackle them.* The ESRB recommendations are governed by an "act or explain" mechanism, i.e. addressees (either national supervisors, governments of EU Member States, the European Commission and the European System of Financial Supervision) are required to either implement the recommendations or give an adequate justification in case of inaction. Four recommendations addressing systemic risks have been issued so far: Recommendations on foreign currency lending, U.S. dollar-denominated funding, money market funds and the funding of banks. The first two recommendations were due to be implemented in 2012, the last two will have to be implemented in the course of 2014 and 2015.

*Besides addressing systemic risks, the ESRB also aimed to improve the macroprudential oversight framework in the EU* by issuing a recommendation on the macroprudential mandate of national authorities in 2011 and a recommendation on intermediate objectives and instruments of macroprudential policy in 2013.

Box 4

#### Macroprudential Tools – An Overview

*Enhancing the framework for supervision at the macro level, including macroprudential tools, remained at the top of the European supervisory agenda in 2012. The purpose of macroprudential supervision is to address risks that result from the interplay between different forces in financial markets (systemic risks) in contrast to risks at individual financial institutions.*

*Macroprudential tools were an important issue in the negotiations about the new banking legislation at the European level (Capital Requirements Directive IV, CRD IV, and Capital Requirements Regulation, CRR). The new framework for banking supervision will provide competent national authorities across the EU with adequate instruments to mitigate risks to financial stability. The macroprudential toolkit comprises e.g. countercyclical capital buffers, a systemic risk buffer, sector-specific capital requirements, an additional capital buffer for systemically important financial institutions, enhanced disclosure requirements but also instruments to limit concentration risk and the application of higher sectorial risk weights for certain assets.*

*The European Systemic Risk Board (ESRB) has contributed to these effects by taking a broader perspective that goes beyond the banking sector. Its recent recommendation on macroprudential instruments includes not only tools addressed to the banking sector such as loan-to-value ratios, leverage ratios, and loan-to-deposit ratios but also tools applicable to other financial market segments, e.g. minimum requirements for asset-backed securities transactions. Given banks' eminent role in the EU financial market, the banking sector remains the main focus of these tools.*

## Challenging Environment for Insurers and Pension Funds

### Performance of Austrian Financial Intermediaries Received a Noticeable Boost

*Better market conditions in the second half of 2012 and at the beginning of 2013 substantially improved the performance of Austrian mutual and pension funds as well as insurance companies.* Positive returns were partly generated by the appreciation of selected government bonds resulting from declining risk premiums. However, risks remain regarding the performance of Austrian mutual and pension funds in light of a potential resurgence of the sovereign debt crisis and, more generally, with regard to the uncertainty prevailing in financial markets and an expected prolonged period of low interest rates.

*Especially traditional life insurers' products with long-term guaranteed interest rates are challenged by the low-yield environment, particularly through low interest rates at the long end of the yield curve.* Even though the negative effects materialize rather slowly, given that only new premiums and expired investments are invested at current market interest rates, insurers need to adjust to the changed environment and reconsider their investment strategies. However, financial intermediaries should be careful not to revive the overly aggressive search for yield strategies that lead to riskier investments, which, in turn, might backfire in the future.

*Both the insurance industry and supervisors are reacting to the challenges of a low-interest-rate environment.* The European Insurance and Occupational Pensions Authority (EIOPA) had already included a potential low-interest-rate environment ("low-yield satellite scenario") in its 2011 insurance stress test.

The FMA cut the minimum guaranteed rate for classical life insurers from 2.25% to 2% in April 2011 and to 1.75% in December 2013 (valid only for new contracts) and conducted further analyses with respect to the stress resilience of Austrian life insurers. The average guaranteed interest rate of Austrian life insurers' investment stock actually comes to slightly below 3% and is decreasing. The return on investment of Austrian life insurance business was stable at around 4% during 2012 and still decidedly covers the aggregate guaranteed interest rate. In addition to the potential problems resulting from low interest rates, the life insurance business faces a continuous decrease in premium income, which has now lasted for eight consecutive quarters. Lower guaranteed interest rates, changes in taxation and expensive lapse conditions have discouraged new business.

Environment of sustained low interest rates as a challenge for insurance companies

*Property and casualty insurers as well as health insurers were less affected by the weaker environment, and premium growth remained stable.* Both nonlife segments could increase their premium income in 2012 (property and casualty insurers: +2.7%; health insurers: +3.4%). The combined ratio for property and casualty insurance was about 93% and increased slightly by 2 percentage points year on year due to an increase in the loss ratio. The underwriting results remained at a low level owing to high competition especially in the motor vehicle insurance sector.

*A further challenge for the insurance sector is preparing for Solvency II.* An interim regime, which should include parts of Solvency II – systems of governance, a forward-looking assessment of undertakings' own risk, submission of information and pre-application for internal models – is discussed at the EU level. In the first months of 2013, with participation of Austrian insurers, EIOPA ran a "long-term guarantees assessment,"

which will help answer some open questions regarding in particular the valuation of insurers' liabilities under Solvency II.

*Pension funds in Austria continued to grow (to EUR 16.3 billion, up 10% year on year) and generated year-on-year returns of 8.4% in the fourth quarter of 2012.* It should be noted, though, that this good performance was largely driven by their investment in bonds (52% of total assets, of which approximately 50% were invested in government bonds). This positive performance was partly due to the declining interest rates for Austrian and German government bonds. With interest rates at historical lows, the currently high returns for existing bonds may thus be followed by low returns for new issuances.

Positive development in mutual funds

*Austrian mutual funds experienced a very positive second half of 2012 and a good start into 2013.* The performance of all asset classes improved, and overall returns stood at 8.5% in 2012 (13.5% for equity funds, 8.4% for bond funds). Assets under management increased by 7.5% year on year to EUR 148 billion. This increase was driven both by institutional and retail funds. The trend toward investment in institutional funds continues, with about 43% of the total fund volume now belonging into this category. Institutional funds will be subject to the Alternative Investment Fund Managers Directive (AIFM Directive) as of July 2013, which will, for the first time, provide regulations applicable to fund managers in charge of institutional funds, hedge funds, real estate funds and private equity funds under a common European regulatory framework. The AIFM Directive constitutes a welcome instrument counteracting the previous lack of regulation in this area, which had played a non-negligible role in the global financial crisis.

# Special Topics

# The Single Supervisory Mechanism within the Banking Union –

## Novel Features and Implications for Austrian Supervisors and Supervised Entities

Dieter Huber,
Elisabeth von Pföstl[1]

*Over the past decades, the internal market for banking services has flourished. The financial crisis and contagion from banks to sovereigns and across borders has underlined the need to match the size and level of cross-border activities of banks with the integration of banking supervision. To align supervisory and political responsibilities with the competence to provide a financial backstop, the heads of government of the euro area have proposed a three-pillar model for a banking union.*

*As a first step in implementing banking union, supervisory responsibility for banks in participating Member States will be conferred on the ECB. Within the framework of a single supervisory mechanism (SSM), the ECB will share duties with the national authorities. The ECB will be responsible for the overall functioning of the SSM. At the same time, national authorities retain certain responsibilities, including the supervision of less significant banks. The changes to the supervisory process require a suitable organizational setup and procedures that account for the roles and responsibilities of the ECB and national authorities within the SSM and vis-à-vis supervised institutions.*

*JEL classification: K230, K330*
*Keywords: single supervisory mechanism, banking union, ESM, banking supervision, joint supervisory team, ECB framework regulation*

During the crisis after 2007, several European governments had to intervene in their financial sectors to stabilize banks. The crisis demonstrated the rapid spread of distress across financial institutions and country borders, the risks of contagion for public finances, and market fragmentation. With the volume of banking sectors' total assets far exceeding that of national budgets, the need to create an independent integrated supervisory and regulatory framework moved up the priority list. Furthermore, financial stabilization mechanisms were created at the European level. Soon policymakers envisaged extending the scope of these mechanisms from providing financial support to euro area member countries to recapitalizing banks directly through the European Stability Mechanism (ESM) subject to appropriate conditionality once an effective single supervisory mechanism has been established.[2]

### Evolution and Background of the Banking Union

To align supervisory and political responsibility with the competence to provide a financial backstop, the heads of state and government of the euro area put the objective of creating a three-pillar banking union on the political agenda on June 29, 2012. The proposed model is a precondition for banks' direct access to the ESM. Not only does it raise the responsibility for the prudential supervision of banks to the European level (single supervisory

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[2] *According to the main features agreed by the Eurogroup, which will be reflected in the operational framework of the instrument once it has been adopted, the ESM will be able to conduct direct recapitalizations of institutions only if certain eligibility criteria are met.*

mechanism, SSM), but it also aims at creating a single resolution mechanism (SRM) and provides for a coordinated European framework for deposit insurance, underpinned by a comprehensive single rulebook for financial services.

On April 18, 2013, the Council of the European Union and the European Parliament reached a compromise for the establishment of the SSM. The compromise involves two regulations: one confers specific tasks on the ECB concerning policies relating to the prudential supervision of credit institutions (SSM regulation), the other modifies regulation 1093/2010 establishing the European Banking Authority (EBA regulation).[3]

The bank recovery and resolution directive (BRRD) is currently being negotiated, and the European Commission is expected to present a legislative proposal for a European single resolution mechanism in summer 2013. A further harmonization of the national deposit insurance frameworks is being debated and should – together with resolution tools and funds – contribute to resolving nonviable banks in a least-cost manner while fully safeguarding protected depositors.

All these proposals have to be viewed in the context of other initiatives, including the transposition of the Basel III proposals (the Capital Requirements Directive IV and Capital Requirements Regulation), a European Banking Authority (EBA) recommendation on asset quality, and possible revisions of EU State Aid rules as transitional arrangements to anchor market expectations about bank resolution by clearly establishing the pecking order for bail-ins.

## Novel Features and Implications of the SSM

The reform of European banking supervision constitutes a milestone – but with limitations: The agreement on the SSM as a first step toward the creation of a banking union confers specific tasks in supervising euro area credit institutions on the ECB within the SSM framework. The SSM will be composed of the ECB and the national competent authorities (NCAs) of participating Member States. Hence, participation in the SSM will widen the scope of responsibilities of the OeNB and the FMA, e.g. in the context of duties of the new Supervisory Board (see below). Noneuro area Member States may opt to join the SSM by entering into close cooperation arrangements that oblige the respective NCAs to comply with the measures of the ECB and to provide the ECB with all relevant information.

### Legal Foundations and Institutional Framework

The ECB will be responsible for the overall functioning of the SSM. It will oversee euro area banks, sharing responsibilities and closely cooperating with NCAs. The transfer of supervisory tasks to the ECB is based on Article 127 (6) TFEU. NCAs will remain responsible for tasks not explicitly conferred on the ECB.

The SSM regulation will also empower the ECB to adopt guidelines, recommendations and decisions. Furthermore, within six months of the entry into force of the SSM regulation, the ECB must publish an ECB

[3] *These regulations are expected to be submitted to the European Parliament and the Council for a formal vote by July 2013 at the earliest; potentially, the voting will take place in September.*

framework regulation, which is to specify the framework to organize the practical modalities, procedures and division of responsibilities between the ECB and NCAs. In conducting its supervisory tasks, the ECB will apply all relevant EU laws and, where this law is composed of directives, the national legislation transposing those directives. The ECB will be able to require NCAs to make use of certain early intervention powers if national law provides for such powers for the NCA. Above and beyond the competence of NCAs, the ECB may apply certain macroprudential measures, including higher requirements for capital buffers.

The planning and execution of the tasks conferred upon the ECB will be undertaken by a Supervisory Board composed of a Chair, a Vice Chair (the ECB is to submit proposals for the appointments to these two positions to the European Parliament; once the proposals have been approved, the Council will make the appointments), four representatives of the ECB and one representative of each NCA. If the NCA is not a central bank – as is the case in Austria – a central bank representative may participate in addition. The participation in this board is a quantum leap for the OeNB and the FMA in being involved in making decisions about the largest euro area banks. Draft decisions proposed by the Supervisory Board will be deemed adopted unless the ECB Governing Council objects. The Supervisory Board will be supported by a Secretariat and a Steering Committee. An Administrative Board of Review will be established to carry out internal reviews of decisions taken by the ECB in the exercise of its supervisory powers.

The ECB and the NCAs must act independently within the SSM, and the ECB must carry out its supervisory tasks without prejudice to, and separately from, its monetary policy tasks. The ECB is accountable to the European Parliament and to the Council, and as such, it must present in public an annual report to the European institutions and the national parliaments of the participating Member States, which have inquiry rights.

The European Banking Authority (EBA), which was founded in 2010, will be predominantly responsible for rule setting and for the convergence of supervisory practices in the EU, thereby promoting a level playing field.

### Division of Responsibilities among the SSM and the European System of Financial Supervision

The allocation of supervisory tasks and the function of the competent authority at the European level calls for new ways of cooperation between the (formerly) national competent authorities and the ECB, as well as between the ECB and the EBA. The far-reaching deferral of supervisory powers to the ECB with NCAs assisting will also affect the way in which the OeNB and the FMA perform their respective tasks now and in the future.

#### ECB and NCAs

The ECB will be competent to carry out its prudential tasks in relation to all credit institutions established in participating Member States. However, these tasks will be performed within a framework of cooperation between the ECB and NCAs: While the ECB will be the competent authority for about 130 significant banking groups, for which it will enlist the assistance of the NCAs in preparing and implementing supervisory tasks and decisions, the NCAs will be responsible for adopting supervisory decisions on less significant credit

institutions.[4] Based on a preliminary assessment, eight banking groups are considered significant in Austria. The NCAs must follow the instructions given by the ECB, and the ECB will oversee the functioning of the system and may at any time make use of its own investigatory powers.

To carry out its tasks, the ECB will, in general, have all the powers that competent authorities have under the relevant EU law, including wide-ranging supervisory and investigatory powers to ensure compliance with prudential requirements and to perform stress tests in coordination with the EBA; it will also have powers related to early intervention and bank recovery planning.

Special procedures for cooperation are in place to authorize credit institutions and to withdraw authorizations as well as to assess acquisitions and disposals of qualifying holdings. Certain areas, such as branch supervision of non-EU institutions, anti-money laundering, payment services and consumer protection remain national competencies.

The SSM requires an organizational setup that accounts for all relevant activities, links and reporting lines between the ECB and NCAs and their respective roles and responsibilities within the SSM. Joint supervisory teams consisting of ECB and NCA staff could be set up to perform the day-to-day supervision of significant banks. Supervisory processes and procedures for, inter alia, authorizations, supervisory examination programmes, ongoing supervision and decision making for significant banks will need to be defined.

Furthermore, the processes and procedures for performing financial analyses of less significant institutions and the risk profile classification principles of the ECB for supervised banks will be defined. The ECB needs to be notified ex ante of material NCA decisions about less significant banks.

The assumption of supervisory responsibilities by the ECB will be accompanied by comprehensive assessments, including balance sheet assessments of the relevant institutions.

Experts from NCAs will also be involved in on-site examinations of significant banks, while the ECB – in coordination with the EBA – needs to ensure a harmonized approach to the conduct of supervision, thereby promoting the level playing field in supervisory practices and avoiding a home bias.

As the supervision of less significant banks will continue to be driven by the NCAs, these banks do not have to expect fundamental changes to the relationship with their national supervisor. NCAs will continue to be responsible for managing on-site inspection processes and related decision-making. The ECB may assume supervisory responsibilities from the NCA if this is deemed necessary to ensure high supervisory standards.

### European Banking Authority

The EBA was mandated with producing a single supervisory handbook for the entire EU. This set of rules addressed to supervisors will complement the single rulebook, which consists of regulations and directives, guidelines,

[4] *Article 6 para. 4 of the SSM regulation defines a "significant institution" (credit institution, financial holding company, mixed financial holding company or branch) by the significance of its cross-border activities and by its size: An institution is significant if the value of its assets exceeds EUR 30 billion, or if the value of its assets exceeds EUR 5 billion and at the same time the ratio of its total assets to the GDP of the relevant Member State exceeds 20%, or if the ECB, following a notification by the NCA, considers such an institution significant for the domestic economy. Institutions accessing funds of the European Financial Stability Facility or its successor, the ESM, and the three largest instutions of each country will also be subject to the ECB's supervision.*

standards and opinions, with new practical instruments and convergence tools to promote common supervisory approaches and practices.

As a competent authority, the ECB will be a nonvoting member of the EBA's Board of Supervisors and will be subject to the provisions of the EBA regulation. The ECB's manual of supervisory practices will complement EBA rules.

## Implications for Supervisory Cooperation

The authorities of countries participating in the banking union will coordinate their work on significant banking groups within the joint supervisory teams. Therefore, the new focus of supervisory colleges will be coordinating the ECB and NCAs of nonparticipating Member States. While the ECB will play the role of home and/or host supervisor (with the NCAs of all participating Member States as observers) in the context of significant institutions, the NCAs will be home and/or host-supervisors for less significant institutions, with the ECB having the option of participating in the colleges.

The ECB is to assume the tasks conferred on it 12 months after entry into force of the SSM regulation. However, it can decide to carry out its supervisory tasks (other than adopting supervisory decisions) immediately from the date of entry into force of the SSM regulation: As it will be in charge of operational supervisory tasks and responsibilities, the ECB may require NCAs, banking institutions and persons belonging to such institutions to provide information to carry out a comprehensive assessment, including a balance sheet assessment. Such assessment must be performed at least for the significant banks. The interaction between the ECB, NCAs and the banking industry may thus commence at an early stage.

To cover its expenditure, the ECB will levy a risk-based supervisory fee on credit institutions. The higher coordination within the SSM should lead to increased supervisory efficiency for banks with cross-border activities and should produce benefits for market participants and society through financial stability and a level playing field.

By way of representation in the new supervisory board, the OeNB and the FMA will be involved in the decision making on the largest euro area banking groups. These new tasks resulting from the far-reaching deferral of supervisory powers to the ECB with NCAs assisting will significantly alter both the supervisory scope and the procedures of these institutions over time.

## Conclusions and Outlook

The launch of the banking union will extend the regional reach of European supervisory institutions. The single supervisory mechanism, which is scheduled to start operating fully in summer 2014, is a first step in rolling out best supervisory practices to participating Member States and in reconciling responsibilities and accountability. However, to reap the full benefit of a banking union, it will be necessary to establish a single resolution mechanism, to converge material laws for bank recovery and resolution, and to further harmonize credible deposit insurance frameworks. Impartial supervision across Member States and harmonized practices coupled with an effective backstop as a last resort would raise confidence and enhance financial stability by decoupling financial institutions from sovereigns' finances and would prevent market fragmentation along national borders. Ideally, such arrangement would cover the entire single market.

# Household Vulnerability in Austria – A Microeconomic Analysis Based on the Household Finance and Consumption Survey

Nicolás Albacete, Peter Lindner[1]

*This study analyzes the indebtedness and vulnerability of households in Austria using data from the Household Finance and Consumption Survey (HFCS), a new source of microdata. The HFCS allows us to investigate potential risks household debt may pose to financial stability. Following the recent literature on indebtedness, we look first at the intensive as well as extensive margin of credit. The data show that debt participation and the level of debt in general increases with wealth and income, which points toward a relatively low risk to the financial sector. Additionally, our analysis identifies vulnerable households and estimates the financial sector's potential exposure at default and loss given default. We find that the estimates for loss given default range from 0.2% to 10% and are in line with similar studies for other countries. Combining these estimates with important other financial stability indicators, such as the development of initial loan-to-value ratios, we are able to conclude that at present, the risk to financial stability stemming from households in Austria is relatively low.*

*JEL classification: D10, D14, E44, G21*
*Keywords: household indebtedness, vulnerability, exposure at default, loss given default, HFCS*

As we have seen at the beginning of the Great Recession, the household sector of an economy played a central role in the financial (in)stability that developed after the bust of the housing bubble in the U.S.A. (see e.g. Acharya et al., 2009; Claessens et al., 2010). Debelle (2004) had already pointed out that it is the distribution of debt that needs to be analyzed to investigate the effects on the macroeconomy. Aggregate data on the level of debt, income and wealth do not provide sufficient information to analyze exhaustively the vulnerability of households and, hence, the potential risk to the financial sector. This information has to be supplemented with findings on the distribution of debt and the identification of potentially vulnerable households. The Household Finance and Consumption Survey (HFCS) is the first source to provide in-depth information including both the liability and asset side of households' balance sheets in Austria. On the asset side, recent housing price dynamics show relatively strong increases in housing prices in Austria – especially since mid-2010 – compared to other European countries (see OeNB, 2013). On the liability side, the aggregate debt burden (both mortgage and nonmortgage liabilities) in Austria has been modest compared to the euro area (see OeNB, 2012). Over the last ten years consumer credit relative to disposable national income has actually decreased while loans for house purchases have increased substantially.

The study at hand provides a deeper investigation of the various groups holding debt and estimates the exposure of banks to potentially vulnerable households. Drawing on the methods applied in the literature, we describe first the characteristics of the median debt holder before identifying potentially vulnerable households and the risk they pose to the financial sector. In other words, we look at household vulnerability from the perspective of the banking sector and not from the perspective of the household itself.

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Ernesto Villanueva, Banco de España.

This approach is in line with, for example, Costa and Farinha (2012), who recently analyzed the indebtedness of households in Portugal. In both a univariate and multivariate analysis the authors find the usual patterns of debt participation and level, e.g. higher income households are more likely to have debt and have higher median debt, and debt levels decrease over the life cycle. Although Costa and Farinha (2012) discuss indicators of household vulnerability, they do not estimate potential exposures or loss given default for the financial system. We go this step further, estimating these two measures for the banking sector vis-à-vis households in order to assess the potential impact of household debt on financial stability in Austria. This is also done in a recent IMF (2012) country report on Spain, in which microdata are used to assess the vulnerability of households. For Austria, Beer and Schürz (2007) use mostly microdata from the Household Survey on Financial Wealth (2004) for a characterization of indebted households. They find that more affluent households in terms of income and wealth are more likely to hold debt and that debt rises with income, concluding that there are no risks to financial stability from the household sector. More recently, Albacete and Fessler (2010)[2] stress-test households in Austria. Based on different sources of microdata (most prominently the Household Survey on Housing Wealth 2008), the authors estimate the impact of adverse shocks on the estimates of exposure at default and loss given default. In the baseline, using the definition of financial margin, they report about 9% of indebted households as vulnerable. The exposure of the financial sector to these vulnerable households is estimated at around 14% of total credit and loss given default at around 2.5%. In Austria foreign currency loans have long been under close scrutiny. Albacete et al. (2012b) take a closer look at foreign currency mortgage holders.[3] Using inference on counterfactual distributions to analyze the differences between the two groups of foreign and domestic currency debt holders, Albacete et al. (2012b) conclude that over the whole distribution foreign currency debt holders have a higher risk buffer in terms of income, housing wealth level and potential rental income (see p. 70 in Albacete et al., 2012b). Thus, they are better endowed to absorb the additional risks (exchange rate, valuation of repayment vehicle, etc.) of their debt obligation and seem to be able (at least in the present moment) to carry that risk; therefore these debt holders do not pose a serious threat to financial stability.

This paper is organized as follows. First, we introduce the data and shortly discuss the technical specifics of the complex survey data, followed by a univariate analysis of indebted households in Austria. After discussing the basic results about debt in Austria, we look at household debt statistics in more detail, e.g. the loan-to-value ratio for mortgage loans. The next section provides the identification and description of potentially vulnerable households. Finally, we describe the estimation and analysis of financial stability risk channels and key figures, such as exposure at default (EAD) and loss given default (LGD).[4] Section 4 concludes.

[2] *This study also includes an extended literature review, which is not repeated here.*

[3] *See also Beer et al. (2010).*

[4] *Both are defined in detail below.*

## 1 Data and Methodological Background

This study uses data from the HFCS in Austria,[5] which is part of a euro area-wide effort to gather household level microdata. The HFCS is a representative household-level survey covering the whole balance sheet of households. In particular, it includes various types of loans, i.e. mortgage loans collateralized by the households' main residence and other real estate (separately) and all types of nonmortgage loans, as well as all types of households' real and financial assets. In addition, sociodemographic information about the households allows us to get a deeper understanding of the background of households with debt.

A total of 2,380 households successfully participated in the HFCS in Austria, which translates into a response rate of around 58%. Based on a two-stage stratified probability sample, the survey reaches a representative sample of all noninstitutionalized households. As in all analyses using survey data, household survey weights are applied to account for unequal sampling probability and different probabilities of participation across households. The survey was conducted in the period from the third quarter of 2010 to the second quarter of 2011. The stock values reference time is the date of the interviews, i.e. the time of the field phase of the HFCS in Austria. For questions on income, however, the 2009 calendar year is the reference period, i.e. the last full calendar year before the start of the field period.

Partial response refusal is corrected using a Bayesian-based multiple imputation procedure with chained equations. This technique achieves consistent estimates taking into account the uncertainty of imputations. Thus, the results in this study are based on all five implicates of the imputations: Following the literature (see e.g. Rubin, 2004), we calculate a statistic (e.g. proportion, median, etc. denoted $S_i$) separately for each implicate $i$=1,…,5 and take the average so that the final estimate $S$ is given by

$$S = \frac{1}{5}\sum_{i=1}^{5} S_i \quad .$$

Given the available data, one appropriate way to calculate the standard errors is given by the use of replicate weights $r = 1,\ldots,R$ (see e.g. Rao et al., 1992). This bootstrap procedure also has to take into account the uncertainty of imputed values such that total variance is given by

$$T = W + (1+\tfrac{1}{5})B$$

where $W$ is the within variance in a given implicate averaged over the implicates, i.e.[6]

$$W = \frac{1}{5}\sum_{i=1}^{5}\frac{1}{R}\sum_{r=1}^{R}(S_{ir} - \tilde{S}_{iR})^2 \,,$$

and $B$ is the variance between implicates, i.e.

$$B = \frac{1}{5-1}\sum_{i=1}^{5}(S_i - S)^2 \,.$$

For the socioeconomic characteristics of the households such as age or employment status, we use those that apply to the the household head. The definition of the household head is based on the households' choice; that is the households who were required to

[5] *The full methodological documentation of this newly developed survey in Austria can be found in Albacete et al. (2012a). A complete methodological overview of the HFCS in the whole euro area can be found in ECB (2013).*

[6] $\tilde{S}_{iR}$ *is the average of a given statistic over* $R$ *replicate weights in one implicate, whereas* $S_{ir}$ *is the statistic in one implicate using one replicate weight* $r$.

select the financially knowledgeable person, i.e. the person best informed about the household's wealth situation, income and consumption expenditure decisions. This person is used as the reference person (which makes the results comparable to Fessler et al., 2012).

## 2 Debt Market Participation and Household Indebtedness

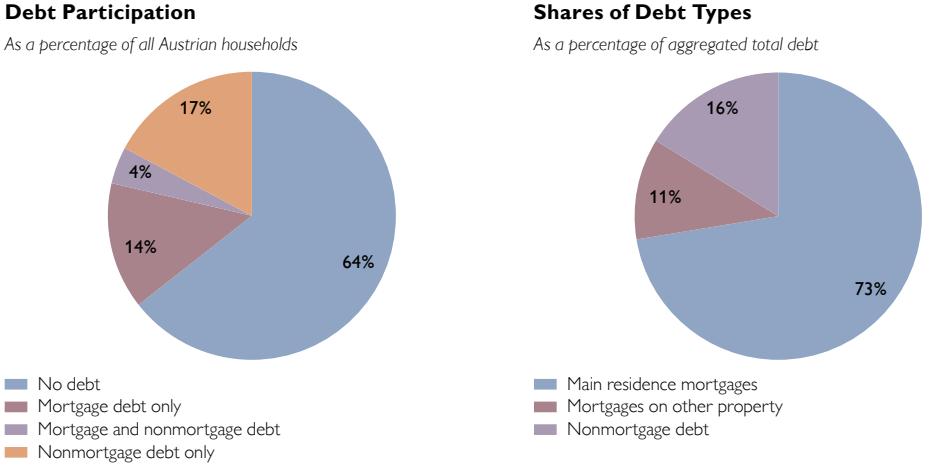
Before starting with the analysis of the vulnerability of households, we have to discuss the underlying structure of debt holdings. Chart 1 (left-hand side) shows that the majority of Austrian households does not participate in the debt market. 64% have neither mortgage nor nonmortgage debt. Only about one-third (36%) of households participates in the credit market. The majority of indebted households holds nonmortgage debt[7] like credit line/overdraft debt, credit card debt, or noncollaterized loans, so that 17% hold exclusively nonmortgage debt and another 4% of all households have both mortgage and nonmortgage debt. The remaining 14% of households in Austria hold exclusively mortgage debt. However, when looking at debt volumes, chart 1 (right-hand side) shows that the aggregate total debt of households to a very large extent consists of mortgages (84%). Only 16% of the aggregate total household debt consist of nonmortgage debt.

Chart 2 shows debt participation and debt levels by mortgage and nonmortgage debt across gross wealth and income distributions.

