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Contents

Reports

Special Topics

Editorial close: May 16, 2008

Reports

Austria's Financial System Faces Difficult Conditions

Turmoil on International Financial Markets Persists

The international financial market turbulence caused by the U.S. mortgage crisis in summer 2007 continued in the first half of 2008. Uncertainty about the distribution of resulting valuation losses across the international financial system generated a loss of trust among banks and led to liquidity strains on the interbank market. At the same time, risks were generally reassessed, and at the beginning of 2008, international stock markets saw a further, markedly sharper downward price adjustment.

In response to the difficulties in the financial markets and the slowdown of economic activity, the Federal Reserve reduced its key interest rate by a total of 3¼ percentage points to 2% between September 2007 and April 2008 while the ECB kept its key interest rate stable at 4%. Furthermore, leading central banks including the ECB, the Federal Reserve and the Bank of England tried to ease financial market tensions by adopting a number of measures to influence liquidity conditions, but those measures have not had a lasting effect so far. On the whole, the gap between money market interest rates and key interest rates has widened visibly since the onset of the turmoil as a result of continued uncertainty. The changed risk perception in bond markets has also significantly increased risk premia on corporate bonds of less-than-prime issuers. For top-rated companies the risk spread has risen substantially in the U.S.A., but not so in the euro area.

Financial market disruptions constitute an increasing risk for the international economy. In view of declining investment in real estate, more stringent credit conditions and rising unemployment rates, economic growth prospects for the U.S.A. have worsened distinctly. As to the euro area, short-term indicators also point to a slowdown in economic growth, albeit to a lesser extent. At the same time, rising energy and food prices have visibly accelerated inflation in recent months.

The emerging economies in Central, Eastern and Southeastern Europe (CESEE) have been affected by the turmoil to a lesser extent so far and recorded robust growth in the second half of 2007. While almost all countries of the region continue to rely on external funding, they do so to largely varying degrees. Financing conditions in international financial markets have, however, come to increasingly reflect risk aspects and in turn particularly countries with high current account deficits and a heavy reliance on loans for funding have become more vulnerable to a sudden unwinding of such imbalances.

Higher Financial Costs for Businesses and Households

While the Austrian economy has remained fairly robust in the first half of 2008 despite the international financial turmoil, its growth prospects have deteriorated noticeably. The corporate sector managed to further improve its internal financing capacity in 2007 thanks to persistently healthy profits. Regarding external finance, the tensions in financial markets made it more difficult for businesses to raise capital particularly in equity markets, whereas no slowdown was registered in bank lending. Loan conditions have, however, started to reflect underlying risks more strongly in recent quarters.

Moreover, financial market turbulence led to higher financing costs for the real economy sectors both for equity and debt financing. Given their high share of variable rate loans, both businesses and households thus faced a swift increase in their interest burden.

In the past year, growth of households' new debt slowed down. Although the foreign currency share in outstanding loans declined by 3 percentage points to 28%, the financing side of households is still characterized by high exchange rate risks.

At the same time, household investment in stocks and mutual fund shares suffered substantial valuation losses in the second half of 2007, which have also affected the performance of stock-based saving instruments and repayment instruments for repaying bullet loans. It has to be mentioned though that households investing in long-term debt securities dispose of above-average incomes and assets and thus predominantly of a high risk-bearing capacity.

Financial Market Turmoil Affects Austrian Banks Only Indirectly

The direct impact of financial market turbulence on Austrian banks has been comparatively limited. By the end of 2007, Austrian banks had to write off EUR 1.1 billion invested in related structured products, which is a relatively small amount compared with other countries. This can largely be explained by the fact that their foreign business activities focus mainly on CESEE. Moreover, Austrian banks' "originate and hold" strategy and the relatively high significance of customer deposits have been particularly effective in this respect.

Yet, Austrian banks were affected by the turmoil indirectly: Refinancing on the interbank market became more difficult for them, and they incurred transaction losses caused by fluctuations in value on capital markets.

Despite these difficult conditions, the Austrian banking sector developed favorably in 2007. The ongoing dynamic activities of Austrian banks in CESEE contributed substantially to this development. In 2007, Austrian banks' CESEE business already accounted for 26% of total assets and 43% of consolidated profits before taxes. Especially the banks' subsidiaries in non-EU countries have been growing at a dynamic pace.

Austrian banks have been able to step up their lending and income not only abroad but also at home. In 2007, fee-based services and commissions advanced operating profits by 14.5% and the (unconsolidated) cost-to-income ratio improved markedly from 65% to 62%.

Given the uncertainty regarding further repercussions of financial market turmoil, there is still the risk that banks might perform less well in future as a result of declining fee and commission income and increasing value adjustments.

Overall, Austrian banks' risk-bearing capacity remains high. Both stable capital ratios and stress tests confirm the Austrian banking sector's good shock resilience. This ties in with a favorable report by the IMF on Austria's financial sector under the 2007 FSAP update.

Continued Financial Turmoil Dampens Global Economic Outlook

Industrialized Countries: Growth Decreases as Inflation Increases, International Financial Market Turbulence Continues

Effects of the U.S. Subprime Crisis and Higher Inflation

Economic growth slowed down in the *industrialized countries* in the fourth quarter of 2007. In April 2008, the IMF revised its growth forecast significantly downward against October 2007. It now expects substantially weaker growth rates than in previous years owing to weak economic developments in the U.S.A and the turmoil in international financial markets, whereas this year's rate of inflation is expected to be both higher than in 2007 and higher than forecast in October 2007 (see table 1). Since August 2007, higher food and crude oil prices have clearly driven up inflation rates in many countries. In early April 2008, the price of Brent crude oil reached around USD 110 per barrel. According to the IMF, the financial turmoil, which set off in the summer of 2007, has intensified and represents a cyclical risk. In the past months, many financial institutions had to make high loan loss provisions for (mainly securitized) claims on subprime U.S. mortgage debtors and for other securitizations. A number of institutions needed to raise capital to strengthen their capital base. Some systemically important institutions experienced liquidity shortfalls and, in part, had to be backed by their respective central banks.

In the *U.S.A.* in the fourth quarter of 2007, real GDP growth was higher year on year (at a rate of 2.8%) than the year's average, but the seasonally adjusted and annualized quarter-on-quarter growth rate of 0.6% was significantly lower than in the previous quarter, when it stood at 4.9%. In the first quarter of 2008, quarter-on-quarter real GDP growth was also 0.6%. A series of short-term economic indicators, at best, point to only weak growth in the first quarter of 2008. In view of declining real estate investments, tighter borrowing conditions and an in-

Table 1

IMF World Economic Outlook: Industrialized Countries

	GDP (real change)					Consumer price inflation				Current account		
	Apr. 08	Oct. 07	Apr. 08		Change in outlook	Apr. 08	Oct. 07	Apr. 08		Apr. 08		
	2007	2008[1]	2008[1]	2009[1]	2008[1]	2007	2008[1]	2008[1]	2009[1]	2007	2008[1]	2009[1]
	%					%				% of GDP		
Industrialized countries	2.7	2.2	1.3	1.3	−0.9	2.2	2.0	2.6	2.0	−1.2	−1.1	**−1.1**
U.S.A.	2.2	1.9	0.5	0.6	−1.4	2.9	2.3	3.0	2.0	−5.3	−4.3	**−4.2**
Euro area	2.6	2.1	1.4	1.2	−0.7	2.1	2.0	2.8	1.9	−0.2	−0.7	**−0.9**
Germany	2.5	2.0	1.4	1.0	−0.6	2.3	1.8	2.5	1.6	5.6	5.2	4.9
France	1.9	2.0	1.4	1.2	−0.6	1.6	1.8	2.5	1.7	−1.3	−2.4	−2.5
Italy	1.5	1.3	0.3	0.3	−1.0	2.0	1.9	2.5	1.9	−2.2	−2.4	−2.3
United Kingdom	3.1	2.3	1.6	1.6	−0.7	2.3	2.0	2.5	2.1	4.9	4.0	**3.9**
Japan	2.1	1.7	1.4	1.5	−0.3	0.0	0.5	0.6	1.3	−4.9	−4.8	**−4.4**

Source: IMF (World Economic Outlook), October 2007 and April 2008.

[1] *Forecast.*

creasing unemployment rate, economic growth prospects in the U.S.A. have deteriorated noticeably. The IMF sees growth at merely 0.5% in 2008, and 0.6% in 2009, despite stimulating monetary and fiscal policy incentives. Other forecasts, however, expect growth to slow down at a less pronounced rate and the U.S. economy to recover more quickly. The broad range of growth rate forecasts illustrates the existing uncertainties about the extent of the economic slump in the U.S.A. In February 2008, core inflation was 2.3% year on year, whereas the consumer price index rose by 4%. However, the IMF expects inflation to recede to an annual average of 3% in 2008.

In the *euro area*, economic growth declined sharply toward end-2007, coming to no more than 2.2% year on year in the fourth quarter of 2007. Various short-term economic indicators point to moderate economic growth in the first quarter of 2008. The IMF expects euro area economic growth to cool off significantly in 2008 and 2009, and has revised its respective forecast downward, albeit not to the same extent as for the U.S.A. Other forecasts for the euro area are slightly more optimistic, especially for 2009. HICP inflation went up to 3.6% in March 2008, thus reaching a record high since the beginning of monetary union. However, the IMF expects inflation to decline again in 2008, namely to an annual average of 2.8%. Survey-based leading indicators have not yet signaled a marked slowdown of the so-far robust economic growth in *Germany*. Like the IMF, German research institutes expect an – albeit less pronounced – slowdown in economic growth for the current year. Net exports and investments will contribute less, while private consumption is likely to support growth. For France, the IMF also expects growth to slow down primarily on account of net exports, which will turn from slightly positive to slightly negative.

In *Japan*, year-on-year real GDP growth in the fourth quarter of 2007 (1.7%) was also lower than the year's average. In the first months of 2008, economic growth diminished further. Expecting growth in Japan to slow down in 2008, albeit to a lesser extent than in the euro area, the IMF revised its forecast for Japan slightly downward. The Japanese consumer price index rose by 1.0% year on year in February 2008.

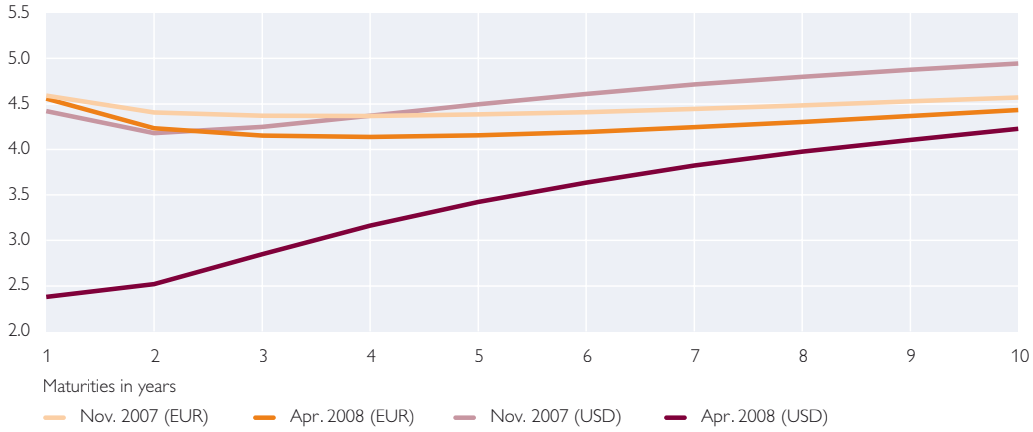
Substantial Interest Rate Cuts in the U.S.A., Financial Turmoil Continues

In view of the financial turmoil and the weakening economic development, the U.S. Federal Reserve slashed its key interest rate by a total of 3¼ percentage points to 2% in seven consecutive steps between September 18, 2007, and May 1, 2008. In the euro area, the ECB left its key interest rate unchanged at 4% despite continuing upside risks to price stability on account of higher uncertainties about euro area growth prospects. Owing to the international financial turbulence observable since August 2007, *money markets* have been tense in several currencies – a situation which has affected interbank trading. These tensions could well be a result of financial institutions' increased preference for liquid funds and higher uncertainties about the distribution of valuation losses linked to structured credit products across the financial system. To counteract said money market tensions, the Federal Reserve, the ECB and the Bank of England took a series of – partly coordinated – liquidity management measures. Although these measures contributed substantially to stabilizing money markets, so far they

Chart 1

Euro Area and U.S. Yield Curves

Based on swap rates, %



Source: Thomson Financial, OeNB.

have not sustainably reduced the volatility of long-term money market rates. The three-month EURIBOR increased by approximately 10 basis points to 4.8% from November 2007 to April 2008, while the U.S. dollar three-month LIBOR decreased by 220 basis points to 2.7%.

In the U.S.A., the *capital market yield curve* shifted downward noticeably. Between November 2007 and April 2008, one-year swap rates declined by approximately 200 basis points, while ten-year swap rates decreased by approximately 70 basis points – a movement which meanwhile has resulted in the yield curve again showing a rising profile also in the one- to two-year segment. The decline in interest rates reflects the Federal Reserve's key interest rate cuts, sharply deteriorating growth prospects as well as investors' higher risk aversion and preference for liquid funds in view of the international financial turmoil. In the euro area, the yield curve shifted downward by 10 to 20 basis points and remained slightly inverted in the one- to four-year range.

Investors' higher risk aversion and preference for liquid funds also showed in the long-term *government bond* markets. In the euro area, yield spreads against German bonds widened noticeably. Break-even inflation rates derived from inflation-indexed bonds, however, remained stable on the whole in the euro area and the U.S.A.

Risk premiums on corporate bonds issued by top-rated debtors (AAA rating) and less highly rated issuers (BBB rating) increased further. In the euro area and in the U.S.A., BBB risk premiums augmented by approximately 120 basis points between November 2007 and April 2008. For top-rated debtors, risk premiums went up by around 10 basis points in the euro area and around 70 basis points in the U.S.A. The period of low risk premiums on corporate bonds issued by lower-rated debtors, as observed from 2003 to mid-2007, appears to have come to an at least temporary end. Ten-year swap spreads were volatile, but while in the euro area, their level had hardly changed by April 2008 as compared to November 2007, they had slightly narrowed at a higher level in the U.S.A.

On euro area and U.S. *stock markets*, prices plummeted in January 2008 on account of growing concerns about the economic situation emanating from the U.S.A. and investors' higher risk aversion; stock price losses in the euro area were noticeably greater than in the U.S.A. Greater stock market uncertainties also became apparent in the development of implied volatility (derived from the prices of options on futures on broad-based stock market indices), which increased in the U.S.A. as well as in the euro area.

On the *foreign exchange markets*, the economic slowdown and markedly decreasing interest rates in the U.S.A. caused the U.S. dollar to weaken. Consequently, between November 2007 and April 2008, the U.S. currency lost approximately 7% to 8% against the euro and the Japanese yen. The euro topped out, reaching a record high of around USD 1.59 per euro. The euro also gained roughly 12% against the pound sterling, which depreciated in the wake of the economic slowdown in the United Kingdom and concerns about the British financial system, peaking at an unprecedented rate of around GBP 0.80 per euro. The Swiss franc gained some 5% against the euro, with exchange rate movements correlating closely with the stock market development.

Emerging Markets: Growth Is Expected to Weaken, but Remain Robust while Net Capital Inflows to the Private Sector Are Expected to Contract

Economic Activity Remains Robust while Consumer Prices Go Up

The IMF expects real GDP in emerging market economies (EMEs) and developing countries (DCs) to climb by 6.7% and 6.6%, respectively, in 2008 and 2009. While remaining below the comparable rates of previous years, these expansion rates are still higher than the long-term average. From a regional perspective, growth in 2008 is likely to be strongest in *Asia* and the *Commonwealth of Independent States (CIS)* – like in 2007. At the same time, however, the IMF also expects these regions, followed by *Europe* and *Latin America*, to record the most significant economic slowdown in 2008, while economic growth in the *Middle East* and in *Africa* (particularly given developments in Nigeria) is expected to accelerate slightly.

In *Asia*, growth contributions are anticipated to shift from slackening growth of exports to industrialized countries toward domestic growth and intra-Asian exports. For China, the IMF expects authorities' efforts to curb high investment demand by taking a tighter credit and monetary policy stance to be partially successful. (However, in April the Chinese statistics authorities revised their estimate for 2007 growth upward from 11.4% to 11.9%.) Also in *Latin America*, economic growth in 2008 will rely more on the domestic economy, in spite of a more restrictive monetary policy. In *Africa*[1], growth is fueled particularly by the oil-exporting countries, which are expected to expand by more than 8% per year in the period from 2007 to 2009. However, also the economies of the oil-importing countries appear set to grow by more than 5% per year in 2008 and 2009, as in 2007. Altogether, the IMF states that these countries have made progress in diversifying their economies and kept up the momentum of structural reform. Also in the *Middle East*, the strong (above-average) economic growth of

[1] *Excluding Libya and Egypt, which are subsumed under the Middle East.*

Table 2

IMF World Economic Outlook: Emerging Market Economies and Developing Countries

	GDP (real change)					Inflation			Current account		
	Apr. 08	Oct. 07	Apr. 08		Change in outlook	Apr. 08			Apr. 08		
	2007	2008[2]	2008[2]	2009[2]	2008[2]	2007	2008[2]	2009[2]	2007	2008[2]	2009[2]
	%					%			% of GDP		
All EMEs and DCs	**7.9**	**7.4**	**6.7**	**6.6**	**−0.7**	**6.4**	**7.4**	**5.7**	**4.2**	**4.1**	**3.4**
Europe	**5.8**	**5.2**	**4.4**	**4.3**	**−0.8**	**5.7**	**6.4**	**4.3**	**−6.6**	**−7.2**	**−6.9**
Poland	6.5	5.3	4.9	4.5	−0.4	2.5	4.1	3.8	−3.7	−5.0	−5.7
Romania	6.0	6.0	5.4	4.7	−0.6	4.8	7.0	5.1	−13.9	−14.5	−13.0
Turkey	5.0	5.3	4.0	4.3	−1.3	8.8	7.5	4.5	−5.7	−6.7	−6.3
CIS	**8.5**	**7.0**	**7.0**	**6.5**	**0.0**	**9.7**	**13.1**	**9.5**	**4.5**	**4.8**	**2.4**
Russia	8.1	6.5	6.8	6.3	0.3	9.0	11.4	8.4	5.9	5.8	2.9
Ukraine	7.3	5.4	5.6	4.2	0.2	12.8	21.9	15.7	−4.2	−7.6	−9.7
Middle East	**5.8**	**5.9**	**6.1**	**6.1**	**0.2**	**10.4**	**11.5**	**10.0**	**19.8**	**23.0**	**19.4**
Egypt	7.1	7.3	7.0	7.1	−0.3	11.0	8.8	8.8	1.5	0.8	−0.5
Iran	5.8	6.0	5.8	4.7	−0.2	17.5	20.7	17.4	10.4	11.2	8.4
Africa	**6.2**	**6.5**	**6.3**	**6.4**	**−0.2**	**6.3**	**7.5**	**5.9**	**0.1**	**1.7**	**0.9**
Nigeria	6.4	8.0	9.1	8.3	1.1	5.5	8.6	8.5	0.7	6.5	5.7
South Africa	5.1	4.2	3.8	3.9	−0.4	7.1	8.7	5.9	−7.3	−7.9	−6.5
Asia	**9.1**	**8.3**	**7.5**	**7.8**	**−0.8**	**4.8**	**5.5**	**3.9**	**6.5**	**5.3**	**5.2**
China	11.4	10.0	9.3	9.5	−0.7	4.8	5.9	3.6	11.1	9.8	10.0
India	9.2	8.4	7.9	8.0	−0.5	6.4	5.2	4.0	−1.8	−3.1	−3.4
Indonesia	6.3	6.1	6.1	6.3	0.0	6.4	7.1	5.9	2.5	1.8	1.2
Korea	5.0	4.6	4.2	4.4	−0.4	2.5	3.4	2.9	0.6	−1.0	−0.9
Latin America[1]	**5.6**	**4.3**	**4.4**	**3.6**	**0.1**	**5.4**	**6.6**	**6.1**	**0.5**	**−0.3**	**−0.9**
Argentina	8.7	5.5	7.0	4.5	1.5	8.8	9.2	9.1	1.1	0.4	−0.5
Brazil	5.4	4.0	4.8	3.7	0.8	3.6	4.8	4.3	0.3	−0.7	−0.9
Mexico	3.3	3.0	2.0	2.3	−1.0	4.0	3.8	3.2	−0.8	−1.0	−1.6

Source: IMF (World Economic Outlook), October 2007 and April 2008.

[1] *Including the Caribbean.*
[2] *Forecast.*

oil-importing Egypt is remarkable. In *Turkey*, exports continue to be the mainstay of growth, whereas the country's restrictive monetary policy course (geared at combating inflation), renewed fiscal consolidation efforts and weaker credit growth dampen domestic demand.

As compared to October 2007, the IMF revised its forecast for 2008 downward by a total of 0.7 percentage points for the EMEs and the DCs as a group. The size of this downward revision corresponds to that for the euro area, albeit starting from a significantly higher level. From a regional perspective, the IMF's revision almost exclusively mirrors developments in Asia (particularly China) and Europe (particularly Turkey). However, growth forecast revisions for Africa and Latin America vary immensely across countries, with the forecast for Mexico declining particularly given its close ties to the U.S. economy. The IMF quotes high productivity gains in the wake of better integration into the global economy as well as rising commodity prices, which fueled exports, FDI inflows and fixed capital formation, as the reasons why

the financial market turbulence that had originated in the U.S.A. had a relatively small effect on its forecasts for EMEs on the whole.

This evidence, however, must not distract from the fact that recently, the risk of contagion through financial and trade channels has gone up markedly for EMEs and DCs. In particular, EMEs with high *current account deficits* that are financed largely by private foreign borrowing are vulnerable to the implementation of stricter credit standards abroad and to increasing risk aversion. Altogether, EMEs and DCs will again record a substantial current account surplus in 2008 and 2009, whereas Europe is likely to be again the only region with a comparatively large current account deficit which, despite the recent depreciation observed in some countries, will slightly increase in 2008. Nevertheless, depending on the availability of crude oil, current account balances differ widely across countries within the CIS, Africa and Latin America.

In most EMEs and DCs, the IMF sees the main challenge for 2008 in combating the sharp rise in *inflation* caused by higher food and fuel prices as well as increased domestic demand. In China, for example, food prices drove up year-on-year inflation from 1% in July 2006 to 8.7% in February 2008 despite a freeze in administered prices. Not least in view of inflationary pressure, the Chinese policy of a gradual appreciation of the Chinese renminbi-yuan against the U.S. dollar allowed a noticeable appreciation at the end of 2007. Combating inflation poses a major challenge also to the oil-exporting countries whose currencies are tied to the U.S. dollar and which feature strongly increasing money supply growth in connection with high current account surpluses. In Turkey, current political uncertainties and their implications for the stability of the national currency represent, along with high food and energy prices, an additional obstacle to meeting the 2008 inflation target.

FDI Inflows to Private Sector Remain High, while Public Sector Net Capital Outflows Continue

In recent years, *net capital inflows to the private sector* have been at historically high levels in many EMEs and DCs. In 2007, these capital inflows rose by more than one and a half times, although inflows weakened from August 2007 onward. Traditionally FDI dominates net inflows. An additional factor in 2007 was a sharp rise in net inflows from loans borrowed abroad. The IMF, however, expects net inflows to almost halve in 2008. This expected reduction may be connected to a significant decrease in net inflows from cross-border loans and an expected turn, in volatile portfolio investment, from net inflows to net outflows, as Asia's private sector is expected to increasingly invest in foreign securities – a development which is anticipated to slow down significantly in 2009.

In Africa, Asia, the Middle East and Latin *America, FDI* remains the dominant type of net capital inflows to the private sector in EMEs and DCs in 2008. While having been the most important source of external finance in the CIS and in Europe in 2007, net *credit* inflows will probably play a clearly minor role in 2008. As a consequence, FDI is likely to become the most important type of financing in CIS and rank equally in importance in Europe. Whereas in Asia, net inflows from bank loans are expected to remain the second important source of finance, the Middle East and Latin America will once again experience continued net

Table 3

Net Capital Inflows to Emerging Market Economies and Developing Countries[1]

	2004	2005	2006	2007	2008[2]	2009[2]
	USD billion					
Net capital inflows to the private sector	241.9	251.8	231.9	605.0	330.7	441.5
By instrument						
Direct investment	188.7	259.8	250.1	309.9	306.9	322.4
Portfolio investment	16.4	−19.4	−103.8	48.5	−72.2	31.0
Other flows (especially loans)	38.5	13.3	87.5	248.8	98.0	90.0
By region (country)						
Europe (CESEE)	74.3	118.1	120.4	170.5	162.5	158.2
CIS	6.7	32.5	57.9	115.1	59.1	89.1
Middle East	−17.0	−56.7	−43.4	−21.0	−62.1	−63.0
Africa	16.0	30.5	39.6	47.1	57.5	64.2
Asia	146.6	90.8	47.9	193.5	40.7	116.2
Latin America and the Caribbean	15.2	36.7	9.5	99.7	73.0	76.8
Net capital inflows to the public sector[3]	−70.7	−109.9	−160.0	−149.0	−162.3	−149.8
Memorandum item						
Current account balance	*297.2*	*517.3*	*698.0*	*738.1*	*814.7*	*750.0*
Reserve assets[4]	*−509.3*	*−595.1*	*−752.8*	*−1236.2*	*−1004.1*	*−1071.4*
of which: held by China	*206.3*	*207.0*	*247.0*	*461.9*	*380.0*	*500.0*

Source: IMF (World Economic Outlook), April 2008.

[1] *This table shows aggregated balance of payments data sets of 131 nonindustrialized countries, including 44 major EMEs. Europe = Central, Eastern and Southeastern Europe excluding European CIS countries and including Turkey. Asia = including Hong Kong, Korea, Singapore and Taiwan.*

[2] *Forecast.*

[3] *A minus sign indicates net outflows of capital from developing countries to industrialized countries.*

[4] *A minus sign indicates an increase.*

outflows on bank loans. As in 2007, net inflows to *portfolio investment* are anticipated to be significant only in Latin America.

The only region with a persistently high *current account deficit*, namely Europe (CESEE), has been attracting the highest *net capital inflows to the private sector* since the mid-1990s and is likely to remain in the lead (after briefly coming in second to Asia in 2007). The Middle East is the only region which, as in previous years, will experience *net capital outflows from the private sector* (investment of *current account surpluses* resulting from petrodollars). All other regions have recorded a combination of *current account surpluses* and *net capital inflows to the private sector* since 2004 – a development that appears set to continue in 2008 and 2009, except in Latin America, where the slight current account surplus is expected to turn slightly negative.

In all the regions under review (except in Latin America), the *public sectors* (excluding central banks) recorded *net capital outflows* in 2007 (both repayment of foreign debt and investment abroad); the same should hold for 2008 and 2009, this time with the exception of Africa and Latin America. Again, overall developments will primarily be attributable to developments in the Middle East. Moreover, all regions under observation are expected to continue to *increase official reserves* in 2008, albeit Asia and Latin America will do so to a lesser extent than in 2007. In absolute figures, the increase will be strongest in Asia, however, given that Asia records the largest current account surplus in absolute terms.

Table 4

Claims of BIS Reporting Banks on Central, Eastern and Southeastern Europe[1]

	AT	DE	IT	FR	NL	SE	BE	UK	Europe[2]	US	Japan
	% of GDP of the recipient country										
CESEE	8.8	6.8	6.5	4.6	2.6	2.9	3.7	1.7	44.5	2.2	0.7
CESEE EU Member States (excluding the Baltic countries)											
Bulgaria	12.3	4.0	17.6	5.2	1.4	0.0	0.5	0.3	70.6	1.0	0.2
Czech Republic	28.7	5.3	9.6	17.5	3.4	0.0	24.6	..	93.7	3.1	0.6
Hungary	24.3	23.1	18.4	4.9	3.6	0.2	11.8	..	93.7	2.2	1.6
Poland	3.5	9.8	12.5	3.3	5.7	1.2	4.5	0.4	51.3	2.8	1.2
Romania	27.6	14.1	6.8	11.6	4.7	0.1	0.6	0.1	80.0	1.2	0.1
Slovakia	40.8	5.4	26.9	2.2	6.1	0.1	9.9	..	93.7	2.5	0.1
Slovenia	28.0	14.2	13.8	5.7	1.6	0.0	6.2	0.5	73.7	1.1	0.9
Other CESEE countries											
Croatia	64.8	8.8	59.7	15.9	0.6	0.0	0.8	0.8	153.6	0.5	1.0
Ukraine	8.2	2.9	1.5	6.4	2.1	1.2	0.4	0.5	28.7	0.9	0.6
Russia	1.6	4.0	1.6	2.4	1.6	0.4	0.5	..	15.1	1.5	0.8
Turkey	0.4	3.0	..	2.4	1.3	0.1	2.3	..	18.8	2.9	0.5

Source: BIS, Eurostat, Thomson Financial, national sources and OeNB calculations.

Note: The claims shown here correspond to the „Consolidated foreign claims of reporting banks" published by the BIS (BIS Quarterly Review March 2008, table 9B). For every bank, these include the claims (in all currencies) of both parent and subsidiary companies on borrowers outside the group in the relevant countries. In this consolidated overview, claims of Austrian banks do not include claims of the Bank Austria (BA) group.

[1] *As of end-September 2007.*

[2] *In addition to the countries of origin listed individually, „Europe" comprises Denmark, Greece, Ireland, Portugal, Finland, Spain, Switzerland, Norway and Slovenia.*

Continued High Level of Austrian Bank Claims on CESEE

At end-September 2007, Austrian banks'[2] claims accounted for nearly 9% of nominal GDP in the recipient countries in CESEE, putting Austrian banks ahead of all other countries' banks in terms of claims on the region (see table 4). Austrian banks account for nearly one-fifth of total claims on the region of all BIS reporting banks.

By international comparison, Austrian banks had the highest claims on Slovenia, the Czech Republic, Slovakia, Hungary, Romania, Croatia and Ukraine and the second-highest claims on Bulgaria (after Italian banks). Together with Italian banks, Austrian banks had the third-highest claims on Russia after German and French banks. In Slovenia (as a member of the euro area), the Czech Republic, Slovakia, Romania, Croatia and Ukraine, in turn, the fact that more than 25% of the claims of all BIS reporting banks on this region are held by Austrian banks confirms the prominent role of Austrian banks in the region.

Eurobonds under Pressure from Protracted Global Nervousness in Financial Markets

Since its beginnings in the summer of 2007, the global financial turmoil has been affecting developments on the international Eurobond market. Thus, the trend of rising average *yield differentials* of emerging market issuers' government bonds denominated in euro and U.S. dollar against U.S. and euro area government bonds (as measured by JPMorgan's (Euro) EMBI (Emerg-

[2] *The BIS consolidated banking statistics does not subsume the BA group among Austrian banks.*

ing Markets Bond Index) Global) has continued since June 2007. In the reporting period from end-September 2007 to end-March 2008, spreads widened by a total of 111 basis points (U.S. dollar bonds) and 57 basis points (euro bonds). The different development of spreads of these two indices is also attributable to differences in the development of the benchmark bonds underlying each index. The general upward trend in yield spreads was interrupted by two downward movements in December 2007 and February 2008. This development seems to have eased somewhat since mid-March 2008, after the average yield differential of U.S. dollar-denominated bonds had reached its highest level since June 2005 and that of euro-denominated bonds had reached its highest level since July 2004. Yield spreads had thus widened by 174 (U.S. dollar) and 91 (euro) basis points to their highest levels from their all-time lows recorded at the end of May/beginning of June 2007. This up-and-down movement with an overall upward tendency was in line with the movements observed in other segments of the international financial market and reflects that investors are gradually becoming informed of the dimensions of the financial problems and losses involved.

In spite of widened yield differentials, total returns were positive for both indices from end-September until end-March: The euro-denominated Euro EMBI Global recorded total returns of more than 1.6% (not annualized), and the corresponding rate for the EMBI Global came to 3.3%.

As in the last reporting period, the current period showed a discrepancy between the rise in yield spreads and the *development of economic fundamentals* (as measured by average ratings) at the level of overall indices. Although the number of rating upgrades by the three largest rating agencies for the countries contained in both indices was noticeably lower compared with the previous year, it was clearly above the number of rating downgrades. Despite the posi-

Table 5

Eurobonds: Spreads to Reference Bonds and Returns by Region

	EMBI Global (USD)						Euro EMBI Global (EUR)					
	Weight in overall index in %	Yield spreads in basis points		Total return in %	Rating	Duration	Weight in overall index in %	Yield spreads in basis points		Total return in %	Rating	Duration
	March 31, 2008	March 31, 2008	Change since Sep. 30, 2007	Since Sep. 30, 2007	March 31, 2008	March 31, 2008	March 31, 2008	March 31, 2008	Change since Sep. 30, 2007	Since Sep. 30, 2007	March 31, 2008	March 31, 2008
Overall index	100.0	325	70	0.6	BB+	7.00	100.0	129	38	1.0	BBB+	5.18
Africa	2.7	428	84	1.3	BB+	4.71	4.6	254	126	–2.5	BBB+	4.72
Asia	17.4	272	58	1.8	BB+	6.58	4.8	115	23	1.7	BBB	3.55
Europe	26.9	272	77	0.6	BBB–	6.40	72.8	103	30	1.3	BBB+	5.44
Latin America	49.5	347	72	0.1	BB+	7.75	17.8	224	57	0.4	BBB–	4.60
Middle East	3.5	577	56	2.7	B–	4.79	..	..	..	..	..	..

Source: Bloomberg, JPMorgan, OeNB calculations.

Note: The EMBI Global and Euro EMBI Global indices differ in composition (in terms of currencies, countries covered, instruments, maturities, etc.). Differences in the level and development of yield spreads and returns as well as in other index features can be attributed in part to this different composition and in part to different investor structures. The rating is calculated as the average of Moody's, Standard & Poor's and Fitch's ratings for long-term government foreign currency sovereign debt and is expressed in the rating categories of Standard & Poor's.

tive development of economic fundamentals, demand for Eurobonds issued by emerging market sovereign debtors ebbed after the onset of the financial crisis. Assuming that ratings are appropriate, the divergent development of fundamentals and yield differentials may either be interpreted as a contagion-related temporary negative overshooting or as a sustained correction of investors' previously excessive risk appetite. The further development of the global financial market turbulence and its real economic implications join country-specific developments (particularly regarding external balances and political stability) as main risk factors for the Eurobond market.

Just like Eurobonds issued by European EMEs typically lag the overall index in times of decreasing yield spreads (meaning that owing to their much lower initial level, the decline in their yield spreads and their total return lag behind those of the overall index), the negative developments observed during the reporting period likewise only had a limited impact on these Eurobonds. Among European Eurobonds, those issued by Serbia, Ukraine, Bulgaria, Romania and Turkey were hit hardest by the crisis. In these countries, yield spreads increased at a rate that was clearly above the average of all countries contained in the indices, and the three most important rating agencies partly revised downward their rating outlooks for Serbia, Romania and Bulgaria.[3]

Central, Eastern and Southeastern Europe: Robust Growth amid Higher Inflation and Partly Higher Current Account Deficits

Strikingly Divergent Exchange Rate Developments within the Region

In the recent period of financial market turmoil, the exchange rate of the Bulgarian lev remained stable within the framework of the currency board regime in place. By contrast, the exchange rate curves of the not formally pegged currencies reviewed here (Hungarian forint, Slovak koruna, Czech koruna, Croatian kuna, Romanian leu, Russian ruble, Polish zloty) showed a diverse picture against the euro in the review period from end-September 2007 to end-March 2008. While the tightly managed Croatian kuna remained broadly stable against the euro, marked value changes were observed for the other six currencies (see chart 2), with three of them gaining and the other three losing in value. In the period under review, the Czech koruna posted the highest gains against the euro (+8.7%), followed by the Polish zloty (+7%) and the Slovak koruna (+4%). The Hungarian forint depreciated by 3.4%, the Russian ruble by almost 5%, and the Romanian leu by 10.3%.

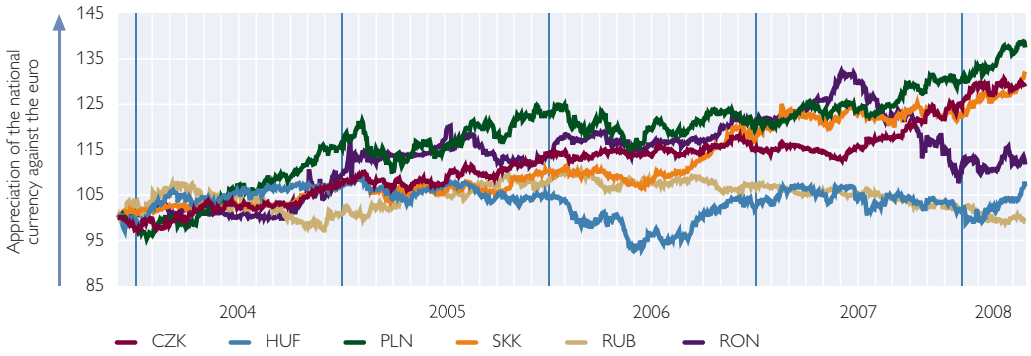
Based on their June 2007 values, the Slovak, Polish and Czech currencies appreciated by 5% (Slovak koruna), 9% (Polish zloty), and even more than 13% (Czech koruna). On the one hand, this development reflects persistently robust economic growth in all three countries combined with a strong export performance and substantial FDI inflows. The Czech koruna was strengthened further by the unwinding of carry trades in which it had served as

[3] *In the reporting period, outlooks were downgraded from stable to negative for Romania by Standard & Poor's and Fitch, for Bulgaria by Fitch and for Serbia by Standard & Poor's.*

Chart 2

National Exchange Rates against the Euro

Dec. 31, 2003 = 100



Source: Thomson Financial.

Note: Index based on euro per unit of national currency.

the funding currency until investors' risk appetite declined in about mid-2007. Expected or actual key interest rate hikes in the Czech Republic and Poland in the light of accelerated inflation also seem to have influenced exchange rate developments.

In the period under review, both the Russian ruble and the Hungarian forint continued their slight but steady decline against the euro that had started in spring 2006 and spring 2007, respectively. The depreciation of the Russian ruble against the euro was primarily attributable to the country's orientation on a de facto currency basket (55% USD and 45% EUR), which means that the Russian currency partially follows the depreciation of the U.S. dollar against the euro. Notwithstanding its recent slight recovery, the Hungarian forint has depreciated by nearly 6% since its maximum value of April 2007. This long-term downward trend can be largely explained by relatively weak medium-term growth perspectives, general political fragility and the associated uncertainty regarding the continued implementation of fiscal consolidation plans. The depreciation of the Romanian leu started a few months later than that of the Hungarian forint, but it was considerably stronger. Having reached its highest value since 2002 at the beginning of July 2007, the leu depreciated by more than 16% so that its value at end-March 2008 was roughly the same as in early 2006. The main reasons for this decline were a deterioration of fundamentals (high and rising current account deficit, rapid unit labor cost growth and loose fiscal policy) as well as the relatively high proportion of short-term capital in the foreign exchange market. Among the currencies reviewed here, the Romanian leu was, in view of these factors, hit hardest by the global financial market turmoil and the resulting increase in investor risk aversion.

In most CESEE countries *economic activity* remained very robust also in the second half of 2007. In 2007 as a whole, GDP growth was especially pronounced, compared with 2006, in Croatia and Slovakia as well as in Poland, and markedly lower only in Romania and Hungary. Annual growth in the region amounted to between slightly above 5.5% in Bulgaria and Romania and nearly 10.5% in Slovakia, where one-off factors were instrumen-

Table 6

Fundamental Factors Influencing Exchange Rate Developments

	GDP growth (in %)		Contribution of net exports to GDP growth (in percentage points)		Balance of trade and services (in % of GDP)		Balance on income (in % of GDP)		Demand for external financing (in % of GPD)[1]		Demand for external financing plus net FDI inflows (in % of GDP)	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Bulgaria	6.3	6.2	−8.3	−5.8	−18.4	−21.6	−2.1	−1.1	−17.1	−20.3	6.0	0.1
Czech Republic	6.4	6.5	0.4	0.7	3.2	4.7	−5.7	−7.2	−2.9	−2.4	0.4	1.8
Hungary	3.9	1.3	3.7	2.3	0.4	2.5	−6.9	−7.9	−5.3	−4.0	−2.5	−3.0
Poland	6.2	6.5	−1.1	−0.9	−1.8	−2.7	−2.8	−3.0	−2.6	−2.6	0.3	1.2
Romania	7.9	6.1	−9.6	−14.9	−12.1	−14.3	−3.3	−3.6	−10.5	−13.2	−1.6	−7.4
Slovakia	8.5	10.4	2.3	5.4	−3.2	−0.5	−3.7	−4.3	−7.1	−4.8	−0.3	−1.2
Croatia	4.8	5.6	−1.1	−0.8	−7.7	−8.4	−7.7	−2.9	−8.1	−8.4	−0.6	0.2
Russia	7.3	8.1	−3.9	−7.0	12.7	8.7	−3.0	−2.3	9.6	5.3	10.6	5.8

Source: Eurostat, national central banks, OeNB.

[1] *Demand for external financing = sum of current account balance and capital account balance.*

tal in accelerating growth in the second half of 2007. Hungary continued to stand out with a further reduction of growth to only 1.3% due to government austerity measures.

While the growth contribution of *domestic demand* increased in Croatia, Poland and especially in Romania, it declined in the other countries and turned negative in Hungary. Among the domestic demand components, investment growth (considerably) outpaced the growth of private consumption in 2007 in all countries but Croatia. In Hungary, private consumption growth was negative. At the same time, private consumption growth was stronger than GDP growth only in Croatia and especially in Romania. Disregarding developments in Hungary, domestic demand in the region was mainly driven by strong real wage and loan growth.

With the exception of Slovakia, Hungary and the Czech Republic, the *contribution of net exports to growth* remained negative, and the *goods and services balance* deteriorated in 2007. Especially Bulgaria and Romania, which recorded the highest negative growth contribution of net exports together with Russia, saw the goods and services deficit rise further from already high levels. The high and rising external imbalances may, however, be partially explained by the economic catching-up process and strong investment demand. Still, in Romania, import growth appears to have been fueled further by the persistently strong growth of private consumption (11%), which caused the goods and services deficit to rise while GDP growth declined.

The *combined current account and capital account balance* remained negative (i.e. indicating a need for external finance) in all countries of the region except Russia. Yet the level and structure of the deficits varied highly across the region. In the four Central European countries the deficit in the combined current and capital account in 2007 basically reflected a negative income balance, which can in turn be explained by outflows of dividends and profits to foreign investors. In all four countries, demand for external financing was below 5% of GDP and lower than in 2006 (even though only slightly lower in Poland). In contrast, demand for external financing increased over

2006 in Croatia and especially Bulgaria and Romania, fueled by the development of the trade and services balance. In most CESEE countries, net FDI inflows (including intracompany loans) remained high enough to cover the demand for external financing, the only exceptions being Slovakia, Hungary and especially Romania, where the remaining gap widened markedly compared with 2006.

The Hungarian forint and the Romanian leu continued to exhibit the highest *short-term interest rate differentials relative to the euro area*. While those differentials were narrowing moderately in Hungary until December 2007 and sharply in Romania until September 2007, the differentials have since been widening again by over 90 basis points (Hungary) or as much as 380 basis points (Romania) in line with their NCBs' monetary policies. These developments have made foreign currency loans more attractive in Hungary and Romania, when leaving aside the higher exchange rate risk. In Poland the short-term interest rate differential to the euro area has risen markedly following several key rate increases, while the Czech Republic's persistently negative differential relative to the euro area gradually declined following several key rate increases. At the same time, Slovakia's differential remained relatively stable; it has been slightly negative since mid-August 2007, mainly because of the increase of interbank rates in the euro area.

Croatia was the only CESEE country to execute larger-scale *foreign exchange interventions* in order to influence exchange rate dynamics in the report period. Responding to the slight appreciation of the kuna since the beginning of April 2007, Hrvatska narodna banka intervened four times in the course of 2007, and most recently in February 2008, to counteract appreciation pressures on the kuna that had risen following liquidity-absorbing measures combating inflation. Likewise, measures taken by the Czech and Polish governments and central banks at the end of March and the beginning of April, respectively, can be interpreted as influencing the foreign currency supply on the exchange market: in Poland, an EIB loan taken up by the state was transferred to a foreign currency account of the central bank, and in the Czech Republic an agreement was reached stating that future privatization profits are to be frozen on a dedicated central bank account.

Banks' net external asset position deteriorated in 2007 in Bulgaria, Poland, Slovakia, Hungary, Romania and Russia. The deterioration was especially pronounced in Bulgaria and also strong in Romania. While Bulgaria (and Poland) saw a previously positive net asset position turn negative, the other countries experienced a further increase in their already negative net asset positions. These developments are likely to have contributed to the firming of the zloty and the Slovak koruna, whereas they may have slowed down the depreciation of the leu.

In view of the global financial market turmoil the most important *risk factors* for the CESEE countries lie in a slowdown of GDP growth in the euro area, a deterioration of the investment climate and a worsening of external financing conditions. That would affect most of all countries which have elevated current account deficits and where net FDI inflows are insufficient to cover external financing needs.[4]

[4] *For further information see also the study of Gardó et al. in this issue.*

Yield Spreads of Local Currency-Denominated Government Bonds Widen Marginally

In the Central and Southeastern European countries analyzed here (Bulgaria, Poland, Romania, Slovakia, the Czech Republic and Hungary) the yield spreads of ten-year local currency-denominated government bonds widened against euro benchmark bonds during the review period (see table 7). Hungary recorded the highest spread increase by far with about 220 basis points, whereas the yield spreads of Bulgarian, Czech and Polish government bonds widened by more or less equal amounts (about 60 to 80 basis points) from divergent levels. The yield spreads of Slovakian bonds widened by just close to 20 basis points. As a result, Slovakia recorded the smallest spread among the six countries in March 2008, followed by the Czech Republic and Bulgaria. At the same time, the risk premiums of Bulgaria, the Czech Republic, Poland and Hungary reached the highest levels since the beginning of 2005.

Across CESEE, the development of the *inflation differential against the euro area* had an adverse impact on local currency-denominated bond yields – the only exception being Hungary, where the inflation differential slightly declined, albeit remaining at a relatively high level. Slovakia was the only CESEE country to match the euro area's annual inflation rate in March 2008. As before, inflation in CESEE continued to be primarily driven by developments in international commodity prices (energy and food). Some countries moreover experienced indirect tax hikes and rising unit labor costs, while private consumption generated substantial inflationary pressures only in Romania. Yield spreads increased in line with inflation differentials, but more moderately, in all countries except for Hungary. This gap shows that the latest uptick in inflation in these countries is considered rather a temporary phenomenon and that long-term inflation expectations have not been revised upward substantially. In Hungary, yield spreads moved in the opposite direction of the inflation differential, as the

Table 7

Fundamental Factors Influencing Local Currency-Denominated Government Bond Yield Spreads

	Nominal yield of local currency-denominated ten-year government bonds p.a. (in %)			Nominal 3-month interbank money market rate in local currency p.a. (in %)			HICP year on year (in %)			General government budget balance (in % of GDP)[1]		Balance of trade and services (in % of GDP)		Demand for external financing plus net FDI inflows (in % of GDP)[1]	
	Mar. 07	Sep. 07	Mar. 08	Mar. 07	Sep. 07	Mar. 08	Mar. 07	Sep. 07	Mar. 08	2006	2007	2006	2007	2006	2007
Bulgaria	4.2	4.4	4.9	3.8	5.2	6.7	4.4	11.0	13.2	3.0	3.4	−18.4	−21.6	6.0	0.1
Czech Republic	3.8	4.5	4.7	2.6	3.5	4.1	2.1	2.8	7.1	−2.7	−1.6	3.2	4.7	0.4	1.8
Hungary	6.8	6.7	8.4	8.0	7.7	8.1	9.0	6.4	6.7	−9.2	−5.5	0.4	2.5	−2.5	−3.0
Poland	5.2	5.7	6.0	4.2	5.1	6.0	2.4	2.7	4.4	−3.8	−2.0	−1.8	−2.7	0.3	1.2
Romania	7.5	6.9	6.9	7.5	6.8	10.8	3.7	6.1	8.7	−2.2	−2.5	−12.1	−14.3	−1.6	−7.4
Slovakia	4.2	4.6	4.3	4.5	4.3	4.3	2.1	1.7	3.6	−3.6	−2.2	−3.2	−0.5	−0.3	−1.2
Euro area[2]	4.0	4.2	3.8	3.9	4.7	4.6	1.9	2.1	3.6	−1.3	−0.6	−0.1	0.0	n.a.	n.a.

Source: Eurostat, national central banks, OeNB. Monthly values are monthly average values.

[1] *Demand for external financing = sum of current account balance and capital account balance.*
[2] *Euro area: Current account balance (corrected for statistical discrepancies within the euro area) instead of balance of trade and services.*

impact of inflation on yields was masked by other influencing factors.

Changes in the *differentials between short-term money market rates in the countries analyzed here and the euro area* pointed in the same direction as changes in long-term yield premiums in all countries during the review period. At the same time, the change of the short-term interest rate differential was considerably more pronounced than the change in yield spreads in Bulgaria and Romania, and markedly weaker in Hungary.

All countries except for Romania reported lower *budget deficits* in 2007 than in 2006; and Bulgaria was able to increase its surplus. These developments may have dampened the widening of spreads. The reduction of the deficits was favored by strong economic growth and rising inflation. However, the Central European countries and most markedly Hungary also managed to correct structural budget balances. Hungary, while successful in cutting its deficit substantially, still retains comparatively high budgetary imbalances. At the same time, uncertainties regarding the continuation of austerity measures had a negative effect on the government bond market.

The development of *the net external balance* and related exchange rate expectations also may have influenced local currency-denominated government bond yield spreads during the review period in some countries, especially in Romania and Bulgaria.

Finally, the globally declining risk propensity continued to have a substantial impact on the local currency-denominated bond yields of the six countries reviewed here. Risk premiums on local currency-denominated government bonds will be influenced substantially by developments in international financial markets also in the coming months. In view of higher inflation rates, anchoring inflationary expectations on a low level, especially through an active communication policy, may help prevent a further increase of yield premiums. What will also remain important in this respect is the adherence to existing plans of fiscal consolidation as well as the implementation of prudent and differentiated wage policy measures in the public sector.

Financing Conditions Have Tightened for the Real Economy Sectors

Corporate Sector Slightly Affected

Output Growth Is Past its Cyclical Peak

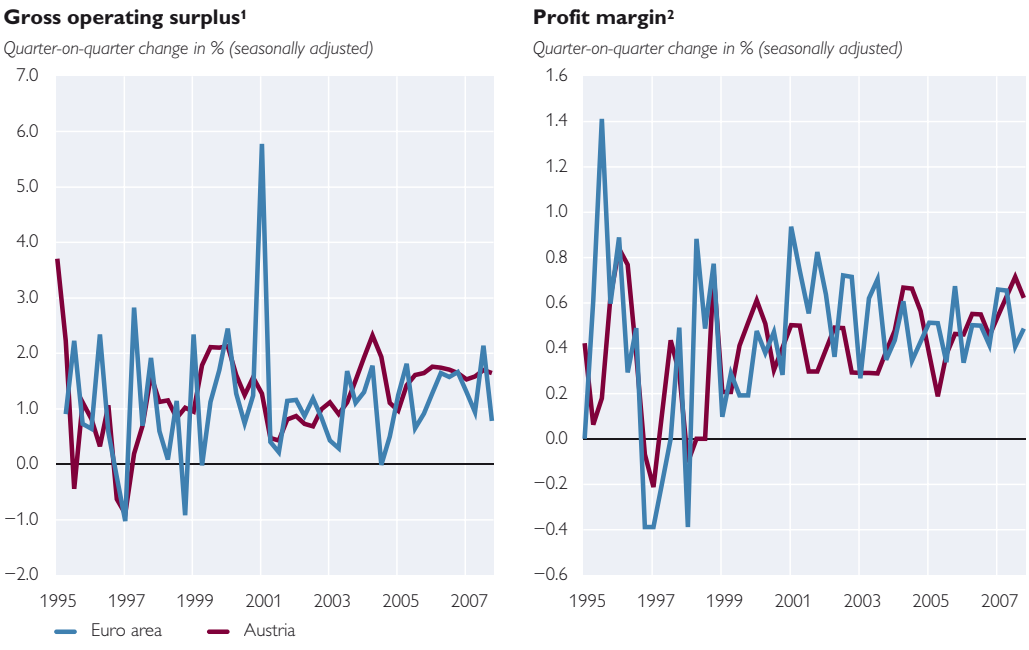
Despite the ongoing turbulence in international financial markets and its negative effects on global economic activity, the Austrian economy performed relatively well in the first half of 2008, even though real GDP growth is expected to be less dynamic in 2008 than in the two previous years. Owing to the euro's increasing external value and the cooling of global economic activity Austrian exports slowed down. In the course of 2007, investment lost momentum – a trend which lasted in early 2008. Real consumer demand, which has clearly lagged behind the development of real disposable household income in recent years, continued to develop moderately.

After having grown robustly in recent years, corporate profitability in Austria – similarly to the euro area as a whole – continued to improve in 2007 despite the appreciation of the euro and high crude oil prices, as the development of the profit margin[1] and gross operating surplus[2] indicates.

The economic boom of the past two years is also reflected in the develop-

Chart 3

Indicators of Profitability Performance in the Corporate Sector



Source: Eurostat.

¹ Inkluding mixed income of the self-employed.
² GDP deflator less unit labor costs.

[1] The profit margin is the ratio of the gross value added deflator to unit labor costs.

[2] The gross operating surplus is the surplus created by corporate operations after the remuneration of the production factor labor. It is calculated from GDP less compensation of employees and less taxes on production (excluding subsidies) and is thus the SNA (System of National Accounts) equivalent of gross operating income.

ment of corporate insolvencies – typically a lagging indicator – which in the first quarter of 2008 was 15% below the corresponding 2007 value. Particularly the number of no asset cases fell by approximately 25%, while the decline of newly opened insolvency proceedings came to 4% and was thus significantly weaker. The estimated default liabilities decreased by around 20%. In the first quarter of 2008, the default liabilities sank to 0.5% of the corporate sector's total liabilities (according to the national accounts).

Financial Turmoil Affected the Financing Through Equity Markets

Regarding external finance, turbulence in international financial markets made it more difficult for businesses to raise capital notably in equity markets. According to the securities issues statistics, new issues on the Vienna stock exchange (Wiener Börse AG) by nonfinancial corporations came to EUR 2.2 billion in the second half of 2007, which corresponded to only about one-third of the value registered in the first half of the year. In the first quarter of 2008, no new listings were reported and three issues already fixed were cancelled owing to the unfavorable market conditions. A closer look at the financing raised on the Vienna stock exchange, where international institutional investors are becoming ever more dominant, clearly reveals the tighter integration of corporate financing into international capital flows. Whereas in 2003 the share of foreign market participants in the trading volume at the Vienna stock exchange was less than one-fourth, this figure burgeoned to 64% in 2007.

As stock prices lost ground at the Vienna stock exchange following financial market turmoil, the market capitalization of the nonfinancial corporations listed at the Vienna stock exchange fell by more than EUR 4 billion to EUR 93 billion in the second half of 2007, which corresponded to some 34% of GDP. The market capitalization of all stocks listed on the Vienna stock exchange (including financial corporations) came to almost 56% of GDP at the end of 2007.

Including OTC equities, close to 40% of nonfinancial corporations' external financing volume was in the form of equity in the second half of 2007. As a result of the declining stock prices, the share of equity in total liabilities decreased by almost 1 percentage point to 37.0% in 2007, as equity listed on the stock exchange is valued at current market prices in line with the national accounts conventions.

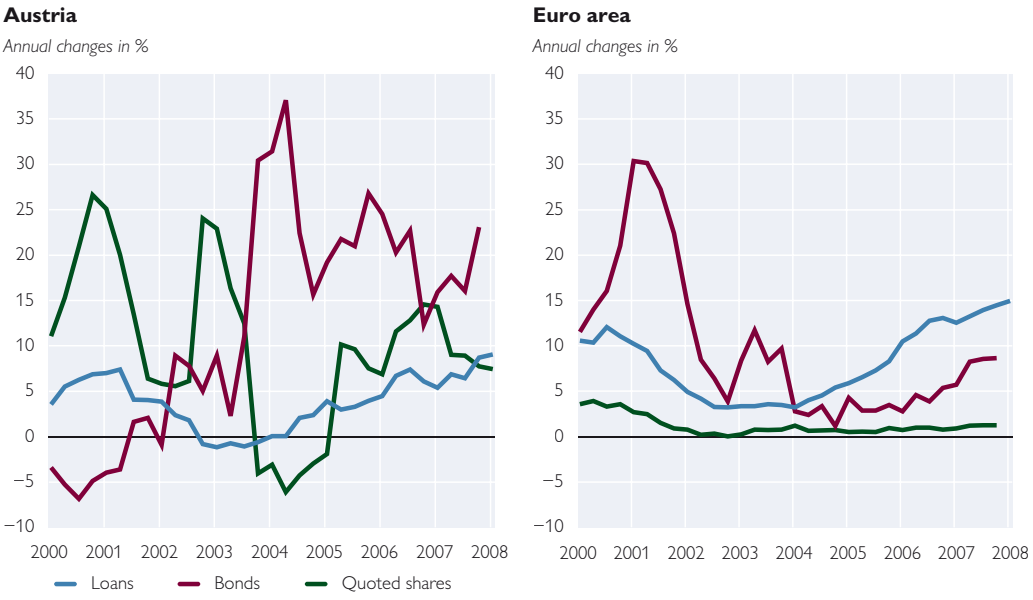
In contrast, the development of bank lending to the corporate sector has not shown any signs of deceleration recently as the annual growth rate of bank loans accelerated in the course of 2007 and came to 9.1% in March 2008.[3] Yet, loan growth still developed less dynamically in Austria than in the euro area. At recently more than 98%, the share of variable rate loans in new business remained very high. In the second half of 2007 and the first quarter of 2008, the maturity structure shifted toward longer-term loans. This is an indication that loans were mainly used to finance investment projects rather than to bridge liquidity gaps.

As companies had difficulties to raise capital on equity markets, they in-

[3] *According to MFI balance sheet statistics. By analogy to the method employed by the ECB, the outstanding volume of bank lending is calculated as the percentage change against the previous year on the basis of changes in transactions, i.e. adjusted for reclassifications, revaluations, exchange rate and other nontransaction changes.*

Chart 4

Key Elements of External Corporate Finance



Source: OeNB.

creasingly turned to banks for loans. At the same time, their good performance improved the creditworthiness of many businesses. According to the Austrian results of the Eurosystem bank lending survey, in the second half of 2007, corporate demand for loans was mainly driven by the need to finance fixed investment. Another key motive for borrowing included the funding of mergers and acquisitions as well as corporate restructuring. In the first quarter of 2008, however, corporate credit demand was no longer driven by any of these factors. The surveyed banks indicated that sound internal financing continued to act as a certain damper on credit demand.

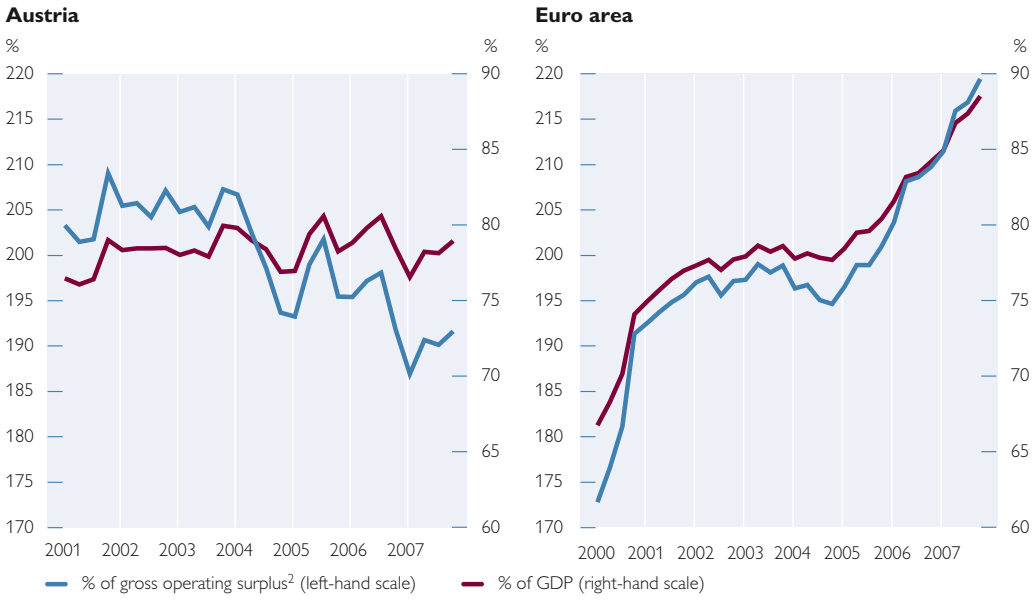
Bond financing remained highly dynamic in the second half of 2007. According to the securities issues statistics, the net issuance of corporate bonds increased by 23.1% compared with the corresponding value of the previous year.[4] Hence, the Austrian growth rate has remained well above the euro area as a whole until recently. In the second half of 2007, construction and real estate companies were the biggest issuers. Close to 70% of the volume issued in this period were fixed rate bonds, while variable rate bonds accounted for the rest. More than 90% of the bonds were denominated in euro and the remainder in Swiss francs.

In 2007, the debt burden of businesses rose slightly faster than their gross operating surpluses (including mixed income of the self-employed) as a result of the rather lively expansion of debt financing. Yet, this increase was more moderate than in the euro area, where the corporate debt ratio has clearly been on the rise since 2005.

[4] *Also based on the ECB method.*

Chart 5

Corporate Sector Debt[1]



Source: OeNB.

[1] Short-term and long-term loans, money market instruments and capital market securities.
[2] Including mixed income of the self-employed.

Financial Turmoil Tightens Financing Conditions

The financing conditions for Austrian companies were tightened in 2007 and 2008, both for borrowing funds and for issuing equity capital.

Since November 2007, share prices at the Vienna stock exchange declined significantly in the wake of international financial market turbulence. Between the end of October 2007 and the end of March 2008, the Austrian Traded Index (ATX) fell by around 17%. By contrast, the profits of companies listed on the Vienna stock exchange continued their upward trend. As a result, the earnings yield[5] rose visibly since mid-2007, which implies that the cost of tapping the stock market increased. The earnings yield also rose significantly in relation to the development of government bond yields, which is among others an indicator of an increased stock market risk premium.

On the euro bond market, the yields for corporate bonds rose significantly in the 12 months until the end of the first quarter of 2008.[6] Whereas long-term yields on government bonds dropped by approximately ½ percentage point since mid-2007, risk premia on corporate bonds climbed relative to government bonds of similar maturities as credit risks were reassessed following the subprime crisis.

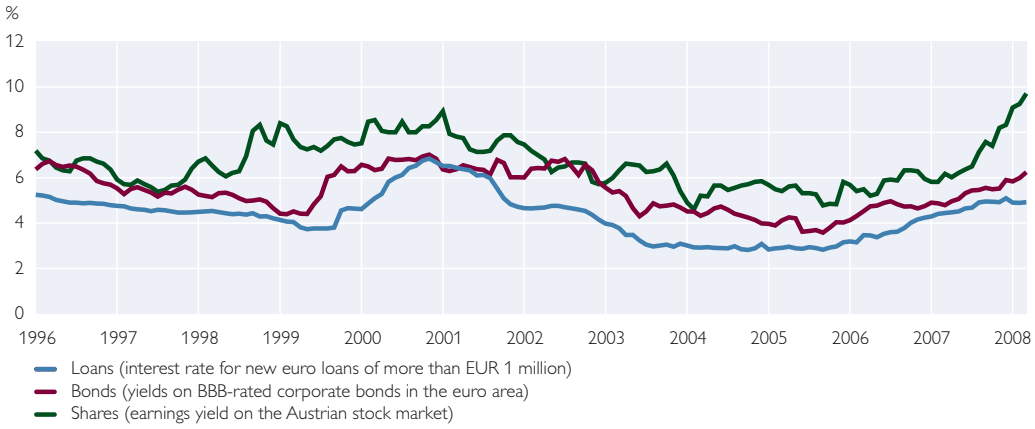
Terms and conditions for new loans have worsened as well. Since the end of 2005, interest rates on corporate loans were going up which, until mid-2007, basically mirrored the ECB's key interest rate increases. From summer 2007 onward and following the crisis of con-

[5] The earnings yield is the inverse of the price/earnings ratio.

[6] Based on the development of BBB-rated bonds in the euro area. No separate data series are available for Austria.

Chart 6

Corporate Financing Conditions

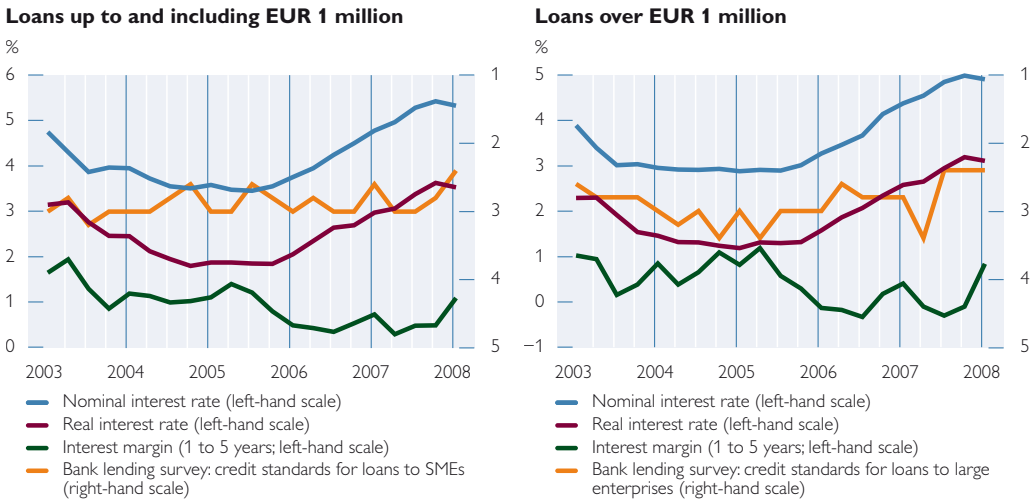


Source: OeNB, Thomson Financial, Wiener Börse AG.

fidence in international financial markets, the increases were caused by a substantial widening of the gap between money market rates – which are the benchmark for variable loan rates – and key interest rates. Risk premia for corporate loans, in contrast, did not start to widen slightly until the first quarter of 2008, as is evidenced by the development of the difference between corporate loan interest rates and swap rates with corresponding maturities (as an indicator of interest rates for largely risk-free assets). In this context, risk premia rose more strongly for large loan volumes than for loans up to and including EUR 1 million.

Chart 7

Conditions for Corporate Loans

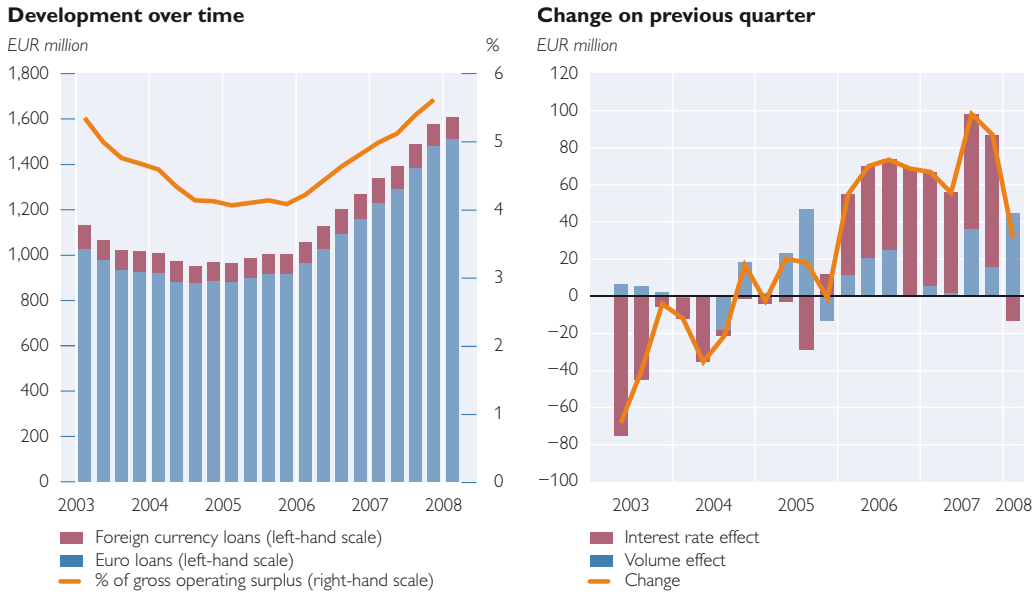


Source: OeNB, ECB.

Note: Right-hand scale ranging from 1 (tightened considerably) to 5 (eased considerably).
Real interest rate: nominal interest rate less the OeNB's HICP forecast for the year following the forecast date.
Interest margin: interest charged for loans with a maturity from 1 to 5 years less 3-year swap rate.
Bank lending survey credit standards: changes in the credit standards for loans to enterprises over the last three months.

Chart 8

Interest Expense on Corporate Loans



Source: OeNB, Eurostat.

Note: Interest expense on euro loans: loans to nonfinancial corporations according to MFI balance sheet statistics multiplied by the corresponding interest rates on outstanding amounts according to MFI interest rate statistics. Interest expense on foreign currency loans: loans to nonfinancial corporations according to MFI balance sheet statistics multiplied by the corresponding interest rates on U.S. dollar, Japanese yen and Swiss franc loans to households and nonfinancial corporations according to MFI interest rate statistics..

This evidence is broadly in line with the Austrian results of the Eurosystem bank lending survey. Since the third quarter of 2007, banks have tightened their margins on loans to enterprises, above all for riskier loans and less strongly for average loans. At the same time, the credit standards for loans to enterprises (to larger corporations and small and medium-sized enterprises (SMEs) alike) have been tightened somewhat since mid-2007. In this respect, the standards for long-term loans were tightened a lot more strongly than those for short-term loans. The changed credit standards are largely attributable to recent international financial market turmoil and its effects on the financing conditions in the money and bond markets.

Slightly Higher Exposure to Interest Rate Risks

Following a decline in recent years, corporate exposure to interest rate risks increased somewhat as credit growth picked up in the second half of 2007. This increase resulted primarily from a rise in liabilities with short-term interest rate risks (loans and variable-rate bonds). In comparison, the share of fixed-income bonds, which are subject to long-term interest rate risks, remained relatively stable in the past few quarters.

Due to the higher share of loans in liabilities and the rise in interest rates, interest expense on corporate loans continued to climb in the first quarter of 2008 (see chart 8).[7] Yet, the interest expense figure shown here includes

[7] *The interest rates for new business (both corporate and household) were used to determine interest on foreign currency loans, as the interest rate statistics do not contain any data on outstanding amounts of foreign currency loans. As the lion's share of foreign currency loans is at variable rates, which are adjusted periodically, this approximation should be fairly adequate.*

only interest payments proper; it does not reflect noninterest rate charges. As is evident from the chart, the rise in interest rate expense in recent quarters can basically be attributed to the higher interest rate level, which did not start to ease somewhat until the first quarter of 2008. Given the high share of variable-rate loans, rising money market rates have very quickly pushed up interest rate expense.

Visibly Reduced Exchange Rate Risks

The corporate sector's exposure to foreign exchange risks shrank markedly in 2007. On balance, enterprises continued to reduce their foreign currency loans, which brought down the foreign currency share in corporate loans from 10.8% at the end of 2006 to just 8.1% at the end of 2007. Moreover, the share of foreign currency-denominated corporate bonds also continued to fall. By end-2007, foreign currency-denominated liabilities accounted for merely 3.5% of overall corporate sector's liabilities against 4.6% a year earlier.

Conclusion: Corporate Financial Position Only Slightly Affected

On balance, the corporate sector's risk position remained favorable in the first quarter of 2008. Even more than half a year after the financial turmoil had begun, the currently available figures do not generally point toward a reduction of the loan supply. In recent quarters lending has, however, become more differentiated in terms of underlying risks. Banks have become more cautious in their financing activities, particularly with regard to large volumes involving high risks. Consequently, competition for prime borrowers might intensify and thus prolong the favorable financing conditions in this sector.

So far, the recent financial turmoil has, first and foremost, driven up financing costs, for equity and debt financing alike. Businesses have seen their debt burden rise quickly, given their high share of variable-rate loans. Although this development does not yet seem to be grave at the aggregate level, highly indebted businesses are likely to have been hit considerably more strongly by the higher interest rates. On balance, businesses' debt/income ratio rose only slightly in 2007. Furthermore, as profits have risen until recently, they enhanced the debt-servicing capacity of companies. Yet, higher financing costs might dampen businesses' propensity to invest. At the same time, continued healthy profitability should enable businesses to substitute internal financing for external financing. Moreover, quite a substantial amount of corporate loans taken out in recent years have probably been used to fund financial transactions, such as mergers and acquisitions. Consequently, a potentially decreasing propensity to lend might affect such transactions and, to a lesser extent, projects in the real economy.

Economic conditions are unlikely to underpin corporate risk positions to the same extent as in the past. With the Austrian economy having visibly lost momentum in 2008, the profit outlook for businesses has become less bright. Last but not least, the high exchange rate of the euro and higher commodity prices may be an additional cost burden on companies.

Financial Market Turbulences Impact on Households' Risk Exposure

Strong Employment Growth, but Stagnating Real Wages

The economic boom years of 2006 and 2007 brought a significant improvement in Austrian labor market conditions. The sharp increase of payrolls by 126,000 over both these years pushed down the Eurostat unemployment rate from 5.2% in 2005 to 4.4% in 2007.

But with a real growth of 1.5%, consumer spending was subdued in 2007, despite the robust income development. This may reflect stagnating real wages and a change in saving behavior prompted by the pension reforms. In a complementary development, the saving rate rose from 9.7% in 2006 to 11.3% in 2007.

Portfolio Shifts in Response to Financial Market Turbulences

Falling stock market prices depressed household demand for stocks and mutual fund shares. Mutual fund shares even registered net capital outflows. As in the first half of 2007, the share of deposits and bonds in financial investment in the second half was high against previous years.

Slight Decline in Exposure to Price Risks

The shift that has been observed over the past few years in the exposure to valuation risks stemming from interest rate changes to valuation risks stemming from price changes did not continue into the second half of 2007. At end-2007, 21% of households' financial assets were subject to valuation risks stemming from interest rate changes and 10% to valuation risks stemming from stock price changes.[8] The low level of new investment, coupled with a fall in prices, caused a slight reduction in households' exposure to price risks in the second half of 2007 relative to end-2006.

High Revaluation Losses in Financial Assets

Household investment in long-term securities, notably stocks and mutual fund shares, suffered above-average revaluation losses in the second half of 2007. Securities accounted for approximately 28% of households' financial assets at end-2007. In the second half of that year, households lost around 5% of the capital invested in these instruments. The revaluation losses on quoted stocks – against private households' stock holdings in mid-2007 – ran to around 16%. While quoted stocks make up some 7% of households' financial assets, around 85% of the revaluation losses can be traced back to price falls in these financial instruments. The financial market developments also hit the performance of mutual funds, which explains why mutual fund shares likewise posted revaluation losses.

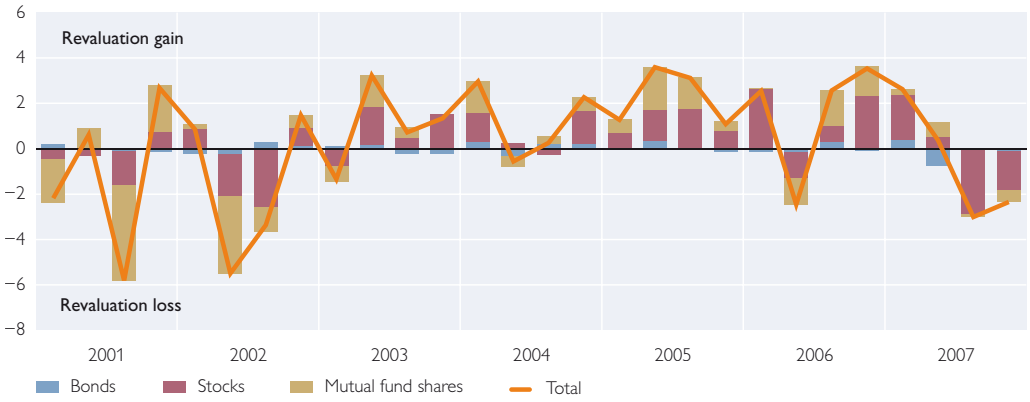
As only a minority of households directly hold investment-related products that are subject to price risk, and since those that do are generally high earners with above-average financial assets, the corresponding risk tends to be low. However, given the increasing popularity of stock-based personal pension plans, more sections of the population are likely to be exposed to stock market risks in future.

[8] *This includes both direct investment in bonds or stocks and indirect investment in the form of fixed income or equity funds as well as the volume of bonds and stocks held through pension funds, severance funds and insurance plans.*

Chart 9

Revaluation Gains and Losses in Households' Financial Assets

% of assets invested in long-term securities



Source: OeNB.

Box 1

Stock Holdings in Austria[1]

Stocks are not widely spread in Austria and stock holdings are concentrated among wealthy, high-income households. This finding from the OeNB's Survey on Financial Household Wealth (SFHW) ties in with available international data. So the households that bear the brunt of sharp price falls in the international financial markets are those that are better able to absorb the losses. Stock price declines thus have little impact on financial stability.

Some 22% of Austrian households hold shares or mutual fund shares. Whereas only 4% of households in the lowest wealth quartile hold shares or mutual fund shares, some 74% of the top 5% on the wealth distribution scale do so.

International comparison shows that Austria not only has a low rate of stock market participation, but that even where households do participate, shares or mutual fund shares make up no more than a small proportion of their total financial assets.

While the percentage of households holding shares or mutual fund shares in Austria is around 22%, it is approximately 34% in the Netherlands and as high as around 49% in the U.S.A. At around 19% in both countries, the participation rates in Italy and Germany are similar to the Austrian rate. At an average of 23% the share of total financial assets held among owners of shares or mutual fund shares in Austria is also relatively low and barely increases even in higher wealth deciles. Differences across countries are primarily attributable to different pension systems (funded versus pay-as-you-go). It is interesting to note that the lowest wealth deciles in most countries share similarly low participation rates. A clear divergence only becomes visible in the upper quartiles, owing in part to institutional reasons (savings subsidies, retirement provisions) and different financial systems (market-based versus bank-based).