In general, mortgage debt participation and levels increase both with gross wealth and income. In the first gross wealth quintile, households do not own their main residence and hence do not hold mortgage debt at all. In the highest gross wealth quintile, households generally already own their real estate outright and have thus (at least partially) repaid the mortgage(s) used to finance this investment. Although one can see a decreasing trend in nonmortgage debt participation over wealth quintiles, it remains relatively stable over the income distribution. We also see a stark difference between the levels of mortgage and nonmortgage debt. As mortgage

Chart 1

**Household Debt Participation and Shares of Debt Types**

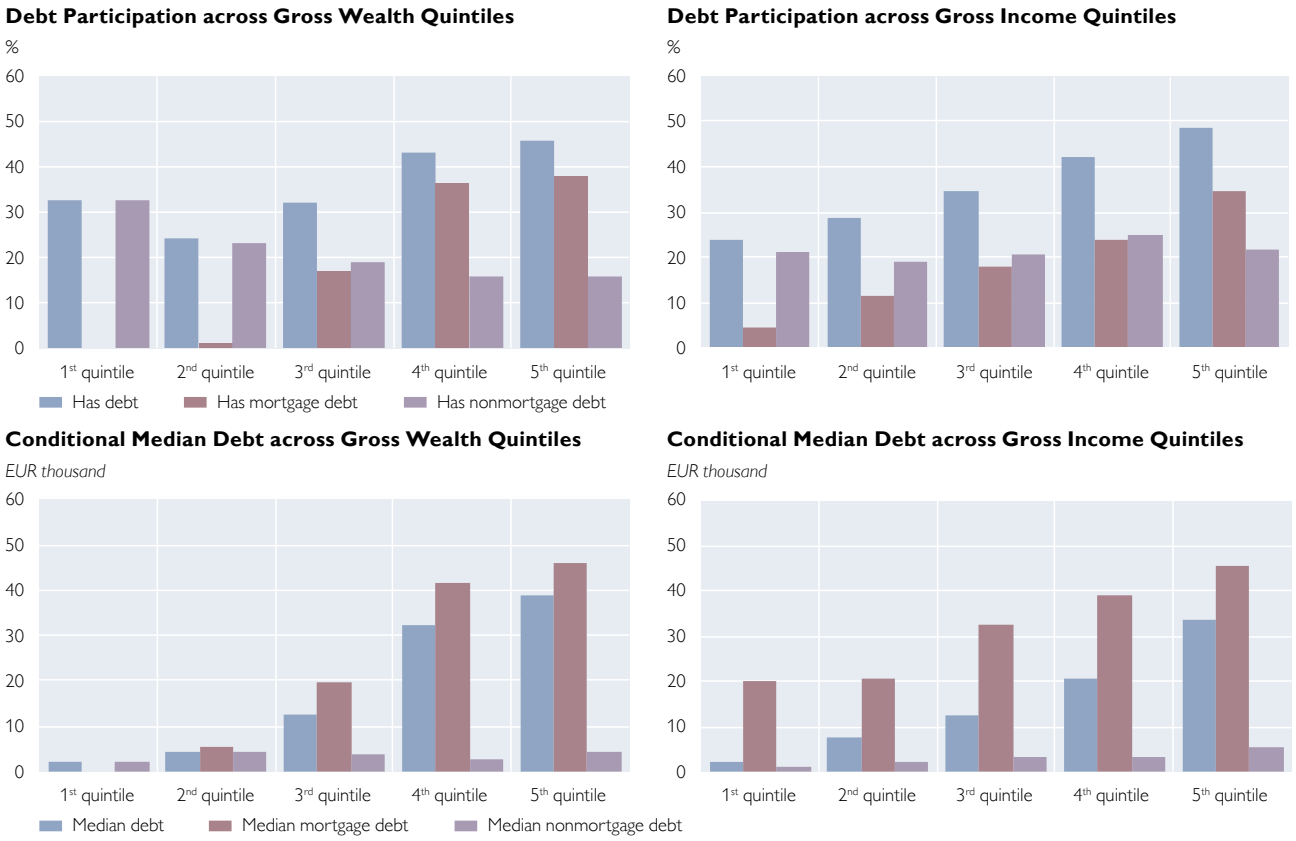



*Source: HFCS Austria 2010, OeNB.*

[7] *Leasing contracts are not included.*

Chart 2

**Debt Participation and Debt Level across Gross Wealth and Income Distributions**




*Source: HFCS Austria 2010, OeNB.*

debt is used to finance housing wealth as opposed to smaller purchases funded by noncollateralized debt, the level of the former is higher by far, e.g. it is higher by a factor of more than 15 for the third gross wealth quintile. These two findings point toward the banking sector being successful in screening loan applicants and thus facilitating credit market participation for customers that are able to repay the funds they receive. Most of these results are comparable with similar estimates for Portugal (see Costa and Farinha, 2012), where, e.g., total debt participation is reported to be at 37.7%, and the pattern over the income distribution is similar to the one shown in chart 2; in Portugal, however, the majority of indebted households holds mortgage loans.

The median debt level of the 36% of households in Austria that hold debt is EUR 13,777 (see table 1). Breaking this amount down by collateralized and noncollateralized debt, we see that mortgage holders' median debt is EUR 35,546 whereas nonmortgage debt holders' median debt is EUR 3,016. These results show that high levels of debt are usually incurred due to investments in real estate. This can also be observed across household sizes and age groups for debt levels and debt participation. Table 1 shows for households with a relatively younger reference person a high level of debt and increasing participation in the credit market for

Table 1

**Debt Participation and Debt Level across Household Characteristics**

| Variables | Share of population | Total debt participation | Mortgage debt participation | Nonmortgage debt participation | Conditional median total debt | Conditional median mortgage debt | Conditional median nonmortgage debt |
|---|---|---|---|---|---|---|---|
| | % | | | | EUR | | |
| All | 100.0 | 35.6 | 18.4 | 21.4 | 13,777 | 37,546 | 3,016 |
| 1 household member | 38.7 | 26.4 | 7.5 | 20.4 | 3,842 | 23,008 | 2,000 |
| 2 household members | 34.7 | 30.7 | 15.9 | 18.3 | 13,360 | 27,519 | 4,000 |
| 3 household members | 11.3 | 49.3 | 33.1 | 23.6 | 24,963 | 40,007 | 3,295 |
| 4 household members | 8.9 | 59.9 | 39.6 | 27.1 | 40,636 | 69,719 | 5,340 |
| 5+ household members | 6.5 | 59.7 | 42.1 | 31.9 | 24,966 | 41,612 | 3,638 |
| Age 16 to 24 | 4.9 | 30.8 | 12.3 | 19.8 | 13,566 | 63,414 | 1,002 |
| Age 25 to 34 | 14.3 | 44.8 | 16.9 | 32.1 | 10,525 | 62,912 | 2,361 |
| Age 35 to 44 | 18.2 | 55.7 | 32.7 | 30.5 | 28,841 | 64,000 | 3,581 |
| Age 45 to 54 | 19.9 | 42.0 | 22.8 | 25.1 | 12,429 | 28,761 | 4,100 |
| Age 55 to 64 | 19.2 | 29.0 | 15.4 | 16.1 | 9,325 | 16,240 | 2,567 |
| Age 65 to 74 | 14.3 | 20.3 | 11.4 | 11.4 | 11,534 | 18,846 | 1,389 |
| Age 75+ | 9.1 | 7.4 | 2.7 | 5.3 | 3,600 | 9,643 | 2,215 |
| Employed | 43.2 | 46.8 | 25.5 | 26.9 | 17,318 | 40,807 | 3,634 |
| Self-employed | 9.6 | 46.2 | 30.9 | 23.2 | 39,988 | 62,000 | 5,000 |
| Unemployed | 4.9 | 42.5 | 9.3 | 36.7 | 3,711 | 50,503 | 1,880 |
| Retired | 35.5 | 18.7 | 8.1 | 12.3 | 6,808 | 19,420 | 1,948 |
| Other | 6.8 | 32.9 | 15.5 | 19.9 | 8,160 | 23,048 | 3,400 |
| Primary education only or no formal education | 0.4 | 74.6 | 36.7 | 67.0 | 4,700 | 151,083 | 1,600 |
| Secondary education | 71.4 | 35.6 | 17.2 | 22.6 | 11,653 | 31,106 | 3,065 |
| Tertiary education | 28.2 | 35.0 | 21.2 | 17.5 | 22,732 | 58,379 | 3,170 |
| Owners – outright | 30.4 | 9.5 | 0.0 | 9.5 | 4,625 | . | 4,625 |
| Owners – with mortgage | 17.3 | 100.0 | 100.0 | 21.8 | 39,183 | 37,472 | 2,121 |
| Renters/other | 52.3 | 29.4 | 2.0 | 28.1 | 3,581 | 44,273 | 3,096 |
| Eastern Austria | 43.4 | 34.8 | 14.3 | 24.1 | 12,213 | 33,960 | 3,662 |
| Southern Austria | 22.2 | 35.6 | 20.1 | 19.5 | 12,961 | 37,447 | 3,090 |
| Western Austria | 34.4 | 36.6 | 22.5 | 19.1 | 17,553 | 41,024 | 2,471 |
| Indebted and has foreign currency loan | 10.5 | 100.0 | 97.0 | 34.2 | 80,384 | 80,480 | 5,000 |
| Indebted but has no foreign currency loan | 89.5 | 100.0 | 46.3 | 63.0 | 10,840 | 30,322 | 2,970 |

*Source: HFCS Austria 2010, OeNB.*

*Notes: The regions in Austria are based on the NUTS-1-level codes. Eastern Austria: Burgenland, Lower Austria and Vienna. Southern Austria: Carinthia and Styria. Western Austria: Upper Austria, Salzburg, Tyrol and Vorarlberg. Cells that cannot be estimated because of no observations in some of the multiple imputation implicates are marked with ".".*

mortgage loans mostly in order to finance the purchase of the primary residence. Later in life the debt is paid back so that both debt level and participation decrease again. Bigger households in terms of household members are more likely to take out mortgage loans. Looking at the employment status, we can see that households with a self-employed reference person have the highest share of mortgage debt holders. While there are very few households with a reference person that is unemployed, these households' median level of mortgage debt is substantial. Most of these households, however, only hold nonmortgage debt at a much lower level. It should be noted that households with a reference person with a low level of education have a very high debt participation rate, especially for nonmortgage debt with a rather low

median level of debt. This indicates that these households are more likely to need some sort of credit for relatively small purchases compared to other education groups. The overall level of debt, however, increases with education, as is expected since income streams generally increase with education as well. The very high median for mortgage loan holders with no formal education is an outlier that is due to the very low number of observations. By definition, outright owners of their main residence do not have mortgage debt for their main residence and also do not have other debt collateralized by other real estate. Almost the entire share of mortgage debt is held by households that have a mortgage for their main residence. Regional differences are rather small, in particular when taking into account that the discrepancy in mortgage debt participation between eastern Austria on the one hand and western and southern Austria on the other hand is driven solely by the capital city Vienna, where mortgage participation is very low at 8% (not shown in the table). As regards mortgage loans, one can see that the median outstanding value for foreign currency loan holders is considerably higher than for euro loan holders. This is due to the fact that almost all foreign currency loans in Austria are bullet loans (the principal is repaid at the end of maturity in a final bullet). As Albacete et al. (2012) pointed out, these households are likely to be able to bear the additional risk of such loans.

## 3 Systemic Risk Analysis

### 3.1 Debt Burden

Whether and to what amount a household is indebted does not say much about the debt-bearing capacity of that household. In order to say whether a household has a low or a high debt burden it is necessary to compare the amount of debt with the resources households have at their disposal to carry that debt. In the literature (see e.g. ECB, 2013) there are several indicators that try to measure households' debt burden. For our analysis we use two of them: the debt-to-asset ratio and the debt service-to-income ratio.[8]

The debt-to-asset ratio $(DA_i)$ is defined for every indebted household $i$ as

$$DA_i = \frac{D_i}{W_i} \times 100$$

where $D_i$ is the household's total liabilities and $W_i$ is the household's total gross wealth[9] (excluding public and occupational pension plans). This ratio provides information about the extent to which debt can be paid back from the total stock of assets. It is an indicator of a household's potential need to deleverage in the medium to long run.

The debt service-to-income ratio $(DSI_i)$ is defined for every indebted household $i$ that holds not only credit line/overdraft debt or credit card debt (as for these debt types no debt service information is collected) as

$$DSI_i = \frac{DS_i}{I_i} \times 100$$

where $DS_i$ are the household's total monthly debt payments[10] and $I_i$ is the household's gross monthly income[11]

[8] *We have also performed the analysis using the debt-to-income ratio, but this indicator is not presented here due to space constraints.*

[9] *Zero total gross wealth is bottom coded at EUR 1.*

[10] *Regular payments into the repayment vehicle, in case of bullet loans, are included. Lease payments are not included.*

[11] *Zero gross monthly income is bottom coded at EUR 1 per month (which is the case for just three households).*

(gross yearly income divided by 12). This ratio provides an indicator of the burden that debt holdings represent to current income and reflects more the significance of short-term commitments. One advantage of the debt service-to-income ratio over the debt-to-asset ratio is that the former also reflects loan maturities and interest rate levels: Longer maturities or lower interest rates reduce debt service to income, but do not influence the debt-to-asset ratio.

Chart 3 shows the distribution of each ratio across percentiles. We can see that in general the median debt burden is low for indebted Austrian households. For example, the median debt-to-asset ratio among indebted households is around 17%. Measured in debt service to income, the median household needs less than 6% of its current gross income for debt servicing.

However, chart 3 also shows that there are some households that have to carry a very large debt burden. For example, about 18% of indebted households report negative wealth (i.e. $DA_i > 100$). Furthermore, about 10% of indebted households need at least 25% of their gross income to service their debt. Of course, in terms of net income, the debt service-to-income ratio would be considerably higher.

Before looking at these households more closely, it is interesting to find out how the median debt burden of households has developed in the past decades in Austria. Unfortunately, only one wave of the HFCS has taken place so far; therefore, we construct a time series for an estimate of the initial loan-to-value (LTV) ratio of the household's main residence at the time when the mortgage was taken out or refinanced by using some retrospective information included in the first wave of the HFCS. This retrospective information consists of the year of acquisition of the household's main residence, its value at the time of acquisition, the year when the mortgage was taken out or refinanced and the initial amount borrowed. Combining these variables, we construct for each household an estimate of the initial LTV ratio, then we group households by the year when the mortgage was taken out or refinanced, calculate the median initial LTV ratio for each one of these groups, and plot them across the years as moving averages (see chart 4). Given data limitations (e.g. few observations in early

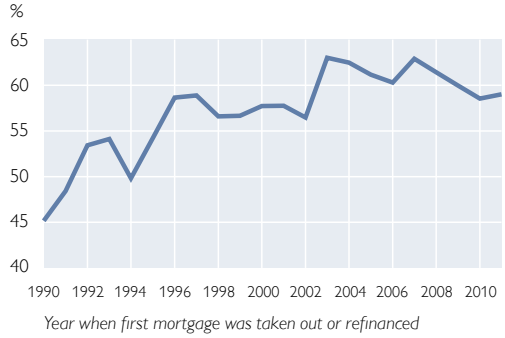
Chart 3

**Distribution of Debt Burden Measures across Percentiles**


*Source: HFCS Austria 2010, OeNB.*

Chart 4

**Development of the Median Initial LTV Ratio during the Past Decades**




*Source: HFCS Austria 2010, OeNB.*
*Note: Ratios are eight-year moving averages.*

year brackets, exclusion of mortgages that are no longer outstanding, etc.), these estimates are the best possible approximation of the initial LTV ratio. Chart 4 shows that this estimate of the households' debt burden has increased during the past few decades. The median initial LTV ratios rose from a range of 40% to 50% in the 1990s to around 60% in the past few years. Furthermore, they show a cyclical pattern with ups and downs around this trend. Since the financial crisis, which broke out in 2008, for example, the median initial LTVs have declined somewhat.

Despite this increasing tendency of median LTV ratios in Austria, the levels are still low compared to the U.K., for example. May et al. (2004) report for the U.K. a mean initial LTV ratio of 83% in 2004.

## 3.2 Identification of Potentially Vulnerable Households

### 3.2.1 Measures of Vulnerability

Chart 3 shows that most households have a relatively small debt burden, but still there are some with relatively large debt ratios at the right tail of the ratio distributions. For the rest of the paper we want to focus on these potentially vulnerable households and see whether they can pose a threat to the stability of the Austrian financial market. Therefore, in the following section we first define what a vulnerable household is and check what its characteristics are. Then we highlight the risk channels through which vulnerable households could pose a threat to financial stability and, finally, we quantify the aggregated risk to the Austrian financial market stemming from these households via the exposure-at-default and loss-given-default measures.

In order to identify potentially vulnerable households we use the two debt burden ratios from the previous section and set thresholds which are commonly used in the literature (see e.g. ECB, 2013). If a household has a debt burden ratio above this threshold it is defined as potentially vulnerable according to that measure. The thresholds are as follows:

- $DA_i \geq 75$: The debt-to-asset ratio indicates how easily a household can pay its debt from the total stock of its assets; households above the 75% threshold might need to deleverage in the medium to long run in order not to run into financial difficulties. This is especially the case for households that have debt-to-asset ratios above 100% (negative wealth) because their assets are not large enough to offset the total debt level. The definition of vulnerable households using this indicator does not imply that households are in payment difficulties at present, therefore it is thought of as an upper bound for the estimates of the aggregated risk.
- $DSI_i \geq 40$: The debt service-to-income ratio provides information about how easily households can pay back their debt from their income. For households with a debt service-to-income ratio above 40% an unexpected income shock might trigger problems in the repayment schedule; therefore these households are classified as vulnerable. Again it must be noted, however, that households with a ratio close to 40% are not necessarily in default at present.

Additionally, we introduce another vulnerability measure, which is based on the subjective assessment of the household itself. In the HFCS all households were asked to state whether (in the 12 months preceding the interview) the household's income was higher or lower than, or equal to, their expenses (excluding purchases of assets). If the income was lower and if the household holds debt at the time of the interview, we define the household as potentially

vulnerable according to this measure.[12] This measure is also closely connected to the widely used indicator of whether a household is able to service its debt and to finance its basic consumption needs from its current income (financial margin).

In the rest of the paper we use these three vulnerability measures in order to identify vulnerable households, analyze the channels through which they can pose a threat to financial stability and estimate the exposure and loss given default if all these households would actually default on their debts. This static analysis allows us to identify problematic groups of households from the perspective of a bank and also potential risks to financial stability.

### 3.2.2 Determinants of Vulnerability

We first perform a univariate analysis by estimating the frequency of vulnerable households across different household characteristics. The results are shown in table 2.

Overall, about 19% of indebted households are vulnerable according to the debt-to-asset ≥75% measure and the expenses-above-income vulnerability measures. The debt service-to-income ≥40% vulnerability measure seems to be more restrictive and delivers only 5% vulnerable households.

These proportions seem to be in line with those found in other countries described in the literature. In Canada, Djoudad (2012) estimates the share of vulnerable households in indebted households at 5.7% using the debt service-to-income ≥40% vulnerability measure. In Spain, IMF (2012) estimates this share at 16.5% for 2008.[13] Using a similar measure, Fuenzalida and Ruiz-

Table 2

**Vulnerability Measures across Household Groups**

| Variables | Debt to asset ≥75% | Debt service to income ≥40% | Expenses above income |
|---|---|---|---|
| All | 18.8 | 5.0 | 18.9 |
| 1–20 gross income pct | 40.1 | 20.2 | 27.2 |
| 21–40 gross income pct | 22.4 | 3.8 | 21.9 |
| 41–60 gross income pct | 20.0 | 6.1 | 13.7 |
| 61–80 gross income pct | 14.2 | 2.5 | 21.4 |
| 81–100 gross income pct | 9.3 | 1.9 | 14.5 |
| 1–20 gross wealth pct | 60.2 | 8.5 | 26.4 |
| 21–40 gross wealth pct | 25.2 | .. | 20.5 |
| 41–60 gross wealth pct | 10.4 | 4.2 | 17.8 |
| 61–80 gross wealth pct | 6.6 | 4.7 | 17.4 |
| 81–100 gross wealth pct | 3.2 | 5.6 | 14.9 |
| 1 household member | 27.2 | 7.7 | 20.2 |
| 2 household members | 13.4 | 4.0 | 20.3 |
| 3 household members | 13.8 | .. | 14.0 |
| 4 household members | 19.5 | 6.4 | 18.5 |
| 5+ household members | 17.5 | 4.6 | 19.2 |
| Age 16 to 24 | 41.1 | 9.2 | 16.8 |
| Age 25 to 34 | 26.5 | 5.9 | 15.0 |
| Age 35 to 44 | 19.9 | 5.5 | 18.3 |
| Age 45 to 54 | 13.6 | 3.9 | 16.5 |
| Age 55 to 64 | 16.5 | 3.4 | 22.1 |
| Age 65 to 74 | 7.7 | 6.3 | 29.0 |
| Age 75+ | 10.3 | .. | 29.2 |
| Owners - outright | 1.9 | .. | 22.1 |
| Owners - with mortgage | 6.5 | 5.2 | 13.9 |
| Renters/other | 35.9 | 5.0 | 24.0 |
| Eastern Austria | 23.6 | 5.2 | 20.1 |
| Southern Austria | 19.1 | 4.6 | 17.4 |
| Western Austria | 12.9 | 5.1 | 18.5 |
| Employed | 18.6 | 3.7 | 16.4 |
| Self-employed | 7.1 | 7.7 | 8.7 |
| Unemployed | 51.2 | 11.7 | 35.8 |
| Retired | 14.9 | 5.3 | 28.8 |
| Other | 25.3 | .. | 16.8 |
| Primary education only or no formal education | .. | .. | 69.1 |
| Secondary education | 22.0 | 5.5 | 19.4 |
| Tertiary education | 10.9 | 2.9 | 16.1 |
| No nonmortgage debt | 6.1 | 4.2 | 11.8 |
| Has nonmortgage debt | 27.3 | 5.7 | 23.6 |
| Has foreign currency loan | 12.2 | 4.4 | 11.7 |
| No foreign currency loan | 19.6 | 5.1 | 19.8 |

*Source: HFCS Austria 2010, OeNB.*

*Note: Cells that cannot be estimated because of no observations in some of the multiple imputation implicates are marked with ".."; pct = percentile.*

[12] *Note that this is the only measure that could be easily extended to be observed also among households without debt. We mention and make use of this extension of the measure in section 3.3.1.*

[13] *However, IMF (2012) uses disposable income instead of gross income.*

Tagle (2009) find that in Chile, 13.6% of indebted households were vulnerable in 2007. Using a vulnerability measure called negative financial margin, which is comparable to our expenses-above-income vulnerability measure, Sugawara and Zalduendo (2011) estimate the range of vulnerable households in Croatia to be between 13.5% and 22.4% of indebted households. Vatne (2006) estimates the share of vulnerable households in Norway to be 19% in 2004. In Sweden, Johansson and Persson (2007) estimate that the share of vulnerable households was only 6.3% in 2004. Using a similar method, Herrala and Kauko (2007) find that in Finland about 13% to 19% of households were vulnerable between 2000 and 2004. The latter three studies also use the concept of negative financial margin.

When looking at household characteristics in table 2, we see that vulnerable households are concentrated in the lowest income and lowest wealth categories. Single person households and renters are also more often vulnerable than the average; the same is true for households living in eastern Austria. Households whose reference person is unemployed are extremely often identified as vulnerable.[14] Looking at households' debt properties, we can observe peaks of vulnerability among nonmortgage debt holders, non-foreign currency debt holders,[15] and households with fixed interest rate mortgage debt (the latter ones are not shown in the table).

We also perform a multivariate analysis to find possible sources of vulnerability. Therefore, we run logit regressions where $y$ is the vulnerability indicator, which equals 1 if the indebted household is vulnerable and 0 otherwise, and $x$ is a vector of independent variables that include household characteristics (gross income, gross wealth,

Table 3

**Regressing Household Characteristics on Vulnerability Measures**

| Variables | Debt to asset ≥75% | Debt service to income ≥40% | Expenses above income |
|---|---|---|---|
| Gross income | –8.57e–07 | | –3.05e–07 |
| | (8.33e–07) | | (4.67e–07) |
| Gross wealth | | 4.84e–09 | –1.91e–08 |
| | | (1.87e–08) | (3.00e–08) |
| Household size | 0.00838 | –0.00543 | 0.015 |
| | (0.00977) | (0.00873) | (0.0131) |
| Age of reference person | –0.0026 | –0.000613 | 0.00251 * |
| | (0.00161) | (0.00115) | (0.00137) |
| Eastern Austria | 0.0468 * | 0.00635 | –0.000297 |
| | (0.0273) | (0.0227) | (0.0320) |
| Unemployed reference person | 0.0860 ** | 0.0287 | 0.101 * |
| | (0.0425) | (0.0452) | (0.0573) |
| Reference person has tertiary education | –0.0576 | –0.0277 | –0.000441 |
| | (0.0384) | (0.0357) | (0.0349) |
| Food expenditure | –8.18e–06 * | 7.15e–07 | –3.77e–06 |
| | (4.76e–06) | (3.13e–06) | (5.25e–06) |
| Has nonmortgage debt | 0.109 *** | 0.0143 | 0.104 *** |
| | (0.0328) | (0.0264) | (0.0241) |
| Has foreign currency loan | 0.0402 | –0.0119 | –0.0468 |
| | (0.0619) | (0.0526) | (0.0600) |
| Has adjustable interest rate mortgage debt | –0.0500 | 0.0151 | 0.0276 |
| | (0.0420) | (0.0324) | (0.0352) |
| Observations | 803 | 639 | 803 |

*Source: HFCS Austria 2010, OeNB.*

*Note: Marginal effects are reported, standard errors are in parentheses (calculated with bootstrap, 1,000 replications). Due to endogeneity problems, gross wealth is not a regressor in the debt-to-asset ≥75% regression and gross income is not a regressor in the debt service-to-income ≥40% regression. *** p<0.01, ** p<0.05, * p<0.1*

[14] *Note that the age profiles of vulnerable households differ across the three measures. While the first two identify predominantly households with a relatively young reference person, the third measure to a larger extent identifies elderly households as potentially vulnerable. This might be due to a life savings pattern according to which the latter group draws on their savings later in life (see also table 5). For the analysis below, we restrict this group even further by using the additional vulnerability measure "unable to meet expenses." We thank the referee for pointing out this issue.*

[15] *This result is in line with the findings of Albacete et al. (2012) that financial sector institutions have been successfully monitoring the selection of foreign currency borrowers as they are less likely to be vulnerable than euro loan holders.*

size, food expenditure, region dummy, nonmortgage debt holding dummy, foreign currency loan holding dummy) and characteristics of the household's reference person (age, age squared, tertiary education dummy, unemployment dummy). The corresponding average marginal effects are reported in table 3.

On the one hand, the results show that being unemployed or having nonmortgage debt are strong determinants that significantly increase the probability of a household's vulnerability by about 10% (in two of three vulnerability measures). On the other hand, a determinant that decreases the household's probability of being vulnerable (in all vulnerability measures, but not significantly) is tertiary education (by 3% to 6%).

## 3.3 Risk Channels

Before quantifying the aggregated risk to financial stability in Austria stemming from household debt, we will highlight three channels through which vulnerable households can directly influence this risk: debt market participation, indebtedness, and negative wealth.

### 3.3.1 Debt Market Participation of Vulnerable Households

Using an extended expenses-above-income vulnerability measure that also includes households without debt (not included in table 4, see footnote 12) indicates that most vulnerable households (61%) participate in the debt market. It seems that debt holding is an important source of household vulnerability.

Furthermore, and going back to our vulnerability definitions according to table 4, among vulnerable households holding debt, the majority participates in the nonmortgage debt market. The share ranges from 61% to 88%, depending on the vulnerability measure. Vulnerable households seem to use nonmortgage debt as a substitute for income or wealth.

### 3.3.2 Indebtedness of Vulnerable Households

The pattern seen in table 1 and chart 1 (right-hand side) that among indebted households, the level of nonmortgage debt is much lower than the level of mortgage debt does not change in the sample of vulnerable households shown in table 4: The median mortgage debt of vulnerable households is at least about 10 times higher (according to the expenses-above-income vulnerability measure) than the median nonmortgage debt of vulnerable households. This general pattern together with the fact that the majority of vulnerable households hold nonmortgage debt

Table 4

**Debt Holding, Indebtedness and Negative Wealth of Vulnerable Households**

| | Participation (%) | | Indebtedness (EUR) | | | Has Negative Net Wealth (%) | | |
|---|---|---|---|---|---|---|---|---|
| Vulnerability measure | Has mortgage debt | Has nonmortgage debt | Median debt | Median mortgage debt | Median nonmortgage debt | All debt holders | Mortgage debt holders | Nonmortgage debt holders |
| Debt to asset ≥75% | 18.8 | 87.6 | 18,400 | 220,565 | 9,232 | 78.9 | 42.9 | 83.2 |
| Debt service to income ≥40% | 58.7 | 61.4 | 51,301 | 89,434 | 4,195 | 29.7 | .. | 39.2 |
| Expenses above income | 39.0 | 75.0 | 13,473 | 32,223 | 3,794 | 22.7 | 2.2 | 29.8 |

*Source: HFCS Austria 2010, OeNB.*

*Note: Cells that cannot be estimated because of no observations in some of the multiple imputation implicates are marked with "..".*

suggest that the aggregate risks stemming from vulnerable households are limited, as we will also see when we estimate the exposure-at-default and loss-given-default measures.