[1] *See Fessler, P. and M. Schürz (2008). Stock Holdings in Austria. In: Monetary Policy & the Economy Q2/08. OeNB.*

Interest Income Expands

Looking at the impact of interest rate changes on income from deposits and bonds, we can distinguish between short-term interest rate risk (related to deposits and bonds with an initial fixation rate of up to one year) and long-term interest rate risk.

At end-2007, around 43% of households' financial assets were exposed to short-term and 27% to long-term interest rate risk. The importance of in-

terest rate risk for households' investment ensues from the share of deposits in financial assets (45%), which had already been large before expanding further in the second half of 2007.

Savings deposits (holdings) carried an interest rate of 2.3% in January 2008, and were thus 0.7 percentage points higher than in January 2007. Households' interest income in the second half of 2007 was 19% higher than in the first half-year. Some 65% of the rise in interest income resulted from the climb in interest rates and around 35% from the increase in deposit holdings.

Increase in Austrian Real Estate Prices in 2007 Still Slight by International Comparison

Real estate is of key importance as an asset and as collateral for loans. Price developments in the real estate markets have a strong impact on household debt and consumer and investment decisions through wealth effects. Real estate prices in Austria, which are no more than moderate in comparison to other countries, picked up in 2007. The price increase abated again at the beginning of 2008 and amounted to 1.2% (following 5.1% in the third quarter of 2007 and 3.5% in the fourth, both year on year). The rise in prices for new owner-occupied housing was less steep than that in prices for rented accommodation.

Credit Standards for Home Loans Remain Unchanged while Lending Rates Go Up

According to the Eurosystem bank lending survey, banks – in contrast to the trend observed in the U.S.A. – generally left their credit standards for home loans to households unchanged throughout 2007 and the first half of 2008. However, owing to the short-term scarcity of money market liquidity, increases in interbank interest rates in the fourth quarter of 2007 sharply pushed up interest rates on newly approved loans, particularly those on home loans which reached 5.27% (up 23 percentage points on September 2007, or a rise of almost one percentage point on the 4.28% rate recorded in December 2006). This interest rate was even higher than the euro area average and, for the first time since the start of interest rate statistics (in January 2003) exceeded the traditionally higher average interest rate of 5.22% on home loans in Germany. The same development could be observed in interest rates on aggregate outstanding loans. The interest rates on new consumer loans were 64 basis points higher than a year earlier.

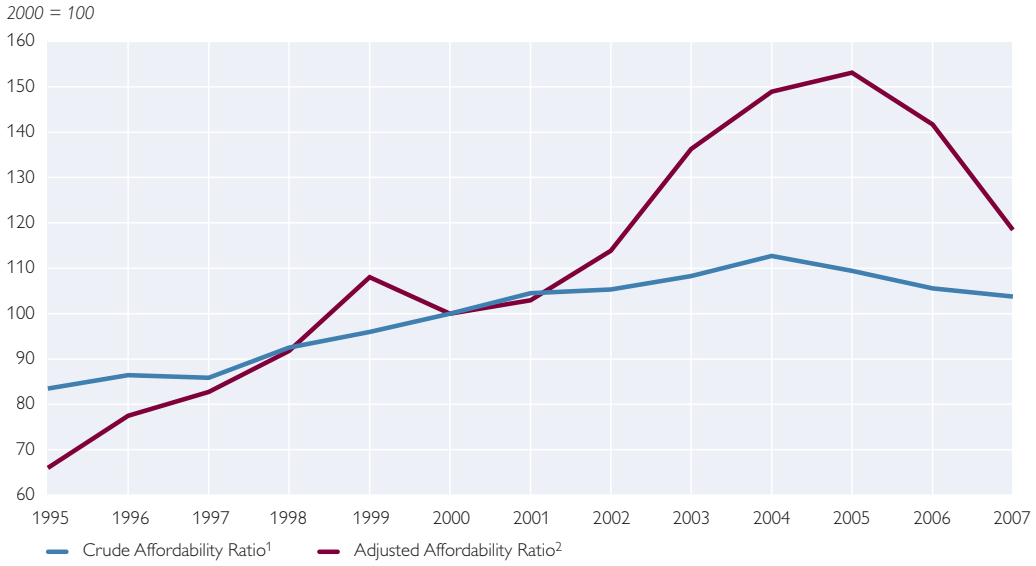
The unadjusted Affordability Ratio[9] has declined slightly since 2005. The rise in the adjusted Affordability Ratio,[10] which takes interest rate effects into account, reflects the increase in interest rates on home loans since 2005 and the consequently higher interest burden on private households.

[9] *For this ratio, households' disposable income, which is a major factor influencing the demand for real estate, is related to the real estate price index.*

[10] *Ratio of disposable household income to the expenses for home loans.*

Chart 10

Affordability Ratio in Austria



Source: OeNB, Statistics Austria, Vienna University of Technology.

[1] *Ratio of disposable income per household to the real estate price index.*
[2] *Ratio of disposable income per household to expenses for home loans.*

Domestic real estate prices can be expected to rise further over the next few years owing to the increasing costs of building materials triggered by high oil prices. However, neither the developments in recent years nor the latest developments in the Austrian real estate market, where price increases largely stem from higher commodities prices, in any way indicate the formation of a price bubble.

Little New Borrowing

The annual growth rate of bank loans, adjusted for non-transaction-related changes, amounted to 5% in 2007. In the second half of that year, the fall-off in credit growth seen since the start of 2005 continued, probably because of the rise in lending rates and weak consumer demand. Credit growth in Austria was around one percentage point below the euro area average. Lately, however, the slowdown in credit growth in the euro area has been much sharper than in Austria; besides higher interest rates, this probably reflected developments in real estate markets in some euro area countries.

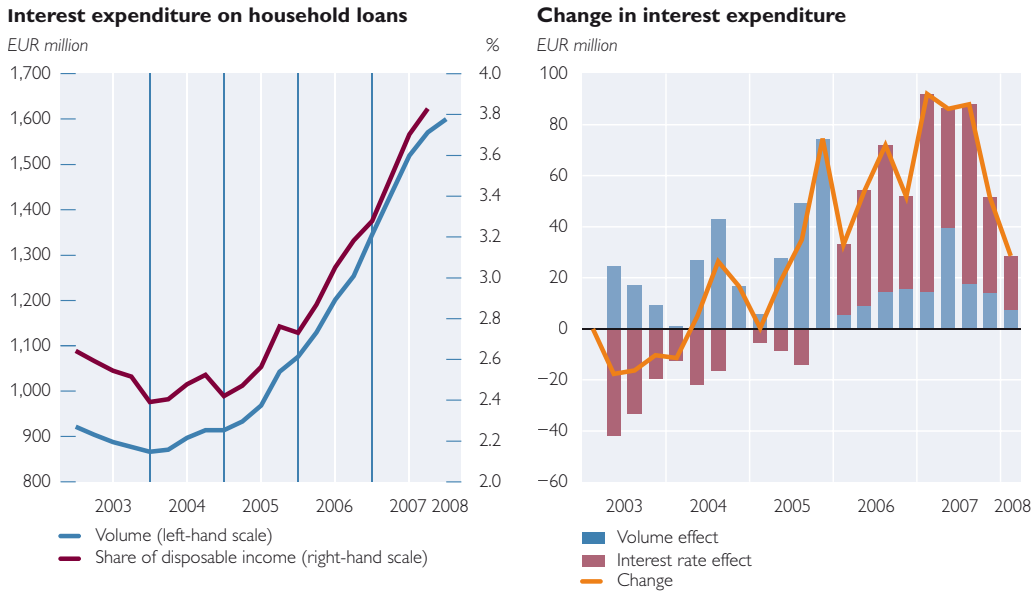
According to the financial accounts, home loans accounted for 62% of credit to households at end 2007. These loans are generally secured by real estate. As explained above, revaluation losses on real estate in Austria and any ensuing problems in securing home loans are likely to be comparatively limited.

At end-2007, loans made up around 35% of households' financial assets or 89% of disposable household income. The ratio of debt to financial assets has been quite stable over the past few years; but household debt relative to disposable income has been climbing steadily.

These aggregated figures, however, do not allow for drawing more qualified conclusions on households' debt burden and debt-servicing capacity. Any further analysis of debt alongside income and wealth at the household

Chart 11

Interest Expense on Household Loans



Source: OeNB.

level would require microdata. A recent analysis[11] concluded that the rising levels of household debt did not necessarily pose a heightened risk to financial stability, since higher-debt households generally own more financial assets.

Interest Expense again on the Rise

The share of variable rate loans to households is relatively high in Austria in comparison to the euro area average. In 2007, around 89% of new consumer loans and over 65% of new home loans were issued at variable rates. And since foreign currency loans are generally at variable rates, too, changes in market rates pass through to consumer interest retail rates relatively quickly.

On the back of rising interest rates and higher indebtedness, the increase in interest expense[12] on household loans seen since the beginning of 2004 continued up to the first quarter of 2008. In the fourth quarter of 2007 the interest expense on retail loans came to 3.8% of disposable household income[13] and was thus 0.7 percentage points higher than in the fourth quarter of 2006. Around three-quarters of the increase in interest expense can be attributed to the higher lending rates. Based

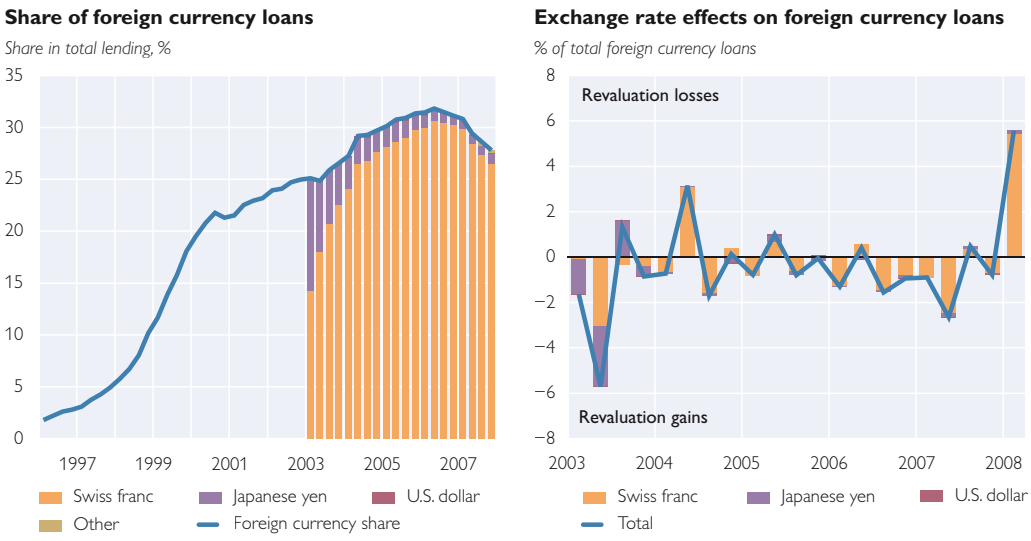
[11] *See Fessler, P. and P. Mooslechner. 2008. Arme Schuldner – Reiche Schuldner? Haushaltsverschuldung und Geldvermögen privater Haushalte auf Basis von Mikrodaten. In: Intervention. European Journal of Economics and Economic Policies, 5(1), 31–45, forthcoming.*

[12] *Interest expense on loans to households is calculated as the product of total loans by purpose, maturities and the respective interest rates.*

[13] *In interpreting these data, it should be borne in mind that the interest expense is calculated in relation to the income of the total population, including those households that have not taken out any loans. Estimates put the share of households servicing loans at around 40% (Fessler, P. and P. Mooslechner, 2008; see footnote 5 Arme Schuldner – Reiche Schuldner? Haushaltsverschuldung und Geldvermögen privater Haushalte auf Basis von Mikrodaten. In: Intervention, European Journal of Economics and Economic Policies, 5(1), 31–45. Forthcoming.). As households with outstanding loans tend to have above-average incomes, the average share of interest expense in their disposable income can be expected to come to about 8%.*

Chart 12

Exchange Rate Risk – Liabilities



Source: OeNB.

on interest expense at end-2007, a 100 basis point rise in lending rates would drive up the share of disposable income spent on interest expense by 0.7 percentage points.

Deposits outpaced liabilities in 2007 and the deposit rates on new business climbed more quickly than lending rates. The ratio of interest expense to interest income consequently fell back by around 20%. All in all, the household sector has thus benefited from the rise in interest rates.

Small Decline in Foreign Currency Loans

The share of foreign currency loans in total lending declined in 2007, coming to 28% at year-end, more than 3 percentage points lower than at end-2006. More than 95% of foreign currency loans were denominated in Swiss francs. The decline in foreign currency loans probably reflects the smaller interest rate advantage of loans denominated in Swiss francs vis-à-vis loans denominated in euro and heightened risk awareness among households.

Despite this decline, the share of foreign currency loans in loans to households was just as high as before, presenting a material exchange rate risk. Owing to exchange rate developments, in the second half of 2007 households still noted slight revaluation gains of around 0.3% of total outstanding foreign currency loans. In the first quarter of 2008, the Swiss franc gained rather strongly against the euro, creating revaluation losses in the order of 5.6% of total lending, which thus surpassed total revaluation gains in 2007. These gains and losses were book gains and losses, however.

According to the OeNB's foreign currency loans statistics, no more than 15% of foreign currency loans in 2007 were instalment loans, 11% were bullet loans not linked to repayment vehicles and 75% were bullet loans linked to repayment vehicles. Owing to the high proportion of bullet loans, foreign currency loans are not only subject to exchange rate risks but also to valuation risks associated with the repayment vehicles, whose performance is impaired

by falling stock market prices. Since a large share of foreign currency loans have a residual maturity of more than 10 years, households' capacity to service loans will largely depend on financial market developments over the coming years.

Conclusion: Households' Risk Position Worsened

As a result of financial market developments, households' risk position deteriorated over the second half of 2007. On the asset side the price falls in the stock market led to revaluation losses on households' financial assets. Furthermore, they impaired the performance of stock-based saving instruments and repayment vehicles used to redeem bullet loans.

On the liabilities side, the effects of the financial market crisis were reflected in higher money market rates, which – owing to the high share of variable rate loans – pass through relatively quickly to consumer interest rates and consequently to interest expense. The favorable employment scenario in the labor market is not reflected in corresponding real income growth, and so has probably not improved households' capacity to meet their repayment obligations.

On the liabilities side there are still considerable exchange rate risks stemming from foreign currency loans, despite the decline in their share in total loans. In addition, since the majority of the foreign currency loans were issued in the form of bullet loans, the associated repayment vehicles are subject to significant valuation risks. These valuation risks remain in place even if the foreign currency loans are converted to euro loans.

Judging by financial market developments, households' risk exposure is likely to expand further over 2008.

Austrian Financial Intermediaries Perform Well despite Financial Market Turbulence

Banks' Activities in Central, Eastern and Southeastern Europe Remain an Asset

Sustained Solid Asset Growth

In 2007, Austrian banks' unconsolidated total assets continued to rise sharply. Fueled by the persistently dynamic external business, their total assets increased by around EUR 101.8 billion or almost 12.8% year on year to EUR 899.5 billion, thus topping the corresponding rate in 2006 (+9.9%). The share of the five largest Austrian banks[1] in the unconsolidated total assets continued to drop somewhat and amounted to almost 43% at the end of the year. On a consolidated basis, i.e. also including the data of subsidiaries in Central, Eastern and Southeastern Europe (CESEE), total assets augmented by 15.7% or EUR 145.5 billion to EUR 1,073 billion year on year at the end of 2007, with the share of the five largest Austrian banks[1] rising slightly to 62.5% owing to their strong external business operation.

Buoyant external business boosted external assets by EUR 57.5 billion or 19.6% to EUR 351.0 billion (on an unconsolidated basis) in 2007, which corresponded to a share of 39% of total assets at the end of 2007 compared to 36.8% in 2006. Over the same period, the share of external liabilities fell from 32.5% to 30.4%, which was partly attributable to the decline in foreign currency loans. On the asset side, the higher foreign share is mainly the result of growing claims on foreign nonbanks, which climbed by 28.4% year on year, while the claims on foreign banks augmented by 13.7%. The rise in external liabilities was primarily driven by an increase in liabilities to foreign nonbanks by 14.6%.

Domestic business growth was less pronounced in 2007. While in 2006 claims on domestic nonbanks had increased by close to 5%, they augmented by only 3.4% to EUR 287.5 billion up to the end of 2007. On the liability side, liabilities to domestic nonbanks rose by 11.7%, thus significantly stronger than in the same period of 2006 (+4.7%). Despite the fact that all deposit categories of domestic nonbanks recorded gains at the end of 2007, time deposits stood out with an increase by 51.0% year on year, as financial market uncertainty considerably raised the attractiveness of saving products. The growth of direct domestic issues to nonbanks was similarly outstanding: It went up by around 24% year on year compared to 15.4% in the same period a year earlier. Growth was almost equally fueled by the rising number of debt securities issued and other securitized liabilities.

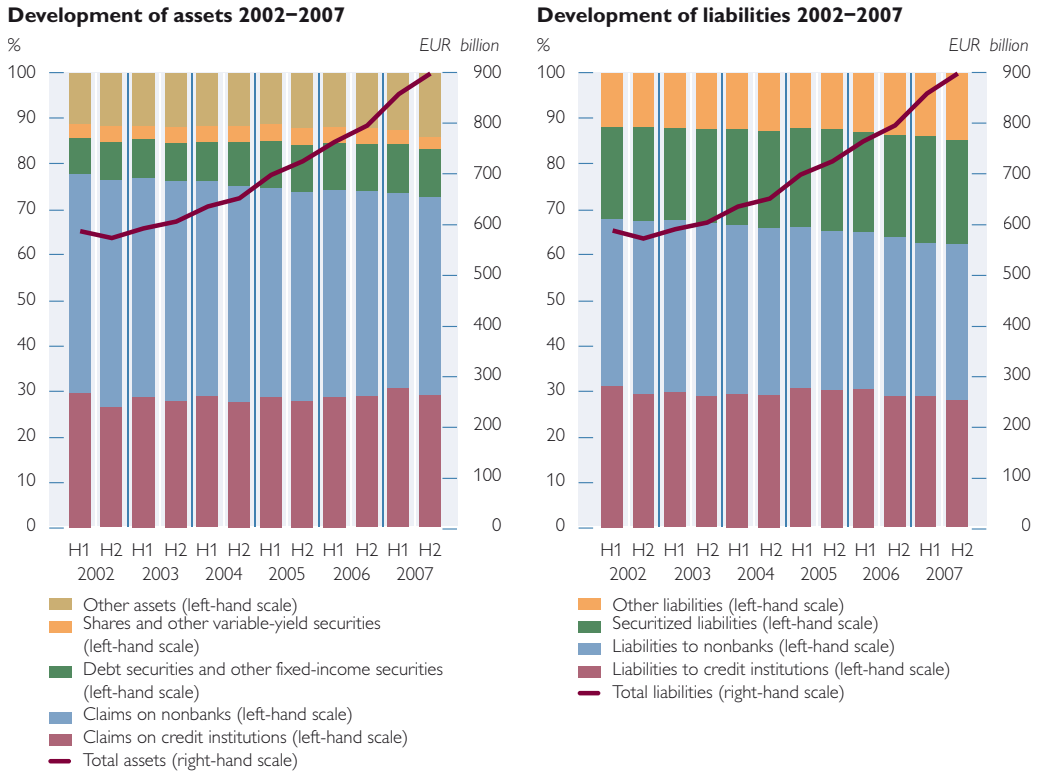
Special off balance sheet transactions (derivatives business) continued to rise visibly, namely by 23.8% year on year to around EUR 2,056 billion in December 2007,[2] which was basically 2.3 times the amount of total assets. Interest rate contracts (around 82%) as well as exchange rate and gold contracts (16.9%) accounted for the lion's share of these transactions.

[1] *Bank Austria AG (BA), Erste Bank der oesterreichischen Sparkassen AG (Erste Bank), Raiffeisen Zentralbank AG (RZB), Bank für Arbeit und Wirtschaft und Österreichische Postsparkasse AG (BAWAG P.S.K.) and Österreichische Volksbanken AG (ÖVAG).*

[2] *As the data are based on nominal values, it is not possible to make any statement about the riskiness. In addition, it has to be noted that this position is highly volatile.*

Chart 13

Balance Sheet Structure of the Austrian Banking Sector (unconsolidated)



Source: OeNB.

In 2007, the downward trend in the number of banking offices in Austria was interrupted, as their number went slightly up to 5,156 from 5,150 banking offices existing at the end of 2006.[3] Even though this was only a minor net increase, it was the first one since 1992. At the same time, staff numbers increased by around 2.6% to 68,221 employees. While in Austria one bank employee statistically serves 109 inhabitants, the average EU-25 ratio is 152 inhabitants per employee.[4]

External Business Remains Profit Generator

Although the developments in the international financial markets have not left Austria completely untouched, the Austrian banking sector continued to report solid profits in 2007 owing to its pronounced exposure to CESEE. Consolidated operating profits[5] went up by EUR 1.8 billion or 19.7% to EUR 11.1 billion in 2007 compared with EUR 9.2 billion in the same period of the previous year. Although the operating

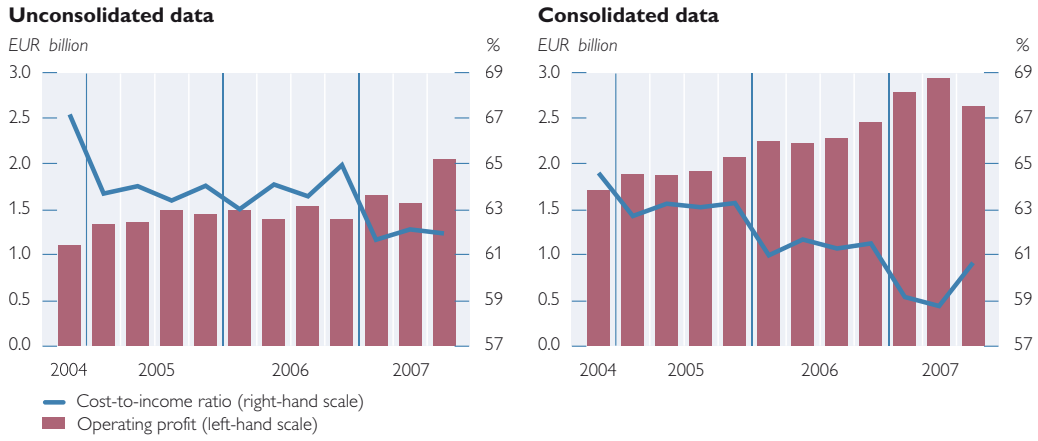
[3] *At the end of 2007, 5,156 banking offices including 870 head offices and 4,286 branches.*

[4] *Source: ECB report "EU Banking Structures," October 2007.*

[5] *As banks use different accounting standards, aggregated consolidated data may convey a slightly distorted picture.*

Chart 14

Comparison of Unconsolidated and Consolidated Operating Profit



Source: OeNB.

profit margin[6] was not much higher in 2007 at 1.03% than in 2006, the underlying increase in total assets had been very strong. Reflecting a further improvement in efficiency, banks' consolidated cost-to-income ratio came down from 61.5% at the end of 2006 to 60.7% in December 2007. Consolidated operating income went up by 17.1% – thus more markedly than consolidated operating costs (+15.5%).

Driven by credit expansion in CESEE, consolidated interest income advanced by EUR 3.1 billion or 20.7% to EUR 18.0 billion year on year in 2007, thus already making up about two-thirds of the total growth of consolidated operating income. Consolidated fee income, which rose by even 21.1% year on year, accounted for the remainder. International financial market turmoil reduced the consolidated trading income by almost one-quarter to about EUR 0.8 billion in 2007 compared to the previous year.

On the expenditure side, administrative expenses climbed by 17.6% against the previous year, thus outpacing staff cost growth (+16.4%). The consolidated end-of-period result decreased by EUR 0.6 billion or 7.8% to EUR 6.9 billion year on year. In December 2007, the consolidated return on assets (ROA) rose to 0.75%.[7]

Domestic Business Profits Have Also Grown Markedly

Despite financial market turmoil domestic profitability developed dynamically in 2007. Unconsolidated operating profit advanced strongly by around 14.5% or EUR 0.9 billion to almost EUR 6.7 billion year on year. Likewise, the unconsolidated cost-to-income ratio improved considerably from 65.0% at the end of 2006 to 62.0% at the end of 2007 as operating profits, driven by fee-based income and income from participating interests, grew markedly stronger year on year (+5,5%) than operating cost (+0.5%), which remained almost at the growth level of the previous year. Yet, financial market turmoil did also surface in Austria: Among oth-

[6] *Consolidated operating profits relative to consolidated total assets.*

[7] *In 2006, ROA amounted to 0.94%. One-time effects caused by restructuring within the UniCredit group are the reason for the upward distortion of this value. Adjusted for these effects, ROA comes down to 0.69%.*

ers, it had an impact on the net result of financial operations, which contracted by more than half to EUR 0.4 billion in December 2007 against the same period in 2006.

By end-2007, net interest income was up higher than in previous periods: It climbed by around 3.2% or EUR 0.23 billion to close to EUR 7.4 billion against the previous year. This rise is particularly remarkable given that the interest margin was at a historically low level of 0.95% in the last three quarters of 2007. Liquidity shortage in the money market caused by financial market turbulence in 2007 led to a general increase in interbank interest rates, which banks were at least partly able to pass on to their customers as clearly reflected by rising retail interest rates. Given higher refinancing costs, banks are now challenged not to narrow their interest margins any further. The share of net interest income in total operating income moved slightly downward again from 43.1% to 42.3% between 2006 and 2007.

Fee-based income developed favorably: In spite of a slightly weaker growth in the last two quarters of 2007, net fee-based income increased by 9.5% against the previous year. With its share in operating income climbing to 26.9% – this was an increase by 1 percentage point against the previous year – fee-based income remained a key driver of growth; it accounted for 45.7% of total growth in unconsolidated operating income. In the wake of volatile financial markets the conditions for generating fee-based income will, however, become more difficult in the future.

Income from equity shares and participating interests picked up by 22.3% against the same period a year earlier.

On the expenditure side, administrative expenses climbed above-average, namely by 5.3%, whereas the rise of staff costs (+0.3%) remained at almost the same level as in the previous year. The latter can mainly be explained by the release of pension fund reserves as wages and salaries augmented by around 5.6% against 2006.

Box 1

Financial Market Turmoil Has Had Little Impact on Austrian Banks

In the summer months of 2007, high default rates on U.S. subprime mortgages triggered strong turbulence on international financial markets which spread out in several waves. Initially, the disruptions were primarily limited to the market for structured products based on U.S. subprime mortgages; over time, however, rising uncertainty about individual banks' exposure to the resulting losses caused liquidity constraints in the money market. Upon publication of third-quarter operating results it became obvious that other segments of the structured credit market had also been strongly affected, which in turn led to further value adjustments and an increase in credit default swap (CDS) spreads. The next wave spilled mainly over to U.S. bond and credit insurers, whose top ratings were questioned given the high insurance commitments they had incurred for structured credit products. Finally, the turmoil also caused leverage to decline more strongly in large parts of the financial system, with negative effects on the liquidity in various markets. The situation relaxed somewhat once the takeover of a large U.S. investment bank initiated by the U.S. authorities had worked out and the accompanying monetary policy measures were in place.

So far, current financial turbulence has most heavily hit banks, particularly those in the U.S.A., Switzerland and Germany. The effects on the banks in these countries are primarily the result of their direct and indirect exposure to the U.S. subprime market, their refinancing patterns and their "originate and distribute"[1] strategy.

[1] *See footnote 2.*

Owing to their relatively little exposure to the U.S. subprime market, Austrian banks have remained largely unscathed. By and large, the effects translated into increased value adjustments for structured credit products, shrinking trading income and higher refinancing cost. In 2007, Austrian banks had to write off EUR 1.1 billion of their investments in structured credit products according to an OeNB survey. The fact that Austrian banks were comparatively little affected is mainly attributable to their "originate and hold"[2] strategy and to their focus on activities in CESEE.

Overall, turbulence of the past months revealed various vulnerable spots of the international financial system. In order to eliminate these vulnerabilities, the Financial Stability Forum (FSF), which is set up at the BIS, drafted on behalf of the G7 finance ministers recommendations aimed at enhancing the resilience of the global financial system. These include strengthening the liquidity and risk management as well as the prudential oversight of off balance-sheet activities, enhancing transparency and valuation, reforming credit rating process for structured products, rendering the implementation of the findings more effective as well as harmonizing crisis management cooperation internationally.

[2] *"Originate and hold" stands for a business model in which the bank granting a loan generally also holds it to maturity, whereas banks implementing "originate and distribute" strategies sell the loans to other market participants.*

In the event of continued strain on international financial markets, the profitability of Austrian banks might also be affected by the ensuing adverse effects despite their limited exposure to the U.S. market. Apart from the need for further value adjustments and declining dynamics in fee-based income, it is primarily the medium-term impact of financial turmoil on the real economies of Austria and CESEE which constitute a potential threat.

Stable Lending Despite Difficult Financial Market Conditions

In view of the current financial turmoil, the question arises to what extent it affects Austrian banks' lending activities. Up to now, the credit volume has hardly been touched. By end-2007, the total loan volume growth of Austrian banks reached 5.6%. A look at the economic sectors shows that lending[8] to businesses remained stable with an annual growth rate of 5% in December 2007, whereas the growth of loans to households[9] reached 5.6% and was clearly above the level of the previous year.

A long-term comparison shows that the loan volume of Austrian banks has somewhat declined since the beginning of 2006. This rather moderate decline may come as a surprise, given that Austrian banks have raised their retail interest rates for new loans in the wake of current financial market difficulties. Particularly housing loans became more expensive in the course of 2007 with interest rates for new business climbing by almost 1 percentage point from 4.28% in December 2006 to 5.27% in December 2007 (interest rates for consumer loans rose from 5.84% in December 2006 to 6.56% in December 2007). In 2007, businesses had to pay an interest rate of 5.5% for new loans of less than EUR 1 million (2006: 4.55%), and 5.1% for loans of more than EUR 1 million (2006: 4.24%).

[8] *The growth rate is calculated on the basis of data reported by credit institutions, which are required to report their asset positions according to annex A1a of the unconsolidated balance sheet statement (pursuant to article 1 paragraph 1 of the regulation on the Report of Condition and Income Regulation).*

[9] *In this context, the economic sector "households" also comprises "nonprofit institutions serving households (NPISH)".*

Following the increased sale of loans and the strong growth in new business at some banks, the credit volume development of Austria's largest banks varied considerably in the second half of 2007. It is therefore not possible to make out a uniform trend for the individual institutions of Austria's five largest banks; at an aggregated level their loan volume growth amounted to 5.3% at the end of the year. The median growth of the Austrian banks' outstanding loans totaled 4.1% in the same period.

A look at the development of the lending activities in the individual banking sectors shows that joint stock banks performed below-average in the second half of 2007, while at the same time state mortgage banks and Raiffeisen credit cooperatives posted above-average annual growth as the change in the loan volume amounted to 18.3% and 14.2% respectively in December 2007.

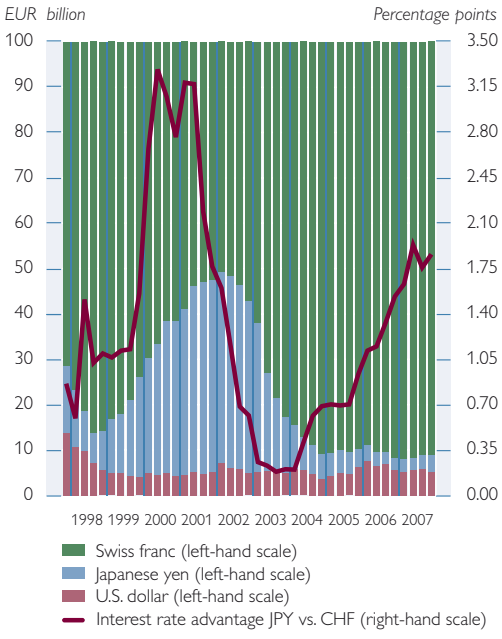
Dwindling Interest in Foreign Currency Loans

In 2007, the popularity of foreign currency loans continued to decline. Whereas at the end of 2006 around 18.7% of all claims on domestic nonbanks were still denominated in a foreign currency, this figure dropped to just 16.2% in December 2007 and the volume shrunk by around EUR 5.4 billion to close to EUR 46.7 billion. For the first time since 1996, the share of foreign currency loans in lending to nonfinancial corporations fell below 10% and amounted to 8.1% at the end of 2007. Similarly, the share of foreign currency loans to households came down to 27.5%, which also represents a pronounced decline compared with the historical peak of 31.5% in June 2006. Both developments point to borrowers' heightened risk awareness.

Contrasted with 2006, the currency composition of foreign currency loans remained almost unchanged. By end-2007, the Swiss franc (CHF) was still the dominant currency, even though its share of 90.8% in the previous year had dropped slightly to the current 88.7%. Around 5% of all foreign currency loans were denominated in U.S. dollar (USD), another 3.6% in Japanese yen (JPY). The first half of 2007 saw dynamic growth in loans denominated in Czech koruna (CZK) caused by currency speculations and low interest rates. But as this trend did not last throughout the second half of the year, only about EUR 0.9 billion or 2% of all loans to domestic nonbanks were denominated in Czech koruna at the end of 2007.

Chart 15

Foreign Currency Lending by Austrian Banks – Shares of Currencies



Source: OeNB, 3-month interbank interest rates (Bloomberg); included currencies: CHF, USD, JPY.

At the end of 2007, around 79% of all foreign currency loans to domestic households and nonfinancial corporations were bullet loans. Out of these, 77.8% were backed by repayment ve-

hicles. A distinction between household and nonfinancial corporations shows that households held a significantly higher share of foreign currency-denominated bullet loans, namely 85.0%, than nonfinancial corporations, whose share amounted to merely 60.0%. The difference was even more pronounced for loans involving repayment vehicles. Whereas 87.2% of all households backed their bullet loans by repayment vehicles, only 34.5% of the nonfinancial corporations did.[10]

Although the share of foreign currency loans in total lending has declined, exchange rate risks and performance risks of repayment vehicles remain particularly significant for households given that markets are still volatile.

Box 2

Reform of Financial Market Supervision in Austria

At the end of 2007, the Austrian parliament adopted a reform of financial market supervision, which went into effect on January 1, 2008. Under the new regime, the organizational concept of a "dual" supervisory system that comprises the Financial Market Authority (FMA) and the OeNB was maintained, but the latter's competences in banking supervision were broadened. The reform was designed to improve the allocation of competences and to strengthen the FMA's and OeNB's shared responsibility for overall financial market supervision.

The FMA has retained its status as an independent and autonomous integrated financial supervisor and remains the authority in charge of banking supervision. The OeNB has become responsible for all on-site inspections and all off-site analyses of banks. As a basis for on-site inspections, the FMA and the OeNB draw up an annual inspection program. In principle, the FMA continues to issue inspection mandates to the OeNB. However, the OeNB is entitled and obliged to request the FMA to extend ongoing inspections or initiate inspections not envisaged in the inspection program if necessary. The FMA must decide on such requests by the OeNB without delay, at the latest, however, within a week. Furthermore, the OeNB is entitled to conduct on-site inspections on its own initiative for "macroeconomic reasons."

As part of its responsibility for off-site analyses, the OeNB is obliged to make all analysis results and any relevant information available to the FMA and to inform the FMA without delay if there is a substantial change in the risk situation or if there is reason to suspect a breach of regulatory provisions. Moreover, the OeNB must carry out specific off-site examinations or provide further explanations of analysis results on the FMA's request. The OeNB also has to draw up expert opinions in approval procedures for all risk management models, has to conduct economic assessments of business models in the course of mergers/demergers[1] (consultation procedure) and has the right, jointly with the FMA, to propose the conclusion of memoranda of understanding by the Federal Minister of Finance.[2]

In addition to the reform, the OeNB's financial stability mandate was explicitly established in Article 44b of the Federal Act on the Oesterreichische Nationalbank (Nationalbank Act). Accordingly, the OeNB shall, in the public interest and based on extended data access rights, monitor all circumstances that may affect the maintenance of financial stability in Austria. These enhanced competences entail the obligation that the OeNB inform the Federal Ministry of Finance and the FMA of any findings of a principal nature or of particular importance to financial stability. Upon request, the OeNB must produce the necessary technical explanations, make documents available and deliver opinions.

[1] *In the course of licensing procedures, the OeNB had to be heard already before the reform.*

[2] *To guarantee the efficiency of the supervisory process, the FMA shall whenever possible draw on the OeNB's inspections, expert opinions and analyses as well as on the data available in the joint database the OeNB operates with a view to ensuring a common level of up-to-date information.*

[10] *Contrary to foreign currency loans, only 28% of all euro-denominated loans to domestic households and nonfinancial corporations were bullet loans in December 2007; out of these around 11.6% were backed by payment vehicles.*

Credit Quality: Banks Rate Customers' Creditworthiness Favorably

Specific loan loss provisions for claims on nonbanks recorded by resident banks in their unconsolidated balance sheets shrank by EUR 1 billion to EUR 9.6 billion over the course of 2007, while net claims on nonbanks increased by EUR 32 billion to EUR 392 billion.[11] Declining from 2.86% to 2.39%, the ratio of specific loan loss provisions to claims on nonbanks thus decreased more rapidly in 2007 than in the previous three years (end-2003 level: 3.31%). This reduction is due partly to external claims – the loan loss provision ratio for external claims shrank at a faster pace than that of domestic claims[12] and the share of external claims in total claims on nonbanks increased from 23% at end-2006 to 27% at end-2007 – and partly to developments at major banks: the five largest banks' aggregate loan loss provision ratio dropped by 0.87 percentage points to 1.93% in 2007, which contrasts with a mere –0.22 percentage points to 2.67% for all other banks combined.

Since loan loss provisions are reserves banks allocate to cover expected losses from lending, it follows from the above figures that banks' assessment of credit quality continues to improve. Today's historically low level of loan loss provisions could, however, become a problem for banks' profitability should the credit cycle take an adverse turn.

To ascertain whether in the past loan loss provisions built up in a given year correlated to the defaults observed in the subsequent year, chart 16 contrasts the annual change in Austrian businesses' actual average default rates[13] with the annual change in loan loss provision ratios.[14, 15] The linear relationship between the changes in default rates and in loan loss provision ratios inferable from the chart underscores the predictive power of loan loss provisions vis-à-vis expected losses.