#### 3.3.3 Negative Net Wealth of Vulnerable Households

In order to appropriately assess the risks to the financial market, it is necessary to consider not only the liability side but also the asset side of households' balance sheets. Especially relevant for financial stability is the information whether vulnerable households have negative net wealth or not, i.e. whether their assets do not suffice to offset their total debt level or whether their assets are high enough. If the latter applies, these households' debt poses a relatively low risk to financial stability, given that Austrian debtors are fully liable for their debt (all their assets and even future income can be used to cover the debt). But if the assets do not suffice to offset the debt, banks will incur losses on the default of the vulnerable household; this increases the risk to financial stability.

Table 4 shows that according to most vulnerability measures (debt service to income ≥40%, expenses above income), the proportion of vulnerable households with negative net wealth ranges between 23% and 30%. The debt-to-asset ratio ≥75% vulnerability measure is the only one that identifies a majority of vulnerable households to have negative net wealth. This is not surprising, as this measure selects specifically households with a high debt-to-asset ratio, including those with a ratio larger than 100%. This measure therefore much more often than other indicators identifies new real estate buyers that started to pay off debt only recently to be vulnerable, although such households probably do not have payment difficulties at the moment. Thus, especially when interpreting the link between negative wealth and financial stability one should be very cautious when using this vulnerability measure.

Finally, we can see that the occurrence of negative net wealth among vulnerable households is concentrated in the nonmortgage debt market, even according to the debt-to-asset ≥75% vulnerability measure: While the proportion of vulnerable households with negative net wealth ranges between 2.2% and 43% in the mortgage debt market, these proportions increase in the nonmortgage debt market to between 30% and 83%. This also suggests that vulnerable households use nonmortgage debt as a substitute for wealth.

### 3.4 Aggregated Risk

After identifying vulnerable households and after analyzing the channels through which they can pose a threat to financial stability in Austria, we can now estimate the potential range of the financial sector's exposure to vulnerable households in Austria using the exposure-at-default and loss-given-default measures. However, it is worth noting that these measures do not imply a default of households. The HFCS does not allow us to measure actual defaults of households on their debt; it only yields indicators of households' vulnerability.

#### 3.4.1 From Vulnerability to Default

The difference between vulnerability and default is shown in the upper part of table 5: It provides the answers of vulnerable households (according to the expenses-above-income vulnerability measure) to the question about their sources of extra income to meet their expenses. The most common answer to this question – given by 66% of

vulnerable households – is spending savings or selling assets. Further common options to meet expenses are getting another loan (27.9%), getting help from relatives or friends (26%), or incurring credit card debt or an overdraft (22.3%). The least common source of extra income is leaving some bills unpaid (5%). This option is the most critical one in terms of how vulnerable a household is, and only a very small share of households uses it. It gives however a good indicator of the share of vulnerable households that are unable to meet their expenses and that may be close to default. Therefore, when estimating the potential range of the financial sector's exposure to vulnerable households in Austria in the next section (table 6), we will use this indicator to get a lower bound of this exposure.

The bottom part of table 5 shows that most vulnerable households (60.5%) had unusually high expenses in the last 12 months, while only 6.8% had unusually low expenses. The rest (32.7%) had expenses just about average. Furthermore, a majority of vulnerable households (52%) would be able to get EUR 5,000 from friends or relatives in case they needed financial assistance.

Table 5

**How Vulnerable Households Avoid Default**

| | % |
|---|---|
| Source of extra income to meet expenses | |
| Savings, assets | 65.5 |
| Credit card debt/overdraft | 22.3 |
| Another loan | 27.9 |
| Help from relatives/friends | 26.0 |
| Leaving bills unpaid | 5.0 |
| Other | 6.0 |
| Comparison of past 12 months' expenses with average expenses | |
| Expenses higher than average | 60.5 |
| Expenses lower than average | 6.8 |
| Expenses just about average | 32.7 |
| Ability to get financial assistance from friends or relatives | |
| Able to get EUR 5,000 from friends | 51.5 |

*Source: HFCS Austria 2010, OeNB.*

*Notes: Vulnerable households are defined according to the expenses-above-income vulnerability measure.*

### 3.4.2 Exposure at Default and Loss Given Default

The standard measures of the risk to financial stability are exposure at default (EAD) and loss given default (LGD). We define them as follows:

$$EAD = \frac{\sum_{i=1}^{N} PD_i \times D_i}{\sum_{i=1}^{N} D_i} \times 100$$

where $PD_i$ is the probability of default of household $i$, which we assume to equal one if the household is vulnerable and zero otherwise, $D_i$ is the total debt of household $i$ and $N$ is the total number of households in the sample;

$$LGD = \frac{\sum_{i=1}^{N} PD_i \times (D_i - W_i) \times NW_i}{\sum_{i=1}^{N} D_i} \times 100$$

where $NW_i$ is an indicator variable which equals 1 if household $i$ has negative net wealth and zero otherwise. As before, $W_i$ denotes gross wealth of household $i$.

Table 6 shows the EAD and LGD measures for each vulnerability definition including the "unable to meet expenses" definition introduced in the previous section. Furthermore, the EAD and LGD measures are split into mortgage and nonmortgage debt to highlight the differences between the two debt markets.

We can see that the proportion of total debt held by vulnerable households (EAD) ranges between 0.8% and 29%, depending on the vulnerability measure. When taking into account each vulnerable household's wealth, the proportion of total debt held by vulnerable households which is not covered by their assets (LGD) ranges between 0.2% and 10%. The debt-to-

Table 6

**Exposure at Default and Loss Given Default according to Vulnerability Measures**

| Vulnerability measure | Exposure at default (EAD) | | | Loss given default (LGD) | | |
|---|---|---|---|---|---|---|
| | Any debt | Mortgage debt | Nonmortgage debt | Any debt | Mortgage debt | Nonmortgage debt |
| | % | | | | | |
| Debt to asset ≥75% | 29.3 | 24.0 | 54.7 | 10.2 | 6.4 | 26.1 |
| Debt service to income ≥40% | 11.9 | 9.5 | 22.4 | 2.8 | .. | 4.1 |
| Expenses above income | 16.5 | 14.6 | 25.9 | 2.2 | .. | 10.3 |
| Inability to meet expenses | 0.8 | 0.8 | 1.1 | 0.2 | .. | 0.3 |

*Source: HFCS Austria 2010, OeNB.*

*Notes: Cells that cannot be estimated because of no observations in some of the multiple imputation implicates are marked with ".."*.

asset ≥75% vulnerability measure can be thought of as an upper bound for the risk to financial stability, because it identifies new real estate buyers that started to pay off debt only recently as vulnerable more often than other vulnerability measures, although such households probably do not have payment difficulties at the moment (see also section 3.3.3). Furthermore, the inability-to-meet-expenses vulnerability measure can be thought of as a lower bound for the risk to financial stability because it only identifies those households as vulnerable that may be closest to default (see 3.4.1).

The above figures are in line with the results for other countries. In Spain, the IMF (2012) estimates[16] an EAD of 46% and an LGD of 1% for 2008 (and projects 40% and 2% respectively for 2011) using the debt service-to-income ≥40% vulnerability measure. This compares to our estimates of 11.9% and 2.8%. In Canada, Djoudad (2012) estimates an EAD of 10.63%. In Chile, using a similar measure, Fuenzalida and Ruiz-Tagle (2009) estimate an EAD of 20%. Using the negative financial margin as the vulnerability measure, which is comparable to our expenses-above-income vulnerability measure, Sugawara and Zalduendo (2011) estimate an EAD of 27.1% to 31.3% and an LGD of 5.4% to 6.3% for Croatia. This compares to our estimates of 16.5% and 2.2%. Using the same measure, Vatne (2006) estimates an EAD of 16% for Norway in 2004; Holló and Papp (2007) estimate an EAD of 7.1% to 22% for Hungary in 2007. In Sweden, Johansson and Persson (2007), using the same measure, estimate an EAD of only 5.6% and an LGD of 0.9% for 2004.

Table 6 also shows that in the nonmortgage debt market, EAD and LGD are much higher than in the mortgage debt market. We know from section 3.3.1 that this is due to the fact that the majority of vulnerable households participates in the nonmortgage debt market, which is where negative net wealth occurs more often. It seems that vulnerable households use nonmortgage debt as a substitute for income and wealth. Moreover, this low risk is not strongly concentrated on certain regions or bank sectors, as further calculations done by the authors show (not presented in this paper).

[16] *The results for different countries might not be fully comparable due to time differences and differences in data and definitions; they are provided as up-to-date reference indicators.*

## 4 Conclusions

The debt burden of some groups of Austrian households is quite large. Households with low income and low wealth, or households with an unemployed reference person are found to be particularly vulnerable. Additionally, the median indebted household's loan-to-value ratio at the time the mortgage was taken out or refinanced seems to have increased during the past decades.

However, the risk to financial stability stemming from the debt of vulnerable households seems to be relatively low. First, most vulnerable households hold nonmortgage debt, which tends to be much lower than mortgage debt. Second, most vulnerable households have positive net wealth. Third, most vulnerable households have extra sources of income to meet their expenses. Fourth, there is no heightened concentration of risk in terms of LGD in certain regions or bank sectors. Fifth, the comparison of loan-to-value ratios, the proportion of vulnerable households, and the EAD and/or LGD risk measures with those of other countries shows that in Austria these indicators are in line with what is found in the literature.

However, a qualification to this analysis is that it is based on current income, wealth and debt figures, which may change with economic conditions. Especially in Austria, where adjustable interest rate loans are more common than fixed ones, or where foreign currency loans are (very) popular among indebted households, the debt burden may be quite sensitive to changes in interest rates, exchange rates, or stock markets. Therefore, a dynamic vulnerability analysis is left for future research.

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# Stress Test Robustness: Recent Advances and Open Problems

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*This paper reviews recent advances made in improving the robustness of stress-testing models against potential misspecification or risk-factor-distribution misestimation, including conceptual advances in measuring robustness against pricing-model misspecification. In addition, we address an important open problem of stress tests as they are carried out today: the endogeneity of financial risks. Traditional stress-testing frameworks model a single-person decision problem in the face of an exogenous source of risk. Yet financial risks arise from the complex interaction between individuals, firms and financial institutions. A stress-testing framework that falls short of incorporating this risk endogeneity will ultimately only be able to capture the financial stress of individual institutions in a non-crisis environment.*

*JEL classification: G01, G28, G38, C02*
*Keywords: stress testing, financial stability, systemic risk, robustness*

## 1 Introduction

The idea of stress testing financial portfolios stems from the realm of risk management.[2] Risk managers use stress tests to identify possible scenarios that would be extremely damaging to the value of the current portfolio, and to quantify the losses that might occur under such detrimental scenarios. Stress tests are meant to help financial institutions figure out whether their ultimate risk-bearing capacity is sufficient to remain solvent even in an extremely difficult economic environment. Lately, even entire financial systems have been subjected to "macroprudential" stress tests. While stress tests used to receive attention only in small circles of risk management professionals and regulators, they have gained broader public attention during the recent financial crisis. The U.S. Federal Reserve System has been mandated to perform annual stress tests of major financial institutions under the Dodd-Frank Act, and also the newly created European Banking Authority will conduct stress tests for European banks on a regular basis. Despite this policy prominence, the methodology of stress testing is still in its infancy and needs further development. In this paper we discuss some recent advances that might improve stress testing and identify some open issues. We provide an overview of recent research evidence on how to make stress tests more robust against model misspecification within the traditional stress-testing framework. Yet while more robustness is desirable we believe that, ultimately, the stress-testing framework as such needs to be enhanced to capture the economic nature of financial crisis more adequately. In this respect we also discuss what we consider to be the most important open problem of current stress tests.

## 2 Statistical Risk Models

Most of the current stress-testing methods are based on concepts derived from statistical risk models, with a risk factor distribution serving as the foundation of the abstract framework. Within this framework, the individual risk factors are coordinates of the state space $\Omega$, which codifies our lack of

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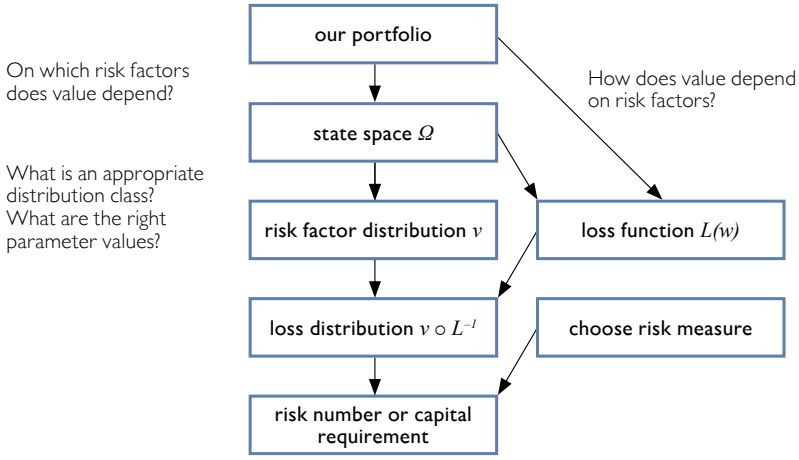
[2] *For a standard textbook treatment of stress testing, see Jorion (2000). An important supervisory reference is the Basel Committee on Banking Supervision (2009).*

Chart 1

**Standard Risk Measurement Procedure**




*Source: Authors' analysis.*

knowledge regarding all uncertain events that may affect the value of a given portfolio, financial institution or system of financial institutions. The resulting risk factor distribution $v$ assigns a probability to every event. It summarizes our statistical knowledge about the system in question. Often it results from the choice of a model class, or from a parameter estimation procedure based on historical data.

Within this framework, the financial portfolios that the statistical risk models are meant to assess are described by real functions $L$ on the state space. The random variable $L(\omega)$ can be thought of as the disutility of the portfolio outcome described by $L$ if state $\omega$ occurs. We refer to $L$ as the loss-pricing function.

The basic structure of a standard portfolio stress-testing model is illustrated by chart 1: The state space $\Omega$ is determined by the risk factors on which the value of the portfolio depends. In turn, the specification of a distribution class and a parameter estimation procedure applied to historical data determine the risk factor distribution $v$. *How* the portfolio value depends on the risk factors is described by the loss-pricing function $L$. Each of these three steps involves modeling decisions and is hence a potential source of misspecification. Both the risk factor distribution and the loss function determine the distribution of losses $v \circ L^{-1}$. The model thus produces a risk measure that assigns a risk number or a capital requirement to the loss distribution.

Based on this structure, we distinguish between two main types of model risk. *Distribution model risk* stems from statistical model misspecifications or from parameter estimation errors, and leads to a wrong risk factor distribution $v$. *Pricing model risk* stems from modeling errors concerning the dependence of the portfolio value on the risk factor values. It leads to a wrong loss-pricing function $L$.

***Example 1.*** *For a linear portfolio the loss is given by a linear function of n risk factors. In vector notation the loss function is* $L(\omega)=l\cdot(\mu-\omega)$, *where vector* $\omega$ *of the risk factor values is modeled as normally distributed with mean* $\mu$ *and covariance matrix* $\sum$, $\omega \sim v=N(\mu,\sum)$. *The vector* $l$ *describes the portfolio weights. (For equity portfolios, the specification must be adjusted as the value of*

Table 1

**Estimating Rating Class Transitions and Related Losses (Example)**

| | AA1–2 | AA3 | A | BBB | BB | Default |
|---|---|---|---|---|---|---|
| | % | | | | | |
| Loss from rating class transition | –3.20 | –1.07 | 0.00 | 3.75 | 15.83 | 51.80 |
| Estimated transition probabilities | 0.09 | 2.60 | 90.75 | 5.50 | 1.00 | 0.06 |

*Source: Authors' analysis.*

*a stock cannot fall below zero. The solution is to either assume the risk factors to be distributed log-normally rather than normally, or to take the risk factors to be log-returns, in which case the loss function is exponential rather than linear.)*

***Example 2.*** *A simple credit risk model can be used to assess the n states in which an obligor may find himself or herself at some future time, i.e. to indicate the probabilities of a transition from the current rating class to some rating i by $p_i$. The model serves to estimate the reference risk factor distribution v based on historical data and to produce a traditional transition matrix where each column represents a vector $v=(p_1,...,p_n)$. For each possible final rating, the loss $l_i$ caused by a transition into that class is specified by market data and obligor data.*

*The table above provides a numerical example for an A-rated bond. Model estimations show the probabilities with which this rating can migrate into other rating classes (second row of the table) and the losses that are to be expected (first row). (These loss numbers were determined from credit spreads of A-rated industrial bonds maturing in five years, as given by Bloomberg.) Under the estimated transition probabilities the expected loss is 0.37% of the bond value.*

## 3 Stress Tests as Scenario Analysis

In its early days, stress testing was intended to provide risk information about an institution or portfolio without relying on a specific risk factor distribution, which might be misspecified or misestimated. The approach was to evaluate a simple loss function $L$ at certain scenarios. The scenarios themselves were chosen in an informal discussion among experts on potential risk factor realizations that are regarded extreme yet plausible. The precise meaning of these terms was left undefined. Sometimes existing models were used to construct the scenarios, like the central banks' macro forecasting model, sometimes scenarios were chosen based on historical experience or other considerations.

***Example 3.*** *For the linear portfolio of example 1, one scenario could be a 3σ drop of all risk factors from their current values μ, $\omega=\mu-3(\sqrt{\Sigma_{11}},...,\sqrt{\Sigma_{nn}})$. The resulting loss would be $L(\omega)=3(l_1\sqrt{\Sigma_{11}}+...+l_n\sqrt{\Sigma_{nn}})$. For the credit risk model of example 2, one scenario could be a downgrade of the bond from A to BB, leading to a loss of 15.83%.*

If the loss resulting from the given scenarios $L(\omega)$ was deemed unacceptable, the institutions needed to decide whether the scenario $\omega$ was plausible enough to warrant counteraction, and to determine what this counteraction could be. This "scenario analysis" procedure is still popular and continues to underlie most of the stress tests currently performed. Financial institutions invest very substantial efforts to translate scenarios provided by supervisors in terms of a handful of macroeconomic risk factors into risk factor moves of the institution's internal risk model.

This approach suffers, however, from two important drawbacks. First, a stress test that comes up with acceptable results for the scenarios analyzed may provide an unjustified illusion of safety, as it does not provide any information about any other scenarios that were not taken into consideration. Banks may, after all, become insolvent despite having passed recent stress tests. A notable example are the supposedly successful stress tests of Irish banks in 2010, which had to be bailed out a few months later.

Second, the judgment whether an alarming stress-test result warrants counteraction is necessarily based on a concept of plausibility, be it explicit or implicit. If stress scenarios are highly implausible, an alarming stress-test result may trigger a false alarm. The plausibility concept of scenarios should somehow be based on information about risk factor distribution. However, if this concept requires exact knowledge of the distribution it threatens to undermine the original purpose of stress testing, namely to provide information about an institution without relying on a specific risk factor distribution.

A first attempt to overcome the two drawbacks was made by Studer (1997, 1999) and Breuer and Krenn (1999), who developed what one could call "traditional systematic stress tests." Their approach, used in the context of multivariate normal risk factor distributions, is to first select ellipsoids (of a specified Mahalanobis radius) to arrive at a set of sufficiently plausible scenarios and then to identify the worst case among those scenarios. This approach addresses the two drawbacks: It does not sound a false alarm because only scenarios of sufficient plausibility are considered, and it does not create a false illusion of safety because the worst-case search ensures that no dangerous and plausible scenarios are neglected. This approach is probably a sensible compromise between presupposing exact knowledge of the risk factor distribution and assuming complete ignorance about the distribution. It uses some distributional information in the definition of the set of plausible scenarios. All scenarios within this set are on the same footing; all scenarios outside this set are neglected. Hence the infinity of possible density values of scenarios is reduced to the two values "in" and "out."

Breuer et al. (2013) apply these ideas to a comparative stress-testing exercise for a big aggregate loan portfolio based on loan data from the Spanish loan register. They show that, compared to standard stress-test procedures, worst-case searches of plausible domains identify more harmful scenarios that are equally plausible than the scenarios considered in standard procedures.

While this approach solves the problems of creating false illusions of safety or false alarms, it has problems of its own. First, choosing a Mahalanobis ellipsoid as a scenario set is natural only for elliptical risk factor distributions, like normal or Student $t$-distributions. It is not clear how to choose sets of plausible scenarios if the risk factor distribution is not elliptical. For example, how should systematic stress tests be performed in credit risk models with discrete rating classes? Second, the stress-testing procedure is subject to model risk because it has to commit to a specific risk factor distribution. It is not robust with respect to the misspecification of risk factor distribution: The stress tester does not know by how much worst-case losses differ if the risk factor distribution is different from the one anticipated. Third, the Mahalanobis

distance as a plausibility measure reflects only the first two moments of the risk factor distribution. This is not in line with intuition. A given extreme scenario should be more plausible if the risk factor distribution has fatter tails. Fourth, the maximum loss over a Mahalanobis ellipsoid depends on the choice of coordinates, as pointed out in Breuer (2008). Fifth, the worst-case loss over the ellipsoid is not a law-invariant risk measure: portfolios might have the same profit-loss distribution without having the same worst-case loss.

## 4 Systematic Stress Tests for Distribution Model Risk

In this section we focus on one important form of model risk, namely risk-factor-distribution uncertainty. Given the variety of opinions of economists and analysts about future average asset returns, correlations or volatilities, chances are that only one model, if at all, will correctly anticipate the risk factor distribution. All others, if not all, must bear the consequences of model risk. In the finance literature the term "model risk" frequently refers to uncertainty about the risk factor distribution, see Gibson (2000). We do not follow this convention, although the term is sometimes used in a wider sense (see Crouhy et al., 1998). As we take the term, it is equivalent to ambiguity in the sense of Ellsberg (1961).

The canonical expression describing worst-case expected losses over a set of alternative risk factor distributions is

$$\sup_{Q \in \Gamma} E_Q(L) \qquad (1)$$

for some closed convex set $\Gamma$ of risk factor distributions. Problem (1) is a formal model of both stress testing and model risk. In the context of stress testing the distributions $Q$ in expression (1) are interpreted as smeared versions of a particular scenario $\omega$. In the context of model risk the distributions $Q$ are plausible alternatives to the risk factor distribution $v$.

Expression (1) provides a starting point for generalizing the idea of worst-case search over plausible domains. The key idea is to think in terms of sets of risk factor distributions rather than a particular risk factor distribution. The stress test is then carried out with a view to identifying the worst expected loss of the portfolio across risk factor distributions in the set $\Gamma$. This leaves the question of how $\Gamma$ should be chosen. One key idea, advanced by Hansen and Sargent (2001), is to work with the set of all distributions whose relative entropy with respect to an initial prior distribution is below a given threshold. This leads to a generalized version of worst-case search over plausible domains where the threshold on relative entropy provides a plausibility constraint.

### 4.1 Relative Entropy as a Measure of Model Plausibility

We take the set $\Gamma$ as the set of distributions which have relative entropy with respect to best-guess distribution $v$ smaller than some threshold $k>0$:

$$\Gamma = \{Q : D(Q \| v) \leq k\}. \qquad (2)$$

The relative entropy $D(Q||v)$ is taken as a measure of (im)plausibility of a particular risk factor distribution $Q$ when the distribution-class specification and an estimation process lead to the best-guess distribution $v$. This choice for the set $\Gamma$ amounts to considering *all and only* the risk factor distributions above the plausibility level $k$. It encompasses both estimation risk and misspecification risk in the sense of Kerkhof et al. (2010).

In the literature, various "distances" of probability distributions are used.[3] One family of such distances – the *f*-divergences of Csiszár (1963), Ali and Silvey (1966) and Csiszár (1967) – corresponds to convex functions *f* on the positive numbers. Relative entropy corresponds to $f(t) = t \log t$, several other choices of *f* also give distances often used in statistics. Another important family are the Bregman (1967) distances, which also contain relative entropy as a special case. The results reported below can be generalized to sets $\Gamma$ which are balls for *f*-divergences or for Bregman distances.

Relative entropy has already been used in econometrics; see Golan et al. (1996), Avellaneda and Paras (1996), Avellaneda et al. (1997) and Borwein et al. (2003). Using relative entropy in stress tests as well appears reasonable, though we do not claim that it is necessarily the best choice among the various distances of distributions. Relative entropy balls are a popular choice for describing model uncertainty in portfolio selection, asset pricing, and contingent claim pricing; see e.g. Friedman (2002a, 2002b), Calafiore (2007), Barillas et al. (2009), Hansen and Sargent (2008) and others cited there. Special instances of the maximum loss theorem discussed below have been used already in Friedman (2002a) and Hansen and Sargent (2008), who considered linear and quadratic portfolios depending on normally distributed risk factors.

### 4.2 Relative Entropy and Estimation Errors

A partial analysis of model risk often addresses parameter estimation errors but assumes the model class to be well specified. Parameter estimation errors may lead to a distribution differing from the true one in mean, correlations, volatilities, etc. Which range of distribution parameters is plausible enough to be considered in a model risk analysis? If the model class is an exponential family, the confidence regions are specified in terms of relative entropy. Many of the common distributions of statistical interest are of the exponential type: normal, $\chi^2$, Poisson, binomial, multinomial, negative binomial, etc.

### 4.3 Maximum Loss Theorem

Choosing for $\Gamma$ relative entropy balls of radius *k* around the distribution *v*, problem (1) reads

$$\mathrm{MR}(L,k) := \sup_{Q:D(Q\|v)\le k} E_Q(L). \qquad (3)$$

Breuer and Csiszár (2012) solved this problem explicitly by translating the problem into the problem of solving an integral equation in one variable, which under some regularity conditions has a unique solution. This solution determines the worst-case distribution in and the maximum expected loss over distributions in $\Gamma$.

This generalizes the results about the most severe scenario among a set of plausible point scenarios, which were described in section 3. Yet while this setting provides for the identification of models with risk factor distributions, it at the same time neglects errors in the specification of the loss function *L*, which are an important aspect of model risk.

***Example 4.*** *For the linear portfolio of example 1, the worst-case scenario is a normal distribution with the same covariance matrix* $\sum$ *as the reference distribution v, but with the mean equaling* $\mu - \frac{h}{\sqrt{l^T \Sigma l}} \Sigma l$, *where* $h=\sqrt{2k}$. *The worst-case loss is* $\mathrm{MR}(L,k)=\sqrt{2k}\,\sqrt{l^T \Sigma l}$,

[3] *Distance is written in quotation marks because relative entropy is not strictly speaking a distance measure because it is neither symmetric nor does it fulfill the triangle inequality.*

*which equals the loss in the worst pure scenario over the ellipsoid*
$\{\mathbf{r} : \sqrt{(\omega-\mu)^T \Sigma^{-1}(\omega-\mu)} \le h\}$.

### 4.4 Systematic Stress Testing and Decision Theory

Expression (1) also plays a role in decision theory. It allows us to interpret the choice of a portfolio – or measures to rebalance or hedge assets – resulting in a portfolio with a loss-pricing function $L$ as the move of an ambiguity-averse decision-maker with multiple priors (see Gilboa and Schmeidler (1989), Casadesus-Masanell et al. (2000) – also known as maxmin expected utility (MMEU) theory). According to MMEU, ambiguity-averse agents prefer acts with lower values of (1). The set $\Gamma$ is interpreted as a set of priors held by the agent, and ambiguity is reflected by the multiplicity of the priors. A decision-maker who ranks portfolios by lower values of $L$ is ambiguity averse. And vice versa: Ambiguity-averse decision-makers act as if they were minimizing the loss function $L$. The relation (1) between ambiguity and risk has to be fleshed out by specifying the set $\Gamma$.

### 4.5 Stress Tests as Risk Measures

Expression (1), the worst expected loss over a fixed set $\Gamma$ of scenarios, also defines a coherent risk measure. It could thus serve as a stress test-based capital requirement. And what is more, *any* coherent risk measure can be represented as the worst expected loss over an appropriate set of risk factor distributions (see Artzner et al., 1998).

## 5 Stress Tests and Pricing Model Risk

Stress tests use models of the loss-pricing function $L$. Such models describe the loss of the portfolio as a function of the specified risk factors. Typically the number of risk factors in the model, although it may go into the thousands, is much smaller than the number of variables influencing the loss. The risk factors are (derived from) prices of basic financial instruments. Describing the price of the portfolio as a function of the prices of these basic instruments is a modeling exercise, which is prone to errors. It involves asset pricing theories of finance with highly nontrivial assumptions on no arbitrage, complete markets, equilibrium, etc. While these asset pricing theories are widely used in business as well as in the public sector, there is yet little evidence that they explain past portfolio values very well and even less evidence that they are very good in predicting the future value of a given portfolio of financial instruments (see Bossaerts, 2002). To acknowledge this fact, a good stress-testing model should be robust with respect to the specification of the loss function.

The question of the robustness of the loss function ranges from the question of what valuation or pricing model would be the right basis for the loss function, to the question of whether prices should be marked to market or based on impact-adjusted valuation such as liquidation prices. Clearly the reliance on standard asset-pricing models combined with mark-to-market valuation was one of the main reasons why risk management systems failed dramatically in the run-up to the financial crisis.

There is a recent growing literature dealing with the effects of liquidity on pricing: Important references are Holmstrom and Tirole (1997), Brunnermeier and Pedersen (2009) or Geanakoplos (2003). Most of the papers in the economics literature, including the papers referenced above, provide a qualitative theoretical understanding of how liquidity and pricing interact. These models can, however, not be

directly applied to a quantitative analysis of loss-function robustness with respect to pricing risks. While a systematic analysis of loss-function robustness might be out of reach at the moment because it is not clear which sort of perturbations should be looked at, the results in Caccioli et al. (2012) suggest that some progress has been made in arriving at a quantitative understanding of the problems involved in mark-to-market accounting. Caccioli et al. (2012) find evidence that liquidation prices are approximately

$$p_f = p_0(1 - Y\sigma\sqrt{S/V}), \qquad (4)$$

where $p_0$ is the current price, $S$ is the size of the position to be liquidated, $V$ is the daily transaction volume, $Y$ is a numerical constant of order unity, and $\sigma$ is the daily volatility. The liquidation discount increases with the size of the liquidated position in comparison to the market, and with the volatility of the price. Valuating a portfolio with liquidation-discounted prices $p_f$ instead of mark-to-market prices $p_0$ brings into the picture the actions of other agents via the variables $V$ and $\sigma$. But it falls short of modeling the feedback between the act chosen by an agent and actions of other agents, which affect the risk factor distribution of the first agent.

The valuation error that could be made by relying on mark-to-market approaches for a baseline valuation is particularly strong for leveraged positions. While the mark-to-market value of a leveraged position might be high, the liquidation values might be next to zero or even negative.

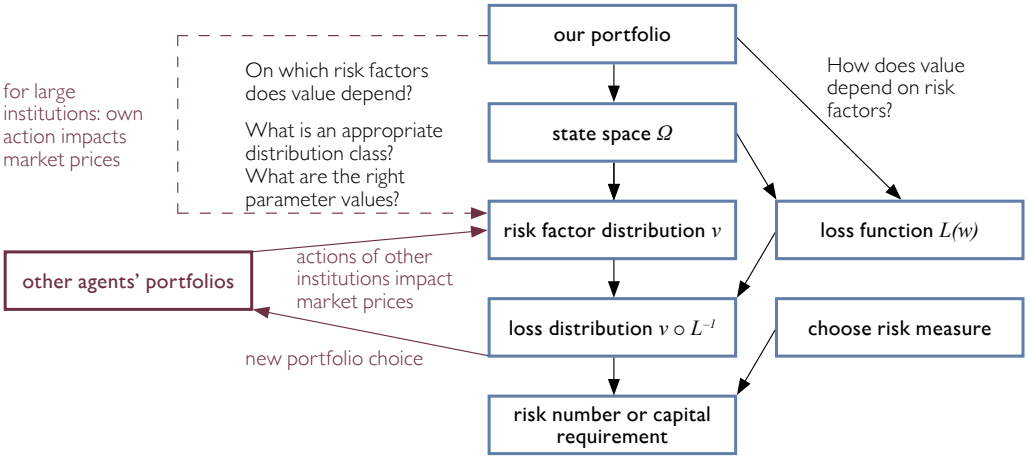
## 6 Open Problems

Stress testing is a relatively new field. It is therefore not surprising that it is a field with many open problems. From these many problems we would like to pick the one we believe needs particular attention from researchers: Stress situations for financial portfolios are not exclusively but typically situations of widespread distress in the financial system. The microprudential and the macroprudential perspective cannot be separated any more. Financial crisis situations and prices that emerge in such a situation are a systemic problem that can only be analyzed by understanding the interaction and feedback between individual actions and the pricing of risk in the financial system. The assumption of an exogenous risk factor distribution is inappropriate in such a situation. We must find ways to take into account the systemic nature and the endogeneity of financial risk. The models we have discussed so far ignore this risk endogeneity by thinking about risk and uncertainty in the context of a single-person decision problem, where risks are exogenous and do not depend on the behavior of individuals.

Recent accounts of financial crisis such as Brunnermeier (2009), Shin (2010) or Geanakoplos (2010) suggest the following boom-bust narrative of financial distress: A crisis usually begins in good times. People become more optimistic and get convinced that fundamental structural changes in the economy would allow taking on greater financial risk. This is usually the beginning of a leverage cycle, in which lenders lower their lending standards and collateral requirements, allowing the most upbeat investors to conduct leveraged asset purchases, feeding an asset price boom. If risks are measured from historical data, perceived risk decreases, allowing for yet more leverage in the system. At the peak of a leverage cycle, minor decreases in asset values can drive the most leveraged investors into default. The assets serving as collateral go to other investors who value the assets less highly, reinforcing the

Chart 2

**Standard Risk Measurement Procedure**




*Source: Authors' analysis.*

decline in asset prices and potentially driving more investors into default. At this stage lenders step up their lending standards and liquidity evaporates, forcing fire sales of leveraged institutions and individuals, feeding the negative spiral even further.

A stress-testing model that can take these self-feeding boom-bust scenarios into account would need to depart significantly from the current stress-testing framework that we have discussed in this paper. Rather than conceptualizing the stress test as a single-person decision problem, we need to think of the stress test as an interactive decision problem, in which certain risks result from the interaction of individuals or institutions.

To better understand how a situation of systemic risk changes the standard stress-testing framework, let us revert to the structure of the standard stress-testing model. With endogenous risk, three additional interaction channels enter the picture (chart 2). While in the standard framework the influence of my portfolio choice on the risk factor distribution is ignored, this influence has to be taken into account in an endogenous risk framework. This channel does not appear in the standard framework because it is assumed that the institution which does the stress test is negligible in the financial system as a whole and can treat risk factor distributions as given. Even when it is assumed that my own portfolio is fixed and given, in an endogenous risk world the risk factor distribution depends on all the other portfolio decisions in the system. This is also ignored in the standard stress-testing framework. Additionally it has to be assumed that, even if I keep my portfolio constant, other participants in the system will adjust their portfolios. Thus there is a feedback loop between the risk factor distribution and the portfolio composition of all the other participants in the financial system. This feedback loop is also ignored in the traditional stress-testing framework.

Some recent papers suggest different variations to the traditional stress-testing framework without developing a systematic general analysis of risk assessment and stress testing in a world with endogenous risk. The papers either depart in suggesting the

consideration of a wider set of scenarios than the standard scenarios that have been used in the past. An example for these kinds of suggestions is Greenlaw et al. (2012). Others differ with regard to their suggestions of how the loss function can be reformulated to more accurately capture the systemic nature of the risks. Papers in this direction include for instance Elsinger et al. (2006a, 2006b), Gauthier et al. (2012), Duffie (2011) and Pritsker (2012) as well as Acharya et al. (2012). Finally Brunnermeier et al. (2011) suggest new approaches to data collection that would in principle allow the development of a stress-testing framework based on interactive decisions and endogenous risk.

Despite the progress made in these papers, we believe that we still lack a stress-testing framework which seriously takes into account the endogeneity of risk factor distribution. In this context there is an interesting connection of the endogenous risk problem to the paper by Caccioli et al. (2012). The empirical regularities that are summarized in a universal impact function might be a bridge to the problem of how positions should be valued in a system where endogenous risk is prevalent without modeling a fully-fledged interactive decision problem.

Cont and Wagalath (2012) propose a way to quantify the influence of fire sales on both prices and risk factor distribution. Starting from assumed deleveraging schedules for banks, and assuming that assets are sold proportionally in the deleveraging process, they show that realized correlations between returns of assets increase further in bad scenarios, due to deleveraging. Such an approach could be the basis of stress test procedures taking into account the endogeneity of risk and feedback effects of market participants' reaction to adverse scenarios.

## 7 Conclusions

Stress testing is a new field and as a result there is still scope for methodological improvement. Given the high uncertainty that goes with the task of making quantitative assessments about the risk-bearing capacity of financial institutions under extremely adverse circumstances, model robustness is a highly desirable property. As reviewed in this paper, the biggest advances in enhancing the robustness of stress-testing models have been made with respect to the assumptions about risk factor distribution. The key idea is not to rely exclusively on the estimated risk factor distribution but to consider a larger set of distributions as possible. In this context a coherent and universally applicable stress-testing model can be formulated that generalizes the main ideas of worst-case search over plausible domains of distributions. It helps to make stress tests robust not only with respect to distributional assumptions and gives precise meaning to the requirements that a stress test should consider scenarios that are extreme yet plausible.

We have seen that risk factor distribution is not the only model-vulnerable input to a stress test. The other object that is of concern for designing robust procedures is the loss function. To our best knowledge there has yet been no work on loss function robustness in a stress-testing environment. Given the progress made in assessing the problems of mark-to-market valuation, which could be useful for enhancing loss function robustness, this area would be an interesting avenue for deeper investigation.

Mark-to-market pricing versus liquidation-discounted pricing as in equation (4) is an issue that could build the bridge to the biggest unresolved problem in current stress testing. Although the use of a liquidation discount falls

short of a full-fledged model of the feedback between the actions of different agents and the risk factor distribution, it provides a simple description of some consequences of this feedback: stronger than normal price declines when agents deleverage. Using liquidation-discounted prices instead of mark-to-market prices would allow applying the more traditional stress-testing techniques discussed here, and still take into account some of the more important consequences of risk generated by agents within the system.

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# Macroeconomic, Market and Bank-Specific Determinants of the Net Interest Margin in Austria

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*The objective of this article is to identify key determinants of the net interest margin (NIM) in the Austrian banking sector. In Austria, the NIM is one of the most important income drivers of banks given the importance of relationship banking, where interest income dominates other sources of revenue. However, the NIM differs substantially among Austrian banks. Drawing on a unique supervisory dataset for the Austrian banking sector of around 42,000 observations between the first quarter of 1996 and the second quarter of 2012, we analyze under which circumstances a bank has a relatively high or low NIM. We contribute to the empirical literature on the NIM by factoring in a bank's business model in terms of its balance sheet structure and by accounting for the financial crisis from the third quarter of 2007 onward. Our estimation results suggest that not only the determinants identified in the existing empirical literature (different types of non-interest income and expenses, various risk measures, competition, macroeconomic environment) have a significant influence on the NIM, but also our two innovations (balance sheet structure, financial crisis).*

*JEL classification: E43, G21, D40, L11*
*Keywords: Net interest margin, balance sheet structure, panel estimation*

## 1 Introduction and Motivation

For most banks, interest income represents a substantial part of their operating income. In particular, this applies to small and medium-sized banks that are involved in relationship banking with a strong emphasis on the German-style "Hausbank" (see e.g. Allen and Gale, 1995). In Austria, interest income still accounts for nearly 50% of banks' operating income, which is why, in commercial banking, the importance of the net interest margin (NIM) as a measure of profitability of financial intermediation cannot be neglected.

Interestingly, there has been a substantial reduction in the NIM throughout Europe over the past years. Liebeg and Schwaiger (2006) report such a decline for euro area banks between 2000 and 2005. Annual Bankscope data for Western Europe confirm a further decline in rates in most countries between 2005 and 2011. Austria is no exception to this trend, as already noted earlier by Liebeg and Schwaiger (2006): the NIM shrank by almost 50% between 1996 and mid-2012 (see chart 1).

The seminal work of Ho and Saunders (1981), which is covered in section 2 in more detail, laid a good foundation for empirical research aimed at detecting the driving forces of interest margins. These papers already provide comprehensive theoretical guidance about which variables could be tested empirically. We find a considerable number of papers that present the following determinants of the NIM.

First, banks may have established complementary sources of income (e.g. income from fees and commissions) or refinancing opportunities (e.g. covered bonds). Allen (1988) extended the original Ho-Saunders model by considering different types of loans and deposits. Beyond their theoretical extension, the

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question remains whether certain types of loans/deposits are strategic substitutes or complements. For lack of sufficiently granular data, most empirical studies use the idea of different types of loans and deposits only by defining broad categories such as bank, consumer, foreign currency and corporate loan shares on the asset side and deposit shares on the liability side.[2] Another approach is to model different sources of income directly. Liebeg and Schwaiger (2006) follow this approach by considering non-interest revenues as a share of total income, income from fees and commissions and also the share of foreign currency loans.

Second, banks could have increased their efficiency by improving their cost-to-income ratios and/or reducing their staff and other expenditures. Almost all empirical papers incorporate some kind of cost-related variable. Prominent examples are the cost-to-income ratio (see e.g. Liebeg and Schwaiger, 2006, or Entrop et al., 2012), some kind of efficiency index (see Hamadi and Awdeh, 2012) or cost variables in relation to total assets (see e.g. Horvath, 2009).

Third, banks might change their risk appetite. Ho and Saunders (1981) originally considered absolute risk aversion in a bank's utility function. Empirically, there are several ways to incorporate this idea. Saunders and Schumacher (2000), among others, use interest rate volatility to control for major portfolio risks. Another approach, which is more popular in empirical work, is to link risk appetite to credit risk-related variables such as loan loss provisions and/or the nonperforming loan ratio. Hanweck and Ryu (2005) argue that risk-averse bank managers will shift to lower-yielding assets and funds that are less prone to default as credit risk increases. Controlling for the asset structure, as we suggest, could help identify the partial influence of other risk appetite variables on the NIM. Maudos and de Guevara (2004) propose that the risk of nonpayment or default on a credit requires banks to implicitly include a risk premium in interest rates and therefore the NIM.

Fourth and more market-based, competition in the banking system may have intensified, causing margins to decline. Most empirical studies use either the Herfindahl-Hirschman index (HHI; see Herfindahl, 1955, and Hirschman, 1964) or the Lerner index as a measure of competition. Whereas the HHI determines how uniformly market shares are distributed, the Lerner index measures the degree of competition on a bank-by-bank basis (see Angelini and Cetorelli, 2003, for details). As noted by Keeley (1990), banking sector competition and (de)regulation of the banking sector are closely related. In this context, the introduction of (additional) regulatory requirements such as Basel II could impose new restrictions on a bank's optimal interest margin-setting problem. The theoretical impact of capital regulations and deposit insurance was analyzed by Zarruk and Madura (1992).

Fifth, also macroeconomic conditions influence the NIM in terms of changes in the economic environment affecting the banking system as a whole at a given point in time. In most empirical studies, GDP growth is used as a control variable and is assumed to have a positive correlation (see e.g. Horvath, 2009). Many papers consider market interest rates of different maturities and/or their respective standard deviation to capture the development of both

[2] *Maudos and de Guevara (2004) include the loan-to-total assets ratio and deposit-to-total assets ratio. Horvath (2009) only considers the share of total loans.*

the short and the long end of the yield curve.[3] Only a few papers control for additional macroeconomic variables such as inflation (see e.g. Horvath, 2009, and Entrop et al., 2012) and market interest rate spreads (see Rumler and Waschiczek, 2012).

From a financial stability perspective, it is not clear whether a relatively high or relatively low NIM is optimal. On the one hand, a high NIM is associated with a low degree of efficiency, a low degree of financial deepening and noncompetitive market conditions. On the other hand, low net interest rate margins might induce aggressive and highly risky "search-for-yield" activities by banks as suggested by Delis and Kouretas (2011), which pose a threat to financial stability. The 2008 financial crisis showed how such a scenario almost caused the global financial system to collapse. From this perspective, the development of the NIM could profoundly influence the future development of the Austrian banking sector.

The purpose of our study is to identify the most important macroeconomic, market and bank-specific determinants of the NIM and thereby explain the declining margins in Austria. We combine the most suitable determinants from the existing literature and add two innovations. To the best of our knowledge, we are the first to approximate banks' business models by their balance sheet structure and to account for the financial crisis from the third quarter of 2007 onward.[4] The remainder of this article is structured as follows. Section 2 introduces the theoretical model by Ho and Saunders (1981) and game theoretic refinements that put an emphasis on competition. Section 3 describes the data base used for our empirical analysis as well as the data preparation process including outlier detection and summarizes the variables eventually used for estimation. Section 4 lays out the econometric model, and section 5 presents and discusses the estimation results. Finally, section 6 concludes.

## 2 Theoretical Model

In the theoretical literature, we find two major approaches to modeling the NIM. Most papers follow the seminal work of Ho and Saunders (1981), where the bank's intermediation role is defined as a passive dealer between providers and users of funds.

As mentioned by Marrouch and Turk Ariss (2011), their theory rests on banks' ability to match the random arrival and departure of deposits and loans, which allows banks to set the interest margin or spreads for deposits $a$ and loans $b$ with respect to the exogenously assumed money market rate $m$.[5] The random arrival and departure of deposits results in transaction uncertainty, which in turn produces the so-called pure spread/margin. Put simply, the pure margin in Ho and Saunders (1981) is affected by the degree of bank management's risk aversion, the market structure in which the bank operates, the average size of bank transactions and the variance of interest rates.

Maudos and Solis (2009) considerably extended the basic model by including operating costs, credit risk, interaction between credit and market risk, non-interest income, income from fees and commissions and trading income into the pure spread dealership model.

[3] *Maudos and de Guevara (2004), e.g., include the standard deviations of the three-month, three-year and ten-year interest rate.*

[4] *Memmel and Schertler (2011), who included the change of the balance sheet structure into their NIM model, match up closest with our first innovation.*

[5] *The interest on deposits and loans is then defined as $m-a$ and $b+m$, respectively, which results in a NIM of $a+b$.*

As already noted by Ho and Saunders (1981), there are other variables outside the theoretical pure margin model which influence the NIM. In the most comprehensive study by Maudos and Solis (2009), these variables, such as implicit interest payments, opportunity costs of holding reserves, quality of management and loans to total assets as well as deposits to total assets, are included in their theoretical model. Finally, GDP growth and inflation are added.

The less popular alternative for modeling the NIM applies standard theory from industrial organization. The Monti-Klein model considers a monopoly bank where it can be shown that interest rates on loans and deposits can be determined separately (separability theorem) if there is no default risk (see Monti, 1972, and Klein, 1971). With credit risk, the separability theorem no longer holds. However, as stated by van Hoose (2010), pure monopoly or monopsony is a rare occurrence in any modern setting. A bank typically faces at least a few rivals, although banking markets may not be perfectly competitive either.

Imperfectly competitive banking markets can be modeled in several ways and enrich the theory on NIM determinants. The basic idea is to integrate imperfect competition in the loan and deposit market into one game theoretic model.[6]

Not surprisingly, this approach highlights the importance of competition and, in more complex models, product differentiation as a major determinant of the NIM. As a consequence, we implement the standard measure of competition, the Lerner index, in our model. We follow the estimation approach by Angelini and Cetorelli (2003), where it is assumed that a bank sets equilibrium prices and quantities in order to maximize its profits $\Pi_i$:

$$\Pi_i^{max} = \max_{q_i} [p(Q,z) - C(q_i,\omega_i)]. \quad (1)$$

Such a decision is based on cost considerations ($C(q_i,\omega_i)$) and on the degree of competition in the market measured by the inverse demand function $p(Q,z)$ where $Q$ is the industry output. For lack of data on different products/services of a bank, we summarize all outputs of a bank in an aggregate banking product. The same is done on the cost side.[7]

The corresponding first order condition to equation (1) is

$$p_i = C'(q_i,\omega_i) - \Theta_i / \tilde{\varepsilon} \quad (2)$$

where the second term on the right-hand side measures the departure from a perfectly competitive benchmark.[8] In line with Angelini and Cetorelli (2003), the separate identification of $\Theta_i$ and $\tilde{\varepsilon}$ is not required if one aims to analyze the bank's overall degree of market power. It is sufficient to estimate $\lambda = \Theta_i / \tilde{\varepsilon}$. Dividing $\lambda$ by the average price $p$ yields the Lerner index. The Lerner index is defined to be between 0 and 1, measuring the relative markup of price over marginal cost. A Lerner index of zero would describe a market with perfect competition, whereas an index of one would imply monopoly power.

[6] *Different combinations of loan and deposit market forms, such as oligopolies and oligopsonies or monopolisties and monopsonisties, are possible.*

[7] *The input variables are interest expenses, staff and other operating expenses, whereas the price of the aggregate banking product is defined as the ratio of the sum of interest income and income from fees and commissions to total assets.*

[8] *The term $\Theta$ is usually defined as the conjectural elasticity of total industry output with respect to the output of the $i^{th}$ firm and $\tilde{\varepsilon}$ is the market demand semi-elasticity to the price.*

For further estimation details, we refer to Angelini and Cetorelli (2003). The result of their estimation technique is a Lerner index for each bank in each quarter, which is integrated in our empirical setup described in section 4.

## 3 Data and Definitions

Our empirical analysis is based on quarterly supervisory data reported by domestically operating banks at the unconsolidated level according to national GAAP. This implies that interest income earned by Austrian banks' subsidiaries in Central, Eastern and Southeastern Europe or the Commonwealth of Independent States is not included in the NIM that is analyzed in the next sections.[9] Instead, by using unconsolidated data, we put the focus on the domestic market, as we are primarily interested in gaining insight into the determinants of the decline of the NIM in Austria (see chart 1).

Bank-specific variables and the Lerner index are built from data on balance sheet items, the profit and loss statement and data on regulatory capital and capital requirements. The observation horizon runs from the first quarter of 1996 to the second quarter of 2012, yielding $T = 66$ time periods. We consider all institutions that held a banking license at some point during the observation horizon but exclude special purpose banks and affiliates of foreign banks in Austria and arrive at a sample of $N = 1{,}011$ banks.

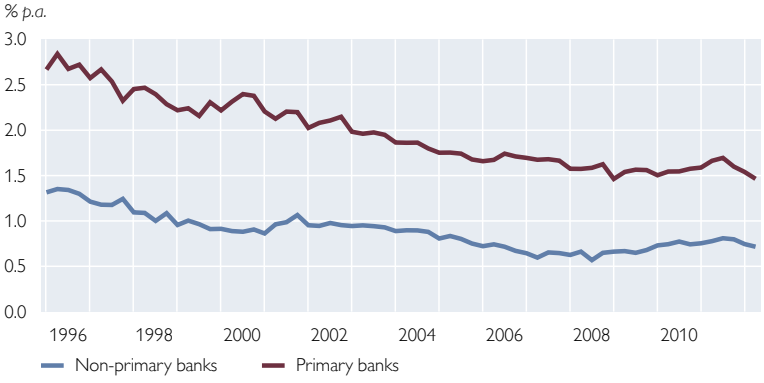
To prevent outliers from distorting the empirical analysis, we apply a two-stage cleaning algorithm to the variables used. First, we eliminate outliers across banks for each time period. An observation is considered an outlier if it is too far from the median (more than four times the distance between the median and the 2.5% or 97.5% quantile). In a second stage, we eliminate outliers across time for each bank. Here, the threshold distance is defined as 12 times the distance between the median and the 10% or 90% quantile. Such parameters ensure that the number of removed observations remains limited and the resulting distributions exhibit a reasonable shape when judged from a qualitative perspective. This procedure leaves us with around 42,000 observations.

With regard to our two innovations, we use the share of different types of assets and liabilities as approximation for the business model and a crisis dummy from the third quarter of 2007 onward to account for the new challenges banks have faced in the global financial crisis. Since the overall balance sheet structure does not change significantly at a quarterly frequency and stays reasonably stable over time, it can be considered a good proxy.

Finally, we use the Lerner index and a primary-bank dummy as market variables. The latter dummy variable indicates whether or not a bank is a

Chart 1

**Austrian Banks' Net Interest Margin (unconsolidated data)**




*Source: OeNB.*

*Note: The definition of primary banks is given in this section. Interest on other assets and liabilities is included in the numerator of the NIM.*

[9] *However, nondomestic business is taken into account in terms of cross-border loans granted by domestically operating banks.*

"primary bank," i.e. typically a small retail-oriented bank in the bottom layer of one of the tiered sectors of the Austrian banking system (savings banks, Raiffeisen credit cooperatives, Volksbank credit cooperatives).

Macroeconomic data are taken from the OeNB's macroeconomic dataset which serves as input for the Austrian Quarterly Macroeconomic Model AQM (see Schneider and Leibrecht, 2006). Specifically, we use real GDP growth, the GDP deflator and long- and short-term interest rates.

Descriptions of variables are given in table 1. For the ease of readability, those variables that are normalized by dividing by total assets are named by their numerator in the sequel (e.g. "bank loans" instead of "bank loans divided by total assets").[10] The column "Normalized by total assets" in table 1 indicates whether this naming convention applies. Profit data (i.e. net interest income, net

Table 1

**Description of Variables**

| Name | Description | Normalized by total assets | Expected sign[1] |
|---|---|---|---|
| Net interest margin | Net interest income over total assets[2] | by definition | |
| Euro-denominated loans to domestic nonbanks | Loans to domestically domiciled nonbanks (i.e. customers) denominated in euro | yes | + |
| Foreign currency loans to domestic nonbanks | Loans to domestically domiciled nonbanks (i.e. customers) denominated in foreign currency | yes | + |
| Loans to foreign nonbanks | Loans to foreign domiciled nonbanks (i.e. customers), all currencies | yes | + |
| Bank loans | Loans to domestic and foreign banks, all currencies | yes | + |
| Interest-bearing securities | Exchange-traded interest-bearing securities (held as assets) issued by domestic and foreign banks and nonbanks, all currencies | yes | + |
| Nonbank deposits | Deposits taken from domestic and foreign nonbanks (i.e. customers), all currencies | yes | – |
| Bank deposits | Deposits taken from domestic and foreign banks, all currencies | yes | – |
| Securitized debt | Liabilities in the form of securitized debt obligations and transferable certificates | yes | – |
| Net fee income | Net income from fees and commissions (smoothed) | yes | – |
| Staff expenses | Staff expenses | yes | + |
| Other operating expenses | Operating expenses other than staff expenses | yes | + |
| Leverage ratio | Eligible tier 1 capital over total assets | by definition | ± |
| RWA | Risk-weighted assets (credit risk only) | yes | ± |
| LLP ratio | Specific loan loss provisions over gross exposure (loans to domestic and foreign nonbanks, all currencies), smoothed[3] | no | ± |
| Lerner index | Relative markup of the price of an aggregate bank product over marginal costs; estimated by three-stage least squares in a simultaneous equation model | no | + |
| Crisis dummy | Time dummy from the third quarter of 2007 onward | no | – |
| Primary bank dummy | Dummy variable indicating whether a bank is a "primary bank" | no | + |
| GDP growth | Annual growth rate of quarterly real GDP | no | + |
| GDP deflator | Annual growth rate of the level of prices of all new, domestically produced, final goods and services in Austria | no | ± |
| Short-term interest rate (–1) | Short-term nominal interest rate (3-month EURIBOR) p.a. at lag 1 (previous quarter) | no | + |
| Long-term interest rate (–1) | Long-term nominal interest rate (10-year Austrian government bond yield) p.a. at lag 1 (previous quarter) | no | + |

*Source: OeNB.*

[1] *Theoretical considerations and/or evidence in the existing literature suggest that the impact of a variable on the NIM is either positive (+), negative (–) or mixed (±).*

[2] *Interest on other assets and other liabilities (e.g. receivables from goods and services) is excluded from net interest income. Including these items basically has only a negligible effect on the estimation results.*

[3] *According to national GAAP, specific loan loss provisions essentially are set aside only for loss events that have already occurred in the past, i.e. they do not exhibit a forward-looking character.*

[10] *In table 2, which presents the estimation results, normalization by total assets is mentioned explicitly.*

fee income, staff expenses, other operating expenses, various profit components for constructing the Lerner index) refer to quarterly flows.

## 4 Empirical Analysis

In this section, we briefly outline the econometric approach to the application of the Ho and Saunders (1981) model and its later refinements, as laid out in section 2, to the data described in section 3. The structure of our data ($N$=1,011 banks are observed for $T$=66 time periods) calls for a panel-data analysis. As not all institutions were active during the entire observation horizon, the resulting panel is unbalanced.