The data series represented in chart 16 start in 1997; the default rate for 2008 was extrapolated from the first quarter. The sample thus comprises 11 data points. There could be several reasons why the relationship is not more pronounced: e.g. default figures only include a small share of households but households are fully accounted for in the loan loss provision ratios,[16] banks'

[11] *Data are sourced from the report of condition and income. Claims in this context are defined as loans and unlisted debt securities.*

[12] *The loan loss provision ratio for external claims sank by 0.67 percentage points to 1.13% in 2007, while that for domestic claims contracted by 0.32 percentage points to 2.84%.*

[13] *Based on data provided by Kreditschutzverband von 1870.*

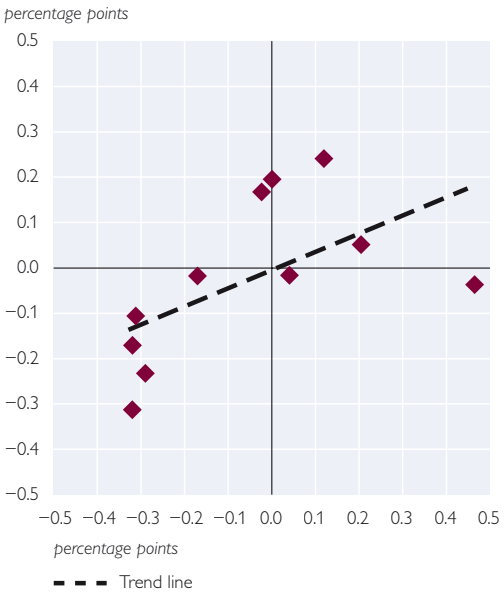
[14] *The loan loss provision ratios refer to year-end figures. Using annual changes rules out distortions that could arise from seasonal patterns in specific loan loss provisioning.*

[15] *Under accurate loan loss provisioning, a change in the loan loss provision ratio implies, under certain conditions, a proportionate change in the default probabilities estimated by banks and should thus, on average, also be reflected by a proportionate change in actual default rates. It is fair to assume that said conditions, i.e. constant estimation of loss given default (LGD) and a constant portfolio structure, are in reality not fulfilled completely but still to such an extent that the linear relationship between the changes in loan loss provision ratios and default probabilities is approximately valid.*

[16] *Specific loan loss provision data refer to overall claims on nonbanks and are not available for subaggregates, such as households.*

Chart 16

Annual Change in Average Default Rate and Loan Loss Provision Ratio for Domestic Claims on Nonbanks



Source: OeNB, Kreditschutzverband von 1870.

x-axis: Annual change in Austrian businesses' average default rate
y-axis: Annual change in loan loss provision ratio for domestic claims on nonbanks

estimates of LGDs are not constant over time or the portfolio structure changes over time.[17]

Significance of Market Risk Remains Low

Market risk continues to affect banks operating in Austria to a lesser extent than credit risk. The unconsolidated regulatory capital requirement for position risks[18] came to around 4% of total capital requirements (credit risk: 90%, operational risk: 6%) at end-January 2008, i.e. the first binding reporting date under the new Basel II framework. Capital requirements for the market risk inherent in interest rate instruments increased by over 30% in the first half of 2007, but grew at a slower pace in the second half. As a result, averaged out over 2007, the increment in this category came close to 50%, driving up the capital requirement to EUR 1,083 million. The capital requirement for equity positions more than doubled in the first six months of 2007 before contracting slightly again. Overall, this translated into an increase of some 80% to EUR 181 million in 2007.[19] By contrast, the capital requirement for open foreign exchange positions remained unchanged at about EUR 75 million throughout 2007.

Banks are also faced with market risk arising from interest rate risk in the banking book. In the absence of explicit regulatory capital requirements applicable to this risk category, the second pillar of Basel II nevertheless calls on banks to also pay heed to the interest rate risk in the banking book in ensuring capital adequacy. Under the supervisory reporting system, banks calculate the Basel ratio of interest rate risk, an indicator that relates potential losses arising from the interest rate risk in the banking book to unconsolidated eligible assets. Measured by this ratio, interest rate risk in the banking book[20]

[17] *The fact that a 1 percentage point change in the average default rate goes hand in hand with a change in the loan loss provision ratio of less than 1 percentage point (0.4 percentage points according to the trend line in chart 16), points to an LGD of below 100%.*

[18] *Position risks refer to the risk of value changes triggered by stock price and interest rate fluctuations in the case of positions in the trading book and of value changes arising from exchange rate and commodity price fluctuations in the case of all bank positions.*

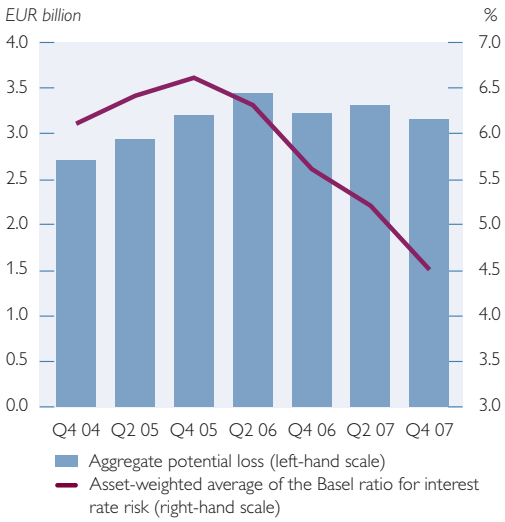
[19] *The increase in the capital requirements for both interest rate instruments and equity positions during the year 2007 may be traceable to the new reporting requirements, since mutual fund shares are possibly subsumed under the underlying risk categories.*

[20] *The loss potential is defined as the change in the present value of the banking book that would follow in the wake of a parallel yield curve shift of 200 basis points for all currencies.*

decreased noticeably in 2007, in a repeat of 2006. The asset-weighted average of the Basel ratio for interest rate risk of all banks diminished by more than 1 percentage point to a historical low of 4.5% in 2007. As is evident from chart 17, mounting eligible assets were driving this development because the aggregate potential loss resulting for the Austrian banking system from the assumed interest rate shock continues to be pegged at slightly more than EUR 3 billion.

Chart 17

Basel Ratio for Interest Rate Risk



Source: OeNB.

Austrian Banks' Liquidity Situation Remains Sound in the Face of Global Market Turbulence

Liquid claims (with maturities of up to three months) and liquid assets (e.g. government bonds) held by Austrian banks at year-end 2007 amounted to 110% of short-term liabilities (with maturities of up to three months). In other words, Austrian banks are in a position to absorb even an unexpected negative liquidity shock (such as a further tightening of refinancing conditions in the euro money market).

Analyzing the cumulative net funding gap produces a similar picture. The net funding gap is calculated based on data reported for the residual maturity statistics, where assets and liabilities are netted in three maturity bands (next banking day, up to one month, up to three months). Consideration is given to positions vis-à-vis both banks and nonbanks on both sides of the short-term balance sheet. The net positions are subsequently totaled over the three maturity bands. Austrian banks' cumulative net funding gap is inevitably negative, given the pivotal role of the banking system, namely maturity transformation. In 2007, this indicator rose slightly from 11.7% of total assets to 14.4% from the second quarter to year-end. Banks insure against liquidity risk that comes with a negative cumulative funding gap by holding liquid assets. As a matter of fact, the Austrian banking system's coverage of the cumulative net funding gap stood at a comparatively sound 127% at year-end 2007. However, euro money market developments have pushed up liquidity risk somewhat, considering that coverage had still stood at 162% in the second quarter 2007.

Austrian banks are highly resilient to liquidity shocks, as was again made evident by the results of stringent liquidity stress testing conducted under the IMF's FSAP update. The resilience is above all attributable to the very solid financing structure of Austrian banks by international standards, where customer deposits play a greater role than in other banking systems. In Austria, 46% of households' financial assets take the form of bank deposits, which is substantial in an international comparison. Amid the financial market turbulence, bank deposits became even more important for Austrian households. At EUR 11.6 billion, they accounted for the lion's share (62%) of the increase of financial assets in 2007. This took some of the edge off the tougher refinancing

conditions in the euro money market and curbed dependence on more volatile money market financing sources. The cumulative net funding gap vis-à-vis other banks is a mere 4.4% of total assets in Austria, and its coverage through liquid assets runs to some 420%.

Austrian banks must comply with the liquidity regulations laid down in Article 25 of the Austrian Banking Act. The liquidity ratio relates liquid assets to the corresponding liabilities. According to Article 25 of the Austrian Banking Act and the Fourth Liquidity Regulation of the Austrian Federal Minister of Finance, a minimum ratio of 2.5% applies to liquid resources of the first degree (cash ratio) and of 20% to liquid resources of the second degree (quick ratio).[21]

An analysis of individual bank data likewise attests to Austrian banks' solid liquidity situation. The average minimum level for aggregate first-degree liquidity (LI 1) came to about EUR 4.9 billion from January to March 2008, while the actual LI 1 level was 5.6 times higher at some EUR 27.1 billion. The average minimum value of aggregated liquid resources of the second degree (LI 2) amounted to EUR 52.4 billion during that period. At EUR 112 billion, the actual LI 2 level outperformed the target value by 2.1. In light of the conditions in the euro money market since August 2007, the OeNB has intensified the monitoring of Austrian banks' liquidity situation and its communication with market participants.

Upscaling from TARGET to TARGET2 – Another Important Milestone toward a Harmonized Market Infrastructure

TARGET, short for Trans-European Automated Real-time Gross settlement Express Transfer system, interlinked the national payment systems of the euro area central banks for the real-time processing of interbank payments. On November 19, 2007, it was succeeded by the second-generation system TARGET2, which runs on a single shared platform (SSP). The central banks of the euro area each operate their own TARGET2 component system; Austria's TARGET2-OeNB and the OeNB's Home Accounting Module HOAM.AT, the successor to ARTIS used exclusively to process domestic payment transactions, were included in the payment systems statistics in November 2007.

TARGET2-OeNB and HOAM.AT were the most significant payment systems in Austria in terms of the value of transactions processed (some EUR 6,857 billion) in the second half of 2007, which underlines their importance for the economy as a whole. The largest number of transactions (about 133.5 million) was again settled via direct debit payment systems (with Maestro/POS leading the charge). In the second half of 2007, retail payment systems supporting credit transfers registered a clear increase both in the number (+28.4%) and in the value (+33.9%) of transactions processed compared with the first half of the year, with this uptrend essentially attributable to one payment system. By contrast, in sync with overall financial market trends, securities settlement systems posted considerable declines in the number (–31.5%) and the value (–26.5%) of

[21] *Federal Law Gazette II No. 14/1999.*

transactions processed. International payment systems have been attracting a steady stream of Austrian banks as new participants. The large-value payment system EURO1 remained the most important international payment system for Austrian banks in terms of the value of transactions processed (around EUR 837 billion). In the same vein, the retail payment system STEP2 continued to process the largest number of transactions initiated by Austrian participants (about 8.9 million).

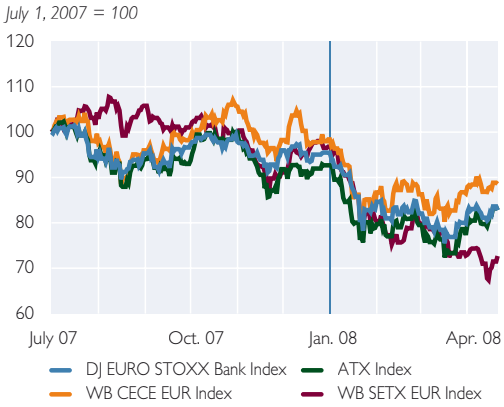
As to system security, the second half of 2007 saw a total of 17 system disruptions, which, however, exclusively affected relatively small infrastructure providers and had no repercussions for the Austrian financial system.

Central, Eastern and Southeastern Europe Continues to Gain in Importance[22]

The subprime crisis set in motion a global repricing of risk in financial markets.[23] From July 2007 to April 2008, (almost) all financial marketplaces, including the CESEE stock exchanges, suffered in part considerable losses. Comparing equity price developments in CESEE with those in Austria or in the whole of Europe reveals above all a marked difference between the performance of the leading indices in Central Europe[24] on the one hand and Southeastern Europe[25] on the other (see chart 18). Given the divergent macroeconomic developments,[26] banks are now attaching greater importance to country specifics when assessing the investment risk associated with a particular region.

Chart 18

Stock Price Developments on European Stock Exchanges



Source: OeNB, Bloomberg.

The consolidated CESEE business segment reports of the five major Austrian banks active in the region[27] bear testimony to another successful year. Not least due to UniCredit's restructuring of its CESEE business operations, aggregated total assets increased by 46.5% to around EUR 275.3 billion in the CESEE segment, reaching a share of no less than 25.7% at year-end 2007 (2006: 20.3%[28]) in Austrian banks' consolidated total assets. Pretax profit

[22] *Mainly on the basis of quarterly reports on condition and income submitted by Austrian banking groups since early 2002. These reports contain selected items from the consolidated financial statements of parent banks and their fully consolidated subsidiaries abroad. Additional sources, like annual reports or market research data, supplement the analysis where indicated.*

[23] *See also the section "General Repricing of Risk Affects Stock Prices of Major Austrian Banks" in this issue.*

[24] *The CECE EUR Index of Wiener Börse includes the Czech Republic, Hungary and Poland.*

[25] *The SETX EUR Index of Wiener Börse includes Bulgaria, Croatia, Romania and Slovenia.*

[26] *See also the box "Banking Sectors in Central, Eastern and Southeastern Europe: Generally Robust Credit Growth, Largely Stable Performance" in this issue.*

[27] *Bank Austria, Erste Bank, Hypo Alpe Adria International, ÖVAG and RZB.*

[28] *Then still including BAWAG P.S.K.*

climbed by merely 22.1% to EUR 4.0 billion, though, mainly as a result of one-off effects of the financial year 2006. When these effects are factored out, the share of the CESEE segment as at year-end 2007 edges up 3.9 percentage points to 42.6% in Austrian banks' consolidated pretax profit.

In total, 12 Austrian banks with 73 fully consolidated subsidiaries operated in this market as at December 31, 2007. 31 of these subsidiaries are situated in the new EU Member States that joined in 2004 (NMS-2004[29]), 7 in the EU Member States that joined in 2007 (NMS-2007[30]), 24 in other Southeastern European countries (SEE[31]) and 11 in the Commonwealth of Independent States (CIS),[32] where primarily acquisitions made by Bank Austria in Kazakhstan, Kyrgyzstan and Tajikistan broadened the geographical scope. Add to this the not fully consolidated joint venture run by Bank Austria in Turkey, which still does not qualify for consideration on account of reporting requirements. Even without this Turkish subsidiary, Austrian banks have already come to assume a share of some 15.3% of the entire CESEE banking market (see chart 19), which rises to about 22.7% when Russia is taken out of the equation.

A look at the data reported by the fully consolidated subsidiary banks in CESEE[33] shows an ongoing clear focus on the new EU Member States. With the share of aggregated total assets coming to 49.8% in the NMS-2004 and to 15.9% in the NMS-2007 at the end of 2007, more than EUR 150 billion have been generated within the EU (see chart 20); 18.9% (about EUR 43.9 billion) of total aggregate assets are in SEE countries and 15.4% (about EUR 35.7 billion) in CIS countries.

The aggregated total assets of all CESEE subsidiary banks thus mounted by about 46% on the previous year; yet again we have to bear in mind that growth rates were considerably distorted by UniCredit group's restructuring of its CESEE business operations, which was first reflected in the reporting data in 2007. This reorganization significantly exceeded the distortions normally associated with acquisitions.[34] Taking these effects into account confirms the recent observation that the greater the geographical distance to Austria, the faster the rate of growth of subsidiary banks.

[29] *NMS-2004: the Czech Republic (CZ), Hungary (HU), Latvia (LV), Poland (PL), Slovakia (SK) and Slovenia (SI).*

[30] *NMS-2007: Bulgaria (BG) and Romania (RO).*

[31] *SEE: Albania (AL), Bosnia and Herzegovina (BA), Croatia (HR), Montenegro (ME) and Serbia (RS).*

[32] *CIS: Belarus (BY), Kazakhstan (KZ), Kyrgyzstan (KG), Russia (RU), Tajikistan (TJ) and the Ukraine (UA).*

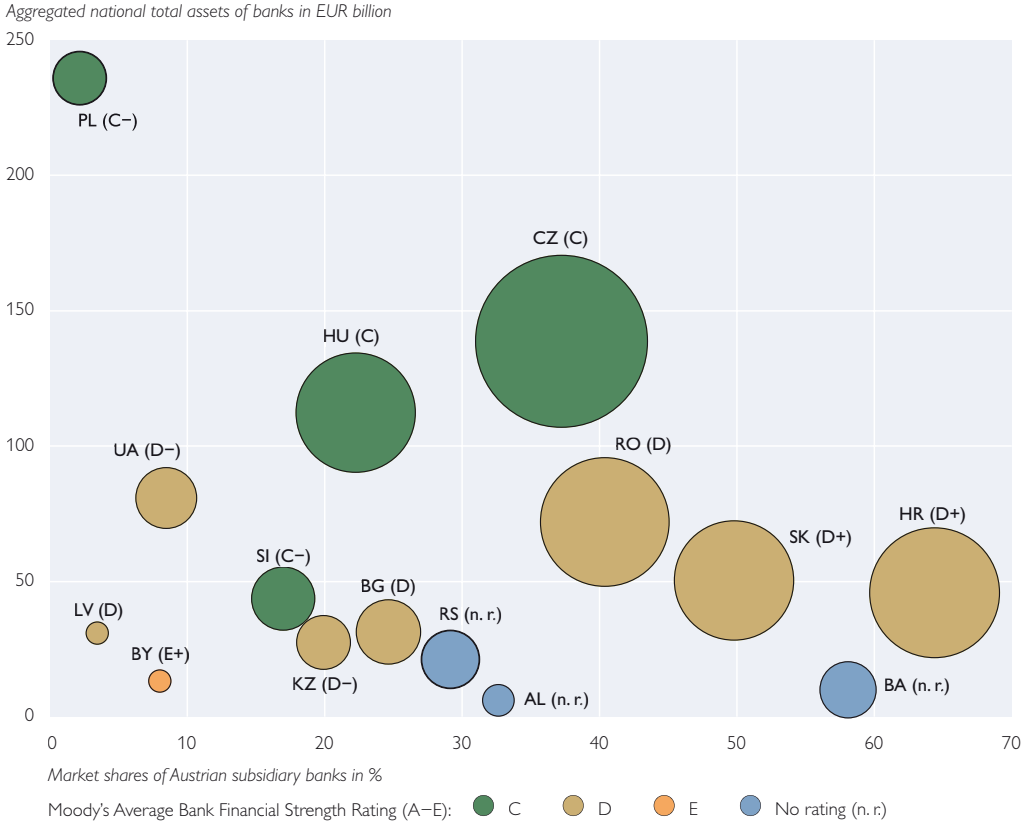
[33] *Based on data from the unconsolidated reports filed under the supervisory reporting system.*

[34] *See OeNB. Financial Stability Report 14, p. 51–55.*

Chart 19

Market Shares of Austrian Subsidiaries in CESEE

As at December 31, 2007



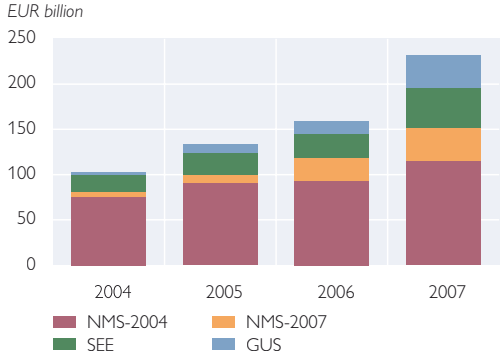
Source: OeNB, national central banks, Moody's.

Note: The chart shows the individual countries according to the Austrian subsidiaries' market share (x-axis) and the aggregated total assets of the national banking industry (y-axis). The size of the circle corresponds to the total exposure of Austrian banks to the respective country. The country color code corresponds to Moody's average Bank Financial Strength Rating (BFSR).
Because the Russian banking sector is so large (around EUR 583 billion as at year-end 2007), the chart does not show Russia, where Austrian subsidiaries held a market share of 3.8%. Apart from this, the chart shows all countries where Austrian subsidiaries record aggregated total assets of at least EUR 1 billion. Recent acquisitions in CIS countries (with the exception of Kazakhstan) and in Montenegro are thus not reflected.

Chart 20

Total Assets of Austrian Subsidiaries in CESEE

As at December 31, 2007



Source OeNB.

Even in a conservative interpretation of the data (for the reasons stated above), the aggregated operating profit of CESEE-based subsidiary banks shows a similar uptrend, having jumped by nearly two-thirds to around EUR 4.7 billion in 2007. As in the case of aggregated total assets, the subsidiaries established outside the EU grew at a more dynamic pace than their EU-based counterparts, which is why the share of the non-EU subsidiaries in the operating profit advanced by 5 percentage points, while that of the EU-based subsidiaries dropped just below two-thirds.

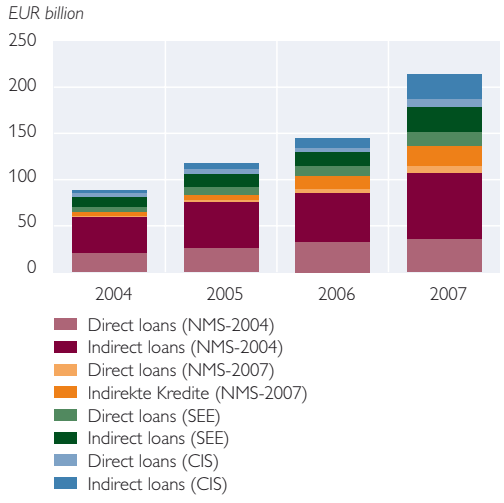
Moreover, the cost-to-income ratio[35] of fully consolidated subsidiary banks in CESEE improved by nearly 3 percentage points to 54.0% in December 2007 year on year.

Similarly, the credit exposure[36] of Austrian banks to CESEE reflects the dynamic growth and the prominent role of this region. Of the total lending volume of EUR 146.7 billion, EUR 93.3 billion are attributable to the new EU Member States (NMS-2004: 48.5%, NMS-2007: 15.1%), which corresponds to a growth rate of close to 40% (see chart 21). This contrasts with much faster growth evident both in the SEE countries, which in the meantime account for EUR 26.7 billion of the indirect lending volume, and in the CIS countries, where subsidiary banks have extended loans to the tune of EUR 26.6 billion. Both regions thus account for a share of some 18.2% each in Austrian subsidiaries' total lending in CESEE. Once again – especially with regard to CIS – the caveat applies that growth rates were driven by restructuring and acquisitions.

Chart 21

Credit Exposure to CESEE Countries

As at December 31, 2007



Source: OeNB.

The new EU Member States also play a dominant, if diminishing, role in subsidiary banks' direct loans[37] extended to CESEE.[38] Their share in the total lending volume of EUR 67.0 billion stands at almost two-thirds (see also chart 21). Unlike in the case of subsidiary banks, the growth rates for direct loans may be interpreted; these rates, however, took a path that differs substantially from that of indirect lending. While the growth rate of direct loans to the NMS-2004 dropped from 22.6% in 2006 to 11.6% in 2007, the respective growth rate recorded by the NMS-2007 nearly doubled to 65.5%. Thus, direct credit exposure to the NMS-2007 grew even more quickly than that to the SEE countries (to EUR 15.3 billion or +39.2%). Only direct lending to CIS countries advanced at a more dynamic pace (to EUR 8.5 billion or +78.0%). The divergent growth rates are, however, also partly due to different starting levels.

To quantify the risk associated with Austrian (subsidiary) banks' credit exposure to CESEE, the OeNB regularly conducts stress tests that capture the impact of a number of different shocks on the Austrian banking system. The FSAP update of late 2007 led to a further refining of the stress testing meth-

[35] *Ratio of administrative costs to operating income before deduction of net risk provisioning in the lending business.*

[36] *Loans extended locally by subsidiary banks in other countries.*

[37] *Loans granted by Austrian banks to borrowers resident in other countries.*

[38] *These data comprise more countries located in this region than those listed in footnotes 29 to 32.*

Table 8

Average Ratings of CESEE Banking Systems and Selected Subsidiaries

As at April 14, 2008

Country	Bank	LT deposit rating	BFS rating	Outlook
Bulgaria		Baa2	D	–
	Raiffeisenbank Bulgaria	Baa3	D+	stable
Kazakhstan		Ba1	D–	–
Croatia		A2	D+	–
	Zagrebacka Banka	Ba1	D+	stable
Latvia		Ba1	D	–
Poland		A1	C–	–
Romania		A3	D	–
	Banca Comerciala Romana	Baa3	D	stable
	Raiffeisen Bank	Baa3	D	stable
Russia		Baa2	D–	–
	ZAO Raiffeisenbank	Baa2	D+	under review
Slovakia		A1	D+	–
	Slovenska Sporitelna	A1	C–	stable
	Tatra Banka	A1	C–	stable
Slovenia		A1	C–	–
Czech Republic		Aa3	C	–
	Ceska Sporitelna	A1	C	stable
Turkey		A3	D+	–
	Yapi ve Kredi Bankasi	B1	D+	stable
Ukraine		Ba1	D–	–
	Raiffeisen Bank Aval	B2	D	under review
Hungary		Aa3	C	–
	Erste Bank Hungary	A2	D+	stable
Belarus		Ba1	E+	–

Source: Moody's Investors Service.

Note: LT: long-term, BFS: bank financial strength.

odology, in particular with respect to CESEE.[39]

The latest results of the standard stress tests[40] introduced in the Financial Stability Report 13 were still satisfactory. At year-end 2007, the capital adequacy results came in slightly higher than in the previous year in light of improved capital levels. One has to bear in mind that these sensitivity analyses exceed historical worst-case scenarios, since the nonperforming loan (NPL) ratios over the sum of all loans to nonbanks are extremely low given recent financial market developments. For this reason, the calculations are based on the higher losses caused by an absolute and a relative deterioration, the extent of which depends on the local risk assessment. In absolute terms, the shock

[39] *See also Boss, M., G. Fenz, G. Krenn, J. Pann, C. Puhr, T. Scheiber, S.W. Schmitz, M. Schneider and E. Ubl (2008), Stress Tests for the Austrian FSAP Update 2007: Methodology, Scenarios and Results, in this issue.*

[40] *See also Boss, M., G. Krenn, C. Puhr and M.S. Schwaiger (2007), Stress Testing the Exposure of Austrian Banks in Central and Eastern Europe, Financial Stability Report 13, p. 115–134.*

fluctuates around NPL ratios that worsened by 5 to 10 percentage points, while in relative terms, the ratios increased by 1.5 to 2 times.

In a worst-case scenario, the shock affects all countries of the region simultaneously; additionally, the revenues of Austrian banks, especially of those in CESEE, are not used to cover the losses. Against this backdrop, the decrease in the consolidated capital ratio recorded by the entire banking system at year-end 2007 from 12.0% to 10.6% (2006: from 11.6% to 10.5%[41]) may be well be viewed as positive. The major Austrian banks proved resilient to shocks also at the level of individual banks. Contrary to the previous year, all five major banks active in the region stayed above the mandatory capital ratio of 8%. In addition to internal analyses, external sources such as bank ratings provide qualitative information on the risk position of the respective banking markets in general and of Austrian subsidiaries in particular (see table 8).

The largely positive results of internal and external analyses notwithstanding, the higher profitability of these markets is inexorably linked with increased risk. In the presence of macroeconomic imbalances in some countries, the banks active there are faced with the risk of marked profitability losses in the event of sudden corrections. These banks must therefore pursue a dual approach: first, in the light of the region's dynamic credit growth, they must endeavor to prevent the accumulation of hidden credit risks and, second, they must continuously adjust their capital buffer in sync with this buoyant growth. At the same time, risks arising from the legal and institutional framework are partly offset by the fact that most Austrian (subsidiary) banks' CESEE activities are still focused largely on EU Member States. Besides, the long-term perspective for both the economy and the banking sector in this region is positive thanks to the ongoing catching-up process. In the face of prevailing imbalances, growth may nevertheless decline or even plummet in the short run despite the region's integration into the EU.

Box 3

Banking Sectors in Central, Eastern and Southeastern Europe: Generally Robust Credit Growth, Largely Stable Performance

In 2007, year-on-year growth in domestic lending to private nonbanks as a percentage of GDP was especially strong in Slovenia, Bulgaria and Romania. Compared with the other CESEE countries, these three countries also saw the most marked credit expansion in 2007 against that of 2006. In Bulgaria and Romania, this development reflected the lifting of various measures aimed at dampening credit growth at the start of 2007 and, in the case of Romania, the effect of the currency depreciation on the amount of total lending (calculated in national currency), which had a clear impact because of the substantial share of domestic credit denominated in a foreign currency. Croatia was the only country where credit expansion was slower in 2007 than in 2006.

[41] *These figures deviate slightly from those published in Financial Stability Report 13 because later updates of the risk assessment for individual countries were, for comparability, factored into the year-end 2006 calculations.*

Domestic Credit to Private Nonbanks

	2004	2005	2006	2007	2004	2005	2006	2007
	Year-end change, % of GDP				*Real rate of change at year-end, %*			
Bulgaria	11.9	10.7	9.3	25.7	43.2	23.4	17.5	45.7
Croatia	7.2	9.5	13.6	9.9	11.0	13.4	20.7	8.8
Poland	1.7	2.5	6.5	9.6	2.1	8.5	22.3	26.2
Romania	4.7	6.6	9.4	13.8	26.2	33.7	46.4	50.1
Slovakia	2.0	7.8	7.3	7.7	1.3	23.5	18.5	19.2
Slovenia	9.4	11.3	13.9	20.3	19.9	21.5	22.5	26.2
Czech Republic	3.7	6.4	7.3	10.5	10.6	19.2	20.1	21.8
Hungary	7.2	8.1	7.9	9.8	12.5	15.1	9.5	10.7

Source: Eurostat, national central banks, OeNB.

Note: The real rate of change is derived by HICP adjustment.

At end-2007, the foreign currency share in outstanding domestic lending to enterprises and households was highest in Croatia (including loans indexed to foreign currencies), Hungary, Romania and Bulgaria. Against end-2006, this share again decreased sizeably in Croatia and declined moderately in Poland, mainly because of measures implemented by their respective central banks. In contrast, it increased sharply in Hungary, Romania and Bulgaria, which was partly due to exchange rate developments in the first two countries.

Domestic Foreign Currency Loans to Private Nonbanks

	2003	2004	2005	2006	2007
	Year-end, % of total domestic loans to private nonbanks				
Bulgaria	43.6	48.2	47.3	45.1	50.0
Croatia	76.6	77.0	77.8	71.7	61.4
Poland	30.6	25.3	25.9	27.0	24.2
Romania	55.4	60.8	54.7	47.4	54.3
Slovakia	18.8	21.5	22.5	20.0	21.3
Slovenia	27.1	43.1	55.7	63.4	7.3
Czech Republic	12.8	11.2	10.0	10.4	9.1
Hungary	33.7	39.0	45.9	49.6	57.2

Source: National central banks, OeNB.

The foreign currency share in outstanding loans to households at end-2007 was especially high in Croatia, Hungary and Romania. Notably in Bulgaria, but also in Slovakia and the Czech Republic, the foreign currency share was considerably lower for loans to households than for loans to enterprises. One reason for the rising share of foreign currency loans recorded in Hungary and Romania was probably the relatively large yield gap against loans denominated in the national currencies. Some borrowers might also have been motivated by the appreciation of the Hungarian forint and the Romanian leu in the first half of 2007.

Domestic Foreign Currency Loans to Households

	2003	2004	2005	2006	2007
	Year-end, % of total domestic loans to households				
Bulgaria	8.9	11.0	15.4	19.0	20.0
Croatia	81.2	79.4	80.0	77.7	67.3
Poland	..	27.2	28.4	30.9	27.9
Romania	29.3	45.9	44.1	41.2	53.1
Slovakia	..	0.6	1.1	1.7	3.0
Slovenia	1.0	22.5	37.4	41.7	15.2
Czech Republic	0.5	0.3	0.3	0.2	0.2
Hungary	4.6	12.9	29.2	42.7	55.0

Source: National central banks, OeNB.

A high share of foreign currency lending constitutes a risk to financial stability, as unfavorably developing exchange rates together with increasing foreign interest rates could have a negative effect on borrowers' solvency, particularly since households and small and medium-sized enterprises (SMEs) might not be appropriately hedged against such risks.

The profitability of banks in CESEE in terms of return on equity (RoE) after tax was highest in Poland, Bulgaria and the Czech Republic and lowest in Romania and Croatia. The most pronounced change was seen in Poland, where the RoE declined, albeit at a high level, and in Hungary.

Nominal Return on Equity

	2003	2004	2005	2006	2007	H1 06	H1 07
	%						
Bulgaria	14.8	16.6	18.0	19.7	21.5	18.1	20.6
Croatia	14.5	16.1	15.6	12.4	11.1	14.7	12.0
Poland	5.5	17.4	24.0	27.2	22.0	28.0	27.6
Romania	17.7	17.7	15.1	11.6	11.5	14.2	12.5
Slovakia	10.5	12.3	13.4	17.6	14.8	16.4	16.6
Slovenia	11.9	12.5	12.7	15.1	..	..	..
Czech Republic	17.8	18.1	18.4	17.1	18.7	19.2	18.7
Hungary	17.2	22.5	21.7	21.4	16.6	23.1	21.3

Source: National central banks, OeNB.

Note: Based on profits after tax. Data are not comparable across countries.

At end-2007, banks' capital adequacy ratio ranged from 10.4% in Hungary to 15.4% in Croatia; it declined markedly in Romania against end-2006, probably reflecting rapid growth in corporate and retail lending.

Capital Adequacy Ratio[1]

	2003	2004	2005	2006	2007	H1 06	H1 07
	%						
Bulgaria	22.2	16.6	15.3	14.5	13.8	16.0	14.4
Croatia	16.2	15.3	13.4	14.0	15.4	12.9	15.0
Poland	13.8	15.4	14.5	13.2	12.4	14.1	12.5
Romania	21.1	20.6	21.1	18.1	12.7	17.8	15.0
Slovakia	21.7	19.0	14.8	13.0	12.4	14.3	13.5
Slovenia	11.5	11.8	10.5	11.1	..	..	..
Czech Republic	14.5	12.6	11.9	11.4	11.5	11.5	11.7
Hungary	12.3	12.8	12.0	11.5	10.4	10.8	11.6

Source: National central banks, OeNB.

[1] Ratio of regulatory capital to risk-weighted assets.

Note: Data are not comparable across countries.

The share of nonperforming loans in total loans at end-2007 was around 2% to 3% in most countries. Only in Poland and Romania were the shares significantly higher according to these countries' classification methods. Against end-2006, however, this share diminished in Poland in particular and also in the Czech Republic and in Slovakia, whereas it expanded sizeably in Romania. Remarkably, the share of nonperforming loans did not rise in Hungary despite slower economic growth. In countries with fast credit growth, however, there is a general risk that these shares give an overly positive impression of portfolio quality.

Nonperforming Claims

	2003	2004	2005	2006	2007	H1 06	H1 07
	(% of total claims)						
Bulgaria	4.2	3.6	2.8	2.2	2.0	2.7	2.2
Croatia	5.1	4.6	4.0	3.2	3.1	3.6	3.3
Poland[1]	21.2	14.7	11.0	7.3	5.2	9.4	6.3
Romania	8.3	8.1	8.3	7.9	9.7	8.4	7.9
Slovakia	9.1	7.0	3.7	3.3	2.5	3.7	3.1
Slovenia	6.5	5.5	4.8	4.2	..	..	..
Czech Republic	5.0	4.2	4.1	3.8	2.9	3.8	3.2
Hungary	2.7	2.7	2.5	2.5	2.4	2.4	2.5

Source: National central banks, OeNB.

[1] Poland: Data comprise both nonperforming and so-called irregular claims.

Note: Data are not comparable across countries.

Capital Ratio Remains Stable

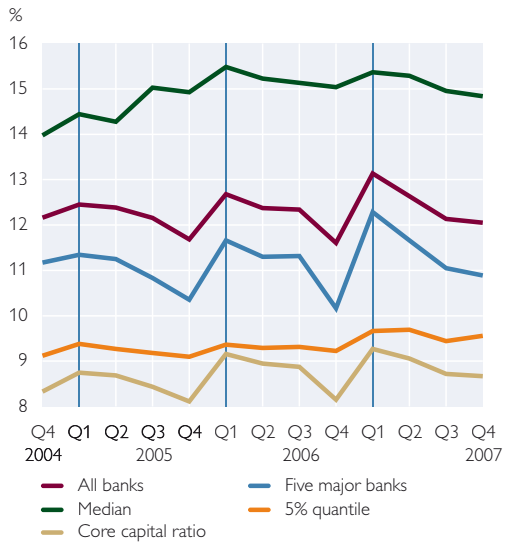
Banks' capital ratio, one of the key indicators for assessing their risk-bearing capacity, draws heightened public attention in times of financial turmoil. At the end of 2007, the consolidated capital ratio (i.e. the ratio of banks' capital to their risk-weighted assets – the assessment base)[42] of all Austrian banks came to 12.1% (see chart 22). Overall, Austrian banks' capital adequacy on a consolidated basis thus improved

[42] *As new capital requirement provisions became effective at the beginning of 2007, banks now directly report their capital requirement for credit risk pursuant to Article 22a to 22h of the Austrian Banking Act instead of providing information on risk-weighted assets. Based on the statutory 8% minimum capital adequacy ratio, risk-weighted assets and the assessment base can be calculated by multiplying the capital requirement for credit risk by the factor 12.5.*

slightly against the previous year (December 2006: 11.6%) and clearly exceeds the statutory 8% minimum capital adequacy ratio required by Basel II.[43]

Chart 22

Austrian Banks' Consolidated Capital Ratio



Source: OeNB.

The capital ratio of the five major Austrian banks is somewhat below the capital ratio reported for all banks. Averaging 10.9% in December 2007, it almost equaled that of major European banks[44] (10.97%).

The value for the 5% quantile, which represents the banks with comparatively low capital ratios, also developed favorably: Not only did it climb to 9.6% in December 2007 (against 9.2% in December 2006) but throughout 2007, in a longer-term comparison, it also exceeded the values recorded in earlier years. No Austrian bank reported a capital ratio that was below the statutory 8% threshold.

As for the core capital ratio, which relates tier 1 capital (core capital) to the assessment base, the consolidated total of all Austrian banks also reached satisfactory levels, coming to 8.7% in December 2007.

Accommodating their continued strong growth in CEE in their medium-term strategic capital planning remains a challenge for Austrian banks, however.

FSAP Stress Tests Confirm Austrian Banking Sectors' Good Resilience to Shocks

During the December 2007 update of the Austrian Financial Sector Assessment Program (FSAP), a number of different stress tests were carried out for the Austrian banking system. Aside from sensitivity analyses regarding market and liquidity risk as well as the indirect credit risk of foreign currency lending, two macroeconomic stress tests were performed over a three-year horizon. The underlying crisis scenarios assumed a regional macroeconomic shock in CESEE that generated spillover effects for the domestic economy on the one hand and a slowdown in global economic growth causing a prolonged recession in Austria on the other.[45] The results of these stress tests reconfirmed the Austrian banking sec-

[43] *From the introduction of the New Basel Capital Accord (Basel II) in Austria on January 1, 2007, to end-2007, Austrian banks had the option, according to Article 103e no. 16 of the Austrian Banking Act, to calculate their regulatory capital either according to the provisions of Basel I or according to those provided for under the Standardised Approach to Credit Risk (Article 22a Austrian Banking Act). As at end-2007, around 10% of Austrian banks reported their regulatory capital according to the standardized approach. Data on capital requirements according to Basel II for all Austrian banks will only be available in the course of 2008.*

[44] *ECB, Financial Stability Review, June 2008.*

[45] *For a detailed discussion, see the contribution "Stress Tests for the Austrian FSAP Update 2007: Methodology, Scenarios and Results" in the Special Topics section of this Financial Stability Report.*

Table 9

Results of the Standardized SRM Simulations Based on End-2007 Data

	Total risk		Credit risk		Market risk		Contagion risk	
	Mean	95% quantile	Mean	95% quantile	Mean	95% quantile	Mean	95% quantile
	%							
Baseline scenario: Simulation without crisis scenario	−1.8	0.9	−1.6	0.6	−0.1	1.1	−0.0	−0.0
Doubling of domestic default probabilities	−0.1	2.6	0.1	2.4	−0.2	1.1	−0.0	−0.0
Increase of euro interest rates by 120 basis points	−0.4	2.1	−1.6	0.6	1.2	2.0	0.0	0.0

Source: OeNB.

Note: The figures represent the mean and the 95% quantile of the loss distribution corresponding to the respective risk category over the first quarter of 2008 relative to eligible capital. Provisions for claims on domestic and foreign nonbanks and foreign banks were deducted from credit risk loss; provisions for claims on domestic banks were deducted from the loss from contagion risk in the Austrian interbank market (which corresponds to credit risk vis-à-vis domestic banks). Accordingly, provisions for all claims were deducted from the loss from total risk.

tor's good resilience to shocks that had already been established during previous stress tests.

Table 9 shows the results for the aggregate Austrian banking system derived from the standardized Systemic Risk Monitor (SRM)[46] simulations of the baseline scenario and of two crisis scenarios, based on end-2007 data. It displays the mean values adjusted for credit risk provisioning and the related 95% quantiles of the loss distributions for the first quarter of 2008 relative to eligible capital. For credit risk, contagion risk in the interbank market and total risk, a negative value means that the related provisions banks have created are higher than the expected losses.[47] For market risk, no risk provisions were taken into consideration; a negative value corresponds to an expected profit for the first quarter of 2008.

In the baseline scenario the means of the loss distributions for total risk and credit risk are sufficiently covered by existing provisions. For total risk, the 95% quantile, i.e. the amount of loss with a 95% probability of not being exceeded, stood at 0.9% of eligible capital. With regard to market risk, for the first quarter of 2008 an average profit of 0.1% of eligible capital is expected. As for contagion risk in the interbank market, losses in the mean and the 95% quantile are not to be expected – neither under the baseline scenario nor under the stress scenarios. A doubling of domestic default probabilities results in expected credit risk losses exceeding the corresponding risk provisions by 0.1% of eligible capital. With a view to total risk, however, expected market risk gains still fully cover expected credit risk losses. At the same time, however, the 95% quantile goes up to 2.6% of regulatory capital. A rise in euro interest rates by 120 basis points has noticeable effects on market risk, with the average loss coming to 1.2%

[46] *For details on the methodology underlying the SRM, see Boss, M., G. Krenn, C. Puhr and M. Summer (2006), Systemic Risk Monitor: A Model for Systemic Risk Analysis and Stress Testing of Banking Systems, Financial Stability Report 11, OeNB, p. 83–95.*

[47] *See note to table 9.*

Table 10

Ratings of Selected Austrian Banks

As at April 14, 2008

	Deposit rating		Bank Financial Strength Rating	
	Long-term	Outlook		Outlook
Bank Austria	Aa2	stable	C+	stable
BAWAG P.S.K.	Baa1	stable	D	stable
Erste Bank	Aa3	stable	C	stable
Hypo Alpe-Adria	A2	positive	D–	positive
Hypo Tirol	Aa1	stable	C	stable
Investkredit	A1	stable	C	stable
Kommunalkredit	Aa2	stable	B–	stable
Oesterreichische Kontrollbank	Aaa	stable	..	..
ÖVAG	Aa3	stable	C	stable
RZB	Aa2	stable	C	stable
Raiffeisenlandesbank Oberösterreich	Aa3	stable	C	stable
Vorarlberger Landes- und Hypothekenbank AG	Aa1	stable	C	stable

Source: Moody's Investors Service.

of capital. But looking at total risk, losses are not expected to exceed risk provisions even under this scenario.

Since 2003, the OeNB has been carrying out stress tests to assess the indirect credit risk of foreign currency loans. These stress tests have now been improved on the basis of the additional information on foreign currency loans that has been available from foreign currency loans statistics since early 2007. An important additional risk factor for many foreign currency loans is the performance risk related to the funding plan (life insurance, equity fund, etc.) used to repay the respective loan at the end of its maturity. Around 79% of Austrian foreign currency loans are bullet loans, 77.8% of which are combined with a corresponding repayment vehicle. To allow for the preponderance of these loans, the chosen stress scenario assumes a 15% deterioration in the performance of the repayment vehicle for all bullet loans[48] on top of a 10% appreciation of the Swiss franc.[49] On an aggregate level and excluding any existing risk provisions, this scenario resulted in a loss amounting to 3.7% of eligible capital. In a semi-annual comparison, the respective risk thus abated slightly by 0.8 percentage points.

Ratings of Austrian Banks Remain Stable

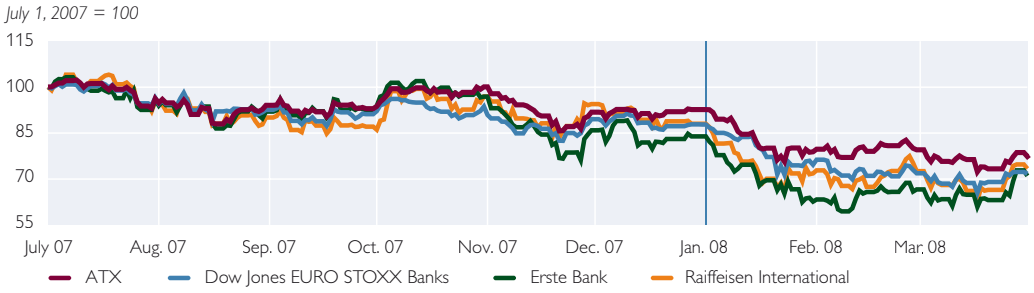
Aside from supervisory reporting data, various market indicators such as stock price developments and ratings serve to assess financial stability. Moody's long-term deposit rating and bank financial strength rating (BFSR) are examples of such market indicators. Neither has changed substantially for Austrian banks over the first few months of 2008.

[48] *Bullet loans without repayment vehicle can be expected to be subject to an implicit repayment vehicle risk related to the performance of the capital earmarked for loan repayment.*

[49] *As loans denominated in Japanese yen have become less and less important over the past few years (with only 3.6% of all foreign currency loans being denominated in Japanese yen at the end of 2007), the respective results will not be reported here.*

Chart 23

Stock Price Developments – Austrian Banks and European Bank Indices



Source: OeNB, Bloomberg.

The introduction of the Joint Default Analysis methodology by Moody's in early 2007 led to changes in ratings for almost all Austrian banks;[50] any subsequent changes have been minor. After Cerberus took over BAWAG P.S.K., for example, BAWAG P.S.K.'s rating for long-term liabilities was lowered from A3 to Baa1, while its BFSR was upgraded from E+ to D. Moreover, the rating outlook for Hypo Alpe-Adria-Bank International AG was changed from stable to positive in May 2007 on news about its takeover by Bayerische Landesbank.[51] In addition, recent analyses by Moody's of end-March 2008 confirmed the stable rating outlook for Erste Bank and RZB.

General Repricing of Risk Affects Stock Prices of Major Austrian Banks

The uncertainties in the financial sector triggered by the U.S. subprime crisis of July 2007, have put banks' stock prices under pressure around the world. High uncertainty regarding banks' subprime exposure as well as frequent reports on subprime-related losses at some banks caused a general slump in stock prices, which seriously impaired market confidence. The two major Austrian banks that are listed on the stock exchange[52] also felt the impact of these developments, although their subprime exposure is relatively low. The subprime crisis, however, sparked a wave of risk repricing on the international financial markets during which the spreads on *credit default swaps (CDS)* increased sharply in almost all CESEE countries.[53] Similar observations were made for the CDS spreads of the two listed Austrian banks. Owing to the negative correlation between stock prices and CDS spreads, implications for Austrian banks' stock prices have begun to materialize: In particular since mid-October 2007, relatively pronounced price corrections have occurred, and the downward trend in stock prices continued until March 2008.[54]

In total, Austrian bank shares have been developing roughly in line with the Dow Jones EURO STOXX Banks index, although the reasons behind these price developments (exposure to

[50] *See Financial Stability Report 13 of June 2007.*

[51] *See Financial Stability Report 14 of December 2007.*

[52] *Erste Bank and Raiffeisen International.*

[53] *CDS spreads mirror market participants' assessment of country risk.*

[54] *In January 2008, a general stock market crisis additionally supported this trend.*

CESEE countries vs. subprime exposure) must be weighted differently for Austrian banks and for large international banks.[55]

The implied volatilities of Erste Bank's at-the-money call options surged by around 70% from mid-November 2007 to end-February 2008, while Raiffeisen International, the ATX and the Dow Jones EURO STOXX Banks index recorded markedly weaker increases.

Box 4

Favorable IMF Assessment of Austrian Financial Market

The regular review of the Austrian financial market under the Financial Sector Assessment Program (FSAP), which the International Monetary Fund (IMF) applies to member countries around the globe, took place at the end of 2007. This exercise was an update of the initial assessment program the IMF had carried out in Austria in 2003; based on an analysis of strengths and weaknesses, it mainly serves to illustrate the priorities to be set for the further development of the financial system.

The IMF's preliminary FSAP results signal a positive assessment of the Austrian financial system; these findings were confirmed, in general, by the IMF's annual Article IV consultation of March 2008, which also covered current developments. In particular, the IMF pointed to the continued further strengthening of the Austrian financial system and acknowledged its shock resilience – two factors that were also confirmed by the complex stress tests that had been performed. Given their sound holdings of deposits and their "originate and hold" strategy, Austrian banks had felt relatively little impact from the recent financial turmoil. Moreover, the IMF stated that Austria had been agile in seizing the opportunities resulting from the opening-up of CESEE markets, which are now paying off in terms of earnings and an improved risk diversification. At the same time, however, the IMF pointed out that the risks resulting from transactions on CESEE markets required close observation and that not least for this reason, the international cooperation of supervisory authorities should be further promoted.

While the IMF recognized further improvements in the regulatory and supervisory framework, which had already conformed to a high standard, it pointed out that, nevertheless, there was still room for improvement in some areas such as the further strengthening of corporate governance principles. Moreover, the IMF considered it necessary that Austria limit its extensive public liability provisions, clearly define the responsibilities of external auditors and further promote their independence. In general, the IMF also demanded higher staffing levels in supervision, the further extension of on-site inspections of financial institutions and the performance of cross-border simulation exercises and intensive stress tests also with insurance companies and pension funds. As the last few years have seen the implementation of extremely complex new regulatory provisions and a reform of financial market supervision, the IMF also deemed appropriate a longer period of consolidation of the supervisory and regulatory framework.

The final results of the FSAP have been available since June 2008.

[55] *Other reasons for stock price losses despite favorable business data might be the clouded economic outlook for the next few years, the above-mentioned uncertainty in the banking sector and the general pessimism prevailing at the stock exchanges.*

Outlook for Other Financial Intermediaries Clouds Over Slightly

Insurance Companies Report Subdued Business Activities

The Impact of the Global Financial Market Turmoil on Austria Appears Manageable

Against the backdrop of a favorable real economic and financial environment, European insurance companies continued on their relatively positive course throughout 2007. Despite claims events induced by natural disasters in some parts of Europe, the overall profitability of the insurance sector went up, which was attributable, in part, to favorable investment results in the first half of 2007. Further improvements in the capital structure combined with higher profitability have increased the overall risk-bearing capacity of the European insurance sector. Given the changes in the perception of risk as well as the higher uncertainty on financial markets it cannot be ruled out, however, that lower investment results affect insurance companies' profitability even though an increasingly risk-adequate pricing of risks assumed and favorable developments with regard to loss events should have a cushioning effect.

On the whole, the Austrian insurance sector also performed well during 2007. Insurance premium income advanced by 1.9%[56] to EUR 15.9 billion year on year. At a rate of 0.4%, growth in the life insurance segment was weaker than in the health insurance and the property/casualty insurance sectors (3.2% and 3.1%, respectively). Compensating the decrease in one-off payments and pension insurance contributions, booming unit-linked life insurance plans (+25%) and subsidized personal pension schemes (+17%) played a substantial role in sustaining demand in the life insurance sector. This development shows that investment risk is increasingly passed on to insurance holders. Winter storms at the beginning of the year, floods in early summer and maturing life insurance policies impacted insurance companies' claim payments in 2007. Claim payments by property/casualty insurance companies climbed by 1.3% to EUR 4.8 billion against the previous year. The Austrian Association of Insurance Companies expects premium growth in the life insurance segment to continue to lag the health and property/casualty segments in 2008. In the first few months of 2008, claims events reflected winter storms; moreover, investment results tended to be less favorable. The sale of an insurance company that was part of a large banking group intensified the concentration in the Austrian insurance market, while it reduced the potential for intragroup contagion effects between the group's insurance and banking branches. Austrian insurance companies continued to expand their CESEE activities and, in general, significantly improved their business performance and profitability.

In 2007, Austrian insurance companies' total assets[57] grew by EUR 5.1 billion to EUR 88 billion; at 6.2% in June 2007, the annual growth rate was below the comparable figure for 2006 (8%). The increase in assets can be attributed to a large extent to *foreign debt securities* (EUR 1.9 billion or +9.3%), other external assets (EUR 1.8 billion or +54.4%) as well as *domestic equity securities and other domestic securities* (EUR 0.9 billion or +3.8%). Accord-

[56] *Press release by the Austrian Association of Insurance Companies of February 21, 2008.*

[57] *Excluding reinsurance business; based on quarterly reports (OeNB insurance statistics).*

ing to the Austrian Financial Market Authority (FMA), asset-backed securities accounted for 2.6% of Austrian insurance companies' overall investment portfolio; some 99 % of these asset-backed securities have an investment grade rating.

Market indicators for both the European and the Austrian insurance sectors reflect higher uncertainty, which is attributable to the financial turmoil on the one hand and to potentially weaker income dynamics on the other. Since the publication of their 2007 annual accounts, which showed that risk provisions for U.S. subprime securities were lower than expected, insurance company's shares have outperformed bank shares. At end-May 2008, the rating outlook for the large Austrian insurers was stable and positive, respectively. The stock prices of insurance companies listed on the prime market segment of Wiener Börse AG went down slightly between October 2007 and May 2008.

Threats to the profitability and stability of the insurance sector do not only originate from shocks in the financial markets (i.a. losses in the market value of structured products) and the higher frequency of major claims events, but also from the underestimation of longevity risk, the continued low performance of the investment portfolio of life insurance companies that hold a high share of policies with a guaranteed minimum yield and from inadequate risk pricing in the face of increasing competition.

Risk of Contagion Remains Low

Year on year, the total exposure of Austrian insurance companies to domestic banks went up slightly by 2.1% to EUR 11.5 billion (13% of total assets) in December 2007, with *debt securities issued by domestic banks* accounting for the lion's share (EUR 8.6 billion) along with cash in hand and deposits other than overnight deposits with domestic credit institutions (EUR 2.3 billion). Insurance companies' investments with domestic credit institutions thus decreased to slightly more than 1% of Austrian banks' consolidated total assets. Owing to the positive business and profit performance and the moderate level of exposure, the risk of contagion between the banking and insurance sectors is still low.

Financial Market Turmoil Decelerates Mutual Fund Growth

The European mutual funds market continued to expand in 2007, although growth dynamics have clearly moderated since the onset of the financial market turbulence in August 2007. Assets under management by European mutual funds[58] went up by 4.9% to EUR 7,925 billion in 2007. The net outflows recorded in the third and fourth quarters of 2007 were basically attributable to investors' reduced risk appetite, which had the strongest effect on bond and equity funds; both segments recorded net outflows for 2007 as a whole. In this environment, funds with a typically more defensive investment strategy (e.g. balanced funds and money market funds) were able to attract investor capital. Against the backdrop of higher financial stability risks in Europe and investors' reduced risk appetite, the outlook for the European mutual funds sector is uncertain.

[58] *Here, mutual funds comprise undertakings for collective investment in transferable securities (UCITS) and non-UCITS.*

Outflows of Austrian Mutual Funds Causes Decline in Assets under Management

Overall developments in the Austrian mutual funds sector were weak in 2007. Assets under management by Austrian mutual funds (including fund-of-fund investments) decreased by 1.9% to EUR 165.6 billion. While valuation gains easily compensated outflows in the first half of 2007, reduced valuation gains, a higher profit distribution and a clear rise in outflows in the second half caused assets under management to shrink for the first time since the introduction of the OeNB's mutual fund statistics in 1998. Combined with investors' reduced risk appetite, higher interest on bank deposits and the increasing popularity of structured products might have contributed to this moderate development. In 2007, mutual funds tended to reduce their holdings of debt securities, foreign stocks and equity securities and to expand their holdings of mutual fund shares as well as their real estate and tangible assets positions. Domestic stocks and equity securities continued to account for 2.3% of assets under management. The capital-weighted average total performance of all Austrian mutual funds in 2007 was 1.9% (against 4.4% in 2006). At 0.95%, fixed income funds showed the comparably weakest performance, while real estate funds' performance went up by 4.6%.

The high volatility and adverse financial market developments in the first quarter of 2008 continued to create an unfavorable environment for Austrian mutual funds. According to the FMA, four of the about 7,900 (domestic and foreign) mutual funds registered for operation in Austria are still subject to a temporary suspension. One of these four funds had been set up by an Austrian investment company. The suspended redemption of shares is connected to the drying up of parts of the credit market.

The business and profit performance of Austrian investment companies, which are largely owned by Austrian banks, continued to be positive in 2007, with operating profits rising by a significant 29%. The risk investment companies pose for Austrian banks is limited, however, and consists mainly of a possible future worsening of their profitability.

Claims on Severance Funds Continue to Rise

In the fourth quarter of 2007, nine severance funds were licensed to manage severance claims in Austria. In 2007, the vested rights to future severance payments climbed from EUR 1.1 billion to EUR 1.6 billion (+43.4%). Eligible capital, by comparison, went up by 9.8% from EUR 22.3 million to EUR 24.5 million and thus exceeds capital requirements calculated at EUR 4 million.

At end-2007, the number of employers that had signed severance fund agreements came to 375,036.[59] Compared to the previous year (345,914 agreements), the number of agreements climbed by 8.4%. The three largest providers have been able to secure their market position; as measured by the number of agreements with employers, they hold a market share of 75% (2006: 75%). In 2007, severance fund agreements established around 5.8 million vesting periods for 2.4 million people, corresponding to a rise by 28.8% and 14.3%, respectively, against the previous year. The number of vesting periods not assigned to any of the severance

[59] *Source: Main Association of Austrian Social Security Institutions.*

funds went up from 54,508 in 2006 to 102,411 in 2007. Severance funds' nominal performance averaged 2% in 2007 after deduction of asset management costs (0.45% to 0.7% of investment groups' assets) – a figure that remained below the 2.2% HICP inflation rate recorded in 2007.[60] The performance of individual severance funds ranged from 0.14% to 3.1% in 2007. From 2004 to 2007, according to severance funds' data, the average nominal performance was 4% per annum, with average inflation coming to 2% per annum over the same period.[61] The cumulated performance of the individual severance funds for the period from 2003 to 2007 ranges between 16.6% and 28.6% in nominal terms.[62] For a better assessment of investment returns, it would be desirable that severance funds publish performance benchmarks for investment groups in advance. This might help render the market more transparent.

Since the new severance pay scheme was introduced, the share of investment returns in investment groups' assets has climbed from –0.1% to 4.4%. At end-2007, the majority of these assets (95.6%) still consisted of contribution payments (minus severance payments made). This situation not only reflects the lackluster investment performance, however, but also the fact that prospective beneficiaries must bear the costs associated with the product; these costs are independent of the funds' investment performance. In relation to investment returns, total costs (administrative costs, asset management costs, deposit costs, transfer costs) accounted for around 40% of investment returns from 2004 to 2006. In 2007, beneficiaries received benefit payments of EUR 66 million (2006: EUR 23 million).[63] The fact that returns have remained below the legislator's expectations (6% per annum in nominal terms) may be attributed to the structure of the new severance pay scheme (capital guarantee and entitlement to severance pay after three years of contributions under certain circumstances; administrative, asset management and deposit costs).

[60] *Source: Severance funds platform; OeNB.*

[61] *The annual returns data published by the severance funds platform date back to 2004. Relevant calculations do not consider investment income tax, as severance funds are exempt from investment income tax. Return on investment (ROI) must be differentiated from return on contributions. While ROI is calculated on the basis of invested capital, the return on contributions takes administrative costs into account and is calculated on the basis of contributions (without prior deduction of administrative costs). Severance funds do not publish their return on contributions, which is typically lower than the ROI.*

[62] *Source: Severance funds.*

[63] *Source: Severance funds platform.*

Special Topics

Stress Tests for the Austrian FSAP Update 2007: Methodology, Scenarios and Results

Michael Boss, Gerhard Fenz, Gerald Krenn, Johannes Pann, Claus Puhr, Thomas Scheiber, Stefan W. Schmitz, Martin Schneider and Eva Ubl[1]

This paper presents the methodology, scenarios and results of the stress tests conducted for the update of Austria's Financial Sector Assessment Program (FSAP) in 2007. The focus of the paper lies in particular on the following two macroeconomic stress scenarios: (a) a regional shock in Central, Eastern and Southeastern Europe hitting Austrian banks through their large exposure in the region, and (b) a global downturn in economic activity causing a deterioration of Austrian banks' domestic loan portfolios, whereby in the second scenario, contagion risk within the Austrian interbank market was also taken into account. Stress test calculations were performed by the OeNB for all Austrian banks (top-down approach) as well as by the six largest Austrian banking groups for their respective exposure (bottom-up approach). The paper describes the methodologies for scenario construction and the stress tests themselves and then discusses the scenarios as well as the stress test results in detail, including a comparison of the two approaches. Finally, the paper presents the results of additional sensitivity stress tests for credit risk emanating from foreign currency lending, for the most important categories of market risk and for liquidity risk. Overall, the update of Austria's FSAP 2007 confirmed the results of previous stress testing exercises, in particular for the large Austrian banking groups that show considerable shock resistance mainly as a result of their generally sound capital buffers and high profitability.

JEL classification: G10, G21, F23
Keywords: Financial stability, stress testing, FSAP

Introduction

The recent turmoil triggered by tensions in the U.S. subprime mortgage market is only the latest instance of financial markets disruptions of the past decades that revealed vulnerabilities of the global financial system and the threat financial crises can pose to the real economy. In 1999, the International Monetary Fund (IMF) initiated the Financial Sector Assessment Program (FSAP) in response to another crisis, the Asian crisis, seeking i.a. "to identify the strengths and vulnerabilities of a country's financial system."[2] Stress testing is a key instrument in achieving this goal and therefore forms an integral part of each FSAP.[3] Austria underwent an assessment under the program in November 2003 (FSAP 2003), followed by an update in November 2007 (FSAP 2007). This paper describes the methodologies, scenarios and aggregate results of the stress tests conducted for the Austrian banking system in the course of the FSAP 2007.[4]

The FSAP 2007 represents the most recent effort of the OeNB in advancing its stress testing capabilities, which have been under development since the late 1990s. The first projects were developed in the context of market risk[5] and were followed by credit risk models allowing for simple macroeconomic stress tests.[6] The FSAP 2003 not only

[1] *The authors would like to thank the two referees and the Austrian Financial Market Authority, in particular Jürgen Bauer, for their valuable input. Special thanks go to Alexander Tieman and the other IMF mission team members for the professional support before, during and after the FSAP mission.*

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[2] *For further details on FSAPs see: www.imf.org/external/np/fsap/fsap.asp.*

[3] *See Blaschke et al. (2001) for an early and Čihák (2007) for a recent overview of FSAP stress tests.*

[4] *See Boss et al. (2004) for a description of the stress tests developed for the FSAP 2003.*

[5] *See OeNB (1999) and Krenn (2001) for early examples.*

[6] *See Kalirai and Scheicher (2002) and Boss (2002).*

gave a fresh impetus to the OeNB's stress testing operations, but also helped institutionally integrate such tests, which led i.a. to the semiannual publication of stress testing results in the OeNB's Financial Stability Report. In 2006, the project "Systemic Risk Monitor" (SRM), a software tool to quantitatively assess the main components of systemic risk in the Austrian banking system,[7] was successfully rolled out and has since been used for quarterly reassessments of financial stability. Given the significant exposure of Austrian banks to Central, Eastern and Southeastern Europe (CESEE), a separate stress testing tool was implemented to assess associated credit risk.[8]

For the FSAP 2007, most of the OeNB's stress testing tools were further refined. As in the case of the FSAP 2003, macroeconomic forecast models were used to develop macroeconomic stress scenarios over a three-year horizon. Substantial progress could be achieved with model integration. This refers in particular to the stress testing tool for the CESEE credit exposure of Austrian banks, to the model linking macroeconomic variables to domestic probabilities of default (PDs), and to the adaption of existing stress testing tools to simulate the impact of the stress scenario over a three-year horizon. In contrast to the FSAP 2003, when all stress tests were calculated in a top-down (TD) manner, i.e. centrally by the OeNB on the basis of reported data, the 2007 stress tests also actively incorporated the six largest Austrian banks. In this bottom-up (BU) approach, banks ran calculations for given stress scenarios based on their internal risk management systems, and the results were in turn collected and evaluated by the OeNB.

The remainder of this paper is structured as follows: section 1 gives a brief overview of the scope of the FSAP 2007 stress tests including risk categories, the part of the banking system covered, and the database used. Sections 2 to 4 cover the macro stress tests, i.e. their methodology, the two scenarios and the results for the BU and the TD approaches. Section 5 describes sensitivity analyses for foreign currency lending for the most important categories of market risk and for liquidity risk. Finally, section 6 provides the main conclusions of the FSAP 2007, including directions and challenges for future stress test research at the OeNB.

1 Scope

1.1 Risk Categories

The following risk categories were taken into account in the FSAP 2007 stress tests: (a) credit risk, including its main components, namely domestic credit risk, credit risk stemming from Austrian banks' CESEE exposure and the credit risk of foreign currency loans triggered by foreign exchange rate fluctuations; (b) market risk, covering interest rate risk, foreign exchange rate risk, equity price risk and volatility risk; (c) contagion risk within the Austrian interbank market, and (d) liquidity risk.

Two different methodological approaches were applied: (a) macro stress tests that take into account various risk factors simultaneously and base the scenario construction on macroeconomic modeling, and (b) sensitivity analyses, which look at the effects of changes in one single risk factor or a limited set of

[7] *A detailed description of the SRM including some results can be found in Boss et al. (2006a). For an overview see Boss et al. (2006b). The scientific foundation is given in Elsinger et al. (2006).*

[8] *See Boss et al. (2007).*

risk factors while all other risk factors are assumed to be constant. As credit risk constitutes the main source of risk in the Austrian banking sector, with credit risk in the CESEE region and domestic credit risk being its most important components, these risk categories were specially addressed through macro stress tests. By contrast, the credit risk of foreign currency loans, the most important categories of market risks and liquidity risk were incorporated in sensitivity analyses.

1.2 Banking System

1.2.1 Bottom-Up Exercise

In line with common practice of FSAP reviews in other developed countries, the IMF proposed to apply the TD as well as the BU approach for the FSAP 2007 in Austria. Accordingly, the OeNB asked the six largest – in terms of total assets – Austrian banking groups to run stress tests as well. The sample consisted of: Bank Austria, BAWAG P.S.K., Erste Bank, Raiffeisen Zentralbank Österreich, Österreichische Volksbank, and Hypo Group Alpe Adria. These groups were chosen as they represent not only the systemically most important Austrian banking groups but also the ones most active in CESEE.

1.2.2 Top-Down Exercise

All stress tests calculated by individual banks under the BU approach were also performed under the TD approach. Furthermore, the OeNB performed a number of complementary TD stress tests. All of these tests were calculated for all individual banks at the group level, i.e. the whole FSAP 2007 stress testing exercise was based on consolidated data. Additionally, results were accumulated for the entire banking system (702 banking groups and/or banks) and aggregates by size and by banking sectors: The subgroups by size were: (a) big banks: the six largest banks as specified above; (b) large banks: 22 banks with total assets above EUR 2 billion, excluding the big six; (c) medium-sized banks: 39 banks with total assets above EUR 500 million but below EUR 2 billion; and (d) small banks: 635 banks with total assets below EUR 500 million. The subgroups by sectors were: (a) 34 joint stock banks, (b) 8 savings banks, (c) 5 state mortgage banks, (d) 561 Raiffeisen credit cooperatives, (e) 64 Volksbank credit cooperatives, and (f) 30 special purpose banks.[9]

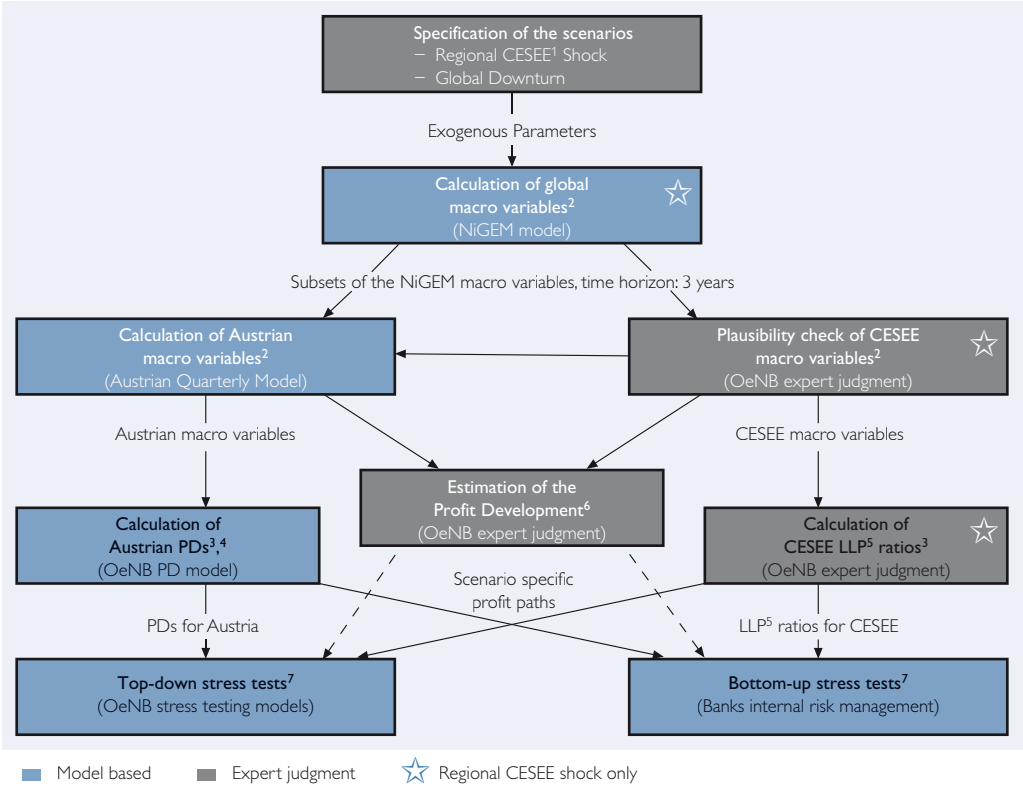
1.3 Data Set

In order to ensure comparability and timeliness of results, the latest reporting data available to the OeNB served as a reference for the FSAP 2007. Hence, data of June 30, 2007 were used under the BU as well as the TD approaches for both the macro stress tests and the sensitivity analyses. TD stress tests were based on banks' regular reports to the OeNB, including the Austrian Central Credit Register. In addition, the OeNB used quarterly default frequencies obtained from the Austrian creditor association Kreditschutzverband von 1870. Data on macroeconomic, market and credit risk factors were taken from the OeNB's macroeconomic database or provided by Bloomberg's financial data services and national central banks. The individual banks were asked to base their stress test calculations on internal

[9] *The definition of these sectors follows the formal sectoral breakdown of the Austrian banking system, with the exception of construction savings and loans banks, which were included in the sector of special purpose banks for the stress testing exercise.*

Chart 1

Components of the FSAP 2007 Macro Stress Tests



Source: OeNB.

[1] *CESEE: Central, Eastern and South-Eastern Europe.*
[2] *Models for the economic environment, see section 2.1.*
[3] *Methods that link the economic environment to credit risk, see section 2.2.*
[4] *PD: Probability of Default.*
[5] *LLP: Loan Loss Provision.*
[6] *Treatment of profits, see section 2.4.*
[7] *Stress testing models, see section 2.3.*

credit risk measures and portfolio positions as at the reference date.

2 Macro Stress Test Methodology

Two forward-looking macroeconomic scenarios were constructed according to the guidelines provided by the IMF corresponding to the main sources of risk in the Austrian banking system: (a) a shock in CESEE that assessed the credit risk exposure of Austrian banks to the region and (b) a shock to the Austrian economy that assessed their domestic credit risk. In order to come up with these scenarios a suite of internal and external models had to be aligned at OeNB. Chart 1 shows the individual steps and corresponding models that were necessary to construct the FSAP-2007 macro stress tests, which are discussed individually throughout the remainder of this chapter.

2.1 Models for the Economic Environment

After the specification of the scenarios, the next step was the construction of the global economic environment. For the first scenario, the "Regional CESEE Shock" scenario, this was implemented

with the global economic model NiGEM.[10] In order to reduce macroeconomic modeling complexity, only Austria and four country aggregates were considered: New EU Member States 2004 (NMS-04), New EU Member States 2007 (NMS-07), Southeastern Europe (SEE), and the Commonwealth of Independent States (CIS).[11] For the second scenario, the "Global Downturn" scenario, the benign global economic environment of the last few years led to scenarios that would not have qualified as a severe shock, hence undermining the purpose of a stress testing exercise. Consequently, OeNB agreed with the IMF to reject NiGEM output and opted for ad-hoc assumptions regarding the global economic environment of the Global Downturn scenario. This is well justified from a risk assessment perspective, but limits the scenario's economic interpretability. In both scenarios, variables and/or assumptions entered the Austrian Quarterly Model, a small to medium-sized macroeconomic model in the tradition of the neoclassical synthesis in line with most models used by Eurosystem central banks.[12] Macroeconomic shocks were assumed to occur at the beginning of the third quarter of 2007. Foreign as well as domestic macroeconomic variables were simulated over a three-year horizon until the second quarter of 2010 on a quarter-by-quarter basis.

2.2 Methods that Link the Economic Environment to Credit Risk

Some measure of credit risk had to be linked to macroeconomic variables to assess the impact of the scenarios on the banking system. This was a straightforward task for the Austrian exposures in both scenarios, as the OeNB has developed a credit risk model that links changes of domestic PDs in different corporate sectors to changes in macroeconomic variables. For CESEE, however, reliable data on PDs is generally not available. Therefore, some expert judgment had to be applied.

2.2.1 Estimation of CESEE Credit Risk

In general, reliable PD time series were not available for the CESEE region. In the limited cases where at least some data exist, time series either encompass several structural breaks in the local economy or are too short to estimate sound econometric models. Therefore, measuring the impact of the Regional CESEE Shock scenario on banks' credit risk was based on loan loss provision (LLP) ratios[13] instead of PDs. Although there are certainly limitations to the use of LLP ratios (e.g. income smoothing), the same applies to potential alternatives, like the nonperforming loan (NPL) ratio (e.g. different legal definitions across countries). Another reason for the use of LLP ratios was the fact that when the FSAP 2007 was conducted, they were the only credit risk

[10] *NiGEM (version v3.07d) is an estimated, theoretically coherent forward-looking model from the National Institute of Economic and Social Research, U.K. For a description of NiGEM, see www.niesr.ac.uk. For an application to simulate a financial crisis, see e.g. Barrell and Holland (2007).*

[11] *NMS-04: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia.*
NMS-07: Bulgaria and Romania.
SEE: Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia.
CIS: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.
It should be noted that not all regions could be fully reflected in NiGEM.

[12] *For a model description, see Schneider and Leibrecht (2006).*

[13] *In the entire paper, LLP and NPL ratios refer to total loans to corporates and households.*

measure for Austrian banks' foreign subsidiaries reported to the OeNB.[14]

But even using LLP ratios as a credit risk measure, the translation of the Regional CESEE Shock scenario had to draw upon expert judgment instead of econometric modeling. Based on the argument by Barisitz (2006) about the asynchronous, but comparable development stages of CESEE banking systems during their post-communist transformation, first estimates of the credit quality under the scenario were based on a single cross-country data set, starting in the mid- to late 1990s. The set contained NPL ratios and LLP ratios as well as GDP growth rates; various univariate regression models were estimated for each of these aggregates. To account for the weak economic foundation of this linear relationship between credit risk and GDP growth across countries for different development stages of economies and banking systems in the region and for diverse LLP levels at the reference date, further expert judgment had to be applied to come up with estimates of the regional credit quality deterioration.

2.2.2 Calculation of Domestic Credit Risk

By contrast to the procedure applied to calculate foreign credit risk econometric modeling was used throughout to assess the impact of both macro stress scenarios on credit risk of Austrian banks with respect to domestic customers. Using an update of the estimation method and model selection procedure presented in Boss (2002),[15] models for 11 sectors of the Austrian economy[16] were developed to assess the dependencies of average sectoral PDs on the macroeconomic environment. Historically observed default frequencies – interpreted as PDs – for each corporate sector were calculated by dividing the number of insolvencies by the number of total firms[17] per quarter in each sector. The resulting quarterly time series of sectoral PDs start in 1969 and cover several business cycles. To account for seasonality, moving averages over four quarters were used for the dependent as well as the independent variables. Starting with a set of 27 macroeconomic variables, the model selection procedure was applied in order to find an optimal model for each sector, optimal meaning that the models had high explanatory power, reasonable overall statistical properties and that all estimates were statistically significant as well as economically meaningful. However, for five sectors[18] no reasonable model could be found and hence a model based on the aggregated PD of the Austrian economy was applied. The remaining seven models contained two to four macrovariables from the following set: GDP, industrial production, the unemployment rate, gross fixed capital formation equipment, the oil price, and the three-month real interest rate. Adjusted R squares of the models varied between 10% and 27%, which is rather low compared to other empirical evidence. This, however, can mainly be explained by the high variance in the quarterly time series, as similar models based on

[14] *This will change with the new reporting regulation, which had not been introduced until January 2008.*

[15] *A publication of the update is planned for 2008.*

[16] *The sectors were defined as: basic industries (including agriculture), construction, energy, financial services, households, production, services, tourism, trading, transport, and others.*

[17] *The underlying data were provided by the Kreditschutzverband von 1870.*

[18] *These sectors were: basic industries, energy, financial services, private households, and others.*

annual data typically show adjusted R squares above 50%.

2.3 Stress Testing Models

For the sake of consistency and comparability, all participating banks, including the OeNB, used the OeNB's estimates of credit risk measures for both scenarios. Under the BU approach, banks were provided with time series of percentage increases of credit quality deterioration over the three-year horizon relative to the reference date June 2007[19] and were asked to use their internal stress testing models to assess the impact of the scenarios. Under the TD approach, the absolute levels entered the respective OeNB stress testing tools. The aim of both approaches was mainly the calculation of additional expected losses under stress based on exposures at the reference date. Losses were calculated for every single credit institution, and aggregation was carried out by simply adding losses, regulatory capital and risk-weighted assets across banking groups and subsequently calculating the stressed capital adequacy ratio (CAR). As all balance sheet positions were assumed to remain constant over the entire time horizon (with the exception of capital), some additional assumptions – in particular regarding profits[20] – had to be made. It should be noted that under the TD approach in the case of uncertainty, worst case assumptions for an estimate of the upper bound of losses were made.