In its general form, a static one-way regression with panel-specific effects reads as follows:[11]

$$y_{i,t}=\alpha+\beta' X_{i,t}+ u_i+e_{i,t} \qquad i = 1,...,N,\ t = 1,...,T \tag{3}$$

where $y_{i,t}$ denotes the dependent variable (NIM), $X_{i,t}$ the $K$ explanatory variables, and $e_{i,t}$ the idiosyncratic error term, which we assume – for the time being – to be independent and identically distributed (i.i.d.): $e_{i,t}\sim N(0,\sigma_e^2)$. $\alpha$ represents the global intercept, $\beta$ the corresponding $K$ regression coefficients, and $u_i$ the panel-specific effect, for which we still need to determine whether it should be treated as a fixed parameter, i.e. fixed effect $u_i$ with

$$\sum_{i=1}^{N} u_i=0$$

for the global intercept to be identified or rather as an i.i.d. random variable, i.e. random effect $u_i$ with

$$u_i\sim N(0,\sigma_u^2),$$
$$\mathrm{Corr}[x_{i,t}^{(k)},u_i]=0 \quad t=1,...,T,\ k=1,...K.$$

The Breusch-Pagan Lagrangian multiplier test for random effects supports this view as it rejects the null of poolability at the 1% level, thereby underlining the importance of taking the presence of any type of bank-specific effect into account. Moreover, the Wooldridge test for autocorrelation in panel data rejects the null of no first-order autocorrelation in the idiosyncratic error terms at the 1% level (see Wooldridge, 2002, and Drukker, 2003). A modified Wald test for groupwise heteroskedasticity likewise rejects the null of homoskedasticity of the idiosyncratic error variances at the 1% level. In the presence of autocorrelation and heteroskedasticity within panels, we have to make a more general assumption about the distribution of the error term and thus employ robust estimators of the variance-covariance matrix hereinafter (see, e.g., Hoechle, 2007, for an overview of robust estimators in panel-data analysis).[12]

It is still unclear which specification of the bank-specific effects in static panel regression – fixed or random – better describes the data-generating process. As we are confronted with heteroskedasticity in the error variance, we need a variant of the Hausman test

[11] *We do not follow the original two-stage estimation technique of Saunders and Schumacher (2000) to distinguish the determinants of the NIM into a pure and a total margin. This approach would not mix bank-specific and macroeconomic variables in a single equation and hence would avoid any estimation bias due to group effects as argued by Moulton (1986). Our panel estimation approach, however, controls for bank-specific characteristics and for the fact that all banks operate in virtually the same macroeconomic environment.*

[12] *Note that preliminary robust fixed effects regressions allowing for variance clustering at (potential) clusters other than the panel identifier (e.g. the sectors within the banking system to which the individual banks belong or the Austrian provinces where the banks' headquarters are located) do not produce substantially different results. The correlation of the error term across panels therefore does not seem to be much of an issue. Another preliminary fixed effects regression allowing for AR(1) disturbances only but not for heteroskedasticity produces similar results.*

to decide for either random or fixed effects that is robust against heteroskedasticity. We therefore employ the Hansen (1982) J-test of overidentifying restrictions, which tests whether the additional moment condition $E_t[X_{i,t} u_i]=0$ as imposed by random effects estimation holds (see Arellano, 1993). As the null of the test of validity of this particular overidentifying restriction is rejected at the 1% level, we conclude that a model with fixed effects better describes the underlying data-generating process.[13]

Even if random effects or pooled OLS estimation may not fit the data as well as fixed effects, we will still present estimation results based on these methods since quantitatively and qualitatively similar estimation results across various estimation methods corroborate the explanatory power of the regressors. In addition, we allow for a primary-bank dummy to capture the difference in evolution of the NIM of this particular type of bank over time as depicted in chart 1. It would not be possible to include such a dummy in a fixed effects regression.

To provide additional evidence for the goodness of fit of our chosen specification, we also cover estimation results based on the feasible generalized least squares (FGLS) estimation, which is another estimator for producing results that are robust against autocorrelation and heteroskedasticity in the idiosyncratic error terms. In particular, we apply two variants: one variant estimates a common autoregressive coefficient and the other allows for panel-specific autocorrelation. As discussed in Hoechle (2007) and as can be seen in section 5, however, the reported robust standard errors of these estimators have to be interpreted with a grain of salt, as they tend to produce downward-biased results.

## 5 Estimation Results

We present our estimation results in table 2, where the NIM is the dependent variable. Generally speaking, not only is the vast majority of coefficient estimates highly significant and has the expected sign, but also the results discussed below hold across estimation techniques. This gives us confidence in the validity of the employed econometric model.

It is not surprising that the influence of the balance sheet structure on the NIM is substantial. The balance sheet structure not only summarizes past and current management decisions, thereby approximating the results of a multi-stage period dynamical optimization problem, but also sheds light on the business model of a bank.

On the asset side, euro-denominated loans to domestic nonbanks generate the highest positive contribution to the NIM, followed by loans to domestic nonbanks and interest-bearing securities. Foreign currency loans to domestic nonbanks only have a coefficient estimate two-thirds as high as their euro-denominated counterpart. Albacete et al. (2012), who conducted an analysis on foreign currency mortgage holders based on the Household Finance and Consumption Survey[14], show that foreign currency borrowers have substantially higher risk buffers than their domestic currency counterparts. As a consequence, the former might have a stronger position in loan contract bargaining, which results in a lower interest rate.

On the liability side, the cheapest refinancing sources are nonbank deposits, followed by bank deposits and secu-

[13] *Note that the fixed effects estimation in section 5 delivers an empirical value of* $Corr(\beta' X_{i,t}, u_i)=0.3649$.
[14] *See http://www.ecb.int/home/html/researcher_hfcn.en.html for more information.*

ritized debt. Here, their coefficient estimates are more or less in the same range and have the expected negative sign.

The negative sign for net fee income is a standard result. Maudos and Solis (2009) argue that more diversified banks have lower intermediation margins. This may reflect a strategy of cross-subsidization with traditional activities. Also Lepetit et al. (2008) find that higher income shares from fees and commissions are associated with lower margins and loan spreads. The latter result is consistent with the conjecture that banks price (or misprice) loans to increase sales of other services.

Staff and other operating expenses represent our cost- or efficiency-related variables. They have a relatively high negative impact on the NIM, which highlights the importance of banks being efficient. From a different perspective, only approximately 45% of an increase in staff or other operating expenses can be passed on to customers by increasing the NIM.

The financial crisis has uncovered the vulnerability of highly leveraged banks. Our results suggest that the higher the leverage ratio, the lower the NIM, which is in accordance with a recently published article by Hamadi and Awdeh (2012).

However, our results are in contrast to most of the empirical literature that is based on the Ho-Saunders dealership model, where the leverage ratio is used to approximate risk aversion and has a positive sign (see Saunders and Schumacher, 2000, Maudos and de Guevara, 2004, and Maudos and Solis, 2009). As we control for more variables, especially for the balance sheet structure, our findings suggest that holding regulatory tier 1 capital is costly in terms of generating net interest income. In other words, the leverage ratio has the same interpretation as other balance sheet liability variables (e.g. nonbank deposits). From a financial stability perspective, it is important to note that it is the second cheapest refinancing source, while, at the same time, a higher leverage ratio increases the risk-bearing capacity of banks, thereby contributing to the overall stability of the banking system.

To factor in the risk appetite of banks, we incorporate risk-weighted assets (RWA) and the loan loss provision (LLP) ratio in our estimation. To the best of our knowledge, we are the first to integrate both variables in a model.[15] Although it is debatable if RWA under Basel II measure risk perfectly, the coefficient estimate is still positive, which indicates that banks demand compensation for riskier assets.

The LLP ratio shows a negative sign, however. At the first glance, this result seems surprising and in contrast to most of the existing literature. Nonetheless, when we control for RWA and consider the fact that provisioning does not exhibit a forward-looking character under local GAAP, the negative coefficient makes perfect sense. Following Hanweck and Ryu (2005), our estimation shows that rising loan losses or nonperforming loans relative to earning assets causes banks to lose interest income generated from these loans and to move funds to lower-yielding assets that are less prone to default. Both effects tend to negatively influence the NIM in the short run, i.e. deteriorations in credit quality tend to decrease the NIM.

The Lerner index has the expected positive sign (see e.g. Liebeg and

[15] *Whereas only Liebeg and Schwaiger (2006) and Entrop et al. (2012) consider RWA, the LLP ratio or closely related variables are standard in the empirical literature on the NIM.*

Schwaiger, 2006, Maudos and Solis, 2009, or Entrop et al., 2012). As discussed in section 2, more market power leads to higher markups resulting in an increase in the NIM.

As described in section 2, the primary-bank dummy seems to have a prominent influence on the NIM (0.35 percentage points). However, after controlling for our variable list, its impact diminishes drastically to only 0.07 percentage points. This demonstrates that our model provides a near-perfect explanation for the difference in the NIM between primary and non-primary banks.

Table 2

**Baseline Estimation Results**

| Dependent variable | Fixed effects | | Random effects | | Pooled OLS | | FGLS, common AR(1) coefficient | | FGLS, panel-specific AR(1) coefficient | |
|---|---|---|---|---|---|---|---|---|---|---|
| Net interest margin | Coefficient | SE (robust) | Coefficient | SE (robust) | Coefficient | SE (robust) | Coefficient | SE (robust) | Coefficient | SE (robust) |
| Euro-denominated loans to domestic nonbanks/TA | 0.0094 *** | 0.0004 | 0.0094 *** | 0.0004 | 0.0101 *** | 0.0002 | 0.0092 *** | 0.0001 | 0.0092 *** | 0.0001 |
| Foreign currency loans to domestic nonbanks/TA | 0.0062 *** | 0.0005 | 0.0064 *** | 0.0005 | 0.0082 *** | 0.0002 | 0.0069 *** | 0.0001 | 0.0066 *** | 0.0001 |
| Loans to foreign nonbanks/TA | 0.0089 *** | 0.0006 | 0.0095 *** | 0.0006 | 0.0116 *** | 0.0003 | 0.0101 *** | 0.0001 | 0.0097 *** | 0.0001 |
| Bank loans/TA | 0.0070 *** | 0.0004 | 0.0072 *** | 0.0004 | 0.0088 *** | 0.0002 | 0.0077 *** | 0.0001 | 0.0074 *** | 0.0001 |
| Interest-bearing securities/TA | 0.0085 *** | 0.0004 | 0.0087 *** | 0.0004 | 0.0102 *** | 0.0002 | 0.0094 *** | 0.0001 | 0.0093 *** | 0.0001 |
| Nonbank deposits/TA | –0.0042 *** | 0.0004 | –0.0042 *** | 0.0005 | –0.0049 *** | 0.0003 | –0.0046 *** | 0.0001 | –0.0045 *** | 0.0001 |
| Bank deposits/TA | –0.0046 *** | 0.0006 | –0.0050 *** | 0.0006 | –0.0064 *** | 0.0003 | –0.0062 *** | 0.0001 | –0.0059 *** | 0.0001 |
| Securitized debt/TA | –0.0056 *** | 0.0007 | –0.0066 *** | 0.0007 | –0.0077 *** | 0.0003 | –0.0076 *** | 0.0001 | –0.0077 *** | 0.0001 |
| Net fee income/TA | –0.2811 *** | 0.0435 | –0.3113 *** | 0.0416 | –0.5587 *** | 0.0276 | –0.4520 *** | 0.0067 | –0.4367 *** | 0.0065 |
| Staff expenses/TA | 0.4435 *** | 0.0366 | 0.4640 *** | 0.0387 | 0.6874 *** | 0.0325 | 0.5383 *** | 0.0042 | 0.5331 *** | 0.0041 |
| Other operating expenses/TA | 0.4477 *** | 0.0538 | 0.4658 *** | 0.0555 | 0.6530 *** | 0.0508 | 0.5904 *** | 0.0052 | 0.5768 *** | 0.0050 |
| Leverage ratio | –0.0043 *** | 0.0007 | –0.0033 *** | 0.0007 | –0.0009 | 0.0009 | –0.0031 *** | 0.0002 | –0.0034 *** | 0.0001 |
| RWA/TA | 0.0005 *** | 0.0002 | 0.0006 *** | 0.0002 | 0.0011 *** | 0.0001 | 0.0011 *** | 0.0000 | 0.0009 *** | 0.0000 |
| LLP ratio | –0.0046 *** | 0.0006 | –0.0042 *** | 0.0006 | –0.0019 *** | 0.0003 | –0.0025 *** | 0.0002 | –0.0024 *** | 0.0002 |
| Lerner index | 0.0066 *** | 0.0008 | 0.0066 *** | 0.0008 | 0.0080 *** | 0.0009 | 0.0080 *** | 0.0000 | 0.0078 *** | 0.0000 |
| Crisis dummy | –0.0003 *** | 0.0000 | –0.0003 *** | 0.0000 | –0.0003 *** | 0.0000 | –0.0003 *** | 0.0000 | –0.0003 *** | 0.0000 |
| Primary-bank dummy | | | 0.0007 *** | 0.0002 | 0.0003 *** | 0.0001 | 0.0005 *** | 0.0000 | 0.0005 *** | 0.0000 |
| GDP growth | 0.0024 *** | 0.0002 | 0.0023 *** | 0.0002 | 0.0020 *** | 0.0002 | 0.0020 *** | 0.0002 | 0.0021 *** | 0.0002 |
| GDP deflator | –0.0062 *** | 0.0008 | –0.0060 *** | 0.0008 | –0.0037 *** | 0.0008 | –0.0053 *** | 0.0005 | –0.0050 *** | 0.0005 |
| Short-term interest rate (–1) | 0.0001 *** | 0.0000 | 0.0001 *** | 0.0000 | 0.0002 *** | 0.0000 | 0.0002 *** | 0.0000 | 0.0002 *** | 0.0000 |
| Long-term interest rate (–1) | 0.0003 *** | 0.0000 | 0.0003 *** | 0.0000 | 0.0003 *** | 0.0000 | 0.0003 *** | 0.0000 | 0.0003 *** | 0.0000 |
| Constant | –0.0029 *** | 0.0003 | –0.0038 *** | 0.0003 | –0.0053 *** | 0.0002 | –0.0043 *** | 0.0001 | –0.0041 *** | 0.0000 |
| No. of observations | 42,332 | | 42,332 | | 42,332 | | 42,327 | | 42,327 | |
| No. of groups | 915 | | 915 | | | | 910 | | 910 | |
| $R^2$ within | 0.723 | | 0.722 | | | | | | | |
| $R^2$ between | 0.761 | | 0.799 | | | | | | | |
| $R^2$ overall | 0.766 | | 0.796 | | 0.817 | | | | | |
| F statistic | 677 | | | | 4,535 | | | | | |
| $\chi^2$ | | | 15,194 | | | | 168,701 | | 185,681 | |
| Corr$[\beta' X_{i,t}, u_i]$ | 0.365 | | | | | | | | | |
| Estimated AR(1) coefficient | | | | | | | 0.343 | | | |

*Source: OeNB.*

*Note: *** denotes statistical significance at the 1%, ** at the 5%, and * at the 10% level. All explanatory variables denoted by "ITA" are expressed as a share of total assets. All estimation methods use robust standard errors (SE). The random effects estimator allows for unbalanced panels as it uses the Swamy-Arora estimator of the variance components. Both FGLS models allow for heteroskedasticity within panels.*

The importance of economic conditions for the NIM is reflected by the significant contribution of GDP growth, GDP deflator growth as well as short- and long-term interest rates.

Consistent with the literature, GDP growth has the expected positive influence on the NIM. Higher overall economic activity generally boosts credit demand.

Instead of GDP deflator growth, most empirical studies on the NIM use an inflation proxy based on the consumer price index (CPI). Horvath (2009) and Rumler and Waschiczek (2012) observe a positive influence on the NIM. We think, however, that GDP deflator growth is a better indicator of price changes in the economy, as it reflects price changes of all goods and services produced within the country, whereas the CPI only reflects the prices of a more or less representative basket of goods and services purchased by consumers. Moreover, our results show a negative coefficient estimate for GDP deflator growth, which coincides with the theoretical considerations of Boyd et al. (2001), who claim that there is a negative relationship between financial sector performance and inflation. They also argue that in economies with high inflation, intermediaries will lend less and allocate capital less efficiently.[16] We believe that banks try to optimally allocate their resources by setting real rates and taking inflation expectations into account. With perfect foresight of inflation there should be no influence on the NIM, at least in theory. In Austria, inflation has been stable for a long period of time, which is in contrast to the countries analyzed in the other studies mentioned here, where a positive coefficient for inflation was estimated. In other words, inflation variance has been very low, which may have caused banks to refrain from pricing in inflation.

We include long- and short-term nominal interest rates lagged by one quarter to avoid problems with interest rate adjustment clauses of banks.[17] The positive coefficient estimates of both interest rates suggest that low interest rate environments put pressure on banks' NIM as nominal (deposit) rates have a lower bound at zero. Additionally, long- and short-term interest rate coefficients enable us to indirectly observe the effects of the market interest rate spread on the NIM. The spread (long-term minus short-term interest rate) also has a positive sign, which is confirmed in Rumler and Waschiczek (2012) since a steeper yield curve helps banks boost their NIM.

To the best of our knowledge, we are the first to quantify the influence of the global financial crisis on banks' NIM. The crisis dummy has the expected negative sign, which points to the fact that the costs of the crisis could not be fully passed on to banks' customers. The significant contribution of the crisis dummy shows that the global financial crisis had an enormous impact on banks' business environment, which was not fully reflected in the macroeconomic variables considered above.

## 6 Summary and Conclusions

In this paper, we investigate the determinants of the net interest margin in the Austrian banking sector. We assess

[16] *The robustness of our negative coefficient for the GDP deflator is confirmed by an alternative estimation where we obtain a negative coefficient for consumer price inflation as well.*

[17] *Although the standard literature on the NIM uses interest rate volatility as an explanatory variable, we think that in the special case of Austria, where the majority of loans are floaters, banks have a natural hedge against interest rate risk and therefore we can gain more insight by including rates. An alternative estimation shows that the short-term interest rate volatility coefficient estimate has the expected positive sign.*

to what extent macroeconomic, market and bank-specific variables influence the NIM. Based on a unique supervisory panel-data set for the Austrian banking sector, which comprises around 42,000 observations between the first quarter of 1996 and the second quarter of 2012, we apply different panel estimation techniques to the determinants of the NIM that have proven to work best according to the existing literature as well as to our two new contributions, namely banks' business models in terms of their balance sheet structure and the global financial crisis. Our estimation results suggest that not only the determinants identified in the existing empirical literature (different types of non-interest income and expenses, various risk measures, competition, the macroeconomic environment) have significant explanatory power with regard to the NIM, but also our two innovations (balance sheet structure, global financial crisis). Since the results are generally robust across estimation techniques and since alternative specifications of dependent and explanatory variables yield very similar outcomes, we are confident that we have identified the key contributors to the NIM in the Austrian banking sector.

For the bank-specific variables net fee income, staff expenses and other operating expenses, we obtain results in accordance with the existing empirical literature. On average, the efficiency of Austrian banks has increased since 1996, which has led to lower positive contributions of staff expenses and – to a minor extent – of other operating expenses to the NIM.

The balance sheet structure is an important driver of the NIM. In fact, the reduction of euro-denominated loans to domestic nonbanks in favor of foreign currency loans to domestic nonbanks and loans to foreign nonbanks (i.e. cross-border loans), which is particularly pronounced for non-primary banks, has driven down the NIM considerably since 1996.[18] The balance sheet structure as a proxy for banks' business models is also the most significant difference between primary and non-primary banks. In fact, this shift partly reflects the expansion to banking markets in Central, Eastern and Southeastern Europe and the Commonwealth of Independent States.

In the context of regulatory requirements, risk-weighted assets play an important role in determining the NIM. Their positive influence is consistent with theoretical considerations that, for riskier assets, higher margins are requested from a forward-looking perspective. Moreover, in contrast to most other empirical studies, the LLP ratio has a negative impact on the NIM. However, this result fits in perfectly with the legal framework when considering the backward-looking character of loan loss provisioning.

Our last bank-specific variable, namely the leverage ratio, confirms that holding more equity is costly in terms of generating net interest income.

The policy implications of these findings are twofold: First, banks price RWA into their NIM. Second, the leverage ratio, which will be an additional part of the Basel III framework, also has a significant impact on the NIM. As more equity (in terms of tier 1 capital) is supposed to serve as a buffer to absorb shocks, the leverage ratio must be gradually increased after the

[18] *This shift toward foreign currency loans to domestic nonbanks and loans to foreign nonbanks was already highlighted as a driving force of the declining NIM by Liebeg and Schwaiger (2006), who analyzed a similar Austrian dataset covering the period from 1996 to 2005.*

introduction of Basel III. However, our findings suggest that holding more equity is only 1 basis point more expensive than customer deposits (the cheapest refinancing source) in terms of a contribution to the NIM. In light of our analysis, the argument that a higher leverage ratio will put downward pressure on credit supply cannot be supported. In fact, the estimated impact of a higher leverage ratio is much lower than the benefits from an increased leverage ratio in terms of the shock-absorbing capacity of the banking system.

Aside from bank-specific variables and the regulatory environment, the Lerner index has the foreseen positive impact on the NIM. Therefore, we can support the structure-conduct-performance theory from industrial organization.[19] Our findings uncover the following: First, the Lerner index had been rather stable between the first quarter of 1996 and the second quarter of 2007 before dropping during the financial crisis, after which the index came back to its long-run level. Second, there is a significant difference between the Lerner index of primary and non-primary banks. Based on the classification of Fischer and Hempell (2006), primary banks with an average Lerner index of 0.22 operate in regional markets with low competition, whereas non-primary banks with an average Lerner index of 0.12 face high competition.

Finally, the macroeconomic environment – approximated by Austrian short- and long-term interest rates, GDP growth and the GDP deflator – has a significant impact on the NIM. The most significant contribution stems from the interest rate environment. More specifically, a low interest rate environment and/or a low spread between long- and short-term market interest rates are a detrimental scenario for the NIM.

As expected, GDP growth boosts the NIM. In contrast to most findings in the literature, inflation does not have a positive impact on the NIM in Austria. We obtain a negative relationship, which could be attributed to the fact that Austria is a low-inflation country with a high share of floating-rate loans that serve as a natural hedge against inflation.

From a macroprudential perspective, it is crucial to monitor banking activities in the current low interest rate environment, as such conditions had prevailed at the beginning of the subprime crisis. In the years to come, detecting excessive search for yield behavior by banks will therefore be high on banking supervisors' radar.

[19] *This paradigm assumes that the market structure determines firm conduct, which in turn determines performance.*

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# Measuring Financial (In)Stability in Emerging Europe: A New Index-Based Approach

Petr Jakubík and Tomáš Slačík[1]

*The importance of assessing financial stability in emerging Europe has increased rapidly since the recent financial crisis. Against this background, in the present paper we contribute to the existing literature in a twofold way: First, by using a broad range of indicators from money, bond, equity and foreign exchange markets, we develop a comprehensive financial instability index (FII) that gauges the level of financial market stress in some key Central, Eastern and Southeastern European (CESEE) countries. In a second step, we perform a panel estimation to investigate which macroprudential indicators that cover both internal and external imbalances explain the evolution of our FII over the past more than 15 years. Our analysis suggests that both the levels and changes of some indicators (such as credit growth and the level of private sector indebtedness) play an important role for financial stability. Moreover, we find that the impact of some key indicators on financial (in)stability is nonlinear and varies over time depending on market sentiment.*

*JEL classification: G28, G32, G33, G38*
*Keywords: Financial stability, crisis, macroprudential framework, emerging Europe, external and internal imbalances*

Financial stability has again shifted into the center of attention, especially since the beginning of the recent global financial crisis. To be able to detect potential threats to financial stability and take appropriate macroprudential measures early on, policymakers not only need to monitor and assess financial stability but also to project its likely future development. One of the lessons to be learned from the recent financial and economic crisis is that a very broad range of indicators must be monitored to be able to assess overall financial stability in a reliable manner. This is because globalization, financial innovations and technological progress have accelerated many financial processes and have brought forth many new and more complicated transmission channels. As a consequence, financial stability assessment has become more challenging.

Several techniques are employed to assess financial stability, and each has its advantages, disadvantages and limitations. Among the commonly used quantitative methods for financial stability assessment are

- early warning systems,
- macro-stress testing, and
- financial stability indices.

Early warning systems are constructed from potential leading indicators to predict the probability of a financial crisis. They use a discrete representation of the dependent variable and the signaling approach to evaluate indicators by minimizing either their noise-to-signal ratio (Kaminski, 1999) or some type of loss function (Bussière and Fratzscher, 2008; Alessi and Detken, 2009).[2] Even though early warning systems may differ substantially as regards the definition of the dependent variable,

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[2] *See Babecký et al. (2011) for a detailed literature survey on early warning systems.*

the projection horizon, choice of regressors and, of course, their econometric approach, in general they aim to predict the outbreak of potential financial crises. However, early warning systems should only be used as a starting point, or a complementary instrument, while more detailed financial stability analyses should follow to carefully assess all the risks the financial system is exposed to and to obtain some information on the respective economy's risk absorption capacity.

Stress testing offers a more precise analysis, which can estimate financial system resistance to adverse macroeconomic scenarios. Stress tests can detect the source of risks and vulnerabilities of the investigated banking sector or, more broadly, the financial sector (see e.g. Čihák, 2007; Schmieder et al., 2011; Buncic and Melecký, 2012; Jakubík and Sutton, 2012).

Apart from early warning systems and stress testing, aggregate financial stability indices represent another quantitative method for measuring the stability of a financial system. Country-specific financial stability indexes have been constructed e.g. by Sales, Areosa and Areosa (2012) for Brazil, by Brave and Butters (2011) for the United States or by Illing and Liu (2003) for Canada. Geršl and Heřmánek (2008) discuss the methodology of selected financial soundness and financial stability indicators. Furthermore, they construct a composite indicator for the stability of the Czech banking system using equal weights for all included components. They point out, however, that constructing a single aggregate measure of financial stability is a difficult task given the complex nature of the financial system and the existence of complex links between various financial market sectors. Gadanecz and Jayaram (2006) provide a review of financial stability measures along with indicators that are commonly used as explanatory variables for financial stability. While they compute single aggregate measures of financial stability, they conclude that such measures should not be employed for financial stability assessment in isolation, but should be combined with other quantitative and qualitative instruments.

Against this background, the present paper contributes to the existing literature in two ways: First, by using a broad range of indicators from money, bond, equity and foreign exchange markets, we develop a comprehensive financial instability index (FII) that gauges the level of financial market stress in selected Central, Eastern and Southeastern European (CESEE) countries. Not only is this, to our best knowledge, the first attempt at developing such an index for the CESEE region but, more importantly and in contrast to the existing literature, we carefully handpicked the index components to capture all relevant market segments in the countries included in the panel and thereby created a really comprehensive "thermometer" to measure the temperature or, as it might be, the "fever" in CESEE financial markets. Having constructed our financial stress measure, in a second step we perform a panel estimation to investigate which macroprudential indicators that cover both internal and external imbalances explain the evolution of our FII over the past 10 to 16 years.

The remainder of the paper is structured as follows. In the first section, we develop a new composite indicator of financial instability for nine CESEE countries under observation. The section provides a detailed description of the construction of the indicator and all its subindices as well as a discussion of striking episodes of elevated financial

instability in the CESEE region in the period under observation. Section 2 focuses on the key macroeconomic indicators that explain periods of financial stress. We present an empirical analysis based on a panel regression and discuss the data employed. Section 3 examines policy implications and provides some financial instability projections based on the estimated model. Finally, the last section summarizes the results and concludes.

## 1 Financial Instability Index

Compared with the objective of price stability, which can be clearly defined (typically primarily by inflation), financial stability is more difficult to grasp and to measure. As stated in the OeNB's Financial Stability Reports, financial stability can be defined as a situation in which "(…) the financial system (…) is capable of ensuring the efficient allocation of financial resources and fulfilling its key macroeconomic functions even if financial imbalances and shocks occur. Under conditions of financial stability, economic agents have confidence in the banking system and have ready access to financial services (…)." (OeNB, 2012).

### 1.1 Definition and Construction

In order to investigate the key fundamentals that might explain future financial instability, we must start by defining periods of financial stress. Approaches found in the literature typically use some sort of composite index of financial (in)stability. To ensure the comparability and compatibility of the time series employed, each individual component of the overall index has to be normalized. There are a number of popular normalization methods that are commonly used in the literature (see e.g. Hallo et al., 2012). One widely used approach transforms all time series' values into their distance from the mean, expressed in standard deviation units. Alternatively, an empirical or mathematical normalization can be applied, transforming each indicator into a number between a defined lower and upper limit, e.g. 0 and 1 (Albulescu, 2010). Another possibility is to map each indicator into quantiles by using the indicator's sample cumulative distribution function (Lo Duca and Peltonen, 2012, or Jakubík and Teplý, 2011). We opt for this latter method in the present study as it reduces the impact of outliers, which are relatively frequent in time series for emerging European countries and can substantially influence the results under other normalization approaches.