2.3.1 Methodology for the Regional CESEE Shock

Additional expected losses were calculated for all domestic nonbank loans as well as for all nonbank exposures to CESEE countries, given the credit quality deterioration of the Regional CESEE Shock scenario on a quarter-by-quarter basis. Under the TD approach, these exposures included unsecuritized as well as securitized domestic lending based on the OeNB's Central Credit Register.[21] CESEE exposures accounted for unsecuritized as well as securitized lending that was either granted as a cross-border loan by an Austrian bank to a debtor domiciled in the CESEE region[22] or by an Austrian parent institution's CESEE subsidiary.[23,24] Under the BU approach, banks were asked to do the same; however, due to resource constraints, they could not comply in all cases. Consequently, a bank's loss implied by the Regional CESEE Shock scenario consisted of three components: the losses from domestic exposure and the losses from direct and indirect CESEE exposures. Under the TD approach, quarterly additional domestic credit risk losses were calculated sector by sector based on the PDs estimated with the Austrian credit risk model. To calculate the additional

[19] *Banks were actually provided with percentage increases for annual PDs in such a way that they resulted in additional quarterly PDs to facilitate the calculation of additional expected losses per quarter. The same was done with LLP ratios, assuming that LLPs are made for one year. By providing relative measures, the OeNB assured consistent scenarios across participating banks while at the same time accommodating for their diverse portfolio composition and/or asset quality.*

[20] *See section 2.4.*

[21] *The Central Credit Register contains information on all exposures above a reporting threshold per bank and borrower of EUR 350,000. OeNB monthly balance sheet reports were used as a complementary data source to account for loans falling below this threshold.*

[22] *These exposures are referred to as "direct exposures" in this study.*

[23] *Referred to as "indirect exposures".*

[24] *For a detailed description of the data sources for direct and indirect CESEE exposures, see Boss et al. (2007).*

losses stemming from direct CESEE exposures, these exposures and the associated LLPs reported in the Central Credit Register were aggregated by country. The resulting LLP ratios were increased on a country-by-country and quarter-by-quarter basis in accordance with the Regional CESEE Shock scenario. The implied additional LLPs were summed across all CESEE countries, yielding the scenario's quarterly loss. For additional losses due to indirect CESEE exposures, LLP ratios from Austrian banks' regional subsidiaries' supervisory reports were increased. The resulting additional LLPs were weighted by the respective parent institution's share in the subsidiary. The sum of weighted additional LLPs across all CESEE subsidiaries gave the quarterly loss for the parent institution. For all three components, this procedure implies a loss given default (LGD) ratio of 100%.[25] As participating banks used their internal risk management systems under the BU approach, most were able to calculate additional losses for domestic and foreign exposure based on PDs, some even on a creditor-by-creditor basis, not all though, again because of resource constraints. Banks, however, were free to choose their preferred credit risk measure as well as their LGD assumptions.

2.3.2 Methodology for the Global Downturn

Under the BU approach, banks were provided with percentage increases of domestic PDs sector by sector on a quarterly basis over the entire three-year horizon relative to June 2007. Banks used this input to calculate additional expected losses under the Global Downturn scenario based on their internal risk management systems in line with the methodology described above. Under the TD approach, the methodology was based on the SRM model, an integrated model to assess credit, market, and interbank contagion risk of the Austrian banking system. The SRM uses a Monte Carlo simulation to estimate the loss distributions of these three risk categories for each individual Austrian bank over a horizon of one quarter.[26] In each step of the Monte Carlo simulation, quarterly changes in market and macroeconomic risk factors are drawn from their joint distribution[27] to calculate banks' losses – or gains in the case of market risk – assuming that the portfolio is not changed over this horizon. For credit risk, CreditRisk+[28] is modified to employ PDs based on individual customer ratings reported to the Central Credit Register adjusted according to the relative increase of the sectoral PDs defined by the scenario as described in section 2.2.2. The outstanding volume is calculated as all credit risk-sensitive instruments including credit lines reported to the Central Credit Register minus collateral at the individual customer level. This corresponds to the assumption that LGDs equal one minus collateral over outstanding volume. For loans below the reporting threshold of the Central Credit Register, the PD of the aggregate economy was used.

[25] *As shown in subsection 4.1.2, this was the single most severe assumption separating TD from BU results for the Regional CESEE Shock scenario.*

[26] *The horizon was chosen in order to integrate credit and market risk without making additional assumptions about banks' reactions to changes in market risk. See Boss et al. (2006a).*

[27] *The SRM uses a grouped t-copula. See Boss et al. (2006a).*

[28] *See Credit Suisse (1997).*

As the Global Downturn scenario was constructed for a three-year time horizon, some changes to the original approach were necessary so that the SRM could be used for multiperiod stress testing. First, market risk was not considered in the calculations, as this would have necessitated additional assumptions regarding banks' reactions to changes in the economic environment, in particular market risk factors. Second, to reduce simulation time, macroeconomic risk factors were not simulated; instead, PDs were shocked directly according to the impact of the scenario on the domestic PDs described above. Third, to assess contagion risk within the Austrian interbank market[29] in a multiperiod environment, the interbank market was cleared after each period. If a bank defaulted in some period, its interbank exposure was ignored in subsequent quarters to avoid double counting of contagion effects. As a default criterion, a CAR below a 4% threshold was assumed.[30] However, to ensure comparability, contagion risk was not taken into account in the comparison of the TD and BU results.

2.4 Treatment of Profits

Profits are banks' first line of defense against unforeseen losses. Therefore, they had to be considered in the multiperiod stress testing exercise. A path of declining profits before additional credit risk losses relative to the reference date was constructed for each scenario. These two paths were based on an analysis of the regional components of earnings and expenses of the six participating banks at the reference date and the changes in macroeconomic variables implied by the scenarios, again under the assumption of constant balance sheets. Historical crises (e.g. the Asian crisis of the late 1990s) and experiences from other FSAPs were used as references. As in the case of credit quality, the six participating banks were provided with an identical path of relative quarterly profit declines for each scenario under the BU approach. The same profit paths were applied under the TD approach. As the scenario covered 12 observation periods, another assumption about banks' behavior had to be made: Whenever a bank remained profitable in a certain quarter, it had to distribute its gains to its shareholders immediately.[31] In case losses exceeded profits, banks had to reduce their (regulatory) capital[32] by additional losses exceeding profits.

3 Macro Stress Test Scenarios

3.1 The Regional CESEE Shock Scenario

3.1.1 Macroeconomic Specification of the Regional CESEE Shock Scenario

The large and highly profitable business of the Austrian banking sector in CESEE places particular relevance on a scenario in which a shock in the region feeds through to the Austrian economy. Austrian banks are affected directly through their local exposure and indirectly through a deterioration of the Austrian economy. After consultation with the IMF, the OeNB designed the Regional CESEE Shock scenario, which

[29] *Currently the exposure of Austrian banks' foreign subsidiaries is not included due to data limitations. The new reporting regulation, which was introduced in January 2008, will remedy these limitations.*

[30] *Subsequently banks below a CAR threshold of 4% are referred to as insolvent.*

[31] *These assumptions were necessary, particularly under the BU approach, to guarantee comparability of BU and TD results as well as of results across participating banks. However, banks were asked to report the results twice, once based on all OeNB assumptions, and once based on their own assumptions.*

[32] *Regulatory capital was defined as eligible tier I and tier II capital.*

focuses on a sudden deterioration of market sentiment and reflects the following considerations:

- A change in sentiment in financial markets toward CESEE and, as a consequence, less access to and a reduction in external finance. The change in sentiment may be due to (a) a persistence of macroeconomic imbalances, or (b) a further unexpected worsening of these imbalances rather than an expected turnaround, or (c) a further tightening of liquidity at major international players in CESEE;
- Regional contagion across CESEE due to (a) insufficient risk differentiation by international investors across countries, or (b) due to common creditor links;
- A rise of policy as well as market interest rates across the maturity spectrum, in combination with a fall in equity prices;
- A dampening effect on domestic demand (growth) and thus on GDP (growth), amplified by other adjustments in the economy (e.g. fiscal tightening, temporary stagnation in wage growth, lower private-sector credit demand, etc.);
- Shadowing of the euro by the NMS-04 and NMS-07 to avoid potential monetary policy reactions in the region;
- The simultaneity of all shocks, with the third quarter of 2007 as their starting point.

The Regional CESEE Shock scenario was simulated with the global economic model NiGEM. The sudden deterioration of market sentiment in CESEE was assumed to have an effect via four channels: (a) equity prices, (b) the term spread risk premium,[33] (c) short-term interest rates, and (d) an endogenous shock to domestic demand. First, within the model's logic, reducing equity prices leads to a reduction of domestic demand in all countries concerned, as the value of equities affects wealth and hence consumption. Second, raising the term spread risk premium is an obvious way to emulate a financial crisis. If term spread risk premiums are raised, the user cost of capital rises, investment falls and output declines. Third, a loss of confidence in the regions' economies forces money markets to react; thus, short-term interest rates will increase. Fourth, the financial shock as described above leads to an additional negative impact on domestic demand, e.g. through fiscal tightening and/or other amplification channels.

3.1.2 Impact of the Regional CESEE Shock Scenario on the CESEE Economies

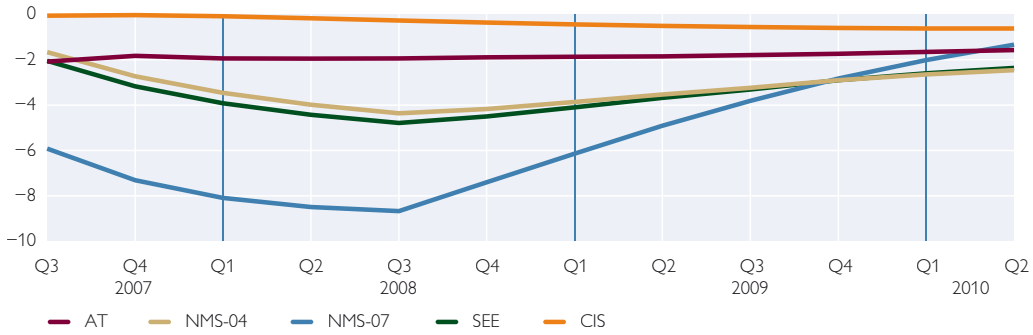
The assumed deterioration of market sentiment led to an initial drop of the real GDP level by 5.9% for the NMS-07 and by 1.7% for the NMS-04, respectively (see chart 2). Although CIS economies were not initially shocked, their real GDP level fell slightly due to modeled spillover effects from other CESEE countries. For both NMS groups, deviations from the baseline scenario reached their trough in the fifth quarter after the initial shock. The short-term dynamics were mainly driven by the shortfall of domestic demand, while decreasing asset prices had a more gradual, although more persistent, impact.

[33] *The term spread risk premium drives a wedge between the development of short-term rates and the long-term rate at a future point in time, i.e. it represents the markup of long-term rates.*

Chart 2

Impact of the Regional CESEE Shock Scenario on GDP

Deviation from baseline of real GDP level in %



Source: OeNB.

Note: GDP for SEE is calculated as the GDP weighted average of the growth rates for the NMS-04 and the NMS-07.

Due to the limited capabilities of NiGEM, GDP growth for SEE was calculated as the GDP-weighted average of the growth rates for the NMS-04 and the NMS-07. This procedure is well justified from a risk assessment perspective of a macro stress test for the Austrian banking system, considering the exposure in SEE, but limits the economic interpretability of the scenario.

3.1.3 Impact of the Regional CESEE Shock Scenario on the Austrian Economy

The impact of the Regional CESEE Shock scenario on the Austrian economy was simulated using the Austrian Quarterly Model of the OeNB. The transmission of the CESEE shock to the Austrian economy works mainly through the export channel, taking into account indirect effects via third countries. Demand for Austrian exports dropped by up to 1.5%. This negative effect was amplified by a loss in price competitiveness of Austrian exporters due to the declining price levels in the CESEE countries. Effects via nominal exchange rate movements were negligible. Given the high exposure of the Austrian economy to the region, two additional confidence effects were modeled. First, the risk premium was assumed to increase by 100 basis points, which caused an increase of external financing costs in the corporate sector and hence investments to fall. Second, the drop in confidence triggered an increase in the saving ratio of private households by 2 percentage points, thereby dampening private consumption.

The entire negative impact of both confidence effects was assumed to hit the Austrian economy in the first quarter of the simulation period, i.e. the third quarter of 2007, while the shock in the CESEE regions and its transmission via the trade channel built up gradually. Consequently, Austrian GDP dropped by 2% below its baseline level[34] already in the third quarter of 2007 and recovered only marginally over the entire simulation horizon (see chart 2). Half of the drop in economic activity was caused by the direct transmission of the shock from the CESEE countries via the trade and competitiveness channel while the other half was caused indirectly via the confidence channel.

[34] *The December 2007 forecast of the OeNB was used as a baseline (Ragacs and Vondra, 2007).*

3.2 The Global Downturn Scenario

3.2.1 Macroeconomic Specification of the Global Downturn Scenario

Although the second scenario was as soundly modeled as the Regional CESEE Shock scenario, it should be interpreted purely as a stress testing exercise, since the aim of the scenario – in accordance with the IMF – was to generate an alternative path of the Austrian economy with zero growth of real GDP for at least eight quarters. To implement this alternative path, several variables for the external environment of the Austrian economy as well as domestic confidence variables were shocked in a rather ad-hoc manner. A rather crude economic interpretation of the scenario would be one of a global economic downturn with strong negative confidence spillovers to the Austrian economy. The Global Downturn scenario includes the following assumptions:

– A slump in global economic activity that causes the demand for Austrian exports to decline sharply;
– Lower global price pressures and an appreciation of the euro that triggers a decline in the international price competitiveness of the Austrian economy;
– A reassessment of global risks that leads to an increase in risk premiums and a fall in equity prices;
– Spillover effects to the Austrian economy that are reinforced by strong negative domestic confidence effects. Households increase their precautionary savings, and the costs of external financing for firms rise sharply;
– The shock starting in the third quarter of 2007 and lasting for three years. The deterioration of the economic conditions builds up gradually, with the maximum effect being reached after four to eight quarters (depending on the variable).

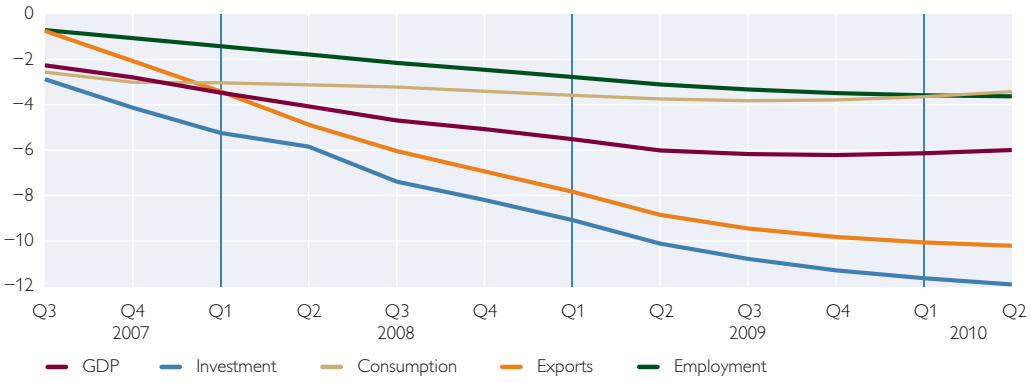
3.2.2 Impact of the Global Downturn Scenario on the Austrian Economy

The impact on the Austrian economy was simulated, again using the Austrian Quarterly Model of the OeNB, and turned out to be significant. In the simulation, economic activity in Austria is 6% below baseline levels after two years (see chart 3).

Chart 3

Impact of the Global Downturn Scenario on the Austrian Economy

Deviation from baseline levels in %



Source: OeNB.

Compared with the OeNB's latest macroeconomic forecast for the Austrian economy (December 2007), this implies two consecutive years with zero growth of real GDP. Such a long period of stagnation is an extraordinary event not observed during the last 30 years. The slump in economic activity is mainly caused by a decline in exports and business investments, while the negative impact on employment and private consumption is significantly smaller.

4 Macro Stress Test Results

4.1 Results of the Regional CESEE Shock Scenario

4.1.1 Impact of the Regional CESEE Shock on the Austrian Banking System

As pointed out in subsection 2.2.1, measuring the impact of the Regional CESEE Shock scenario on banks' credit risk relied on LLP ratios estimated by expert judgment. Table 1 shows the resulting annualized relative credit quality deterioration for the four CESEE regions for the reference date. The expected additional losses for a given one-year period can be calculated by multiplying the provisions as at mid-2007 by the deterioration from the table. In addition, the table provides increases of the aggregate domestic PD relative to the reference date implied by the scenario.[35]

Table 1

Annual Deterioration of Credit Quality for Regional CESEE Shock

	Q2 08	Q2 09	Q2 10
Domestic PD	11.2	18.0	27.6
LLP ratio NMS-04	100	130	80
LLP ratio NMS-07	130	150	–30
LLP ratio SEE	80	120	30
LLP ratio CIS	30	70	110

Note: Domestic PD: average probabiliy of default for Austrian exposure PD and LLP ratios as annual percentage increase.

Source: OeNB.

Moreover, the scenario assumed declining profits during the entire horizon. As the Regional CESEE Shock scenario was motivated by a confidence crisis in the region, overall net interest income was expected to be increasingly squeezed due to a lack of investor confidence in Austrian banks and hence higher refinancing costs. Quarterly profits (before adjustment for additional credit risk losses) were estimated to gradually decline up to 16.7% in the ninth quarter, where they broadly stagnated for the remainder of the scenario horizon.

4.1.2 Results of the Regional CESEE Shock Scenario

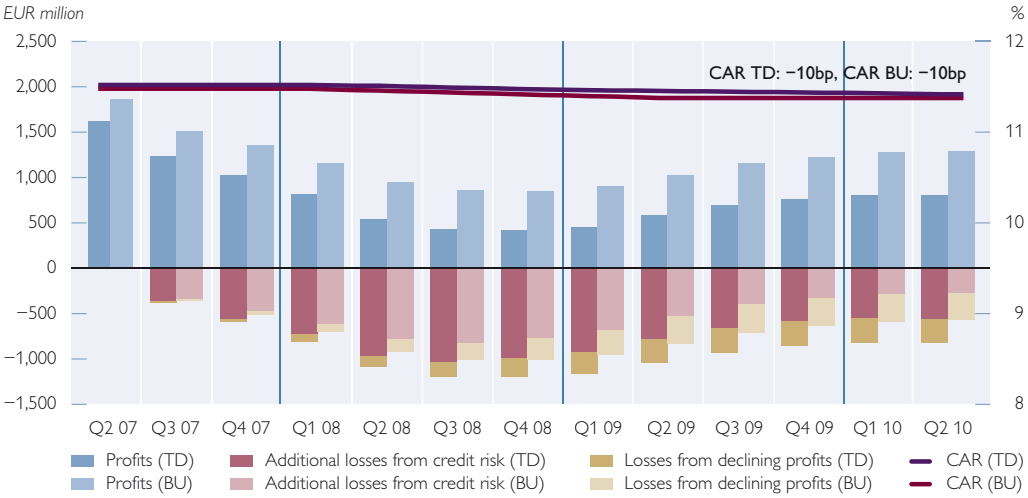
To assess the impact of the scenario in terms of the risk-bearing capacity of a particular bank, that bank's profits relative to the reference date and its stressed CARs[36] were examined. Chart 4 combines these two measures for the aggregate of participating banks under the TD as well as the BU approach. The bars show the use of aggregate profits for each quarter (TD: left bar, BU: right bar, both blue, measured in absolute values against the left-hand axis). Note that the initial size of the bars, which equals aggregate profits at the reference date, remains the same across

[35] *For the domestic loan portfolio, PDs were estimated with the model described in subsection 2.2.2.*

[36] *The stressed CAR was defined as: (regulatory capital + min(0,profits – additional losses)) / risk-weighted assets (RWAs). Note that the losses implied by the scenario would lead to (a) a change in risk weights for affected asset classes, and (b) a reduction of assets through defaults. As neither original risk weights nor the size of the reduction are known, RWAs were kept constant over the scenario horizon, in line with the constant balance sheet assumption.*

Chart 4

Impact on Profits under the Bottom-Up and the Top-Down Approaches for the Regional CESEE Shock Scenario



Source: OeNB.

the entire scenario.[37] Due to losses from the Regional CESEE Shock scenario, some of these profits, however, had to be used to shield the participating banks from taking direct hits against their capital. Hence the profit bar slides underneath the zero value of the x-axis, where the two driving factors – additional expected credit risk losses and the declining profits – are separated. Aggregated, banks remain profitable as long as the profit bar exceeds the zero line of the x-axis. To provide an idea of the dispersion of the results, the chart also shows the aggregate CAR of the participating banks for the TD as well as the BU approach (right-hand axis).

As chart 4 shows, the Regional CESEE Shock scenario had a considerable impact on profits. However the aggregate CAR was hardly affected and dropped by 10 basis points under the TD as well as the BU approach. The latter shows that not every bank remained profitable at all times, but also that no individual bank faced solvency-threatening losses. Notwithstanding the comparable impact on capital of the two approaches, the impact on aggregate profits was substantially larger for the TD than for the BU stress tests. In absolute terms, additional losses for the six banks amounted to about EUR 6.3 billion under the BU approach compared to EUR 10 billion under the TD approach.

This difference is attributable in the first place to the more conservative modeling assumptions of the OeNB as compared to BU banks, with the use of a 100% LGD ratio single-handedly doubling the OeNB's TD losses compared to most of the BU results. In addition, slightly diverging exposures and their assignment to different domestic economic sectors and/or countries (e.g. cross-border loans of subsidiaries), as well as different starting levels for PDs and LLP ratios contributed to these results. The level of PD estimates

[37] *This is another consequence of the constant balance sheet assumption.*

varied widely among participating banks, but appeared to be rather optimistic compared to the data available at OeNB. This is an indication of estimates solely based on the upswing of the economic cycle in the region. The LLP ratios of the same banks, however, far exceed their PDs, which showed that provisions are being built beyond the expected PDs based on recent observations.

Turning to the aggregate TD approach impact of the Regional CESEE Shock scenario, results indicate that some banks could not cover all additional expected credit risk losses, as the stressed aggregate CAR was reduced by about 0.15 percentage points, even though total aggregate profits were by far sufficient to cover the aggregate additional losses (see table 2).

Surprisingly, the Regional CESEE Shock scenario hit small (CAR – 0.49 percentage points) and medium-sized banks (–0.37 percentage points) harder than large and also the participating six banks, with CAR reductions of 0.09 percentage points and 0.10 percentage points, respectively. The impact on small and medium-sized banks

Table 2

Impact on the Capital Adequacy Ratio under the Top-Down Approach for the Regional CESEE Shock Scenario

Regional CESEE Shock: Impact on CAR[1]

	CAR June 07	Quarterly CAR from Sep 07 to June 10												Overall impact[2]
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	
Total System	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.5	12.5	12.5	12.5	12.5	12.5	–0.15
Aggregates by size[3]														
Big banks (6)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.4	11.4	11.4	11.4	–0.10
Large banks (22)	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.2	13.2	13.2	13.2	–0.09
Medium-sized banks (39)	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.1	18.1	18.0	18.0	17.9	17.9	–0.37
Small banks (635)	16.2	16.1	16.1	16.1	16.1	16.1	16.0	16.0	15.9	15.9	15.8	15.7	15.7	–0.49
Aggregates by sector[3]														
Joint stock banks (34)	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.5	13.5	13.5	13.5	13.5	–0.13
Savings banks (8)	10.9	10.9	10.9	10.9	10.9	10.9	10.8	10.8	10.8	10.8	10.8	10.8	10.8	–0.03
State mortage banks (5)	10.5	10.5	10.5	10.5	10.4	10.3	10.2	10.2	10.2	10.2	10.2	10.2	10.1	–0.39
Raiffeisen banks (561)	13.1	13.1	13.1	13.1	13.1	13.1	13.0	13.0	13.0	13.0	13.0	13.0	13.0	–0.08
Volksbanken (64)	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.2	12.2	12.2	12.1	12.1	12.1	–0.23
Special purpose banks (30)	16.2	16.1	16.1	16.1	16.0	16.0	15.9	15.8	15.7	15.5	15.4	15.2	15.0	–1.16
Distribution of banks' CAR according to share in total number of banks														
Over 12%	75.6	75.5	75.5	75.5	75.5	75.5	74.8	74.6	73.9	73.5	73.2	72.4	71.8	–3.85
10% to 12%	16.7	16.7	16.5	16.5	16.4	16.1	16.7	16.1	16.4	16.7	16.2	16.8	17.1	0.43
8% to 10%	7.7	7.8	7.8	7.8	7.8	8.1	8.3	8.5	8.7	8.7	9.3	9.1	9.1	1.42
4% to 8%	0.0	0.0	0.1	0.1	0.3	0.3	0.3	0.6	0.7	0.9	1.0	1.1	1.1	1.14
Under 4%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.3	0.6	0.9	0.85
Distribution of banks' CAR according to share in total assets														
Over 12%	41.5	41.4	41.4	41.4	41.4	41.4	41.3	41.3	41.3	41.1	41.1	41.0	40.9	–0.56
10% to 12%	52.5	52.5	52.5	52.5	52.5	52.5	52.6	52.4	52.4	52.5	52.5	52.6	52.6	0.07
8% to 10%	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.1	6.1	6.1	6.2	6.1	6.2	0.20
4% to 8%	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.08
Under 4%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.21

Source: OeNB.

[1] *Figures in percent if not stated otherwise.*
[2] *Change of CAR in percentage points relative to baseline.*
[3] *Number of banks in brackets, see subsection 1.2.2 for definition of sizes.*

was not driven by these banks' (often nonexistent) CESEE exposure, but by the deteriorating macroeconomic environment in Austria, a modeled consequence of the initial CESEE shock. In most cases the explanation could be found in these banks' profitability, which was far lower than for their larger counterparts at the reference date. Smaller banks were therefore shielded less from additional credit risk losses. These banks, however, did show substantially higher initial CAR levels, which granted them a far greater cushion to deal with these additional losses, at least at an aggregate level.

Looking at the CAR distribution, some small banks ended up below the 8% level (undercapitalized) and a few even fell below the 4% threshold (insolvent). However, the undercapitalized banks accounted for only about 0.1% of the total assets of the Austrian banking system, and the insolvent ones for 0.2%, confirming that only very small banks were affected. In addition, virtually all of them are organized in one of the tiered sectors of the Austrian banking system and would most likely benefit from a solution within their sector[38] thus preventing actual defaults.

To evaluate the robustness of the Regional CESEE Shock scenario results, the OeNB performed various sensitivity analyses, which were based on slightly modified scenario assumptions about the economic development in Austria as well as in the CESEE region. For Austria, a permanent additional increase of the domestic household savings rate by 2 percentage points was assumed and for CESEE the more severe credit quality deterioration of the NMS-07 was applied to varying other CESEE regions. The combination of these two parameters led to seven additional sensitivity checks for the Regional CESEE Shock scenario, which in all cases only showed a slight deterioration in terms of CAR as compared to the original scenario. Some of them, however, led to significantly more impact in terms of profitability, but even under the most severe assumptions,[39] the profits of the six largest banks were sufficient to cover most of the additional credit risk losses, and all but one bank remained above a CAR of 10%. Even the most severely hit bank – in terms of CAR – remained well above 8%.

4.2 Results of the Global Downturn

4.2.1 Impact of the Global Downturn Scenario on the Banking System

In contrast to the Regional CESEE Shock scenario, in the Global Downturn scenario only the impact on the domestic loan portfolio was considered. The PD of the overall Austrian economy increased from about 2.8% in the second quarter 2007 to roughly 5.3% after the three-year horizon – about 2.2 percentage points more than predicted by the model's forecast for the baseline scenario. By analogy to the Regional CESEE Shock scenario, the Global Downturn scenario also had a significant impact on banks' quarterly profits. Based on the methodology described above, quarterly profits before additional credit risk losses due to increased PDs are assumed to decline up to 17.1% over the three-year horizon relative to the reference date.

[38] *This would typically imply a merger or a capital injection organized within the sector.*

[39] *The most severe impact was observed by taking the credit risk measure changes of the NMS-07 for the entire CESEE region and at the same time increasing the domestic household saving rate by 2 percentage points over the entire observation period.*

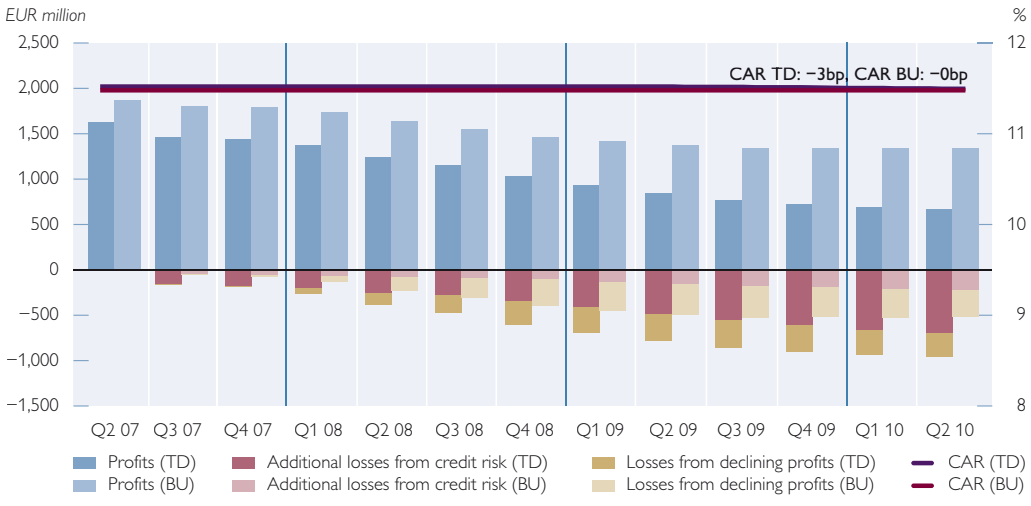
4.2.2 Results of the Global Downturn Scenario

Chart 5 displays the results of both approaches for the Global Downturn scenario on an aggregate level for the six banks that participated in the BU exercise in the same way as described in the corresponding subsection 4.1.2 for the Regional CESEE Shock scenario. As can be seen, the scenario has a considerable impact on profits, though aggregate capital is not affected. However, the impact of the TD stress tests was significantly higher than the BU results. In absolute terms, additional losses for the six banks amounted to about EUR 1.6 billion under the BU approach compared to EUR 4.9 billion under the TD approach. One bank even showed losses at the end of the three-year horizon under the TD approach, though capital is only slightly affected, leading to a decrease of the aggregated CAR of the six banks by a mere 3 basis points.

The difference between the two approaches can be attributed to the worst-case assumption principle mentioned above. The fact that TD losses are about three times higher than BU losses in case of the Global Downturn scenario compared to a factor below two for the Regional CESEE Shock scenario can be largely explained by the following: For individual Austrian customers that have loans at more than one bank, and hence are rated by more than one bank, the TD model applied the highest (most risky) rating, whereas banks naturally used their own internal ratings. As larger banks generally possess more sophisticated risk management tools, their ratings are often less conservative than those of smaller banks, which certainly biases TD losses upward. Once TD stress tests were recalculated based on the PDs actually reported by banks, aggregated losses over the stress horizon amounted to roughly EUR 2.8 billion, which is still considerably more than the EUR 1.6 billion BU losses. The remaining difference can be traced back to lower PDs used by banks for loans falling below the reporting

Chart 5

Impact on Profits under the Bottom-Up and the Top-Down Approach for the Global Downturn Scenario



Source: OeNB.

threshold of the Central Credit Register and/or more optimistic assumptions regarding LGDs.

Under the TD approach, stress tests were calculated for each individual Austrian bank. Due to the fact that some banks could not cover the additional expected credit risk losses, the overall CAR dropped by about 0.22 percentage points, although aggregate profits were still sufficient to cover the additional losses (see table 3). The largest impact on the aggregated level struck small banks, which showed a 1.06 percentage point reduction of their aggregate CAR to 15.1%. Some very small banks fell below the 8% level (undercapitalized), and even fewer fell below the 4% threshold (insolvent). However, the undercapitalized banks accounted for only about 1.4% of total assets of the Austrian banking system, and the insolvent ones for less than 0.1%, which confirms that only very small banks were affected severely by the stress scenario. As for the Regional CESEE shock scenario, the argument concerning intrasector solutions preventing actual defaults holds.

Similar to the Regional CESEE Shock scenario, sensitivity analyses have also been performed for the Global

Table 3

Impact on the Capital Adequacy Ratio under the Top-Down Approach for the Global Downturn Scenario

Global Downturn: Impact on CAR[1]

	CAR June 07	Quarterly CAR from Sep 09 to June 10												Overall impact[2]
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	
Total System	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.5	12.5	12.5	12.4	12.4	−0.22
Aggregates by size[3]														
Big banks (6)	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	−0.03
Large banks (22)	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.2	13.2	13.1	13.1	13.0	12.9	−0.42
Medium sized banks (39)	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.1	18.1	18.0	17.9	17.7	17.6	−0.67
Small banks (635)	16.2	16.1	16.1	16.1	16.1	16.1	16.0	16.0	15.8	15.7	15.5	15.3	15.1	−1.06
Aggregates by sector[3]														
Joint stock banks (34)	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.6	13.5	13.5	13.5	−0.13
Savings banks (8)	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.8	10.8	10.8	−0.03
State mortage banks (5)	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	10.5	−0.04
Raiffeisen banks (561)	13.1	13.1	13.1	13.1	13.0	13.0	13.0	13.0	13.0	12.9	12.8	12.7	12.6	−0.43
Volksbanken (64)	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.3	12.2	12.2	12.2	12.1	12.1	−0.19
Special purpose banks (30)	16.2	16.1	16.1	16.1	16.1	16.1	16.0	15.9	15.8	15.6	15.4	15.1	14.8	−1.32
Distribution of banks' CAR according to share in total number of banks														
Over 12%	75.6	75.6	75.5	75.5	75.2	75.1	74.5	73.4	72.6	71.5	70.7	69.1	67.9	−7.69
10% to 12%	16.7	16.5	16.7	16.7	16.4	16.4	16.7	17.2	16.7	17.5	17.9	17.1	16.4	−0.28
8% to 10%	7.7	7.8	7.7	7.7	8.3	8.3	8.5	8.7	9.5	9.0	9.3	10.4	10.5	2.85
4% to 8%	0.0	0.0	0.1	0.1	0.1	0.3	0.3	0.6	1.0	1.7	1.9	3.0	4.6	4.56
Under 4%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.3	0.4	0.6	0.57
Distribution of banks' CAR according to share in total assets														
Over 12%	41.5	41.5	41.4	41.4	41.4	41.4	41.3	40.7	40.6	40.4	40.3	40.2	40.0	−1.43
10% to 12%	52.5	52.5	52.5	52.5	52.6	52.6	52.6	53.0	53.0	53.1	53.2	52.5	51.2	−1.39
8% to 10%	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.2	6.3	6.2	6.3	6.8	7.3	1.36
4% to 8%	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.4	1.4	1.36
Under 4%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.10

Source: OeNB.

[1] *Figures in percent if not stated otherwise.*
[2] *Change of CAR in percentage points relative to baseline.*
[3] *Number of banks in brackets, see subsection 1.2.2 for definition of sizes.*

Downturn scenario. They considered an additional increase in the domestic savings rate by 2 percentage points and resulted in an even more severe economic downturn in Austria. In addition contagion risk, i.e. additional losses in the interbank market due to insolvent banks, was considered. However, the impact was still moderate: even if the savings rate was increased and contagion risk was taken into account simultaneously, results for the six largest banks remained the same in qualitative terms. The number of small banks becoming insolvent increased slightly, mainly due to contagion, however, their share in total assets was still below 0.4% of total assets of the Austrian banking system. Again, it should be noted that this contagion is more of hypothetical nature as these banks are mostly organized within tiered sectors.

5 Sensitivity Analyses

In addition to the macroeconomic stress tests described in sections 2 to 4, sensitivity analyses were applied to assess the credit risk emanating from foreign currency lending, the most important types of market risk and liquidity risk. A sensitivity analysis employs a scenario that is restricted to the change of a single risk factor or of a limited set of risk factors, ignoring possible interactions with other risk factors. In general, scenario analyses do not make use of sophisticated modeling but establish a straightforward link between the scenario and its impact. In our setup, no profits were considered as cushions against losses, as the analyses focused on the short-term impact.

5.1 Foreign Currency Lending

The share of foreign currency lending in total lending to domestic customers stood at 17% in June 2007, representing a volume of EUR 48.5 billion in outstanding loans. For private households, this share amounts to 29% and for the corporate sector to 9%. With these figures, Austria is quite an exception within the euro area. 90% of total foreign currency lending is denominated in Swiss francs, 3% in Japanese yen.[40]

The scenarios consisted in a 10% appreciation of the Swiss franc and a 20% appreciation of the Japanese yen vis-à-vis the euro, thus covering the 95% quantile of yearly exchange rate changes. In addition to exchange rate fluctuations, another risk of typical Austrian foreign currency loans stems from unfavorable changes in the value of the repayment vehicle, as the vast majority of these loans is arranged as bullet loans.[41] For the scenario regarding the repayment vehicle, we assumed a deviation of –15% from the expected performance. The methodology of the scenario analyses for foreign currency lending is described in Boss et al. (2004), with a straightforward adaption for the incorporation of repayment vehicles: The loss resulting from the impairment of the repayment vehicle is treated in the same way as the loss resulting from higher loan repayments triggered by a foreign currency appreciation. Both losses are assumed to reduce the income of foreign currency lenders in the current year, impairing their repayment ability. It should be noted that this is a quite conservative

[40] *Another 6% are U.S. dollar loans. However, they are usually naturally hedged through real economic activity and hence not affected by foreign exchange fluctuations.*

[41] *The repayment vehicle is created to repay the principal at maturity. It is set up e.g. in the form of a life insurance policy or an investment fund. For private households, the share of bullet loans in total Swiss franc and Japanese yen loans is over 85%.*

assumption, as foreign currency loans typically have maturities of around 20 years and can usually be switched to euro during their lifetime. Scenario analyses for foreign currency lending were run only in a TD exercise.

For the Swiss franc loan portfolio, a sizable decline in CAR is observed when the Swiss franc appreciation (+10%) scenario and the repayment vehicle scenario (–15%) are combined: For the overall banking system, the decrease in CAR amounts to 1.4 percentage points. For the six largest banks, the aggregated decrease in CAR is 0.7 percentage points. Small and medium-sized banks are affected most, with a CAR decrease of 1.8 percentage points. Under this scenario, a few banks representing 0.2% of total assets show CARs below 4% and some additional banks accounting for 1.2% of total assets fall below 8%. However, the result can largely be explained by the conservative assumptions mentioned above. In addition, only small banks are more severely affected, hence the arguments on sector solutions also apply here. In contrast to Swiss franc loans, the impact on the Japanese yen loan portfolio turned out to be negligible even at the level of the most exposed individual banks.

5.2 Market Risks

Regarding market risks, equity prices, interest rates, exchange rates and volatilities were considered as risk factors. Market risk sensitivity analyses were performed as a TD and a BU exercise, except for volatility risk that could not be treated under the TD approach due to a lack of data. Market risk positions included all on and off balance sheet positions of the banking and trading book, including nonbank activities (e.g. insurance subsidiaries).[42] Scenario construction was based on the largest historical movements of the respective risk factors over a three-month horizon.

BU stress tests were confined to the most relevant market risk factors for Austrian banks. Hence, the following scenarios were taken into account under both approaches: parallel upward and downward shifts of the euro yield curve by 200 basis points, a steepening of the yield curve by 200 basis points (linear spread between the overnight and the ten-year rate), depreciation and appreciation of the euro against all other currencies by 15% and a decrease of domestic as well as nondomestic stock prices by 35%. In addition, banks were asked to perform sensitivity analyses for an increase in interest rate volatility by 200 basis points at all maturities and a corresponding decrease by 100 basis points as well as for additional scenarios according to their internal risk management practices.

General differences between the TD and the BU approach can be traced to the facts that (a) foreign subsidiaries and nonbank subsidiaries were not included in the TD stress tests due to the unavailability of data, and (b) TD stress tests relied on aggregated supervisory data, thus representing partial information. If banks hold large and complicated derivative positions, this can even lead to an impact with the opposite sign of the impact under BU calculations, which are based on individual instruments.

[42] *Due to data limitations, this was not possible in all cases, neither under the TD nor under the BU approach.*

Table 4

Results of Bottom-Up and Top-Down Sensitivity Stress Tests for Market Risks

Scenario	Bottom-Up	Top-Down
	Change of CAR in percentage points	
Interest Rate Risk		
Parallel upward shift of euro yield curve by 200 basis points	−0.16	−0.34
Parallel downward shift of euro yield curve by 200 basis points	0.13	0.39
Steepening of euro yield curve through 200 basis points increase of ten-year rate	−0.08	−0.23
Equity Price Risk		
Decrease in domestic equity prices by 35%	−0.04	−0.09
Decrease in nondomestic equity prices by 35%	−0.08	−0.08
Foreign Exchange Rate Risk		
Depreciation of euro by 15%	−0.14	0.08
Appreciation of euro by 15%	0.19	−0.08
Volatility Risk		
Increase by 200 basis points	0.00	n/a
Decrease by 100 basis points	0.00	n/a
Increase by 40%	0.00	n/a
Decrease by 40%	0.00	n/a

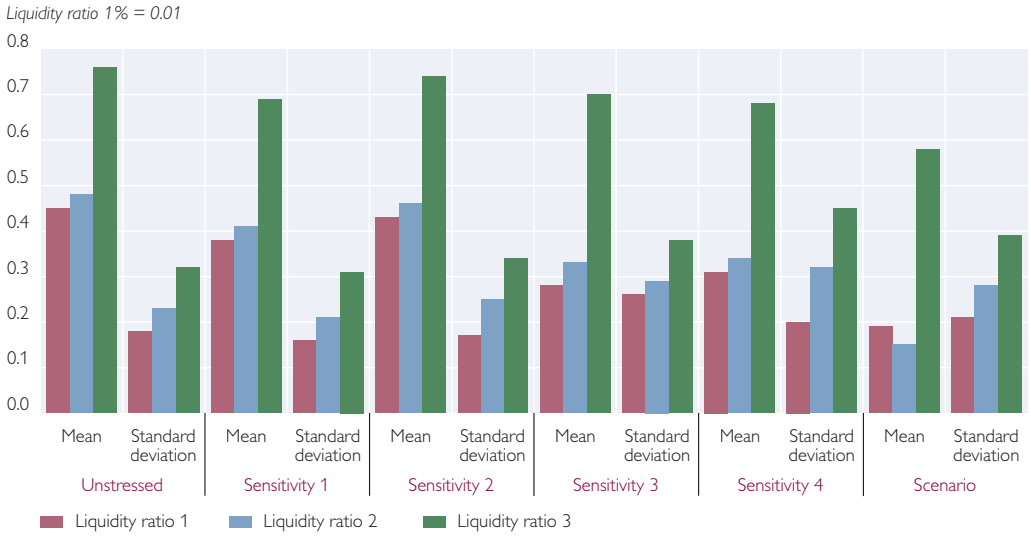
Source: OeNB.

Results of sensitivity analyses for market risks are shown in table 4 for the aggregate of the six participating banks. Regarding interest rate risk, the two approaches produced comparable results for the direction of scenario impact. Reasons for differences in the size of the impact apart from those stated above can be derived from a more accurate matching of the repricing maturities of interest rate-sensitive instruments and the term structure in the case of the BU approach. For the equity price scenarios, no significant differences in the results were produced. The largest divergence between the BU and TD approaches can be observed for foreign exchange rate risk, where the impact even shows opposite signs. In addition to the general difference regarding derivative instruments mentioned above, this large divergence can be explained by the fact that some of the banks included their CESEE subsidiaries in the calculation base. Furthermore, due to data limitations, the TD exercise comprised exposures in U.S. dollars, Japanese yen, Swiss francs and pounds sterling only. BU stress tests for volatility risk show that this risk category is virtually irrelevant for the large Austrian banks.

Under the TD approach, additional sensitivity analyses were performed for a wide range of scenarios for all risk factors, including various movements of the yield curve in the most important currencies combined with changes in the respective exchange rates and different scenarios regarding equity price risk. Altogether, the results of market risk BU and TD sensitivity analyses suggest that the largest loss potential emanates from an upward shift of the euro yield curve. Yet, the impact of this scenario appears quite limited. It has to be borne in mind, though, that – according to the nature of sensitivity analysis – feedback effects of the scenarios on credit risk are not accounted for.

Chart 6

Liquidity Stress Test Results



Source: OeNB.

Note: Individual bank data cannot be published. Unweighted averages across the six banks are reported.

5.3 Liquidity Risk

Liquidity risk stress tests for the six largest banks were mainly conducted by the OeNB.[43] In addition, participating banks were asked to describe their liquidity management in qualitative terms and to perform a stress test assuming a disruption in the money market. However, as all banks reported small impacts of their BU stress tests, the results of TD liquidity stress tests will be discussed below.

All of the six largest banks had limited maturity mismatches at the short end of the balance sheet and sufficient volumes of liquid assets to cover them. In addition, banks that belong to a tiered sector fulfill their liquidity requirements by deposits with the central institution, which in turn has to hold only 50% of these deposits as minimum liquidity requirements and thus benefits from economies of scale in liquidity reserve management. For the stress tests, three liquidity ratios (liquid assets over short-term liabilities) were defined, which were all based on the reported residual time to maturity structure of banks' assets and liabilities at the reference date, but included different definitions of liquid assets. The denominators (short-term liabilities) were identical in all three ratios and consisted of bank and nonbank on balance sheet liabilities with a residual time to maturity of up to three months. In ratio 1, the numerator was defined as cash, deposits at central banks, debt instruments,[44] listed bonds and listed equities. In ratio 2, the numerator consisted of the items under ratio 1 but also included overnight loans to banks and nonbanks minus overdrafts. Under ratio 3, the numerator equaled the numerator in ratio 2 plus 50% of nonbank loans and 100% of interbank loans with residual maturities between two days and three months. In the unstressed system, ratio 1 amounted to 45%, ratio 2 to 48%, and ratio 3 to 76% (see chart 6).

[43] *Concerning the role of banks' liquidity management for central banks, see Schmitz and Ittner (2007).*

[44] *Debt instruments admitted for refinancing at central banks of the European System of Central Banks.*

Four sensitivity analyses were conducted: (a) liquid bonds minus 25%, (b) equity portfolio minus 35%, (c) withdrawal of 40% of all interbank short-term funding, and (d) withdrawal of 50% of nonbank deposits. In addition, a scenario analysis that combined a severe disruption of the money and credit markets (a market shock) with an idiosyncratic shock (a name crisis) for each bank was performed. None of the four sensitivity analyses posed liquidity problems for any of the six banks (chart 6).

In the scenario, a credit crisis affected the bond and equity market (bonds and equities minus 20% and 30%, respectively). The low weight of nonbank loans in ratio 3 of 50% was retained and the same weight introduced in ratio 2 to account for the potential profit and loss effects associated with the loss of market share that would result from not rolling over short-term loans to nonbank customers. Furthermore, potential liquidity problems of interbank counterparties due to the market shock were considered, and hence the weight of interbank loans in both ratio 2 and ratio 3 were reduced to 95%. In addition, each bank faced an idiosyncratic shock. Nonbank customers were said to withdraw 10% of sight deposits, 20% of one-month deposits, and 30% of three-month deposits. Sight deposits are generally of lower volume and thus more likely to be covered by deposit insurance than one- and three-month deposits. Also, interbank counterparties reduced lending to the bank. This impact was said to lead to a reduction of interbank overnight funding by 20%, of one-month funding by 30%, and of three-month loans by 40%. These high numbers reflect the combination of a market and an idiosyncratic shock and the higher responsiveness of banks than of nonbank customers to a name crisis. Overall, the scenario was extreme and unprecedented in Austrian history. The scenario amounted to a negative cash flow of 35% of the sum of short-term loans and 10% of total assets which needed to be counterbalanced by the sale of liquid assets and/or the nonrenewal of short-term loans. The impact of the extreme scenario on all three ratios was substantial. Ratio 1 fell by 26 percentage points to 19%, ratio 2 by 33 percentage points to 15%, and ratio 3 by 18 percentage points to 58%. All banks remained liquid, which highlights the solid liquidity situation of the six largest Austrian banks.

6 Conclusion

Overall, the stress tests conducted for the FSAP 2007 showed that the Austrian banking system exhibits considerable resilience against shocks and hence confirmed results of the FSAP 2003 and the regular stress tests calculated by the OeNB. The main reasons for this resilience are Austria's generally well-capitalized banking system and its focus on the traditional lending business, which facilitates credit risk management through close customer relations. Consequently, credit risk is the most important source of risk in the Austrian banking sector, mostly stemming from (a) exposures in CESEE, from (b) domestic lending, and from (c) credit risk induced by foreign currency lending. The two macro stress tests presented in this paper addressed the first risk factor via the Regional CESEE Shock scenario, assuming a severe regional recession, and the second risk factor via the Global Downturn scenario with the assumption of two consecutive years of zero GDP growth in Austria. Although both scenarios put a substantial strain on the Austrian banking system, capital buf-

fers remained intact for all Austrian banks except for a few very small, unprofitable banks. Unlike the largest Austrian banks, all of which remained well above the regulatory threshold of 8%, some of them became undercapitalized and in a few cases even insolvent. As these banks accounted for a very limited share of aggregate total assets and were mostly organized within a tiered sector, problems would most likely be solved within these sectors. Finally, credit risk induced by foreign currency lending was covered by a sensitivity analysis and produced qualitatively similar results to those of the macro stress tests. Stress tests for market risks confirmed the minor importance of the latter. Interest rate fluctuations posed the most prominent source of market risk. Regarding liquidity risk, stress tests confirmed the shock resilience of the Austrian banking system, as many banks have access to stable funding sources through deposits.

The FSAP 2007 also spurred further development of the stress testing capacities at the OeNB. For the first time, banks were asked to calculate standardized stress tests by means of their own internal risk management tools. Importantly, macro stress tests conducted by the OeNB showed a substantially higher impact than the ones calculated by banks. To a large extent, this can be attributed to the more conservative assumptions in the absence of reliable and/or detailed information at the OeNB. Given the favorable economic conditions in the recent past, credit risk measures used by banks might, however, turn out to be overly optimistic in some cases. Additionally, the large banks' generally high profitability and its impact on the positive results of the macro stress tests raises the issue of modeling risk, which highlights the importance of cooperation between the OeNB and the large commercial banks in the area of stress testing. In addition, options for further improvement of OeNB's stress testing models were pointed out. In particular, stress testing in a multiperiod environment raises questions about banks' behavior, e.g. portfolio adjustments and the treatment of profits, but even more so regarding banks' and authorities' reaction to a crisis. These issues have been addressed, but as the many economic disclaimers throughout the paper indicate, there is still ample room for further research. Finally, results have confirmed the importance of the CESEE region for the Austrian banking sector. Hence, the integration of Austrian subsidiaries into existing tools – in particular the Systemic Risk Monitor – will be one of the main priorities for the OeNB with respect to stress testing in the near future.

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Systemically Important Accounts, Network Topology and Contagion in ARTIS

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This study investigates the relevance of network topology for the stability of payment systems in the face of operational shocks. The analysis is based on a large number of simulations of the Austrian large-value payment system ARTIS that quantify the contagion impact of operational shocks at participants' sites. It uncovers that only few accounts are systemically important. We also find that network indicators at the node level can have some explanatory power, which is higher when the analysis focuses on contagion measured by the number of banks with unsettled payments than on that measured by the value of unsettled payments. The explanatory power is, however, lower than that of the more traditional measures of node activity (value and volume) of payments. At this stage of our research, network indicators at the network level seem to be of limited use for stability analysis.

JEL classification: E50, G10
Keywords: Operational risk, payment systems, network topology, stress tests

1 Introduction

Recent work on the stability of banking systems suggested a systematic relationship between network topology, system stability and contagion (Boss et al., 2004). Similarly, Soramäki et al. (2007) conjectured that network topology might be relevant for the stability characteristics of payment systems. In previous research (Schmitz and Puhr, 2007), we uncovered a large variation of the contagion impact across days, banks as well as scenarios. Here, we investigate whether the position of the stricken account within the network explains its contagion impact and whether daily variation in network topology explains the variation of contagion across days.

In section 2 we provide a brief motivation for studying network topology in network stability. In section 3 we present data on the network topology of the Austrian large-value payment system ARTIS and compare them with the respective results for the U.S. large-value payment system FedWire and for the Austrian interbank market. Section 4 introduces the simulations, and based on the results, we discuss the following questions: Which accounts cause contagion in the system and on what scale? How many accounts are systemically important? In section 5 we address the questions: Do network indicators at the network level on the day of an operational failure relate to the contagion effects in the simulations? And second, do network indicators at the node level of the stricken participant on the day of the operational incident relate to the contagion effects in the simulations? Section 6 summarizes the results.

2 Fundamentals of Network Topology and Network Stability

Many networks in the real world (e.g. the Internet, the World Wide Web, large-value payment systems, such as FedWire in the U.S.A. and BOJ-NET in Japan, the Austrian interbank market) are scale-free networks. Their degree distribution follows a power law $P(k) \sim k^{-\gamma}$, i.e. the probability that a node has k degrees is $k^{-\gamma}$. A few nodes have a

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Bank of Finland

large number of links, while most nodes have only a few links. The network characteristics of scale-free networks are independent of the number of nodes and links. They are robust with respect to random node removal, but disintegrate quickly in case of a targeted attack, when the most highly connected nodes are removed step by step. Random networks constitute a different class of networks. They are characterized by a homogenous network structure, i.e. all nodes have a similar number of links. Random networks are less robust against random node removal, but are more stable with respect to targeted attacks than scale-free networks.

Albert et al. (1999, 2000) study the robustness of the World Wide Web (a subset of the WWW with 325,729 nodes and an average degree k=3.93) and the Internet (at the inter-domain level with 6,209 nodes and k=4.59). They remove a fraction of the nodes and links from the network in a stepwise procedure. The node removals cause the disappearance of all links to and from the removed nodes and reduce the network's connectivity. Some shortest paths between nodes become no longer available; some clusters of nodes that used to connect to the rest of the network get disconnected. In the case of random node removal, a shock is simulated by removing a random sample of nodes and, in the case of targeted attacks, by removing the most highly connected nodes in the network. Albert et al. (1999, 2000) find that the size of the largest cluster of nodes in the WWW and the Internet decreases very slowly under random node removal, but rapidly under targeted attacks. Under the former, the networks disintegrate when about 60% (WWW) and 80% (Internet) of all nodes are removed. Under the latter, the networks break down after the removal of as few as about 0.07% (WWW) and 0.03% (Internet) of all nodes, respectively. The authors explain the robustness results by the scale-free characteristics of the networks as most nodes have few links. As a consequence, random node removal is likely to hit lowly connected nodes with little implications for the connectivity of the entire network. The heterogeneity of the nodes and their distribution are also the reason for the networks' low robustness against targeted node removal. Even after just a few rounds of removals, most of the highly connected nodes that link clusters of lowly connected nodes have disappeared and the network disintegrates.

How relevant are these results for the study of the stability of large-value payment systems with respect to operational problems at individual participants?

In Albert et al. (1999, 2000) the stability of the network is conceptualized as the connectivity of the remaining nodes and measured by the size of the largest cluster in the network and the average path length of the network. As the physical network structure of ARTIS is that of a complete network (participants may submit payments to each other via direct links rather than via hubs), connectivity is not a useful conceptualization of stability. The stability problem is not that Bank A cannot make a payment to Bank C because of a broken link, but that Bank A might not have adequate liquidity. As connectivity relates to the flow of liquidity in the system and the liquidity flows through hubs are higher than those through peripheral nodes, it plays an indirect role for the analysis of stability. Therefore, our measures of the contagion impact of shocks focus on the effects shocks have on the flow of liquidity (i.e. number of accounts with unset-

Table 1

Network Topology Indicators (Network Level) in ARTIS (November 16, 2005 to November 16, 2007) and in FedWire (2004/Q1) (Averaged across Days; Network Definition: GSCC)

	FedWire	ARTIS				
	Mean	*Mean*	*Median*	*Min*	*Max*	*Stdv*
Payments						
Daily volume (number of transactions)	436,000	15,380	15,436	9,786	25,000	2,019
Daily value (EUR billion)	1,068	48.5	46.9	22.6	84.9	10.6
Average value per transaction (EUR million)	2.55	3.2	3	1.9	5.9	0.7
Connectivity measures						
Connectivity (%)	0.3	7.9	7.9	5.9	9.9	0.8
Distance measures						
Average path length	2.6	2.4	2.4	2.2	2.6	0.08
Diameter	6.6	4.4	4	4	5	0.5
Other measures						
Clustering (%)	53	58.3	58.3	51	63.7	2.3
Average degree	15.2	15.6	15.5	14.2	17.8	0.6
Betweenness centrality (%)	–	0.8	0.8	0.6	0.9	0.1
Dissimilarity index	–	0.47	0.47	0.39	0.6	0.03

Source: Authors' calculations (ARTIS), Soramäki et al. (2006; FedWire).

Note: The value and average value figures for FedWire are converted into euro based on the USD/EUR exchange rate of 1.21730 of March 31, 2004.

tled payments and value of unsettled payments) rather than on the disintegration of the network.

3 The Network Topology of ARTIS

The definition of the network under investigation is not trivial in empirical network analysis. In the topology analysis we focus on the giant strongly connected component (GSCC) of ARTIS.[2] The GSCC is the largest component of the network, in which all nodes connect to each other via directed paths (i.e. without passing any node or link more than once). We have chosen this definition of the network for two reasons: first, ARTIS contains a comparatively large number of accounts which are not relevant to financial stability (e.g. small charities and offset accounts of the OeNB's cash distribution subsidiary) and which are not active on most of the days in the sample. Second, we want to ensure the comparability of our data with those reported in Soramäki et al. (2006) for the GSCC of FedWire.

ARTIS processes on average 15,380 transactions per day, with the daily average value totaling EUR 48.5 billion. The average transaction size amounts to EUR 3.2 million. The size of the network is defined by the number of nodes n. On average there are 133.2 accounts in the GSCC during the sample period, of which 63 are in the GSCC on all days. The active nodes are linked by an average of 1,376.1 directed links (m).[3] The connectivity p of the

[2] *For mathematical definitions of the network indicators, see the Appendix in Schmitz and Puhr (2007) and Zhou (2003). For comparable data on the network of all active accounts, see Schmitz and Puhr (2007). For a description of the Austrian banking system, see OeNB and FMA (2004, pp. 50–55).*

[3] *The average number of nodes in ARTIS active on every day was 209.8 and these were connected by 1,637.5 directed links.*

network is captured by the number of actual directed links relative to the number of possible directed links. Connectivity p averages 7.9%.

An indicator of the distance between nodes is the lowest possible number of links that connect each node with each other in the GSCC. It is referred to as shortest path length. We calculate the average shortest path length for each originating node by averaging across terminating nodes and then averaging across originating nodes to derive the average path length l of the entire network. Across days this value equals 2.4, meaning that it takes only slightly more than two links on average to reach any terminating node in the network from any originating node in the network. Hence, the network is compact, with almost all active nodes linked to the largest banks. This network structure is quite stable across days, as the standard deviation is low. The maximum path length across nodes is defined as diameter D. It is calculated by maximizing across maximum path lengths, which corresponds to picking an originating node at the very fringe of the network and counting the lowest possible number of links to the terminating node that is farthest away from it. We thus obtain a value of 4.4 links.

How well are the nodes connected to each other in the network? This is captured by the average degree k of the network, which is calculated by summing across all (undirected) links originating from each node and then averaging across nodes.[4] Averaged also across days, k amounts to 15.6 in the ARTIS system. In other words, when you pick a node in the GSCC on a random day in the sample period, it can be expected to have 15.6 links originating (or terminating) at it. A much larger number of links originates and terminates at the most active nodes, however. The maximum out-degree averages 76 across days, so that the most active node of each day has about five times as many links originating from it than the average node. The maximum in-degree (90) is similarly much higher than the average degree. The clustering coefficient provides a measure of the average connectivity of the neighbors of all nodes in the GSCC. On average, about 58% of the neighbors of each node are also interlinked. Betweenness centrality measures how many shortest paths through the GSCC pass through the average node. The value of 0.8% is quite low and stems from the central position of a few nodes with high betweenness centrality and a large number of nodes with low values. The dissimilarity index captures the relative viewpoints of the network from any two neighboring nodes. If the network looks very similar from the respective node pairs, the dissimilarity index is close to zero. In the GSCC, it amounts to 0.47, which implies that on average the perspectives of the GSCC differ substantially from any two neighboring nodes. Many nodes are linked to each other although not otherwise sharing many network characteristics. We interpret that as further evidence that many of the nodes connect to the largest nodes at the center of the network.

How do these values compare with the results for FedWire? To begin with, we must bear in mind that the FedWire data refer to the first quarter of 2004. Value and volume in FedWire have certainly grown since then. Comparing a

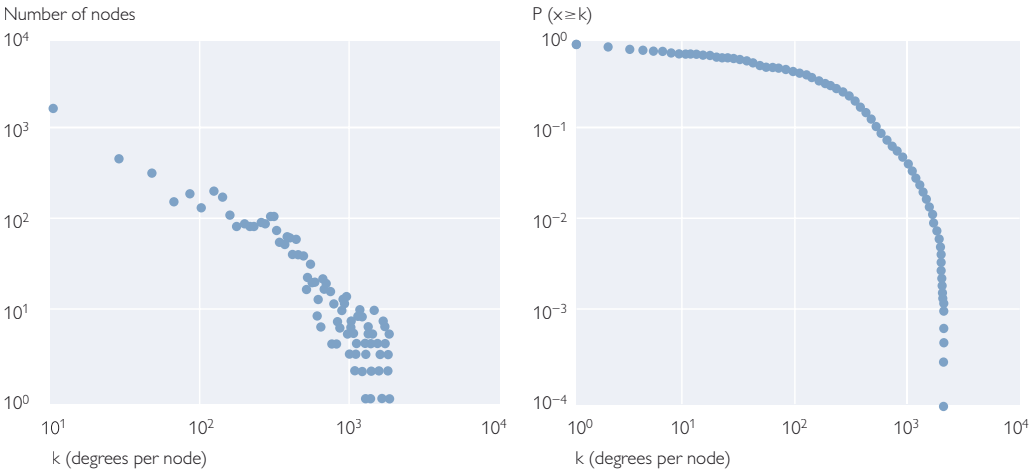
[4] *The out-degree refers to the number of links originating at the node, while the in-degree is based on the number of links terminating at the node. Across the network, the average out-degree and in-degree are equal to m/n, respectively.*

small and a large network can yield interesting insights into the structure of payment systems. The average number of nodes in the GSCC of FedWire (n=5,086) is about 38 times that in ARTIS, implying that the number of possible directed links in FedWire is 1,469 times higher than in ARTIS. But the average number of directed links (m=76,614) is only about 55 times that in ARTIS, so that connectivity should be lower in FedWire by a factor of about 26 (1,469 over 55). And indeed, the ratio between connectivity p in ARTIS (7.9%) and that in FedWire (0.3%) is 26:1. A conjecture based on this observation is that the number of possible directed links grows exponentially in payment systems, but the number of actual directed links only proportionally. The distance measures (average path length 2.6 vs. 2.4 and diameter 6.6 vs. 4.4), however, seem to be quite independent of size, like in other small-world networks.[5] The high clustering coefficients in both networks (on average 53% vs. 58% of the direct neighbors of each node are also linked) corroborate this finding. The average degrees of both networks are very similar too (15.6 vs. 15.2).

Comparisons across networks are often based on the degree distribution. In scale-free networks, it follows a Yule-Simon (or power law) distribution $P(x) \sim k^{\gamma}$ for degree values above a certain threshold. Many real world networks are said to follow a power law. The first indicator of the prevalence of the power law is that the histogram of the degree distribution (on logarithmic scales) is a straight line with slope $-\gamma$, whereby in many real networks $-2 > -\gamma > -3$. The coefficient γ is estimated by a maximum likelihood estimator (e.g. Newman, 2005). The respective value in Soramäki et al. (2005) is 2.11 for $k>10$ for FedWire and that in Inaoka et al. (2002) is 2.3 for $k>20$ for BOJ-Net. For the Austrian interbank market, Boss et al.

Chart 1

Histogram and Reverted Cumulated Distribution Function (on Logarithmic Scales) of the Degree Distribution in the Monthly Network in ARTIS (GSCC)



Source: OeNB.

[5] *In a small-world network, most nodes can be reached from each other by a small number of hops or steps, although connectivity is low and most nodes are not neighbors.*

(2004) report γ for the in-degree, the out-degree and the degree distribution separately as 1.7, 3.1 and 2.0, respectively, for $k>40$. For our monthly network[6] (degree range 1 to 1,925 for the nodes in the GSCC over a period of 20 days), the histogram seems to indicate a power law distribution with $\hat{\gamma}_{ML}=1.4$ for $k>10$ (see left-hand panel of chart 1). However, Newman (2003) argues that the plot of the cumulative distribution function (cdf, on logarithmic scales) must also be a straight line with slope $-\gamma+1$. Newman argues that the cdf plot is superior to the histogram, because it preserves all the information in the data rather than throw out information by binning. In addition, it avoids the problem of noise in the tails that emerges from binning. We plot the cdf for the monthly network in the right-hand panel of chart 1. Obviously, the cdf is not a straight line and we reject the power law hypothesis for the ARTIS network.

It is also interesting to compare the network indicators of the ARTIS system with the two network indicators of the Austrian interbank market presented in Boss et al. (2004; the data cover the period from 2000 to 2003). As they are settled through ARTIS, interbank market transactions can be interpreted as a subset of the transactions processed by ARTIS. The authors find an average path length of 2.26 ± 0.02, which is very close to the respective figure in table 1 of 2.3 ± 0.05. This similarity arises because both the interbank market and the payment system are dominated by large banks. In both markets, many banks cluster around their sectoral central institutions.[7] However, the clustering coefficient is substantially higher in ARTIS than in the interbank network. Maintaining interbank relationships is costly, so banks have to balance the advantages of diversification with the costs of maintaining links. This is clearly not the case in the complete physical network of the large-value payment system, where the marginal costs of an additional link are zero. In addition, transactions in ARTIS are partly driven by customer payments (roughly 20% of the total value). These reflect the network structure of real economic activity, which does not necessarily mirror the structure of the interbank market.

4 The Simulations: Methods, Data and Results

We conducted 31,311 simulations based on 63 different scenarios for 497 transaction days with roughly 650 million transactions from November 16, 2005, to November 16, 2007 (excluding Austrian holidays).[8] These simulations were calculated with a self-implemented Matlab-based software tool (inspired by the Bank of Finland Payment System Simulator), which was tailored to ARTIS particularities. The tool recalculates each day's transactions by adding incoming payments to and subtracting outgoing payments from the respective accounts of the participants. As the

[6] *We conducted the same exercise for the daily, the quarterly and the semiannual networks with the same results.*

[7] *Of the seven sectors the Raiffeisen credit cooperative, the Volksbanken credit cooperatives and the savings banks have a tiering structure. They account for about 80% of Austrian banks in terms of the number of credit institutions and for about 50% in terms of total assets (unconsolidated). In addition, there is no national automated clearing house in Austria and the Austrian banking system relies on correspondent banking relationships to settle a range of customer payments (e.g. credit transfers). The banks that operate in ARTIS have direct access to the system based on their own in-house systems. Although IT solutions within sectors are often similar, there is no evidence that operational risk is correlated across individual banks within a sector.*

[8] *For more details on the simulations, their motivation and design, see Schmitz and Puhr (2007). The operation of ARTIS was discontinued after November 16, 2007, due to the introduction of TARGET2.*

transactions in the input data set provide time stamps, the simulator recalculates the balances of all participants of the system throughout the day depending on the institutional features of the system (e.g. settlement algorithm, queue release mechanism). The institutional features of the system that could not be accounted for in the simulator had to be mapped into the input data set. Since the tool cannot take system participants' behavioral reactions into account, they must be determined exogenously. First of all, system participants might want to stop submitting payments to the participant experiencing operational problems. A stop-sending rule applies if a transfer account of a central bank in the TARGET system experiences an operational problem, i.e. no further payments are transferred to the stricken transfer account.[9] Payments to other participants are not affected. In cases of operational problems at other banks, ARTIS operators at the OeNB provided evidence that participants continue to submit payments to the affected participants, even if the latter cannot submit payments themselves for many hours. Second, participants could react to operational incidents by increasing available collateral. Anecdotal evidence suggests that ARTIS participants already hold large shares of their eligible assets at the OeNB. Consequently, we assume that system participants are not increasing collateral for operational incidents with durations of up to one day. The simulations are based on actual liquidity data for the sample period. We interpret the sum of beginning-of-day balances on ARTIS accounts plus unencumbered eligible collateral held at the OeNB as the binding liquidity constraint for banks. Third, the simulation algorithm takes into account debit authorization by banks for a number of other participants in ARTIS.[10]

The scenarios in Schmitz and Puhr (2007) were designed on the basis of the analysis of actual payment flows in ARTIS, focusing on the most active accounts, which also featured the highest risk concentration measures during the sample period.[11] This resulted in three scenarios: in the first, the most active transfer account[12] was shocked; in the second, the most active bank account was assumed to experience operational problems; and in the third, the three most active bank accounts were stressed simultaneously.

In this paper we run simulations for all 50 banks that are in the GSCC on all Austrian working days throughout the sample period and all 13 transfer accounts that form part of the system on all days in the sample period. We assume an operational incident that hits

[9] *Due to the operating procedures, it actually takes about 40 minutes following the detection of the operational problem at the transfer account until a stop-sending rule is imposed. The implementation of the rule in the simulation algorithm takes this small delay into account.*

[10] *Participant A may grant participant B a debit authorization according to the Terms and Conditions Governing the OeNB's ARTIS System (Article 9). Debit authorization is defined as the right of participant B to initiate (certain pre-agreed) payments from the account of participant A. Debit authorizations are granted to a small number of participants for prearranged purposes (very frequent recurring standard operations) and cannot be interpreted as a crisis mitigation instrument available on short notice in the case of an operational incident.*

[11] *The measures employed were (1) the value of liquidity concentrated at the nodes, (2) the number and value of payments submitted and received (payment concentration channel), (3) the Herfindahl index of concentration of payment flows (based on both the number and the value of payments received and submitted) as well as (4) the monthly network topology.*

[12] *Transfer accounts are ARTIS accounts held by other ESCB central banks at the OeNB. All national TARGET components are directly linked by transfer accounts. All transactions to and from the respective country and Austria are routed via these transfer accounts.*

one account in each simulation. The operational incident is mapped into the simulation as the incapacitation of the participant to process outgoing payments, i.e. the inability to submit transactions, for the whole day.[13] This assumption is extreme but plausible. Shorter outages of participants may lead to payment delays but not to unsettled payments, as shown in Schmitz and Puhr (2007).

The results are graphically represented in the four panels of chart 2. In the upper left-hand panel, the number of contagious defaults per simulation (in terms of the number of banks with unsettled payments) is depicted on the x-axis, the number of simulations that yield *x* contagious defaults on the y-axis. It is evident that about 27% of all simulations (8,604) do not lead to contagion at all. Another 26% (8,230) yield one contagious default and 16% (4,919) two such defaults. About 29% (5,456) lead to three to five contagious defaults and 17% (4,102) to more than five. The maximum contagious defaults across the 31,311 simulations amount to 33.

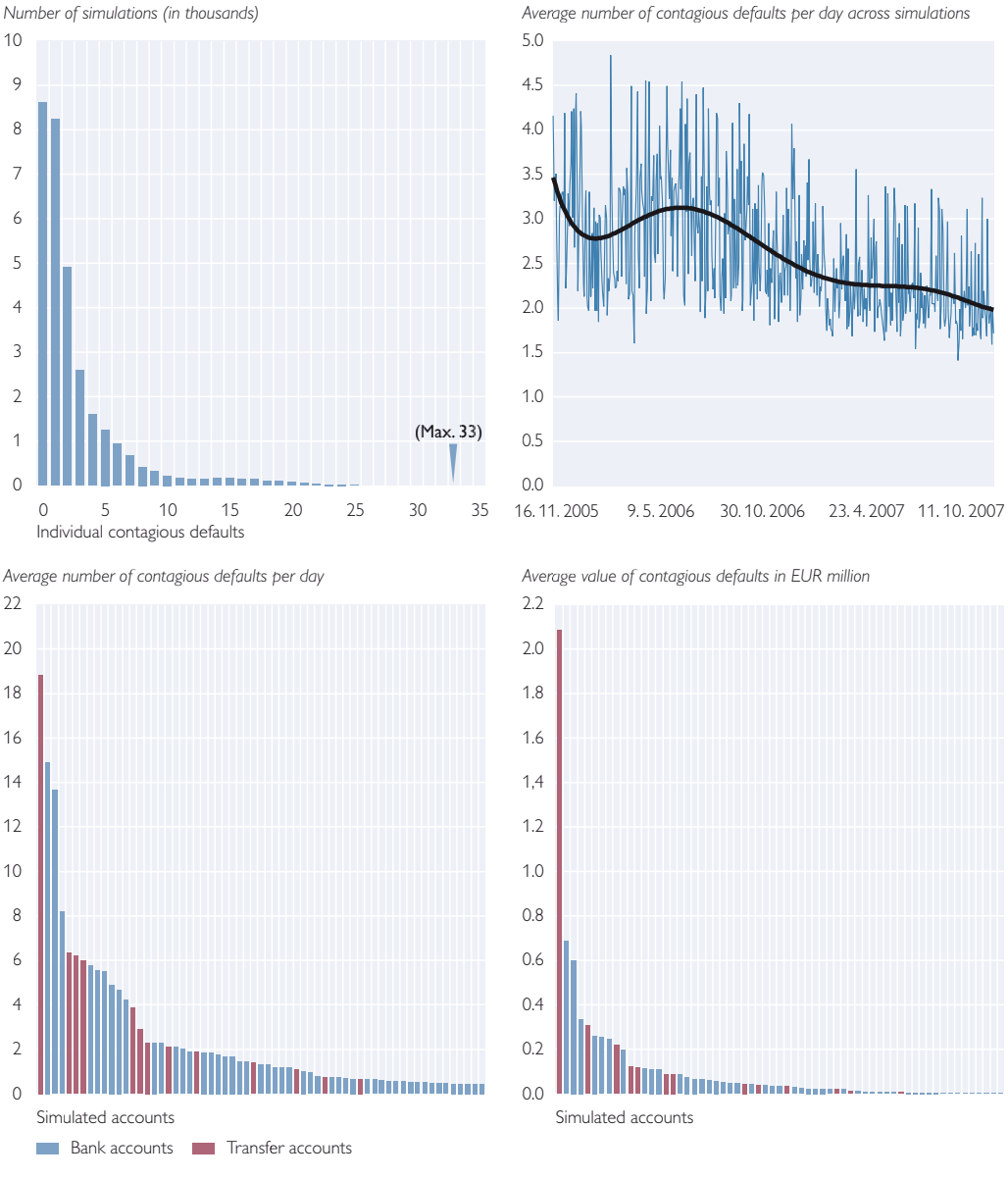
The time series of average contagious defaults (in terms of the number of banks with unsettled payments) per day is featured in the upper right-hand panel. It is quite volatile with a standard deviation of about 25% of the mean. This motivates the investigation in subsection 5.1 as to whether the variation of network topology across days can contribute to the explanation of the fluctuations of average contagious defaults per day.

The lower panels in chart 2 show the average contagious defaults per simulation (in terms of the number of banks with unsettled payments, lower left-hand panel) and the average value of unsettled payments due to contagious defaults (lower right-hand panel) per simulation. We use this information to derive the set of systemically relevant accounts. As argued above, connectivity is not an adequate criterion to capture the systemic impact of an operational problem at one of the nodes in a large-value payment system. Alternatively, we suggest defining a threshold based on the average contagion effect of an individual account. This threshold value, which can be measured by the number of contagious defaults or by the value of unsettled payments in the system, is somewhat arbitrary and depends on the risk aversion of the supervisory authority. Setting the threshold in terms of the number of contagious defaults at 1 (to capture accounts that yield at least an average of one bank with unsettled payments due to contagious default across the sample period), we find that only 39 accounts in the GSCC are systemically relevant. This figure includes 11 transfer accounts operated by central banks (lower left-hand panel of chart 2). The 28 bank accounts constitute 12% of the average of 230 bank accounts in ARTIS (during the sample period) and represent about 3% of the average of 850 banks in Austria. Defining the threshold in terms of the value of contagious defaults to pinpoint only accounts that cause at least an average value of EUR 48.5 million of unsettled payments (or 0.1% of the average value of transactions settled across days), we find that 24 accounts are systemically relevant

[13] *It is assumed that the resulting illiquidity of the participant is not interpreted as potential insolvency by other participants of the payment system and the financial system at large. In addition, ARTIS provides business continuity arrangements for participants. We tested their impact in Schmitz and Puhr (2007), but disregard them in this paper, as they are of little relevance for the interaction between network topology and contagion.*

Chart 2

Simulation Results



Source: OeNB.

(lower right-hand panel of chart 2). Seven of these are transfer accounts, which leaves 17 bank accounts, which account for about 7% of the average of 230 bank accounts in ARTIS (during the sample period) and for around 2% of the average of 850 banks in Austria.

Given that transfer accounts do not hold any liquidity (i.e. the liquidity drain caused by their incapacitation is nil) and that the stop-sending rule considerably reduces the liquidity sink effect, the strong contagion impact of transfer accounts is interesting. This indicates that payment concentration risk is more important for the contagion impact than liquidity concentration risk. The fact that TARGET2 operates on a Single Shared Platform without highly contagious transfer ac-

counts might increase the resilience of this critical infrastructure with respect to operational problems (though not necessarily at the platform level).

The results suggest that the supervision of operational risk in banks' payment processing/submission capacity could focus on a relatively small set of systemically relevant banks in Austria and on their business continuity arrangements.

4.1 Approximating a Probability Distribution across Contagious Defaults per Simulation

In section 3 we showed that large-value payment systems can have common network characteristics despite large differences in size. In order to be able to compare the simulation results across large-value payment systems, we estimate the relation between the number of simulations and the number of contagious defaults they cause (in terms of the number of banks with unsettled payments). Chart 2 (upper-left panel) reveals that the number of simulations y that involve a certain number of contagion events x is a rather regularly declining function in x. In this context it seems natural to look for a simple parametric probability distribution describing the number of occurrences of contagion events in a simulation, given that contagion did actually occur. As such a distribution would attach positive probabilities to low-probability high-impact events, it could be applied in future simulation studies for the analysis of extreme events.