Subsequently, to construct an overall financial (in)stability index, some weights need to be assigned to individual indicators after the applied quantile transformation. The most simplistic approach mentioned in the literature is to apply equal weights to all indicators that make up the aggregate index (see e.g. Albulescu, 2010). Alternatively, weights can be set up according to credit aggregate weights or factor analysis (see e.g. Illing and Liu, 2003). Another approach was introduced by van den End (2006). According to this approach, fundamental indicators that enter the financial (in)stability index are assigned weights that correspond to their contribution to GDP growth. This approach is based on the idea that financial instability negatively affects economic output and that the relative importance of the determinants of financial instability corresponds to the relative importance of drivers of GDP growth. In contrast to the latter study, which defines financial instability on the basis of macroeconomic fundamentals in line with findings in the literature, we believe that a more appropriate measure can

be retrieved from financial market data themselves. For instance, Crespo Cuaresma and Slačík (2009), who develop an early warning mechanism for currency crises based on financial market data, argue that recent research on the predictive power of markets suggests that markets can aggregate disperse information and that market-based forecasts of uncertain events are usually fairly accurate. Moreover, as Wolfers and Zitzewitz (2004) document, such forecasts typically outperform alternative forecasting tools, including highly sophisticated forecasting models, polls or expert surveys.

This is why we follow a similar approach as in Lo Duca and Peltonen (2012) in constructing a financial stress indicator as a composite index that captures risks in money, foreign exchange, equity and bond markets. Yet in contrast to Lo Duca and Peltonen (2012), who use five equally weighted subindices without elaborating on their selection,[3] we try to select and define all subindices in a way which in our view better captures the relative importance of the financial market segments relevant for the respective countries in our panel. As in Lo Duca and Peltonen (2012), all of our subindices are, in principle, weighted equally. However, to increase the weight of the money market for reasons specified below, we construct two subindices for the money market and one index each for the foreign exchange, equity and bond markets. In this way, the money market receives a double weight (40%) compared to other subindices (20% each) in the composite FII. As some of the four markets in question have a very short history in the countries considered, in case the values for some indicators are missing, we distribute the weights equally among the remaining available subindices subject to the restriction of double-weighting for the money market.[4] For example, if bond market data are not available for a country, the weight of its money market is assigned 50%, and weights for foreign exchange and equity markets are both assigned 25%.

The idea behind applying a double weight to the money market is that security and stock markets in CESEE are rather underdeveloped, which makes bank financing the prevailing external source of funding. Moreover, historical evidence shows that all economic crises that occurred in CESEE during the transition period unfolded in the banking sector. Hence, the banking sector plays a key funding and financial stability role for the economies in the region. At the same time, in contrast to other market segments banks are by far the most dominant players in the CESEE money market. Therefore, money market-based indicators provide the closest and most informative signal about the banking sector situation as the crucial financial stability factor in the region.

All subindices – money, foreign exchange, equity and bond markets – are constructed in the same manner, combining annual growth and volatility. The only exception is the overall bond market subindex: In this case, we include the ten-year government bond

[3] *Lo Duca and Peltonen (2012) use two subindices for the equity market and one index for each of the remaining markets. In this way, they implicitly assign a 40% weight to the equity market and a 20% weight to the money, foreign exchange and bond markets, respectively. We think that this construction, whose motivation is not explained in the paper, does not properly reflect the relative importance of financial market segments in the CESEE countries as, typically, the CESEE equity market is still rather underdeveloped.*

[4] *Bond market data are not available for the Czech Republic (until 2000), Hungary (until 1998), Poland (until 1996), Romania (until 2000 and since 2011) and Slovakia (until 2002).*

yield in index construction because, in addition to annual growth and volatility, the yield level itself might be relevant for financial stability. In addition, for the construction of the overall money and bond market subindices we use, respectively, the spread vis-à-vis German sovereign bonds and the country-specific EMBI Global – two widely employed indicators capturing the riskiness of these market segments. Table 1 summarizes the composition of the FII.[5]

### 1.2 Financial Stability Developments in Emerging Europe

Chart 1 shows the development of the FII for the nine CESEE countries under observation – Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, Russia, Slovakia and Ukraine – between 1996 (or later, depending on data availability) and 2012, based on quarterly market data. While interpreting the paths of financial distress, some key features of the FII have to be borne in mind. First, as the FII is standardized by means of percentile mapping as described above, it is normalized between 0 and 1, which means values above the threshold value of 0.5 indicate periods of elevated financial instability. Second, and more importantly, since the FII is normalized individually for each country, comparing index values across countries does not yield entirely meaningful results. Hence, while it is sensible to compare the FII values for one country over time, the informative value of cross-country FII comparisons at a given point in time is limited.[6]

Table 1

**Financial Instability Index (FII)**

| Markets | Weights | Subindices | Subweights |
|---|---|---|---|
| | % | | |
| Money market | 40 | Overall money market development[1] | 50 |
| | | Money market year-on-year change[1] | 25 |
| | | Money market volatility[1] | 25 |
| | | Spread between domestic and German interbank offered rates | 50 |
| Foreign exchange market | 20 | Exchange rate[2] year-on-year change | 50 |
| | | Exchange rate[2] volatility | 50 |
| Equity market | 20 | Stock index year-on-year change | 50 |
| | | Stock index volatility | 50 |
| Bond market | 20 | Overall bond market development | 50 |
| | | Ten-year government bond yield | 33 |
| | | Ten-year government bond yield – year-on-year change | 33 |
| | | Ten-year government bond yield – volatility | 33 |
| | | Composite EMBI Global | 50 |

*Source: Bloomberg, Eurostat, NCBs.*

*[1] Three-month interbank offered rates.*

*[2] Local currency per EUR 1.*

*Note: Our data sample covers Bulgaria (2004–2011), Croatia (1999–2011), the Czech Republic (1996–2011), Hungary (1997–2011), Poland (1996–2011), Romania (1999–2011), Russia (2002–2011), Slovakia (1996–2011) and Ukraine (2003–2011).*

[5] *It goes without saying that the exact composition of the FII is to some extent arbitrary. However, in contrast to the bulk of the literature featuring apparently rather ad-hoc methods in the construction of similar indices we exercised great care in selecting and weighting the indicators that enter our indices. We experimented with many different specifications of the FII. While all of them delivered a similar FII path, we eventually opted for a variant which, in our view, provides the results best in line with economic intuition and financial stability developments in the considered countries.*

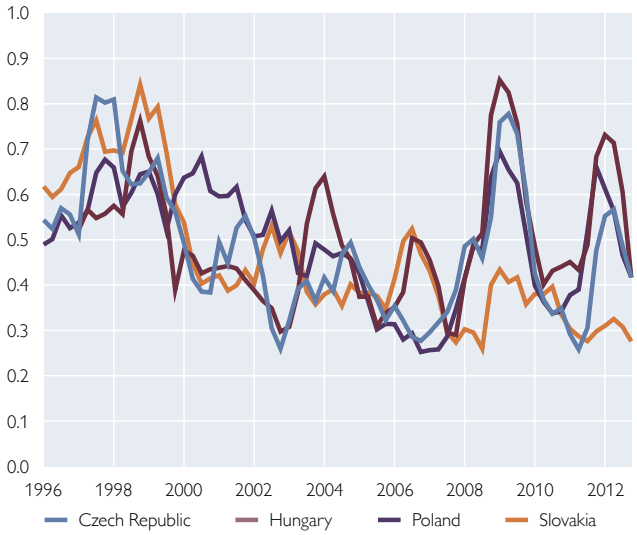
[6] *For example, if the FII amounts to 0.8 in country A and to 0.6 in country B, this does not necessarily imply that the absolute values of the financial instability subindices (raw data before percentile transformation) in country A are worse than those in country B. What it does imply, however, is that historically, the parameter values in country A have led to higher financial stress than those in country B.*

Chart 1

## Development of Financial Instability in Selected CESEE Countries

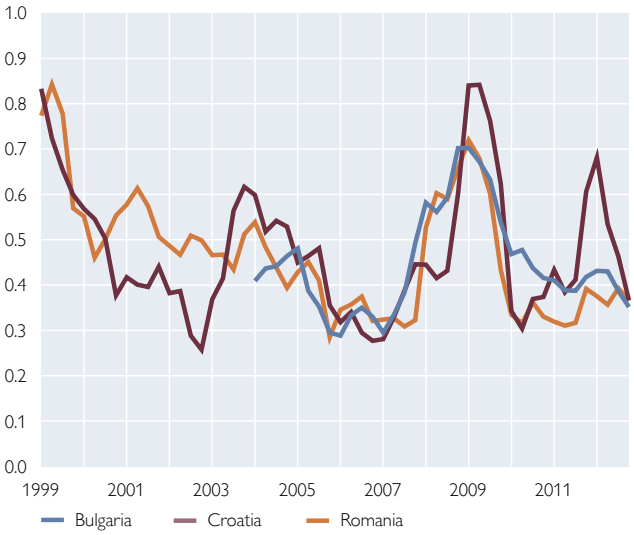
**Selected CEE Countries**

*Financial instability index (FII)*



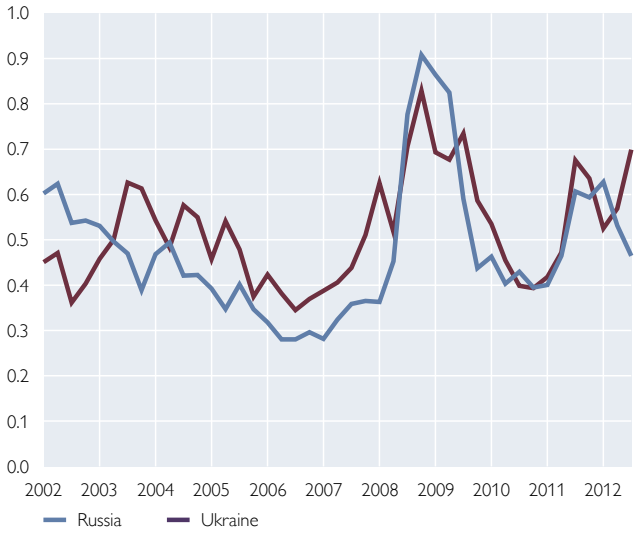

**Selected Balkan Countries**

*Financial instability index (FII)*




**Selected CIS Countries**

*Financial instability index (FII)*




*Source: Authors' calculations.*

*Note: Based on quarterly data. Since the FII is normalized by applying the quantiles approach to each country individually, the comparability of index values across countries is limited.*

The three panels of chart 1 depict FII developments in the four Central and Eastern European (CEE) countries (panel A), three Balkan countries (panel B) and two CIS countries (panel C) in our sample. When taking a look at the FII paths over time, some peculiarities catch the eye. In the Czech Republic, financial distress reached the highest level so far in 1997 – which comes as no surprise as this was the year of the currency crisis – and declined noticeably thereafter. In other countries in the CEE region, by contrast, financial instability rose substantially in 1998, probably in the wake of

the currency and financial crisis in Southeast Asia and Russia. The economic crisis we have been facing since 2008 has, at least at some point, brought about elevated financial stress levels in all countries under observation but Slovakia. Slovakia is the only country in our panel for which the FII has not risen to worrisome levels in the course of the current crisis and has remained well below the 0.5 threshold. However, it is interesting to note that the different phases of the current crisis – ranging from the subprime mortgage crisis at the very beginning to the recent sovereign debt crisis in parts of the euro area – had a different impact on financial instability in the CESEE countries in question. Notably, in all countries under observation the first two crisis years impaired financial stability more than the subsequent sovereign debt and euro crises. In Poland, Bulgaria and Romania financial instability peaked in 2008, suggesting that the very first phase of the crisis was transmitted particularly through short-term channels such as stock or currency markets. By contrast, in the remaining countries financial stress reached the highest levels with a one-year lag in 2009, reflecting markets' uncertainty about longer-term fundamental and real economy issues (e.g. fiscal deficits, low growth), which took some time to feed through into some of the financial stability components of the FII. Moreover, some countries in our sample feature a rather significant rise in the FII between 2008 and 2009. For the Czech Republic, for instance, the FII went up by more than 20% within that one year, peaking just below the levels that had been reached during the currency crisis in 1997. This development indicates that the first subprime phase of the current crisis did not cause much harm in the CESEE region in terms of financial instability.

## 2 Key Driving Factors of Financial Instability

As described above, we defined the FII as a measure for financial markets' assessment of the current level of financial stress. While the FII is based purely on financial market data, we conjecture that periods of financial instability are at least in part driven by fundamental developments that reflect internal and external imbalances which accumulated in the economy in the past. Hence, we now proceed to find an annual model capable of explaining financial stress by past developments of economic fundamentals. In contrast to the literature on early warning systems we do not aim to predict the probability of financial crises but rather to eventually project the future level of financial (in)stability in real time. We therefore do not face the key problem of this literature strand, which is to define crisis periods and which typically has a substantial effect on the results of early warning models.

### 2.1 Data and Regressor Selection

In order to econometrically establish the key driving forces of the FII, we collect a wide range of so-called macroprudential indicators, capturing internal as well as external imbalances and potential vulnerabilities and thus determining the (in)stability of a country's financial sector. Table 2 lists the set of potential explanatory variables for our model, clustered in five categories (sovereign risk, banking sector, contagion risk, real sector and macroeconomy), as well as the sources they have been obtained from. While our indicator selection is not exhaustive and one could certainly think of other potentially relevant drivers of financial

(in)stability[7], it covers all financial market segments. However, as the set of potential explanatory variables is too large given the limited length of our panel, we use univariate regression analyses to eliminate insignificant and improbable regressors. In addition, we consider model specifications that represent each of the key categories important for financial stability, covering

Table 2

**Set of Potential Explanatory Variables for the Panel Estimation Model**

| Category | Indicator | Unit | Time reference | Adjustment | Source |
|---|---|---|---|---|---|
| Sovereign risk | Public debt | % of GDP | End of period | | AMECO |
| | Fiscal deficit (surplus) | % of GDP | Sum over period | | AMECO |
| | Real credit growth (HICP-deflated) | % | End of period | | IMF, NCBs |
| | Credit to private sector | % of (nominal) GDP | End of period | | IMF, NCBs |
| | Current account deficit (surplus) | % of GDP | Sum over period | | IMF, NCBs |
| | Foreign reserves | Import months of goods and services | End of period | | IMF, NCBs |
| | External debt | % of GDP | End of period | | IMF, NCBs |
| Banking sector | Capital adequacy ratio (CAR) | % | End of period | | NCBs |
| | CAR, tier 1 | % | End of period | | NCBs |
| | Nonperforming loans | % of total loans | End of period | | NCBs |
| | After-tax profit | % of average assets | Cumulative sum since year-start | | NCBs |
| | After-tax profit | % of average equity | Cumulative sum since year-start | | NCBs |
| | Foreign currency loans | % of total lonas | End of period | | NCBs |
| | Foreign currency loans and deposits | % of foreign currency deposits (nongovernment and nonbank) | End of period | | NCBs |
| | Loan-to-deposit ratio | % | End of period | | NCBs |
| | Pre-tax profit | % of average equity | Cumulative sum since year-start | | NCBs |
| Contagion risk | Cross-border exposures | % of total assets | End of period | | IMF, NCBs |
| | Exports to EU countries | % of total exports | Sum over period | | wiiw |
| | VIX | % per annum | Average over period | | Thomson Reuters Datastream |
| | EMBI Global | Basis points | Average over period | | Bloomberg |
| Real sector | Corporate sector indebtedness | % of GDP | End of period | | IMF, NCBs |
| | Household sector indebtedness | % of GDP | End of period | | IMF, NCBs |
| Macroeconomic indicators | Real GDP growth | Percentage change period on period | | Seasonally and working-day adjusted | Eurostat |
| | Real industrial production growth | % | | Working-day adjusted | Eurostat |
| | HICP inflation | Percentage change year on year | Average over period | | Eurostat |
| | Central bank policy rate | % per annum | Average over period | | Bloomberg |
| | Real effective exchange rate (CPI-based) | Index, 2005 = 100.0 | Average over period | Seasonally adjusted | IMF |

*Source: Authors' compilation.*

[7] *We did indeed experiment with additional variables such as sovereign debt ratings or indicators capturing political risks (e.g. corruption perception indices, rule of law, government effectiveness, etc.) but eventually decided not to use them given the limited data availability for our country sample, methodological problems with some types of data (e.g. step function-like sovereign debt ratings) and/or the subjective character of soft indicators whose explanatory and, even more so, predictive power may well be questionable.*

internal as well as external imbalances by at least one indicator.

In line with findings in the literature (e.g. Crespo Cuaresma and Slačík, 2009, and Crespo Cuaresma and Slačík, 2008), we hypothesize that factors driving financial distress as well as their relative importance as perceived by the markets change over time, particularly depending on the overall sentiment and risk appetite prevailing in the markets. To capture this phenomenon, we employ the J.P. Morgan Emerging Market Bond Index Global (EMBI Global) and the Chicago Board Options Exchange (CBOE) Volatility Index (VIX, also dubbed the "fear index").[8] In order to capture the possibly time-varying weights markets assign to fundamentals, we interact the two sentiment measures with those variables that do not contribute significantly to the model's explanatory power on their own but should be important for financial stability according to economic theory.

Our raw annual data set consists of a panel of nine CESEE countries and covers, subject to – in some cases rather patchy – data availability, a time span from 1996 to 2012. However, we excluded all Slovak data as of mid-2008, by which time Slovakia's euro area entry was fixed and therefore some of the data employed in the model (money and foreign exchange markets) would bias the results. The poolability test carried out to ensure that the data are sufficiently homogeneous suggests that none of the countries should be eliminated from the panel. After performing the quantile transformation of the raw data and taking into account data gaps, we end up with an unbalanced panel of 74 observations covering the period between 1999 and 2011 to use in our econometric estimations.

### 2.2 Empirical Model

Before estimating a linear panel data model, we first check the stationarity of all considered indicators and we reject the null hypothesis of a common unit root process for all countries as well as the hypothesis of unit root processes for individual countries. As the time series is rather short, we apply the feasible general least squares (GLS) method with cross-section weights instead of the Generalized Method of Moments (GMM), which is better suited for longer samples. The applied cross-section weights allow us to control for the presence of cross-section heteroskedasticity. We test the model for fixed effects. However, as each indicator is transformed into percentiles for all countries, i.e. into a number between 0 and 1, with the median amounting to 0.5 for all countries, tests confirm that fixed effects are not present in the panel. As the time series is rather short, we restrain the number of possible lags to two. Moreover, as we are looking for leading indicators which would enable a projection of financial (in)stability over a one-year horizon, we do not consider current independent variables.

Having explored all economically meaningful combinations of our potential regressors, we find that the best statistical performance (based on the

[8] *Although bond indices and stock market volatilities are used on both sides of the equation, endogeneity concerns are limited as the indicators contained in the dependent variable, for several reasons, are only very loosely related to the regressors: a) the dependent FII contains country-specific EMBI Global and national stock market data while global variables (composite EMBI Global and VIX) are employed on the right-hand side; b) VIX is a measure of the implied volatility of the S&P 500 Index options while the FII contains a measure of the actual volatility of national stock markets; c) the regressors EMBI Global and VIX are lagged. We also conducted formal robustness checks suggesting that endogeneity is not an issue (see below in this section).*

high value of R-squared adjusted and autocorrelation diagnostics) is obtained when specifying a model that explains the FII by public debt combined with fiscal deficit and risk attitude toward emerging markets $(X_1)$, real credit growth combined with the level of credit to the private sector $(X_2)$, risk appetite in advanced economies $(X_3)$, the growth rate of the nonperforming loans-to-total loans ratio combined with the level of the nonperforming loan (NPL) ratio $(X_4)$, the external debt growth rate $(X_5)$, the capital adequacy ratio in the banking sector $(X_6)$ and official foreign reserves $(X_7)$:

$$FII_{i,t} = \sum_{j=1}^{7} b_j X_{j,i,t-l} \qquad (1)$$

where $X_{j,i,t-l}$ is the $j^{th}$ indicator for country $i$ and time $t–l$, $l=\{1,2\}$. Table 3 reports the results of the best-performing model with explanatory variables significant at the 1% level. The number in parentheses indicates the number of lags $(l)$ in years for each indicator. Moreover, it has to be borne in mind that we construct all indicators in such a way that a value closer to 1 corresponds to higher risk. Therefore, the indicators for foreign reserves and regulatory capital were inverted by subtracting the original indicator from 1.

Due to the applied transformation, all variables range between 0 and 1. Hence, the magnitudes of the estimated coefficients represent the relative importance of each variable in explaining financial instability. Our model suggests that public debt combined with budget deficit data, the risk attitude toward emerging markets $(X_1)$ and real credit growth combined with the level of credit to the private sector $(X_2)$ are the most important indicators explaining the FII. We find that each of these indicators contributes roughly three times more to explaining the FII than foreign reserves $(X_7)$ or the capital adequacy ratio $(X_6)$, or has roughly twice the explanatory power of external debt growth $(X_5)$. The third and fourth most important indicators in the model – the NPL ratio growth rate combined with the NPL ratio level $(X_4)$ and the indicator of risk appetite in advanced economies $(X_3)$ – make closely similar contributions to explaining FII development (0.25 and 0.21, respectively). Apart from this static model, we also tried to estimate a

Table 3

**Panel Estimation with FII as Dependent Variable**

| Variable | Coefficient | Coefficient value | Standard error | t-statistic | Probability |
|---|---|---|---|---|---|
| PUBLIC_DEBT(-2)*FISCAL_DEFICIT(-2)*EMBIG(-1) | $b_1$ | 0.2968 | 0.0801 | 3.7037 | 0.0004 |
| CREDIT_GROWTH_REAL_ALT(-1)*CREDIT_TO_PRIVATE_ALT(-1) | $b_2$ | 0.2829 | 0.0433 | 6.5280 | 0.0000 |
| VIX(-1) | $b_3$ | 0.2511 | 0.0201 | 12.4878 | 0.0000 |
| NPL_GROWTH(-1)*NPL(-1) | $b_4$ | 0.2053 | 0.0451 | 4.5493 | 0.0000 |
| EXTERNAL_DEBT_GROWTH(-2) | $b_5$ | 0.1469 | 0.0224 | 6.5655 | 0.0000 |
| 1-REGULATORY_CAPITAL(-1) | $b_6$ | 0.1037 | 0.0367 | 2.8213 | 0.0063 |
| 1-FOREIGN_RESERVES(-1) | $b_7$ | 0.0941 | 0.0304 | 3.0981 | 0.0028 |

| Goodness-of-fit indicators | Indicator values |
|---|---|
| R-square | 0.6885 |
| Adjusted R-square | 0.6606 |
| Durbin-Watson statistic | 2.0446 |
| Mean dependent variable | 0.5069 |

*Source: Authors' calculations.*

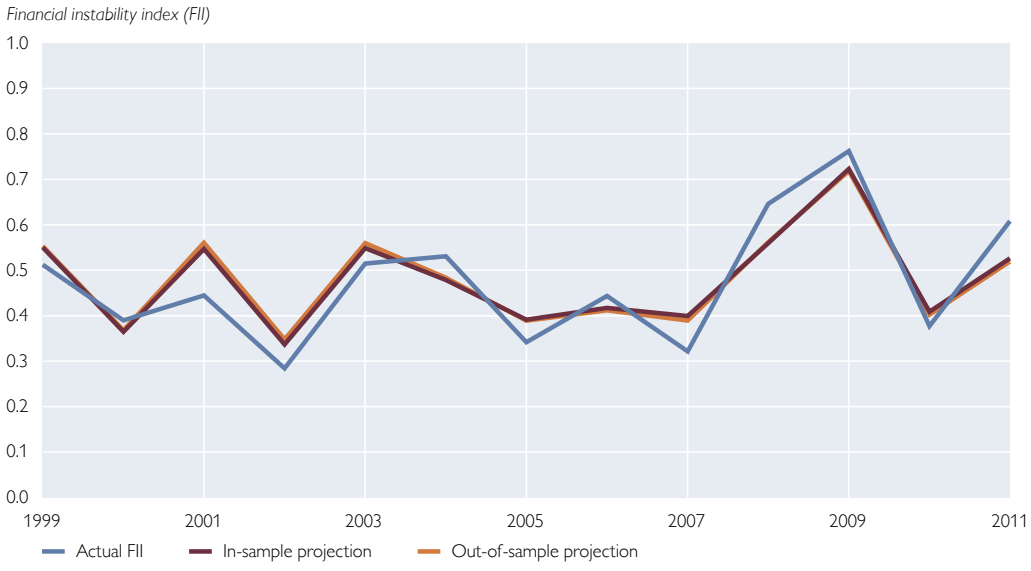
dynamic version, but the lagged FII did not turn out to be significant so that for annual data a static model has better explanatory power.

Moreover, to ensure the robustness of our findings we checked for endogeneity. We estimated model (1) using GMM and including all regressors as instrumental variables. The model's coefficients hardly changed, which suggests that the endogeneity problem is not a major issue in our model. Furthermore, the correlation matrix suggests no presence of multicollinearity among the regressors. The only variables with a correlation of slightly above 0.6 are real credit growth combined with the level of credit to the private sector $(X_2)$ and the capital adequacy ratio in the banking sector $(X_6)$. However, excluding the capital adequacy ratio in the banking sector from the model hardly changes the coefficients of the remaining variables. We therefore decided to keep this indicator $(X_6)$ in the model, given the importance of banking capital for financial stability. The correlations among the other variables were rather low.

As an additional robustness check, we tested the model's out-of-sample fit. As the time series included in our panel is rather short, we were not able to perform a standard out-of-sample test. Instead, we sequentially excluded one country after the other from the sample and each time re-estimated the panel regression with the remaining countries in the panel. Then we used the excluded country to test the performance of the new model by comparing fitted values with the actual (ex-post) path of the FII. This procedure, i.e. the successive exclusion of countries from the sample, did not change the model's estimated coefficients significantly, which suggests that they are relatively stable and thus implies a very high correlation between in- and out-of-sample fitted values. For the sake of illustration, chart 2 shows the in- and out-of-sample fitted values in comparison with the actual (ex-post) FII for Hungary.

Chart 2

**In-Sample and Out-of-Sample Projection for Hungary**




*Source: Authors' calculations.*

## 3 Discussion of Results and Policy Implications

The estimated model suggests which indicators should be carefully followed to assess risks and to detect accumulated imbalances that could threaten financial stability. Our analysis indicates that credit growth combined with the level of credit to the private sector is a particularly good leading indicator for financial instability. Until 2007–2008, many emerging European countries experienced high credit growth, which was driven by softening credit standards and high domestic demand. It was a period when credit risk was accumulated and internal as well as external imbalances were built up. Our results show that not only credit growth but also the level of private sector indebtedness might play an important role in risks accumulation. Based on our empirical analysis, the lag between the building-up of imbalances and their materialization, as reflected in financial stress in the markets, is about one year.

Another key indicator according to our model is public debt combined with the budget deficit and the risk attitude toward emerging markets (as measured by the composite EMBI Global). The model suggests that financial markets perceive lax fiscal policies negatively. However, since the fiscal variables turn out to be significant only in combination with the composite EMBI Global, the proxy for risk appetite, it seems that there is no level of public debt or fiscal deficit that would be perceived as critical per se. Our findings suggest that the impact of public finance indicators on financial instability might depend on market sentiment.[9] This means that public indebtedness and high fiscal deficits hamper financial stability only in times of global distress, when financial markets are typically more sensitive. Moreover, our results suggest that there is a lag of about two years for those risks to materialize and that their materialization is triggered by negative global market sentiment toward emerging markets.

Our analysis also confirms that risks in emerging European countries – mostly small open economies – strongly depend on the risk appetite prevailing in advanced economies (as measured by the VIX). The results indicate that the current risk appetite in advanced economies impacts financial stability in European emerging markets over a one-year horizon.

Furthermore, given the crucial role of the banking sector, which applies a traditional commercial banking model, credit risk is a key risk in emerging Europe. This is in line with the estimated econometric model that ranks the indicator combining the NPL ratio growth rate and the NPL ratio level among the most important drivers of financial stress. This finding suggests that increasing credit risk and/or a high level of NPL stock reduce the banking sector's capacity to support economic growth and thus impose a significant risk for financial stability over a one-year horizon.

In the model, the external imbalances represented by external debt growth affect financial instability within two years. A higher level of foreign reserves decreases a country's financial vulnerabilities. Finally, banks' regulatory capital serves as a buffer against banks' potential losses.

Our empirical analysis shows which indicators may serve as powerful leading indicators for financial (in)stability in

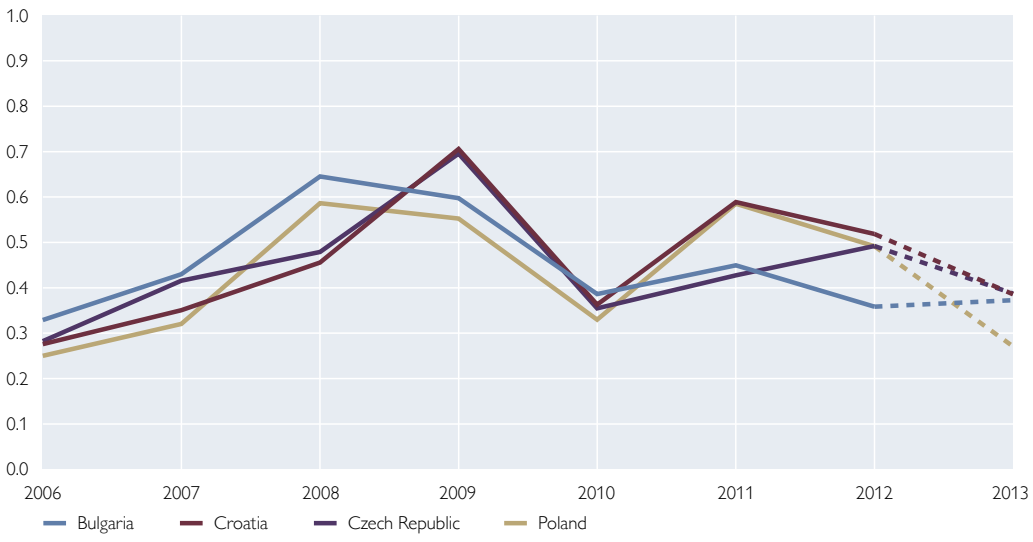
[9] *See e.g. Minea and Parent (2012) for evidence on the nonlinear effect of public debt on economic growth and Cohen and Villemot (2011) on the endogenous (self-fulfilling) character of debt crises.*

the future and which should therefore be carefully assessed and monitored, alongside with other measures of financial stability. Indeed, when developing the FII and deriving its explanatory factors, we aimed to eventually use the FII as a possible real-time financial stability monitoring tool for the CESEE region. Therefore, all variables in the model are lagged so that projections of future financial stability development can be made in real time. To demonstrate this option, chart 3 presents a projection of the FII for 2013 for selected CESEE countries based on the latest information available.[10]

Based on data for the first half of 2012, our calculations suggest that financial instability risk should not substantially increase in any of the countries considered and should stay, or drop, well below the median financial instability value of 0.5 in all countries included in our projection. The easing of financial stress in the region mainly relies on a decline in external risks in 2012 compared to 2011, which reduces the financial stress expected for 2013. Most of the other indicators included in the FII have stabilized or slightly improved in all countries under observation. Credit risk has substantially increased in year-on-year terms in Croatia and only slightly risen – while still remaining at very low levels – in Poland in 2012. Based on our FII projections, financial stability risk in 2013 should be only slightly higher than in 2006, the last non-crisis year, in all countries considered. The key drivers of potential financial instability, however, have changed dramatically. While

Chart 3

**Projections for Selected Countries**




*Source: Authors' calculations.*

*Note: Since the FII is normalized by applying the quantiles approach to each country individually, the comparability of index values across countries is limited.*

[10] *Our projection is confined to Bulgaria, Croatia, the Czech Republic and Poland as data on these countries are available at least until mid-2012, which means they can reasonably be annualized for 2012 as a whole. Hungary was not included in the projection as, in this case, the observable headline data required for the FII have been partially obtained through temporary or unsustainable measures and would thus bias the forecast.*

risks in 2006 were driven mainly by increasing external as well as internal imbalances, the current threats for financial instability emerge from the potential deterioration of the external environment and a higher level of public debt.

## Conclusion

Financial stability has become an important issue especially since the beginning of the recent global financial crisis. Unlike monetary policy with its clearly defined objectives, financial stability is more difficult to measure. Moreover, policymakers need not only monitor and assess financial stability but also project its future development to detect potential threats to financial stability and take appropriate macroprudential measures early on.

Against this background, the present study contributes to this goal and to the existing literature in two ways. Using a broad range of indicators, we first construct a comprehensive financial instability index (FII), which gauges the level of financial market stress in some key Central, Eastern and Southeastern European (CESEE) countries. The FII captures developments in money, foreign exchange, equity and bond markets and thus reflects sentiments in all relevant financial market segments in the countries considered.

In a second step, we perform a panel estimation to investigate which macroprudential indicators covering all important segments of the economy explain the evolution of the FII over the past more than 15 years. To reduce the impact that the relatively frequent outliers in the data have on the results, we use a rather novel approach to normalization by transforming the time series into quantiles of the sample distribution for each individual country. Contrary to other studies, we interact stock and flow variables to construct explanatory variables. Despite the fact that all selected raw variables can be found in the existing literature, this is – to our best knowledge – the first study that shows that the appropriate interaction of these variables might substantially increase the model's explanatory power. We consider indicators that capture sovereign and contagion risk, the macroeconomic environment as well as vulnerabilities in the real economy and the banking sector. This means that our set of potential explanatory variables covers external as well as internal imbalances.

Our analysis suggests that what matters for financial stability are not only the levels and changes of some macroprudential indicators but also the interaction of individual factors with each other as well as with the overall market sentiment toward emerging markets. In concrete terms, credit growth combined with the level of credit to the private sector is a particularly good leading indicator for financial instability. Another key indicator emerging from our model is public debt combined with fiscal deficit and the risk attitude toward emerging markets. Moreover, risks in – mostly small open – emerging European countries strongly depend on the overall risk appetite in advanced economies. In line with the crucial role of the banking sector, which applies a traditional commercial banking model, the interaction of the NPL ratio growth rate with the NPL ratio level also ranks among the most important drivers of financial stress. Other but significantly less important determinants of financial (in)stability are external debt growth, the level of foreign reserves and regulatory bank capital.

Last but not least, we wrap up by showing that because of its specific structure, our econometric model can

also be used for projections of future financial stability developments in real time. Moreover, it can be used as a simulation tool to detect potential imbalances which might emerge under different scenarios. To fully exploit this potential, the model's natural extension – and thus our next avenue of research – will be to cast it in quarterly data.

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# Annex of Tables

# Annex of Tables



Cutoff date for data: June 12, 2013

Conventions used in the tables:

x = No data can be indicated for technical reasons

. . = Data not available at the reporting date

Revisions of data published in earlier volumes are not indicated.

Discrepancies may arise from rounding.

# International Environment

Table A1

## Exchange Rates[1]

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *Period average (per EUR 1)* | | | | | | | |
| U.S. dollar | 1.39 | 1.33 | 1.39 | 1.29 | 1.45 | 1.33 | 1.38 | 1.27 |
| Japanese yen | 130.35 | 116.38 | 110.99 | 102.65 | 130.28 | 111.42 | 107.01 | 101.91 |
| Pound sterling | 0.89 | 0.86 | 0.87 | 0.81 | 0.89 | 0.85 | 0.87 | 0.80 |
| Swiss franc | 1.51 | 1.38 | 1.23 | 1.21 | 1.51 | 1.33 | 1.20 | 1.21 |
| Czech koruna | 26.45 | 25.29 | 24.59 | 25.15 | 25.76 | 24.85 | 24.83 | 25.12 |
| Hungarian forint | 280.54 | 275.36 | 279.31 | 289.32 | 271.10 | 279.07 | 289.21 | 283.26 |
| Polish złoty | 4.33 | 3.99 | 4.12 | 4.18 | 4.18 | 3.99 | 4.29 | 4.12 |

*Source: Thomson Reuters.*

*[1] Data for Slovakia are no longer included as Slovakia joined the ESCB in January 2009.*

Table A2

## Key Interest Rates[1]

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, %* | | | | | | | |
| Euro area | 1.00 | 1.00 | 1.00 | 1.00 | 1.25 | 1.00 | 1.00 | 0.75 |
| U.S.A. | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Japan | 0.11 | 0.09 | 0.10 | 0.08 | 0.07 | 0.08 | 0.07 | 0.08 |
| United Kingdom | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 |
| Switzerland[2] | 0.00–0.75 | 0.00–0.75 | 0.00–0.75 | 0.00–0.75 | 0.00–0.75 | 0.00–0.25 | 0.00–0.25 | 0.00–0.25 |
| Czech Republic | 1.50 | 1.00 | 0.75 | 0.75 | 0.75 | 0.75 | 0.50 | 0.05 |
| Hungary | 9.50 | 6.25 | 5.25 | 5.75 | 6.00 | 7.00 | 7.00 | 5.75 |
| Poland | 3.50 | 3.50 | 3.50 | 3.50 | 4.50 | 4.50 | 4.75 | 4.25 |

*Source: Eurostat, Thomson Reuters, national sources.*

*[1] Data for Slovakia are no longer included as Slovakia joined the ESCB in January 2009.*
*[2] SNB target range for the three-month LIBOR.*

Table A3

## Short-Term Interest Rates[1]

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *Three-month rates, period average, %* | | | | | | | |
| Euro area | 1.23 | 0.81 | 1.39 | 0.57 | 0.80 | 0.95 | 1.53 | 0.28 |
| U.S.A. | 0.69 | 0.34 | 0.34 | 0.43 | 0.34 | 0.34 | 0.39 | 0.37 |
| Japan | 0.59 | 0.39 | 0.34 | 0.33 | 0.53 | 0.36 | 0.34 | 0.33 |
| United Kingdom | 1.22 | 0.74 | 0.88 | 0.86 | 0.74 | 0.80 | 0.95 | 0.66 |
| Switzerland | 0.37 | 0.19 | 0.12 | 0.07 | 0.30 | 0.16 | 0.07 | 0.04 |
| Czech Republic | 2.19 | 1.31 | 1.19 | 1.00 | 1.87 | 1.22 | 1.17 | 0.78 |
| Hungary | 8.64 | 5.51 | 6.19 | 6.98 | 7.64 | 5.40 | 6.31 | 6.64 |
| Poland | 4.42 | 3.92 | 4.54 | 4.91 | 4.20 | 3.85 | 4.82 | 4.82 |

*Source: Bloomberg, Eurostat, Thomson Reuters.*

*[1] Data for Slovakia are no longer included as Slovakia joined the ESCB in January 2009.*

Table A4

## Long-Term Interest Rates

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *Ten-year rates, period average, %* | | | | | | | |
| Euro area | 3.71 | 3.34 | 3.86 | 3.22 | 3.62 | 3.23 | 3.76 | 2.98 |
| U.S.A. | 3.24 | 3.20 | 2.76 | 1.79 | 3.48 | 2.81 | 2.22 | 1.66 |
| Japan | 1.34 | 1.17 | 1.12 | 0.85 | 1.33 | 1.04 | 1.02 | 0.77 |
| United Kingdom | 3.66 | 3.58 | 3.06 | 1.85 | 3.77 | 3.29 | 2.54 | 1.74 |
| Switzerland | 2.20 | 1.63 | 1.47 | 0.65 | 2.11 | 1.46 | 1.06 | 0.57 |
| Czech Republic | 4.84 | 3.88 | 3.71 | 2.78 | 4.70 | 3.63 | 3.45 | 2.24 |
| Hungary | 9.12 | 7.28 | 7.64 | 7.89 | 7.94 | 7.28 | 7.98 | 7.08 |
| Poland | 6.12 | 5.78 | 5.96 | 5.00 | 6.16 | 5.71 | 5.77 | 4.56 |
| Slovakia | 4.71 | 3.87 | 4.45 | 4.55 | 4.55 | 3.80 | 4.60 | 4.19 |
| Slovenia | 4.38 | 3.83 | 4.97 | 5.81 | 4.00 | 3.77 | 5.54 | 6.00 |

*Source: Eurostat, national sources.*

Table A5

## Corporate Bond Spreads

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *Period average, percentage points* | | | | | | | |
| | Spreads of 7- to 10-year euro area corporate bonds against euro area government bonds of the same maturity | | | | | | | |
| AAA | 0.69 | –0.03 | –0.41 | –0.96 | 0.42 | –0.07 | –0.57 | –1.02 |
| BBB | 4.65 | 2.06 | 2.18 | 1.68 | 3.03 | 2.06 | 2.74 | 1.30 |
| | Spreads of 7- to 10-year U.S. corporate bonds against U.S. government bonds of the same maturity | | | | | | | |
| AAA | 1.64 | 0.70 | 0.90 | 0.69 | 0.80 | 0.71 | 1.06 | 0.67 |
| BBB | 4.51 | 2.21 | 2.34 | 2.59 | 3.00 | 2.24 | 2.76 | 2.42 |

*Source: Merrill Lynch via Thomson Reuters.*

Table A6

## Stock Indices[1]

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *Period average* | | | | | | | |
| Euro area: Euro Stoxx | 234 | 266 | 256 | 240 | 258 | 266 | 229 | 245 |
| U.S.A.: S&P 500 | 947 | 1,140 | 1,268 | 1,379 | 1,042 | 1,150 | 1,226 | 1,409 |
| Japan: Nikkei 225 | 9,337 | 10,028 | 9,431 | 9,109 | 10,052 | 9,605 | 8,908 | 9,061 |
| Austria: ATX | 2,131 | 2,558 | 2,466 | 2,099 | 2,457 | 2,587 | 2,094 | 2,144 |
| Czech Republic: PX50 | 962 | 1,171 | 1,111 | 950 | 1,107 | 1,160 | 982 | 961 |
| Hungary: BUX | 16,043 | 22,480 | 20,532 | 18,064 | 19,393 | 22,429 | 18,074 | 18,141 |
| Poland: WIG | 32,004 | 42,741 | 44,605 | 41,636 | 37,237 | 44,588 | 40,743 | 43,255 |
| Slovakia: SAX16 | 318 | 226 | 228 | 197 | 298 | 222 | 221 | 192 |
| Slovenia: SBI TOP | 975 | 891 | 726 | 567 | 1,033 | 834 | 649 | 560 |

*Source: Thomson Reuters.*

[1] *Euro Stoxx: December 31, 1991 = 100, S&P 500: November 21, 1996 = 100, Nikkei 225: April 3, 1950 = 100, ATX: January 2, 1991 = 1,000, PX50: April 6, 1994 = 1,000, BUX: January 2, 1991 = 1,000, WIG: April 16, 1991 = 1,000, SAX16: September 14, 1993 = 100, SBI TOP: March 31, 2006 = 1,000.*

Table A7

## Gross Domestic Product

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *Annual change in %, period average* | | | | | | | |
| Euro area | –4.4 | 2.0 | 1.4 | –0.6 | –3.3 | 2.3 | 1.0 | –0.8 |
| U.S.A. | –3.1 | 2.4 | 1.8 | 2.2 | –1.7 | 2.6 | 1.8 | 2.2 |
| Japan | –5.5 | 4.7 | –0.6 | 2.0 | –3.1 | 4.7 | –0.3 | 0.4 |
| Austria | –3.8 | 2.1 | 2.7 | 0.8 | –2.1 | 3.1 | 1.6 | 0.7 |
| Czech Republic | –4.7 | 2.7 | 1.7 | –1.2 | –4.3 | 2.8 | 1.0 | –1.5 |
| Hungary | –6.8 | 1.3 | 1.6 | –1.7 | –6.0 | 1.9 | 1.4 | –2.2 |
| Poland | 1.6 | 3.9 | 4.3 | 1.9 | 2.4 | 4.5 | 4.6 | 1.2 |
| Slovakia | –4.9 | 4.2 | 3.3 | 2.0 | –4.5 | 4.0 | 3.2 | 1.4 |
| Slovenia | –7.8 | 1.2 | 0.6 | –2.3 | –7.2 | 1.8 | –0.8 | –3.0 |

*Source: Eurostat, national sources.*

Table A8

## Current Account

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *% of GDP, cumulative* | | | | | | | |
| Euro area | 0.1 | 0.3 | 0.3 | 1.8 | 0.6 | 0.5 | 0.9 | 2.1 |
| U.S.A. | –3.6 | –3.3 | –3.3 | –3.0 | –2.8 | –3.0 | –3.0 | –2.8 |
| Japan | 2.9 | 3.7 | 2.0 | 1.1 | 3.3 | 3.6 | 1.7 | .. |
| Austria | 2.7 | 3.1 | 2.2 | 3.0 | 2.3 | 2.7 | 0.8 | 1.7 |
| Czech Republic | –2.4 | –3.9 | –2.9 | –2.5 | –2.6 | –7.2 | –2.4 | –4.3 |
| Hungary | –0.2 | 1.1 | 0.9 | 1.6 | 0.8 | 1.0 | 0.7 | 2.1 |
| Poland | –3.9 | –4.6 | –4.5 | –3.5 | –4.4 | –6.1 | –5.5 | –3.3 |
| Slovakia | –2.6 | –2.5 | 0.1 | 2.3 | –1.4 | –4.8 | –2.2 | 2.1 |
| Slovenia | –1.3 | –0.8 | 0.0 | 2.3 | –1.5 | –1.0 | –0.7 | 3.0 |

*Source: Eurostat, European Commission, Thomson Reuters, national sources.*

*Note: Due to seasonal fluctuations, the comparability of half-year figures with yearly figures is limited. The half-year figures for the U.S.A. are based on seasonally adjusted nominal GDP data.*

Table A9

## Inflation

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *Annual change in %, period average* | | | | | | | |
| Euro area | 0.3 | 1.6 | 2.7 | 2.5 | 0.0 | 1.9 | 2.8 | 2.4 |
| U.S.A. | –0.4 | 1.6 | 3.2 | 2.1 | –0.1 | 1.2 | 3.5 | 1.8 |
| Japan | –1.4 | –0.7 | –0.3 | –0.2 | –2.1 | –0.4 | –0.1 | –0.3 |
| Austria | 0.4 | 1.7 | 3.6 | 2.6 | 0.3 | 1.8 | 3.6 | 2.7 |
| Czech Republic | 0.6 | 1.2 | 2.1 | 3.5 | 0.0 | 1.8 | 2.4 | 3.2 |
| Hungary | 4.0 | 4.7 | 3.9 | 5.7 | 4.9 | 4.0 | 3.8 | 5.7 |
| Poland | 4.0 | 2.7 | 3.9 | 3.7 | 4.0 | 2.4 | 4.0 | 3.3 |
| Slovakia | 0.9 | 0.7 | 4.1 | 3.7 | 0.2 | 1.0 | 4.4 | 3.7 |
| Slovenia | 0.9 | 2.1 | 2.1 | 2.8 | 0.6 | 2.1 | 2.1 | 3.1 |

*Source: Eurostat.*

# The Real Economy in Austria

Table A10

## Financial Investment of Households[1]

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *Transactions, EUR million* | | | | | | | |
| Currency and deposits[2] | 9,115 | 3,371 | 6,688 | 5,571 | 1,900 | 1,106 | 3,487 | 19 |
| Securities (other than shares)[3] | –237 | 865 | 1,503 | 44 | 132 | 710 | –129 | 183 |
| Shares (other than mutual fund shares) | 1,018 | 1,515 | 675 | 572 | 86 | 982 | 630 | 214 |
| Mutual fund shares | 948 | 2,965 | –1,745 | 1,054 | 1,220 | 2,072 | –1,014 | 1,040 |
| Insurance technical reserves | 4,840 | 3,910 | 2,012 | 2,480 | 1,966 | 1,468 | 142 | 809 |
| Total financial investment | 15,684 | 12,626 | 9,133 | 9,721 | 5,304 | 6,338 | 3,116 | 2,265 |

*Source: OeNB.*

*[1] Including nonprofit institutions serving households.*
*[2] Including loans and other assets.*
*[3] Including financial derivatives.*

Table A11

## Household[1] Income, Savings and Credit Demand

| | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|
| | Year | | | |
| | *Year-end, EUR billion* | | | |
| Net disposable income | 169.4 | 171.5 | 176.1 | 182.3 |
| Savings | 19.2 | 15.7 | 13.0 | 14.1 |
| Saving ratio in %[2] | 11.2 | 9.1 | 7.4 | 7.7 |
| MFI loans to households | 132.6 | 139.7 | 142.8 | 143.9 |

*Source: Statistics Austria (national accounts broken down by sectors), OeNB (financial accounts).*

*[1] Including nonprofit institutions serving households.*
*[2] Saving ratio = savings / (disposable income + increase in accrued occupational pension benefits).*

Table A12

## Financing of Nonfinancial Corporations

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *Transactions, EUR million* | | | | | | | |
| Securities (other than shares) | 5,939 | 3,848 | 8,196 | 5,100 | 2,708 | 1,718 | 5,524 | 1,444 |
| Loans | –16,766 | 14,386 | 3,236 | 1,062 | –6,518 | 10,209 | 296 | –1,308 |
| Shares and other equity[1] | 3,781 | –22,672 | 16,079 | 3,134 | 3,576 | –23,660 | 7,242 | 2,144 |
| Other accounts payable | –5,235 | 7,601 | 3,271 | 1,685 | –2,465 | 3,818 | 926 | 347 |
| Total debt | –12,281 | 3,163 | 30,578 | 10,783 | –2,699 | –7,915 | 13,988 | 2,628 |

*Source: OeNB.*

*[1] Including other equity of domestic special purpose entities held by nonresidents.*

Table A13

## Insolvency Indicators

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | Year | | | | 2nd half | | | |
| | *EUR million* | | | | | | | |
| Default liabilities | 4,035 | 4,700 | 2,775 | 3,206 | 2,057 | 3,113 | 1,618 | 1,784 |
| | *Number* | | | | | | | |
| Defaults | 3,741 | 3,522 | 3,260 | 3,505 | 1,837 | 1,798 | 1,603 | 1,689 |

*Source: Kreditschutzverband von 1870.*

Table A14

## Selected Financial Statement Ratios of the Manufacturing Sector

| | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|
| | Year | | | |
| | *Median, %* | | | |
| **Self-financing and investment ratios** | | | | |
| Cash flow, as a percentage of turnover | 7.55 | 8.03 | 7.66 | .. |
| Investment ratio[1] | 1.95 | 1.94 | 1.78 | .. |
| Reinvestment ratio[2] | 63.64 | 66.67 | 66.67 | .. |
| **Financial structure ratios** | | | | |
| Equity ratio | 22.81 | 23.71 | 25.29 | .. |
| Risk-weighted capital ratio | 28.56 | 29.94 | 31.32 | .. |
| Bank liability ratio | 32.80 | 30.94 | 29.40 | .. |
| Government debt ratio | 7.41 | 7.70 | 7.78 | .. |

*Source: OeNB.*

[1] *Investments x 100 / net turnover.*
[2] *Investments x 100 / credit write-offs.*

# Financial Intermediaries in Austria[1]

Table A15

## Total Assets and Off-Balance-Sheet Operations

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, EUR million* | | | | | | | |
| Total assets on an unconsolidated basis | 1,058 | 1,029 | 1,027 | 979 | 993 | 1,014 | 1,011 | 982 |
| *of which: total domestic assets* | 693 | 691 | 675 | 660 | 663 | 693 | 697 | 679 |
| *total foreign assets* | 365 | 338 | 352 | 319 | 330 | 321 | 314 | 304 |
| Interest rate contracts | 1,755 | 1,836 | 2,067 | 1,397 | 1,505 | 1,430 | 1,357 | 1,052 |
| Foreign exchange derivatives | 454 | 419 | 492 | 273 | 261 | 275 | 280 | 251 |
| Other derivatives | 30 | 25 | 27 | 17 | 20 | 16 | 17 | 16 |
| Derivatives total | 2,239 | 2,281 | 2,587 | 1,687 | 1,786 | 1,721 | 1,654 | 1,319 |
| Total assets on a consolidated basis | 1,159 | 1,140 | 1,193 | 1,131 | 1,137 | 1,166 | 1,189 | 1,164 |

*Source: OeNB.*

*Note: Data on off-balance-sheet operations refer to nominal values.*

Table A16

## Profitability on an Unconsolidated Basis

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | 1st half | | | | Year | | | |
| | *End of period, EUR million* | | | | | | | |
| Net interest income | 4,396 | 4,584 | 4,676 | 4,503 | 8,777 | 9,123 | 9,624 | 8,820 |
| Income from securities and participating interests | 1,492 | 1,575 | 2,038 | 1,816 | 3,327 | 4,026 | 3,662 | 3,670 |
| Net fee-based income | 1,810 | 1,970 | 1,964 | 1,901 | 3,603 | 3,950 | 3,835 | 3,850 |
| Net profit/loss on financial operations | 338 | 454 | 366 | 335 | 486 | 664 | 325 | 630 |
| Other operating income | 737 | 766 | 848 | 994 | 1,653 | 1,942 | 1,786 | 2,150 |
| Operating income | 8,773 | 9,348 | 9,892 | 9,551 | 17,846 | 19,706 | 19,232 | 19,120 |
| Staff costs | 2,870 | 2,839 | 2,963 | 2,985 | 5,697 | 5,802 | 6,002 | 6,243 |
| Other administrative expenses | 1,839 | 1,888 | 1,962 | 1,992 | 3,765 | 3,940 | 4,029 | 4,124 |
| Other operating expenses | 734 | 807 | 764 | 804 | 1,056 | 1,252 | 1,179 | 1,827 |
| Total operating expenses | 5,443 | 5,534 | 5,689 | 5,781 | 11,077 | 11,547 | 11,718 | 12,193 |
| Operating profit/loss | 3,331 | 3,813 | 4,203 | 3,770 | 6,769 | 8,159 | 7,515 | 6,927 |
| Net risk provisions from credit business | 3,043 | 3,404 | 2,199 | 2,114 | 4,422 | 2,802 | 2,427 | 1,488 |
| Net risk provisions from securities business | 421 | –43 | 169 | –326 | 4,090 | 520 | 3,276 | 1,033 |
| Annual surplus[1] | 2,536 | 2,974 | 3,876 | 3,577 | 43 | 4,231 | 1,212 | 3,214 |
| Return on assets[1, 2] | 0.2 | 0.3 | 0.4 | 0.4 | 0.0 | 0.4 | 0.1 | 0.3 |
| Return on equity (tier 1 capital)[1, 2] | 3.7 | 4.1 | 5.2 | 4.8 | 0.1 | 5.8 | 1.6 | 4.3 |
| Interest income to gross income (%) | 50 | 49 | 47 | 47 | 49 | 46 | 50 | 46 |
| Operating expenses to gross income (%) | 62 | 59 | 58 | 61 | 62 | 59 | 61 | 64 |

*Source: OeNB.*

[1] *Annual surplus in % of total assets and tier 1 capital, respectively.*
[2] *Retrospective modification due to a change in calculation.*

[1] *Since 2007, the International Monetary Fund (IMF) has published Financial Soundness Indicators (FSI) for Austria (see also www.imf.org). In contrast to some FSIs which take only domestically owned banks into account, the Financial Stability Report analyzes all banks operating in Austria. For this reason, some of the figures presented here might deviate from the figures published by the IMF.*

Table A17

## Profitability on a Consolidated Basis

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | 1st half | | | | Year | | | |
| | *End of period, EUR million* | | | | | | | |
| Operating income | 19,215 | 18,497 | 18,749 | 18,939 | 37,850 | 37,508 | 37,207 | 37,682 |
| Operating expenses[1] | 7,794 | 7,944 | 8,249 | 8,307 | 15,502 | 16,204 | 16,594 | 16,804 |
| Operating profit/loss | 8,450 | 6,612 | 6,529 | 6,525 | 15,620 | 13,478 | 10,369 | 12,097 |
| Net profit after taxes | 2,301 | 1,789 | 2,897 | 3,031 | 1,530 | 4,577 | 711 | 2,971 |
| Return on assets[2, 5] | 0.5 | 0.4 | 0.6 | 0.6 | 0.2 | 0.5 | 0.1 | 0.3 |
| Return on equity (tier 1 capital)[2, 5] | 9.7 | 6.3 | 9.8 | 10.1 | 3.6 | 8.2 | 1.7 | 5.1 |
| Interest income to gross income (%)[3] | 57 | 64 | 65 | 61 | 59 | 64 | 66 | 63 |
| Cost-income ratio (%)[4] | 51 | 58 | 58 | 59 | 53 | 58 | 66 | 62 |

*Source: OeNB.*

*[1] As from 2008, operating expenses refer to staff costs and other administrative expenses only.*
*[2] End-of-period result expected for the full year before minority interests as a percentage of average total assets and average tier 1 capital, respectively.*
*[3] All figures represent the ratio of net interest income to total operating income less other operating expenses.*
*[4] All figures represent the ratio of total operating expenses less other operating expenses to total operating income less other operating expenses.*
*[5] Retrospective modification due to a change in calculation.*

*Note: Due to changes in reporting, the comparability of consolidated values as from 2008 with earlier values is limited.*

Table A18

## Sectoral Distribution of Loans

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, EUR million* | | | | | | | |
| Nonfinancial corporations | 131,971 | 130,206 | 131,744 | 133,302 | 134,176 | 136,913 | 138,627 | 138,032 |
| *of which: foreign currency-denominated loans* | *11,263* | *11,106* | *12,150* | *12,197* | *12,080* | *11,804* | *10,913* | *8,787* |
| Households[1] | 122,378 | 128,224 | 128,221 | 131,288 | 133,370 | 134,520 | 135,031 | 135,485 |
| *of which: foreign currency-denominated loans* | *36,271* | *36,127* | *38,317* | *39,041* | *39,228* | *37,725* | *35,942* | *32,018* |
| General government | 25,994 | 26,116 | 27,324 | 27,174 | 27,930 | 29,953 | 28,518 | 28,780 |
| *of which: foreign currency-denominated loans* | *1,709* | *1,742* | *2,797* | *2,761* | *3,156* | *3,408* | *3,283* | *2,973* |
| Other financial intermediaries | 25,251 | 24,516 | 24,454 | 22,827 | 22,056 | 21,612 | 21,439 | 20,642 |
| *of which: foreign currency-denominated loans* | *3,381* | *3,348* | *3,736* | *3,487* | *3,316* | *3,131* | *2,997* | *2,752* |
| Foreign nonbanks | 121,922 | 117,726 | 120,890 | 117,412 | 119,822 | 123,479 | 124,023 | 117,998 |
| *of which: foreign currency-denominated loans* | *38,319* | *36,100* | *40,274* | *38,286* | *38,656* | *41,242* | *41,291* | *37,842* |
| Nonbanks total | 427,515 | 426,788 | 432,633 | 432,003 | 437,354 | 446,477 | 447,638 | 440,936 |
| *of which: foreign currency-denominated loans* | *90,942* | *88,423* | *97,274* | *95,772* | *96,436* | *97,310* | *94,427* | *84,372* |
| Banks | 353,198 | 333,865 | 334,777 | 281,989 | 300,374 | 294,261 | 299,794 | 266,326 |
| *of which: foreign currency-denominated loans* | *96,271* | *83,728* | *76,629* | *64,293* | *67,835* | *65,033* | *67,497* | *59,026* |

*Source: OeNB.*

*[1] Including nonprofit institutions serving households.*

*Note: Figures are based on supervisory statistics and therefore differ from monetary figures used in the text.*

Table A19

## Foreign Currency-Denominated Claims on Domestic Non-MFIs

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, % of total foreign currency-denominated claims on domestic non-MFIs*[1] | | | | | | | |
| Swiss franc | 86.4 | 86.3 | 85.5 | 86.6 | 87.2 | 86.0 | 85.5 | 86.4 |
| Japanese yen | 5.4 | 5.4 | 5.9 | 5.8 | 5.4 | 6.3 | 6.4 | 6.0 |
| U.S. dollar | 6.7 | 6.7 | 7.2 | 6.1 | 5.9 | 6.1 | 6.6 | 6.2 |
| Other foreign currencies | 1.5 | 1.6 | 1.4 | 1.5 | 1.5 | 1.6 | 1.5 | 1.4 |

*Source: OeNB, ECB.*

[1] *The indicated figures refer to claims of monetary financial institutions (MFIs, ESA definition) on domestic non-MFIs. Given the differences in the definition of credit institutions according to the Austrian Banking Act and of MFIs according to ESA and differences in the number of borrowers, comparability to "Claims on Domestic Nonbanks" is limited. Due to rounding, figures do not add up to 100% for every year.*

Table A20

## Loan Quality

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, % of claims* | | | | | | | |
| Specific loan loss provisions for loans to nonbanks (unconsolidated) | 2.5 | 2.8 | 3.1 | 3.2 | 3.2 | 3.2 | 3.2 | 3.3 |
| Specific loan loss provisions for loans to nonbanks (consolidated)[1] | 2.9 | 3.5 | 3.9 | 4.1 | 4.3 | 4.3 | 4.5 | 4.6 |
| Nonperforming loan ratio (unconsolidated)[2] | 4.3 | 4.2 | 4.4 | 4.7 | 4.6 | 4.5 | 4.6 | 4.7 |
| Nonperforming loan ratio (consolidated)[2] | × | 6.7 | 7.6 | 8.0 | 8.3 | 8.3 | 9.1 | 8.7 |

*Source: OeNB.*

[1] *Estimate.*

[2] *Estimate for loans to corporates and households (introduced in Financial Stability Report 24 to better indicate the loan quality in retail business; not comparable to former ratios).*

Table A21

## Market Risk[1]

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, EUR million (unless indicated otherwise)* | | | | | | | |
| **Interest rate risk** | | | | | | | | |
| Basel ratio for interest rate risk, %[2] | 3.7 | 3.7 | 3.9 | 3.9 | 3.6 | 5.0 | 4.0 | 4.0 |
| Capital requirement for the position risk of interest rate instruments in the trading book | 911.3 | 780.9 | 839.8 | 618.3 | 643.6 | 625.0 | 477.4 | 441.9 |
| **Exchange rate risk** | | | | | | | | |
| Capital requirement for open foreign exchange positions | 89.1 | 75.2 | 83.1 | 81.1 | 83.3 | 92.3 | 84.2 | 70.8 |
| **Equity price risk** | | | | | | | | |
| Capital requirement for the position risk of equities in the trading book | 166.3 | 176.9 | 183.0 | 197.1 | 219.2 | 191.3 | 178.1 | 151.5 |

*Source: OeNB.*

*[1] Based on unconsolidated data. The calculation of capital requirements for market risk combines the standardized approach and internal value-at-risk (VaR) calculations. The latter use previous day's values without taking account of the multiplier. Capital requirements for interest rate instruments and equities are computed by adding up both general and specific position risks.*

*[2] Average of the Basel ratio for interest rate risk (loss of present value following a parallel yield curve shift of all currencies by 200 basis points in relation to regulatory capital) weighted by total assets of all Austrian credit institutions excluding banks that operate branches in Austria under freedom of establishment. For banks with a large securities trading book, interest rate instruments of the trading book are not included in the calculation.*

Table A22

## Liquidity Risk

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, %* | | | | | | | |
| Short-term loans to short-term liabilities | 74.2 | 72.5 | 71.2 | 64.2 | 69.0 | 65.9 | 69.9 | 66.0 |
| Short-term loans and other liquid assets to short-term liabilities | 125.0 | 124.8 | 122.9 | 118.9 | 122.9 | 118.1 | 122.6 | 120.6 |
| Liquid resources of the first degree: 5% quantile of the ratio between available and required liquidity of degree 1[1] | 143.3 | 139.9 | 146.5 | 145.1 | 150 | 152.4 | 238.6 | 295.4 |
| Liquid resources of the second degree: 5% quantile of the ratio between available and required liquidity of degree 2 | 116.8 | 110.8 | 112.4 | 111.3 | 114.1 | 110.9 | 111.2 | 112.1 |

*Source: OeNB.*

*[1] Short-term loans and short-term liabilities (up to 3 months against banks and nonbanks). Liquid assets (quoted stocks and bonds, government bonds and eligible collateral, cash and liquidity reserves at apex institutions). The liquidity ratio relates liquid assets to the corresponding liabilities. Article 25 of the Austrian Banking Act defines a minimum ratio of 2.5% for liquid resources of the first degree (cash ratio) and of 20% for liquid resources of the second degree (quick ratio). The 5% quantile indicates the ratio between available and required liquidity surpassed by 95% of banks on the respective reporting date.*

Table A23

## Solvency

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, eligible capital and tier 1 capital, respectively, as a percentage of risk-weighted assets* | | | | | | | |
| Consolidated capital adequacy ratio | 12.1 | 12.8 | 13.3 | 13.2 | 13.5 | 13.6 | 13.7 | 14.2 |
| Consolidated tier 1 capital ratio | 8.7 | 9.3 | 9.8 | 10.0 | 10.3 | 10.3 | 10.6 | 11.0 |

*Source: OeNB.*

*Note: Owing to the transition to Basel II, the method of calculation of the capital ratio and the tier 1 capital ratio used from Financial Stability Report 16 (December 2008) on differs from the method used previously. The denominator of both ratios is given by the sum of all regulatory capital requirements multiplied by the factor 12.5. The numerator of the capital ratio is given by tier 1 and tier 2 capital less deduction items (eligible own funds) plus the part of tier 3 capital not exceeding the capital requirement for position risk. The numerator of the tier 1 capital ratio is given by tier 1 capital less deduction items (eligible tier 1 capital). The sum of all capital requirements consists of the capital requirements for credit risk, position risk, settlement risk, operational risk and the transition to Basel II as well as the other capital requirements.*

Table A24

## Exposure to CESEE

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, EUR billion* | | | | | | | |
| Total assets of subsidiaries[1] | 257 | 254 | 265 | 264 | 269 | 270 | 281 | 277 |
| *of which: NMS-2004[2]* | *128* | *127* | *131* | *131* | *133* | *127* | *137* | *137* |
| *NMS-2007[3]* | *41* | *40* | *40* | *41* | *42* | *42* | *42* | *41* |
| *SEE[4]* | *47* | *49* | *49* | *49* | *51* | *51* | *51* | *51* |
| *CIS[5]* | *41* | *38* | *45* | *43* | *43* | *50* | *51* | *48* |
| Exposure according to BIS in total[6] | 186 | 204 | 213 | 210 | 225 | 217 | 216 | 210 |
| *of which: NMS-2004[2]* | *103* | *113* | *117* | *116* | *129* | *121* | *124* | *120* |
| *NMS-2007[3]* | *34* | *34* | *33* | *34* | *35* | *33* | *33* | *31* |
| *SEE[4]* | *27* | *40* | *41* | *39* | *42* | *42* | *38* | *37* |
| *CIS[5]* | *22* | *18* | *21* | *20* | *19* | *21* | *21* | *23* |
| Total indirect lending to nonbanks[7] | 165 | 160 | 166 | 169 | 171 | 171 | 176 | 171 |
| *of which: NMS-2004[2]* | *81* | *79* | *80* | *82* | *82* | *79* | *84* | *83* |
| *NMS-2007[3]* | *25* | *25* | *25* | *26* | *26* | *27* | *26* | *26* |
| *SEE[4]* | *31* | *30* | *32* | *32* | *34* | *34* | *34* | *33* |
| *CIS[5]* | *28* | *25* | *29* | *29* | *28* | *31* | *32* | *29* |
| Total direct lending[8] | 51 | 51 | 51 | 49 | 51 | 52 | 54 | 53 |
| *of which: NMS-2004[2]* | *22* | *22* | *22* | *22* | *23* | *23* | *23* | *23* |
| *NMS-2007[3]* | *9* | *10* | *9* | *9* | *8* | *8* | *8* | *7* |
| *SEE[4]* | *15* | *15* | *15* | *14* | *15* | *15* | *17* | *17* |
| *CIS[5]* | *4* | *4* | *5* | *4* | *4* | *6* | *6* | *6* |

*Source: OeNB.*

*[1] Excluding Yapi ve Kredi Bankasi (not fully consolidated by parent bank UniCredit Bank Austria).*
*[2] NMS-2004: Estonia (EE), Latvia (LV), Lithuania (LT), Poland (PL), Slovakia (SK), Slovenia (SI), Czech Republic (CZ), Hungary (HU).*
*[3] NMS-2007: Bulgaria (BG) and Romania (RO).*
*[4] Southeastern Europe (SEE): Albania (AL), Bosnia and Herzegovina (BA), Croatia (HR), Kosovo (KO), Montenegro (ME), Macedonia (MK), Serbia (RS), Turkey (TR).*
*[5] Commonwealth of Independent States (CIS): Armenia (AM), Azerbaijan (AZ), Kazakhstan (KZ), Kyrgyzstan (KG), Moldova (MD), Russia (RU), Tajikistan (TJ), Turkmenistan (TM), Ukraine (UA), Uzbekistan (UZ), Belarus (BY); here also including Georgia (GE).*
*[6] Exposure according to BIS includes only domestically controlled banks. As Hypo Alpe Adria was included in the fourth quarter of 2009, comparability with earlier values is limited.*
*[7] Lending (gross lending including risk provisions) to nonbanks by 69 fully consolidated subsidiaries in CESEE according to the asset, income and risk statement.*
*[8] Direct lending to CESEE according to monetary statistics.*

*Note: Due to changes in reporting, the comparability of values as from 2008 with earlier values is limited.*

Table A25

## Profitability of Austrian Subsidiaries[1] in CESEE

| | 2009 | 2010 | 2011 | 2012 | 2009 | 2010 | 2011 | 2012 |
|---|---|---|---|---|---|---|---|---|
| | 1st half | | | | Year | | | |
| | *End of period, EUR million* | | | | | | | |
| Operating income | 6,638 | 6,585 | 6,934 | 6,666 | 13,396 | 13,436 | 13,608 | 13,268 |
| *of which: net interest income* | *4,253* | *4,584* | *4,728* | *4,465* | *8,693* | *9,333* | *9,405* | *8,781* |
| *securities and investment earnings* | *40* | *34* | *57* | *50* | *50* | *47* | *67* | *61* |
| *fee and commission income* | *1,406* | *1,437* | *1,518* | *1,445* | *2,916* | *2,954* | *3,092* | *2,992* |
| *trading income* | *785* | *-42* | *371* | *301* | *1,238* | *368* | *430* | *790* |
| *other income* | *153* | *572* | *260* | *406* | *498* | *735* | *621* | *643* |
| Operating expenses | 3,122 | 3,177 | 3,400 | 3,374 | 6,267 | 6,678 | 6,814 | 6,950 |
| *of which: personnel expenses* | *1,401* | *1,400* | *1,480* | *1,485* | *2,739* | *2,870* | *2,997* | *2,992* |
| *other expenses* | *1,720* | *1,778* | *1,920* | *1,889* | *3,529* | *3,809* | *3,817* | *3,958* |
| Operating profit/loss | 3,516 | 3,408 | 3,535 | 3,292 | 7,129 | 6,757 | 6,794 | 6,317 |
| Allocation to provisions and impairments | 2,024 | 1,983 | 1,592 | 1,529 | 4,829 | 4,094 | 4,283 | 3,512 |
| Result after tax | 1,190 | 1,117 | 1,578 | 1,356 | 1,775 | 2,073 | 1,763 | 2,093 |
| Return on assets[2] | 0.9% | 0.9% | 1.2% | 1.0% | 0.7% | 0.8% | 0.6% | 0.8% |
| Provisions[3] | 3.9% | 6.2% | 6.8% | 7.8% | 5.3% | 6.5% | 7.3% | 7.6% |

*Source: OeNB.*

[1] *Excluding Yapi ve Kredi Bankasi (not fully consolidated by parent bank UniCredit Bank Austria).*
[2] *End-of-period result expected for the full year after tax as a percentage of average total assets.*
[3] *Provisions on loans and receivables in proportion to gross loans to customers.*

*Note: Due to changes in reporting, the comparability of values as from 2008 with earlier values is limited. Furthermore some positions have been available in detail only since 2008.*

Table A26

## Market Indicators of Selected Austrian Financial Instruments

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| **Share prices in % of mid-2005 prices** | | | | | | | | |
| Erste Group Bank | 49.4 | 66.4 | 66.0 | 91.8 | 94.8 | 35.8 | 39.4 | 59.6 |
| Raiffeisen Bank International | 48.5 | 75.7 | 56.9 | 82.5 | 70.9 | 40.3 | 50.7 | 49.0 |
| Euro Stoxx – Banks | 56.6 | 70.3 | 52.7 | 52.4 | 53.0 | 32.8 | 29.2 | 35.6 |
| Uniqa | 85.1 | 80.3 | 85.5 | 90.2 | 91.6 | 57.8 | 64.4 | 75.9 |
| Vienna Insurance Group | 71.0 | 81.0 | 75.2 | 88.6 | 90.0 | 71.7 | 72.2 | 91.5 |
| Euro Stoxx – Insurance | 62.5 | 75.0 | 63.8 | 71.0 | 77.4 | 58.8 | 60.1 | 83.7 |
| **Relative valuation: price-book value ratio** | | | | | | | | |
| Erste Group Bank | 0.63 | 0.80 | 0.79 | 1.10 | 1.34 | 0.51 | 0.56 | 0.69 |
| Raiffeisen Bank International | 0.72 | 1.12 | 0.84 | 1.22 | 0.99 | 0.56 | 0.71 | 0.46 |
| Euro Stoxx – Banks | 0.74 | 0.94 | 0.66 | 0.64 | 0.58 | 0.36 | 0.46 | 0.55 |
| Uniqa | 1.48 | 1.39 | 1.48 | 1.58 | 2.29 | 1.44 | 1.61 | 1.14 |
| Vienna Insurance Group | 0.93 | 1.03 | 0.95 | 1.12 | 1.23 | 0.98 | 0.98 | 0.98 |
| Euro Stoxx – Insurance | 0.84 | 1.03 | 0.87 | 0.94 | 0.93 | 0.69 | 0.63 | 0.79 |

*Source: Thomson Reuters, Bloomberg.*

Table A27

## Key Indicators of Austrian Insurance Companies[1]

| | 2010 | | 2011 | | 2012 | | % change year on year |
|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | |
| | *End of period, EUR million* | | | | | | |
| **Business and profitability** | | | | | | | |
| Premiums | 9,037 | 16,652 | 8,935 | 16,537 | 8,920 | 16,341 | –1.2 |
| Expenses for claims and insurance benefits | 5,757 | 11,882 | 6,162 | 12,826 | 6,474 | 12,973 | 1.1 |
| Underwriting results | 241 | 373 | 379 | 295 | 345 | 455 | 54.2 |
| Profit from investments | 1,589 | 3,203 | 1,930 | 2,964 | 1,776 | 3,391 | 14.4 |
| Profit from ordinary activities | 552 | 1,101 | 1,028 | 1,162 | 914 | 1,395 | 20.1 |
| Total assets | 102,625 | 105,099 | 106,989 | 105,945 | 107,824 | 108,374 | 2.3 |
| **Investments** | | | | | | | |
| Total investments | 95,541 | 98,300 | 100,094 | 99,776 | 101,917 | 103,272 | 3.5 |
| *of which: debt securities* | *37,062* | *38,223* | *38,332* | *37,813* | *37,772* | *37,614* | *–0.5* |
| *stocks and other equity securities*[2] | *12,621* | *12,559* | *12,988* | *12,363* | *12,249* | *12,505* | *1.1* |
| *real estate* | *5,193* | *5,703* | *5,120* | *5,236* | *5,201* | *5,371* | *2.6* |
| Investments for unit-linked and index-linked life insurance | 14,477 | 15,325 | 15,659 | 15,870 | 16,944 | 18,330 | 15.5 |
| Exposure to domestic banks | 16,442 | 16,458 | 16,925 | 16,405 | 17,700 | 16,872 | 2.8 |
| Custody account claims on deposits on reinsurers | 1,229 | 1,229 | 1,736 | 1,733 | 1,990 | 1,933 | 11.5 |
| **Risk capacity (solvency ratio), %** | × | 356 | × | 332 | × | 350 | × |

*Source: FMA, OeNB.*

*[1] Semiannual data exclusive of reinsurance transactions, based on quarterly returns.*
*[2] Contains shares, share certificates (listed and not listed) and all equity instruments held by mutual funds.*

Table A28

## Assets Held by Austrian Mutual Funds

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, EUR million* | | | | | | | |
| Domestic securities | 49,104 | 48,765 | 50,587 | 51,001 | 51,163 | 50,046 | 50,064 | 50,963 |
| *of which: debt securities* | *16,324* | *16,013* | *16,603* | *15,884* | *15,572* | *16,683* | *17,372* | *17,527* |
| *stocks and other equity securities* | *2,144* | *2,863* | *2,813* | *3,696* | *3,630* | *2,991* | *3,126* | *3,637* |
| Foreign securities | 80,067 | 89,845 | 93,102 | 96,684 | 93,897 | 87,458 | 89,981 | 96,854 |
| *of which: debt securities* | *57,548* | *61,961* | *63,259* | *61,744* | *60,474* | *58,695* | *59,943* | *63,661* |
| *stocks and other equity securities* | *10,064* | *12,663* | *12,870* | *15,540* | *14,918* | *12,097* | *12,355* | *14,208* |
| Net asset value | 129,171 | 138,610 | 143,689 | 147,684 | 145,060 | 137,504 | 140,046 | 147,817 |
| *of which: retail funds* | *80,372* | *85,537* | *88,227* | *88,313* | *84,132* | *78,299* | *79,430* | *84,158* |
| *institutional funds* | *48,799* | *53,073* | *55,462* | *59,372* | *60,928* | *59,205* | *60,615* | *63,659* |
| Consolidated net asset value | 107,076 | 115,337 | 120,526 | 123,794 | 122,398 | 116,747 | 120,169 | 126,831 |
| *changed by: redemptions and sales*[1, 2] | *–768* | *2,399* | *2,133* | *1,012* | *351* | *–2,117* | *–133* | *1,607* |
| Distributed earnings[1] | 930 | 1,767 | 705 | 1,696 | 726 | 1,495 | 995 | 1,433 |
| Revaluation adjustments and income[1] | 3,153 | 7,629 | 3,761 | 3,951 | –1,021 | –2,039 | 3,980 | 6,485 |

*Source: OeNB.*

*[1] The figures concerning the change in the consolidated net asset value are semiannual figures.*
*[2] Change in the consolidated net asset value of Austrian mutual funds by redemptions and sales (net balance of shares in mutual funds issued and bought back).*

Table A29

## Structure and Profitability of Austrian Fund Management Companies

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, EUR million* | | | | | | | |
| Total assets | 546 | 642 | 639 | 699 | 635 | 661 | 629 | 644 |
| Operating profit[1] | 45 | 60 | 64 | 78 | 77 | 48 | 59 | 52 |
| Net commissions and fees earned[1] | 124 | 134 | 149 | 154 | 159 | 125 | 141 | 141 |
| Administrative expenses[1, 2] | 88 | 97 | 96 | 103 | 96 | 99 | 100 | 105 |
| Number of fund management companies | 29 | 30 | 30 | 29 | 29 | 29 | 29 | 29 |
| Number of reported funds | 2,270 | 2,182 | 2,192 | 2,203 | 2,205 | 2,171 | 2,172 | 2,168 |

*Source: OeNB.*

[1] *All figures are semiannual figures.*
[2] *Administrative expenses are calculated as the sum of personnel and material expenses.*

Table A30

## Assets Held by Austrian Pension Funds

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, EUR million* | | | | | | | |
| Domestic securities | 10,415 | 11,721 | 12,482 | 13,017 | 13,077 | 12,576 | 13,231 | 13,293 |
| *of which: federal treasury bills and notes* | *0* | *0* | *0* | *0* | *0* | *0* | *0* | *0* |
| *debt securities* | *163* | *169* | *163* | *173* | *173* | *140* | *113* | *119* |
| *mutual fund shares* | *10,228* | *11,520* | *12,296* | *12,818* | *12,878* | *12,420* | *13,087* | *13,143* |
| *other securities* | *24* | *32* | *23* | *26* | *26* | *16* | *31* | *31* |
| Foreign securities | 1,093 | 1,124 | 1,117 | 1,249 | 1,270 | 1,289 | 1,290 | 2,160 |
| *of which: debt securities* | *182* | *138* | *148* | *181* | *159* | *173* | *123* | *113* |
| *mutual fund shares* | *879* | *932* | *944* | *1,037* | *1,084* | *1,096* | *1,145* | *2,013* |
| *other securities* | *32* | *54* | *25* | *31* | *27* | *20* | *22* | *34* |
| Deposits | 664 | 539 | 318 | 422 | 294 | 644 | 698 | 575 |
| Loans | 185 | 182 | 153 | 137 | 137 | 137 | 139 | 153 |
| Other assets | 264 | 170 | 176 | 152 | 158 | 152 | 182 | 154 |
| Total assets | 12,621 | 13,734 | 14,245 | 14,976 | 14,936 | 14,798 | 15,541 | 16,335 |
| *of which: foreign currency* | *373* | *448* | *424* | *466* | *428* | *416* | *449* | *404* |

*Source: OeNB.*

Table A31

## Assets Held by Austrian Severance Funds

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *End of period, EUR million* | | | | | | | |
| Total direct investment | 1,125 | 884 | 906 | 1,004 | 1,149 | 1,393 | 1,405 | 1,442 |
| *of which: euro-denominated* | *1,103* | *866* | *892* | *985* | *1,125* | *1,363* | *1,377* | *1,415* |
| *foreign currency-denominated* | *22* | *17* | *15* | *19* | *24* | *30* | *28* | *27* |
| *accrued income claims from direct investment* | *20* | *15* | *12* | *16* | *15* | *19* | *18* | *22* |
| Total indirect investment | 1,339 | 1,946 | 2,278 | 2,569 | 2,774 | 2,891 | 3,331 | 3,834 |
| *of which: total euro-denominated investment in mutual fund shares* | *1,293* | *1,858* | *2,126* | *2,379* | *2,567* | *2,741* | *3,114* | *3,540* |
| *total foreign currency-denominated investment in mutual fund shares* | *45* | *88* | *152* | *190* | *207* | *151* | *217* | *294* |
| Total assets assigned to investment groups | 2,464 | 2,830 | 3,184 | 3,573 | 3,923 | 4,284 | 4,713 | 5,254 |

*Source: OeNB.*

*Note: Due to special balance sheet operations total assets assigned to investment groups deviate from the sum of total indirect investments.*

Table A32

## Transactions and System Disturbances in Payment and Securities Settlement Systems

| | 2009 | | 2010 | | 2011 | | 2012 | |
|---|---|---|---|---|---|---|---|---|
| | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 | June 30 | Dec. 31 |
| | *Number of transactions in thousand, value of transactions in EUR billion* | | | | | | | |
| **HOAM.AT** | | | | | | | | |
| Number | 699 | 676 | 597 | 601 | 539 | 472 | 293 | 311 |
| Value | 4,535 | 4,769 | 4,950 | 4,497 | 3,730 | 3,937 | 6,944 | 3,030 |
| System disturbances | 1 | 4 | 4 | 0 | 1 | 0 | 0 | 1 |
| **Securities settlement systems** | | | | | | | | |
| Number | 801 | 1,020 | 1,036 | 1,034 | 1,049 | 1,038 | 788 | 862 |
| Value | 181 | 184 | 230 | 168 | 246 | 193 | 238 | 180 |
| System disturbances | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| **Retail payment systems** | | | | | | | | |
| Number | 272,000 | 302,100 | 298,100 | 318,900 | 337,100 | 328,600 | 328,900 | 359,400 |
| Value | 22 | 24 | 24 | 25 | 24 | 26 | 27 | 28 |
| System disturbances | 5 | 14 | 16 | 9 | 2 | 2 | 2 | 2 |
| **Participation in international payment systems** | | | | | | | | |
| Number | 17,766 | 13,356 | 14,802 | 16,580 | 17,080 | 18,660 | 19,580 | 21,200 |
| Value | 676 | 549 | 594 | 570 | 632 | 674 | 723 | 1,097 |
| System disturbances | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

*Source: OeNB.*

*Note: The data refer to the six-month period in each case.*

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This report reviews the OeNB's mandate, responsibilities and organization as well as the monetary policy of the Eurosystem, economic conditions and developments both in the financial markets and in financial market supervision during the reporting year. Furthermore, it contains the OeNB's financial statements, Intellectual Capital Report and Environmental Statement.

## Konjunktur aktuell — German

This online report provides a concise assessment of the current state of the global economy and the economic situation in the euro area, Central, Eastern and Southeastern Europe (CESEE) and Austria. Furthermore, it analyzes major developments in financial markets and the performance of Austrian banks. The report is published in January, March, April, June, September, October and December; issues published at the end of a quarter additionally contain brief analyses of special economic and monetary policy topics.

## Monetary Policy & the Economy — English

Monetary Policy & the Economy provides analyses and studies on central banking and economic policy topics and is published at quarterly intervals.

## Fakten zu Österreich und seinen Banken — German
## Facts on Austria and Its Banks — English

This semiannual publication provides a snapshot of Austria's economy based on a range of real and financial variables, which are also put into an international perspective.

## Financial Stability Report — English

This semiannual report contains analyses of Austrian and international developments with an impact on financial stability and studies designed to offer in-depth insights into specific financial stability-related topics.

## Focus on European Economic Integration — English

This quarterly publication presents peer-reviewed studies on macrofinancial and monetary integration in Central, Eastern and Southeastern Europe (CESEE) as well as related country analyses and statistics. This publication reflects a strategic research priority of the OeNB.

## Statistiken – Daten & Analysen — German, English summaries

This quarterly publication contains analyses of Austrian financial institutions, cross-border transactions and positions as well as financial flows. 14 tables provide information about macroeconomic, financial and monetary indicators. In addition, this series includes special issues on selected statistics topics published at irregular intervals.

## Research Update — English

This quarterly newsletter is published online *(www.oenb.at/research-update)* and informs readers about selected findings, research topics and activities of the OeNB's Economic Analysis and Research Department.

## CESEE Research Update — English

This quarterly newsletter of the OeNB's Foreign Research Division is published online *(www.oenb.at/cesee-research-update)* and informs readers about OeNB research and analysis output on Central, Eastern and Southeastern Europe (CESEE) as well as past and forthcoming CESEE-related events.

## Proceedings of OeNB Workshops — German, English

These proceedings contain papers presented at OeNB workshops at which national and international experts discuss monetary and economic policy issues.

## Working Papers

English

This online series provides a platform for the publication of studies by OeNB economists or external authors on particular monetary policy topics.

## Conference Proceedings of the OeNB's Economics Conference

English

These proceedings contain contributions to the OeNB's annual Economics Conference, an international platform for exchanging views and information on monetary and economic policy as well as financial market issues.

## Conference Proceedings of the OeNB's Conference on European Economic Integration

English

These proceedings contain contributions to the OeNB's annual Conference on European Economic Integration (CEEI), which focuses on Central, Eastern and Southeastern European issues and the ongoing EU enlargement process.

## Publications on Banking Supervision

German, English

*http://www.oenb.at/en/presse_pub/period_pub/finanzmarkt/barev/barev.jsp*

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