As candidate distributions, we considered discretized versions of the following continuous distributions: exponential, Weibull and gamma. These three distributions are defined on the set of non-negative numbers and have one (exponential) or two (Weibull and gamma) parameters. Discretizing these distributions was accomplished in the following way: The probability of observing just one contagion event was set to the probability of observing the continuous distribution in the interval from zero to one; observing two contagion events was related to the interval from one to two; and so on. The maximum likelihood method was used for estimating the unknown parameters.

A graphical assessment of the adequacy of the estimated distributions shows that exponential distributions are not flexible enough to describe the observed number of contagion events because this distributional family only has a scale but no form parameter. A much better fit is achieved by the Weibull and gamma distributions. When applying chi square tests for goodness of fit, however, it comes as no surprise that these distributions are rejected at any commonly used confidence level as we are dealing with a very large number of observations (22,707).[14] Nevertheless, it can be observed that the Weibull distribution delivers a smaller value of the chi square statistic than the gamma, thus indicating a better fit of the former. For simulations that show at least one contagion event, we conclude that the Weibull distribution is a reasonable choice for describing the probability that the number of observed contagion events C is equal to a positive integer n given by:
$P\{C=n\}=Wei(n|a,b)-Wei(n-1|a,b)$ *for all* $n \geq 1$,
where $Wei(.|a,b)$ denotes the cumulative distribution function of a Weibull distribution with parameters a and b, defined by
$Wei(x|a,b)=1-exp(-(x/a)^b)$ *for all* $x \geq 0$.

[14] *Due to the large sample size, even small deviations of the fitted values from the observed values lead to a formal rejection of the null hypothesis, which reflects a common criticism of statistical tests (DeGroot, 1985).*

We thus approximate the distribution of the number of contagious defaults in a simulation given that contagion actually by means of a discretized Weibull distribution with $\hat{a}_{ML} = 2.61$ and $\hat{b}_{ML} = 0.77$.

5 The Interaction between Network Topology and Stability in ARTIS

In this section, we investigate whether the variation of network indicators at the network level across days (subsection 5.1) and at the node level across stricken accounts (subsection 5.2) explains the variation of contagion across days and across stricken accounts.

Selecting the appropriate measure of network topology is not trivial as the number of available indicators is large. At the network level, we calculate 44 network indicators, taking into account not only those in table 1, but also the directed and/or value-/volume-weighted and/or average/maximum values for selected indicators. Similarly, the number of indicators available at the node level comes to 71.

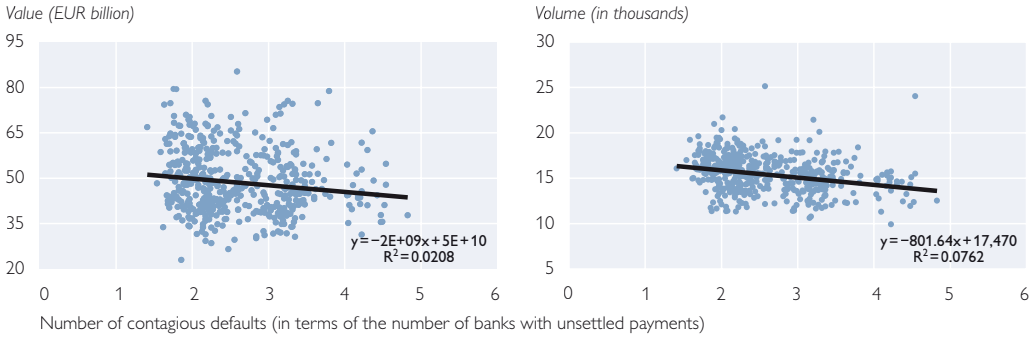
Boss et al. (2004) relate contagion in the interbank market to betweenness centrality at the node level, because this measure has a higher explanatory value than the alternative network indicators in their data set. They uncover a dented linear relationship. Banks with betweenness centrality measures $0 \leq C_B(h) \leq 2$ do not cause any contagious defaults. For $C_B(h) > 2$ they find a linear relationship with a slope of about 0.8.

Borgatti (2005) studies the selection of the appropriate centrality measure for various typologies of flow processes. He classifies flows along two dimensions: the characteristics of the route through the network and the characteristics of the transfer mode. The first dimension encompasses paths, trails and walks. Paths are sequences of links and nodes in which neither links nor nodes are repeated (shortest paths are a special case of paths.) Trails refer to sequences in which nodes, but not links, may be repeated. Walks are unconstrained sequences. The second dimension refers to how the flowing good is passed on along the route from one node to another. While a disease can be passed on without implying the immediate cure of the carrier (Borgatti refers to this as parallel duplication), liquidity is transferred so that the initial holder has to part with it (referred to as transfer). What does this imply for the flow of liquidity in ARTIS? In a physically complete network, banks do not have to make payments to other banks via third parties. Instead, they transfer directly to the ultimate receiver. However, the flow of liquidity does not stop there. Liquidity can be transferred to any other node in the network (including the submitter of the first payment). Where liquidity ultimately ends up is beyond the control (and interest) of the initial submitter of a payment. This implies that liquidity flow follows a walk rather than a path or a trail. Given that betweenness centrality is based on the share of all shortest paths through a node, it is not a good measure of centrality in the study of liquidity flows. Degree centrality is more suitable.

We present our results in terms of four network indicators for three reasons: First, we believe that, given the nature of liquidity flows, degree centrality is the appropriate measure. Second, we want to ensure a high degree of comparability of our results with other papers that use different network indicators (such as betweenness centrality). Third, we want to investigate whether network indicators in general add value to the more traditional mea-

Chart 3

Value and Volume (Network Level) per Day versus Average Number of Contagious Defaults per Day



Source: OeNB.

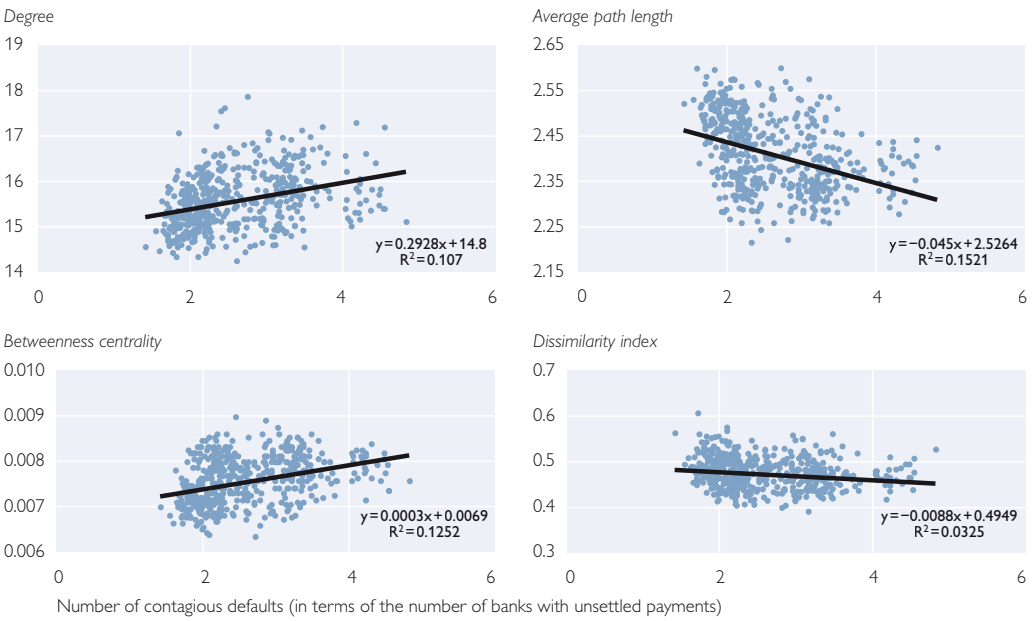
sure used in comparable simulation studies (i.e. the size of the individual node in terms of value and volume of transactions). Therefore we focus on the measures value and volume as well as on the network indicators degree, average path length, betweenness centrality and dissimilarity index in each of the following two subsections.

5.1 Network Level

In chart 3 we depict the daily value (left-hand panel) and the daily volume of all payments (right-hand panel) submitted to ARTIS on the y-axis and the number of contagious defaults (in terms of the number of banks with unsettled payments daily averages across scenarios) per day on the x-axis. The varia-

Chart 4

Selected Network Indicators (Network Level) per Day versus Average Number of Contagious Defaults per Day



Source: OeNB.

tion of value explains 2% and the variation of volume accounts for 8% of the variation of the contagion impact per day.

The explanatory value of the variables value and volume is low. Do network indicators perform any better? In chart 4 we look at the following indicators (unweighted, undirected): degree, average path length, betweenness centrality and dissimilarity index. Similarly to chart 3, the daily number of contagious defaults (in terms of the number of banks with unsettled payments) is depicted on the x-axis and the daily values of the respective network indicator are shown on the y-axis in each panel.

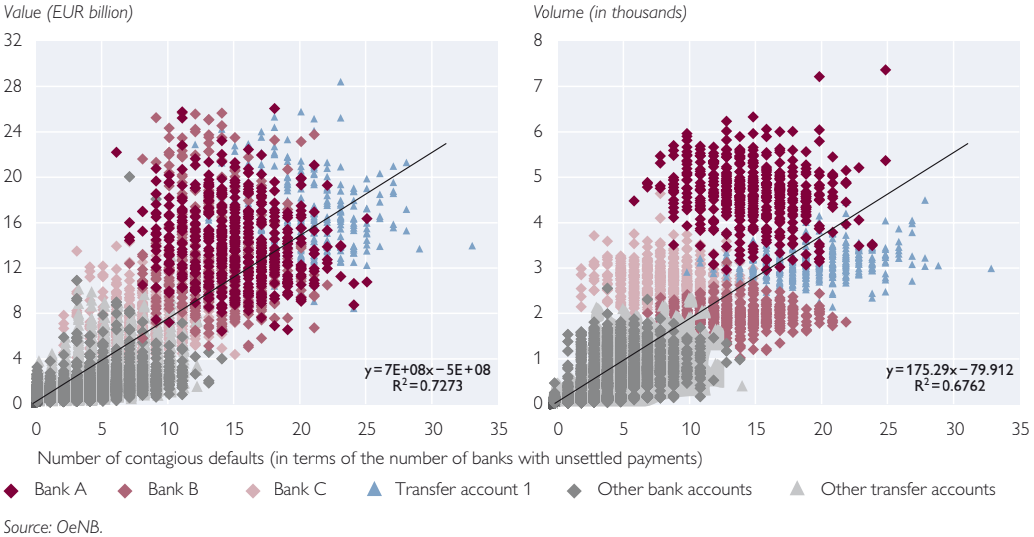
The average path length (15%) and betweenness centrality (13%) have the highest explanatory values. The daily variation in degree accounts for 10% of the variation in contagion and that of the dissimilarity index for only 3%. Although the explanatory power of three of the network indicators is higher than that of value and volume, the levels are still low. The highest explanatory power of any of the remaining 39 indicators is 15.4% (average number-weighted clustering coefficient), while a number of indicators have no explanatory power at all. We conclude that daily variations in network structure are of limited use in the stability analysis of ARTIS. However, this does not preclude that structural differences across networks might influence a network's relative resilience. But as shown above, even large-value payment systems which display considerable differences in size share notable structural commonalities.

5.2 Node Level

In this subsection, we study the large dispersion of contagion effects caused by different nodes (see lower panels of chart 3). Do the different positions of the nodes (that experience the operational shock) in the network account for this variation? In chart 5 we plot the value and volume of payments of the stricken node in each simulation against its contagion effect in terms of the number of contagious defaults (in terms

Chart 5

Value and Volume (Node Level) per Stricken Account versus Number of Contagious Defaults per Simulation



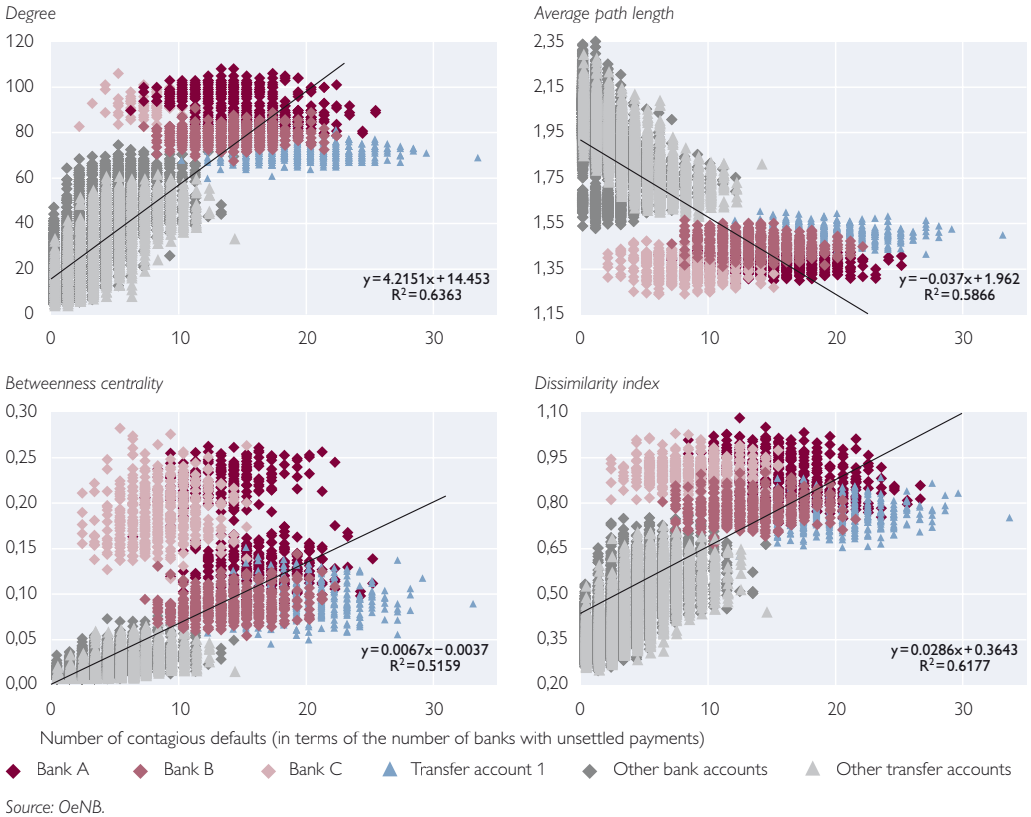
Source: OeNB.

of the number of banks with unsettled payments), i.e. each panel contains 31,311 data points. In addition, the data points of the three most active banks (Bank A, B, and C) and of the most active transfer account (Transfer Account 1) are colored (see the legend of chart 5), while those of all other bank accounts and of all other transfer accounts are dark grey and light, respectively. The variations of value and volume across simulations explain 73% and 68% of the variation of the contagion impact across simulations. The slopes have the expected signs: more active nodes cause more contagion. The differentiation among simulations according to the shocked account reveals a pronounced grouping in both panels. In the right-hand panel, it also points to structural differences in contagion impact not accounted for by variations in volume. Transfer Account 1 and Bank B tend to group below the regression line (i.e. they cause more contagion than estimated by their volumes of transactions) and Banks A and C above the regression line (i.e. they cause less contagion than estimated by their volumes of transactions).

In chart 6 we plot four network indicators (degree, average path length, betweenness centrality and dissimilarity index) of each stricken node against its contagion effect in terms of the number of contagious defaults (i.e. each panel contains 31,311 data points). In addition, the data points of Banks A, B, and C and Transfer Account 1 are differentiated in the same way as in

Chart 6

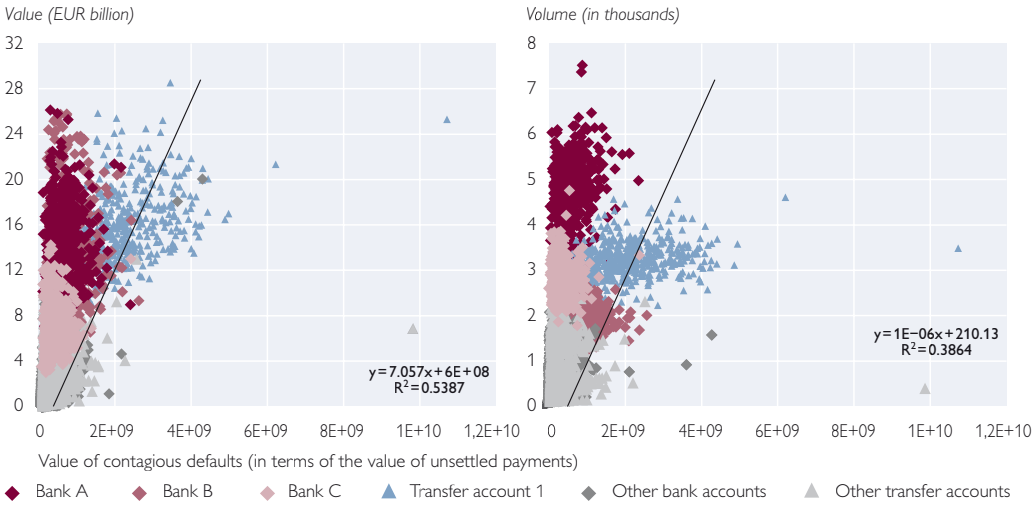
Network Indicators (Node Level) per Stricken Account versus Number of Contagious Defaults per Simulation



Source: OeNB.

Chart 7

Value and Volume (Node Level) per Stricken Account versus Value of Contagious Defaults per Simulation



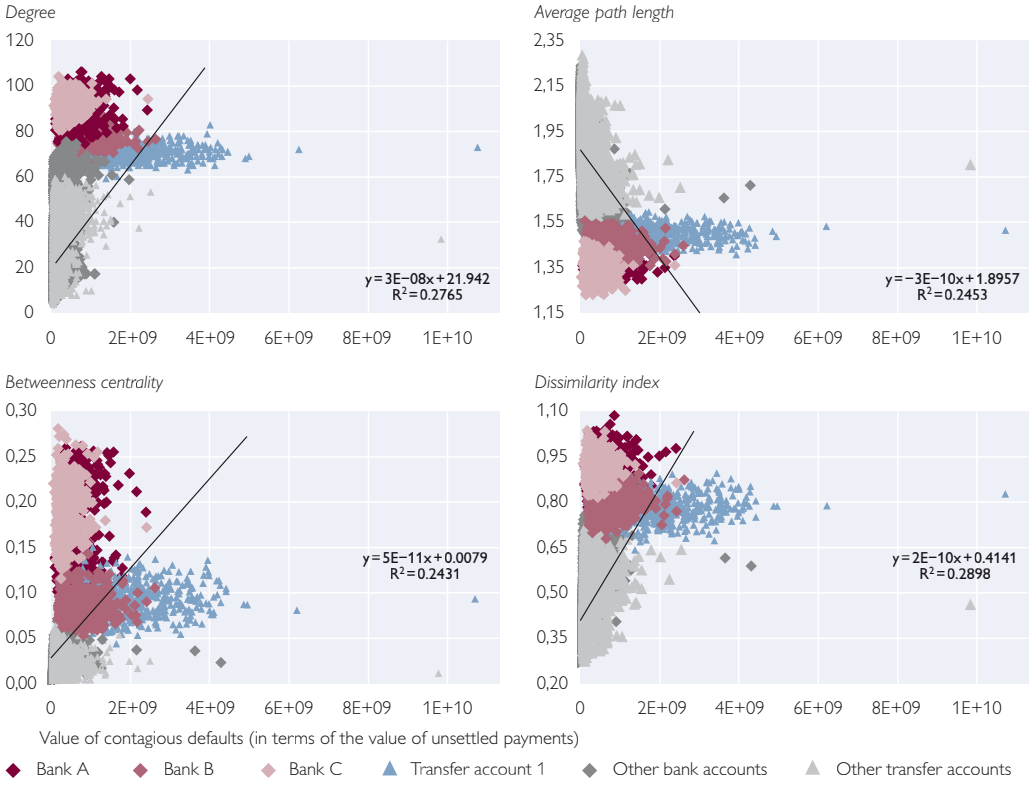
Source: OeNB.

chart 5. The explanatory values of all four network indicators are quite high; the simplest measure degree yields an R^2 of 64%, variations in average path length across simulations account for 59% of the variation of the number of contagious defaults across simulations. The more complex measures betweenness centrality and dissimilarity index yield an R^2 of 52% and 62%, respectively. These values are in the order of magnitude of the reported interaction between betweenness centrality and contagious defaults for the Austrian interbank market (Boss et al., 2004). The signs of the slopes are in line with expectations: simulations in which more active and more central nodes are shocked feature a higher contagion impact. The remaining 65 network indicators yield explanatory values between nil (number-weighted average path length based on payments received) and 77% (relative volume of payments received). The results demonstrate that network indicators at the node level can indeed explain large parts of the variation in contagion across stricken accounts. However, network indicators seem to add little to the high explanatory values of the traditional measures of activity (value and volume). Furthermore, the large set of available indicators and the huge differences in their explanatory values pose a data mining problem. The differentiation according to the stricken account confirms the pronounced grouping evident also in chart 5. In all four panels, simulations based on Transfer Account 1 cluster at the right-hand side of the regression line, while those based on Bank C and to a lesser extent those of Bank A lie to the left of the regression line. This finding points to structural differences in contagion impact, which are not accounted for by measures of activity or network indicators and warrant further research.

We also investigate the interaction between network topology and network stability for another measure of contagion, namely the value of unsettled payments. Again we start with the analysis of the explanatory value of node size, i.e. of value and volume of

Chart 8

Network Indicators (Node Level) per Stricken Account versus Value of Contagious Defaults per Simulation



Source: OeNB.

payments originating at the node (chart 7). Variations in value explain 54% and in volume 39% of the variation in contagion. Both values are lower than the respective results in chart 5.

How well do the network indicators at the node level fare in comparison? The explanatory values are similar for the four network indicators (degree 28%, average path length 25%, betweenness centrality 24% and dissimilarity index 29%, chart 8) and they are considerably lower than the respective values for the measures of size in chart 7. When contagion is measured by the value of unsettled payments, network indicators are clearly dominated by the traditional measures of size. However, the grouping of contagious defaults according to the three most active bank accounts and the most active transfer account are also apparent in charts 7 and 8. Comparing the results for the two measures of contagion, number of banks with unsettled payments (charts 5 and 6) versus value of unsettled payments (charts 7 and 8), reveals that contagion under the latter measure is much harder to explain by the more traditional variables (value and volume of payments) and by network indicators. But, relatively speaking, network indicators do even worse. In future work, we will focus on the investigation of the variations in the value of contagion in a multivariate setting, in which we combine control variables (e.g. beginning-of-day liquidity at individual nodes) with network topology indicators at the network and at the node level.

Table 2

Correlations Between Network Indicators (Node Level)

	Volume	Value	Average path length	Degree	Connectivity	Clustering	Betweenness centrality	Dissimilarity index
	%							
Volume	100	89	–77	84	83	–57	89	85
Value		100	–70	76	75	–52	77	78
Average path length			100	–96	–97	62	–79	–85
Degree				100	99	–72	85	95
Connectivity					100	–72	85	93
Clustering						100	–56	–78
Betweenness centrality							100	87
Dissimilarity index								100

Source: OeNB.

To corroborate our finding that network indicators at the node level do not add much value to stability analysis, we present the correlations between the traditional measures of activity (value and volume) and selected network indicators in table 2. The data reveal that various indicators of centrality (average path length, degree, connectivity, betweenness centrality and dissimilarity index) are highly correlated with value and volume.

The analysis suggests that network indicators provide little value added in the stability analysis of large-value payment systems with respect to operational shocks at a participant. In future research we will extend the analysis from a univariate to a multivariate framework.

6 Summary

The analysis of the network indicators of ARTIS shows that the network is compact, mostly because almost all active nodes are linked to a small number of accounts at the center of the network (the largest banks and the most active transfer accounts). This network structure is quite stable across days. Comparing the ARTIS system with the much larger FedWire network yields interesting insights into the relationship between size and structure of payment systems. The distance measures, the average degree and the clustering coefficient seem to be independent of size, like in other small-world networks. A comparison of the network indicators of ARTIS with those of the Austrian interbank market reveals that the distance measures are very similar, while the clustering coefficients differ substantially. The similarity arises because the interbank market is likewise dominated by a few large nodes at the center of the network.

We conducted 31,311 simulations based on 63 different scenarios for 497 transaction days from November 16, 2005, to November 16, 2007 (excluding Austrian holidays). Although the scenarios focus only on the banks and transfer accounts represented in the GSCC on all days, more than a quarter of all simulations do not lead to contagion (in terms of the number of banks with unsettled payments) at all, and two-fifths yield one or two contagious defaults. Based on two conservative thresholds of contagion impact, we find that only a very small number of accounts are systemically important. If we regard only accounts that yield at

least an average of one contagious default across the sample period as systemically important, we find that no more than 28 bank accounts, but almost all transfer accounts operated by central banks, are systemically relevant. If we define systemic relevance as a contagion impact of at least 0.1% of the average value of transactions settled across days, we find that 17 bank accounts and 7 transfer accounts are systemically relevant. In both cases only 7% to 12% of all bank accounts in ARTIS and 2% to 3% of all Austrian banks are systemically relevant. The simulation results suggest that the ARTIS system is remarkably stable with respect to operational incidents at one of its participants. The strong contagion impact of the transfer accounts is an interesting feature revealed by the simulations and suggests that removing transfer accounts in the Single Shared Platform of TARGET2 can improve the system's resilience compared with the old TARGET system.

The time series of average contagious defaults per day is quite volatile. We find that the variation of network structure across days does not contribute much to the explanation of the variation of contagion across days. At this stage of our research, network indicators at the network level seem to be of limited use for stability analysis.

Network indicators at the node level can have explanatory power. In the simulations some of them are correlated with the contagion impact of an operational shock to a node. Their explanatory power is higher when the analysis focuses on the contagion measured by the number of banks with unsettled payments as opposed to the value of unsettled payments. It is questionable at this stage whether network indicators contain much additional information compared with value and volume, which have traditionally been the focus of stability analysis in simulation studies of operational risk in large-value payment systems. Furthermore, the large number of available network indicators at the node level and the huge differences in their explanatory power pose the problem of data mining. In future research, we plan to explore the large data set compiled in the simulations to investigate the explanatory power of network indicators at the network and at the node level in a multivariate framework, which allows for controlling for other explanatory variables, such as beginning-of-day liquidity at the network and at the node level.

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Is Current Capital Regulation Based on Conservative Risk Assessment?

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We criticize the popular view that separately calculating regulatory capital for market and credit risk yields a conservative aggregate risk assessment. We show that this view depends on a flawed intuition about diversification effects that arise between subportfolios. If a bank's portfolio cannot be neatly divided into two subportfolios along the lines of market and credit risk, simply adding up the respective results may cause the true portfolio risk to be underestimated. Using the example of foreign currency loan portfolios, we show that this underestimation can be quantitatively significant.

JEL classification: G28, G32, G20, C15
Keywords: Integrated analysis of market and credit risk, risk management, foreign currency loans, banking regulation.

1 Introduction

In work of the Basel Committee on Banking Supervision it has been a tradition to distinguish market risk from credit risk and to calculate the respective capital charges separately; aggregate capital requirements are then derived by adding up. While it is acknowledged that adding up separate market and credit risk numbers is not fully satisfactory compared to a model that integrates different risk categories, regulators mostly feel comfortable with this approach because adding up is widely considered to give a conservative estimate of overall capital requirements.

The intuition for this view is based on a diversification argument: If market risk can be roughly associated with the trading book and credit risk can be roughly associated with the banking book, then these two books can be viewed as two subportfolios of a bank's total portfolio. Any coherent risk measure for the total portfolio will produce a risk number which is smaller than the combined risk of the banking book and the trading book, or at most equal to the combined risk. Therefore the amount of capital calculated by adding up separate risk components will constitute an upper bound.

In this paper we argue that this view is flawed. We show that only if the portfolio can be divided into a market subportfolio depending just on market but not on credit risk factors, and a credit subportfolio depending just on credit but not on market risk factors, will integrated risk capital be smaller than the sum of market and credit risk capital. We argue that in many practically relevant risk assessment situations it is impossible to neatly separate the overall portfolio along the lines of the Basel risk categories. It therefore follows from our analysis that the adding-up approach can lead to an underestimation of the overall portfolio risk. Using the example of foreign currency loans, we show that this underestimation can be quantitatively significant.

Our results lead to an important policy conclusion: It cannot in general be argued that banks which have implemented the Basel II capital requirements deserve a capital relief on the grounds that an integrated framework would automatically deliver capital savings not realized under the current approach of adding up market and credit risk capital.

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2 Integrated versus Separate Analysis of Market and Credit Risk

Current regulation is conceptually based upon the distinction between market and credit risk. Market risk is defined as the risk that the price at which a financial position can be sold on the market may deteriorate. The traditional approach to modeling market price changes of positions is to track changes in underlying market risk factors, such as stock or commodity prices, exchange rates, or interest rates. Credit risk is defined as the risk of not receiving the promised payment on an outstanding claim. Credit risk factors determining default losses – such as default probabilities, loss-given default, exposures at default – may be either idiosyncratic properties of individual obligors, or they may be macroeconomic and market variables that influence all obligors in the same way. That is to say, some risk factors may influence both market and credit risk. Interest rates, for example, are market prices that determine the values of various fixed income instruments, but they affect default probabilities as well.

Risk assessment is based on portfolio valuation. To this effect, let us assume that a function $v:A\times E\to R$ is given, which specifies the value of a portfolio in dependence of some vector $a\in A$ of credit risk factors, and some vector $e\in E$ of market risk factors. The separation of risk factors into market and credit risk factors is just an assumption at this stage. For our argument it is not important which risk factors are seen as either market or credit risk factors. What matters is that such a separation is made in the first place. In the conclusion we will discuss the failure of this assumption as one indication of the interaction between market and credit risk.

Mathematically speaking, market risk reflects the value change of a portfolio which arises from moves in market risk factors, on the assumption that credit risk factors are constant at some a_0:

$$\Delta m(e) := v(a_0, e) + v(a_0, e_0).$$

The market risk factors e are usually market prices. Value changes are calculated by comparing the portfolio value after the change of the risk factors with the portfolio value $v(a_0, e_0)$ in a reference scenario (a_0, e_0). Assuming counterparties to default in a pure market risk analysis amounts to setting the default probability a_0 at zero, or to assuming the distance to default to be infinite. In other words, in a pure market risk analysis a_0 is assumed to be fixed; in our analysis, however, it can take on any value.

Analogously, *credit risk* analysis deals with value changes caused by moves in credit risk factors, assuming all market risk factors are constant at e_0:

$$\Delta c(a) := v(a, e_0) + v(a_0, e_0).$$

Credit risk factors are usually related to the payment ability of counterparties, as evidenced by their rating, default probabilities, distances to default, or estimates of recovery rates. Credit risk capital calculations both in Basel II and in most portfolio credit risk models assume market risk factors, such as interest rates or exchange rates, to be constant. Only in the more recent integrated risk models do both market and credit risk factors vary. *Integrated risk* is related to the value change caused by simultaneous moves of market and credit risk factors:

$$\Delta v(a, e) := v(a, e) + v(a_0, e_0).$$

Adding up regulatory capital for market and credit risk implicitly rests on the assumption that integrated value changes of the portfolio are approximated by the sum of value changes related to both market and credit risk factors:

$$\Delta v(a,e) \approx \Delta c(a) + \Delta m(e). \quad (1)$$

This corresponds to the approximation

$$v(a,e) \approx v(a_0, e_0) + \Delta c(a) + \Delta m(e).$$

For a general portfolio valuation function $v(a,e)$ the approximation $\Delta c(a)+\Delta m(e)$ may evidently underestimate the true integrated Δv at times. If in some scenario (a,e) the approximation error

$$d(a,e) = \Delta v(a,e) - \Delta c(a) - \Delta m(e)$$

is negative, we have *malign* risk interaction. (Only if d is non-negative in all scenarios, is there a *benign* interaction of credit and market risk.) This negative interaction of risk is caused by the non-additivity of the value function v. The following proposition classifies the functions v for which the approximation error is zero everywhere.

Proposition 1: The approximation is exact, that is $\Delta v(a,e)=\Delta c(a)+\Delta m(e)$*, if and only if* v *has the form*

$$v(a,e) = v_1(a) + v_2(e) \quad (2)$$

In this case the portfolio can be broken down into two components, one depending only on credit risk factors, the other depending only on market risk factors.

This proposition is technically easy but conceptually important. In particular the "only if" part is interesting. Linear value functions v fulfill condition (2) and are therefore exactly approximated (for a proof see Breuer et al., 2007). The components can be real subportfolios or fictitious components into which single positions can be broken.

Turning from valuation to risk assessment, the properties of the value-change functions in various scenarios (a,e) carry over to risk measures and risk capital. If the parameter space $A \times E$ is equipped with a probability measure, the functions Δv, Δc, Δm give rise to random variables. (In somewhat sloppy notation, we denote these random variables also as Δv, Δc, Δm.) To these random variables one can apply any coherent risk measure ρ. The $\rho(\Delta c)$ we get is the risk capital for credit risk. Similarly $\rho(\Delta m)$ is the risk capital for market risk.

We measure the effect of an integrated analysis of market and credit risk by the index

$$I_{rel} := \frac{\rho(\Delta v)}{\rho(\Delta c) + \rho(\Delta m)}$$

which is well-defined if $\rho(\Delta c)+\rho(\Delta m)>0$ and $\rho(\Delta v)\geq 0$. In case of negative inter-risk interaction, $I_{rel}>1$, I_{rel} is unchanged if the portfolio is scaled by some factor; and $I_{rel}=1.2$ means that total risk is 20% larger than the sum of credit and market risk.

Proposition 2: In the case of benign interaction of risk $(d \geq 0)$ *separate analysis of market and credit risk overestimates true risk:*

$$\rho(\Delta v) \leq \rho(\Delta c) + \rho(\Delta m). \quad (3)$$

This holds for all subadditive risk measures ρ*. Otherwise, in the case of malign interaction of risk* $(d<0$ *somewhere), there exists a coherent risk measure* ρ *for which separate analysis of market and credit risk underestimates true risk:*

$$\rho(\Delta v) > \rho(\Delta c) + \rho(\Delta m). \quad (4)$$

For a proof see Breuer et al. (2007).

A breakdown of portfolios along credit and market risk considerations was considered by Dimakos and Aas (2004) and Rosenberg and Schuermann (2006). In this case v is of the form $v(a,e)= v_1(a)+ v_2(e)$. For such a portfolio by proposition 2 the approximation is exact, i.e. $\Delta v(a,e)=\Delta c(a)+\Delta m(e)$. Thus $\rho(\Delta v)=\rho(\Delta c+\Delta m)\leq \rho(\Delta c)+\rho(\Delta m)$ and $I>0$ for any subadditive risk measure ρ. This implies that inter-risk interaction is always positive for a portfolio with credit and market risk separated into different subportfolios. Under these conditions, the measure provided by adding up risk capital for market risk and risk capital for credit risk will necessarily be conservative. Because the afore-mentioned authors consider only

portfolios that may be neatly divided into market and credit subportfolios, they actually observe diversification effects from the perspective of an integrated analysis of market and credit risk. Yet if there is interaction between credit and market risk, such a separation of risk types into subportfolios is not possible. This is the situation we consider.

3 Separate versus Integrated Risk Assessment of Foreign Currency Loan Portfolios

As an example where the need for an integrated analysis of market and credit risk is obvious and where true risk is underestimated under the current regulatory paradigm we now analyze foreign currency loans. Foreign currency loans have become a particular concern for supervisory authorities because households have become inclined to take out foreign currency mortgages in recent years. Foreign currency-denominated mortgage financing has been especially popular in Austria and in Central and Eastern Europe. Foreign currency loans can be seen as a carry trade. In a carry trade, an investor takes advantage of the differential between low borrowing costs in one country and high investment yields in another country.

Breuer et al. (2007) study a stylized example of a foreign currency loan portfolio to establish a rough idea about the order an underestimation effect might have. They consider a portfolio of foreign currency loans with N obligors indexed by $i=1,\dots,N$. All loans are underwritten at the initial time $t=0$. In order to receive the home currency amount l_i an obligor takes a loan of $l_i/f(0)$ units in the foreign currency. The bank borrows $l_i/f(0)$ units of the foreign currency on the interbank market. When the loan expires after one period at time $t=1$, which we take to be one year, the bank repays the foreign currency on the interbank market with an interest rate r_f while claiming from the customer a home currency amount. The latter is exchanged at the rate $f(1)$ to the foreign currency amount $(l_i/f(0))(1+r+s_f)$, which is the original loan plus interest r_f rolled over from four quarters plus a spread s_f. So the customer's payment obligation to the bank at time 1 in home currency is

$$o_i=l_i(1+r_f)f(1)/f(0)+l_i s_f f(1)/f(0). \quad (5)$$

The first term on the right-hand side is what the bank has to repay on the interbank market, the second term is the spread profit of the bank. For a home currency loan the payment obligation would be $o_i=l_i(1+r_h+s_h)$, where r_h is the interest rate in the home currency and s_h is the spread to be paid by the customer on a home currency loan. Whether an obligor will be able to meet this obligation depends on his payment ability a_i. Like in a structural credit risk model, we assume that an obligor defaults if his payment ability at the end of the period is smaller than his payment obligation.

The profit of the bank with obligor i is therefore

$$v_i:=\min(a_i,o_i)-l_i(1+r_f)f(1)/f(0) \quad (6)$$

In this respect $f(0)$ is the known exchange rate at time $t=0$, whereas $f(1)$ and r are random variables. In the profit function v_i the first term is what the obligor repays and the second term is what the bank has to pay on the interbank market.

Payment ability is modeled as a function of macroeconomic conditions, described by real GDP growth and an idiosyncratic shock with a log normal distribution. The parameters of the log-normal distribution are calibrated such that they match the obligors' ratings and a profit target for the bank. The probability law driving the risk factors

– exchange rate, interest rate and GDP growth – is estimated by a time series model capturing macroeconomic interaction between countries, the so-called global vector autoregressive model (GVAR; see Pesaran et al., 2006) We use time series of quarterly data. In the GVAR these variables are estimated taking into account the macroeconomic interdependence between Switzerland and Austria and their three most important trading partners – Germany, Italy and France – as well as the United States. For a more formal discussion and details we refer to Breuer et al. (2007).

With this stylized model of cash flows related to the foreign currency loan portfolio and the estimated and calibrated probability law for systematic and idiosyncratic risk factors, a portfolio loss distribution can be simulated using Monte Carlo techniques. The example portfolio contains $N=100$ loans of l_i=EUR 10.000 taken out in CHF by customers in the rating class B+, corresponding to a default probability of p_i=2%, or in rating class BBB+, corresponding to a default probability of p_i=0.1%.

When applying the traditional approach to assessing the risks of the portfolio, one would look at market and credit risk in isolation. From a pure market risk point of view, the bank has only an open position with respect to the spread s as long as no defaults occur. From a pure credit point of view, the portfolio would be naively treated as consisting of different obligors with their respective default probabilities p_i. In this case it is obvious why this approach is naive. The probability of default is related to the borrower's payment obligation and payment ability as well as – as a direct function of the market risk factors – to the underlying exchange rate, interest rates and GDP growth. If obligors default, the bank suddenly has bigger open foreign exchange positions vulnerable to moves in the exchange rate, and this matters not only under credit risk considerations but also from a market risk perspective. Clearly the two risks have to be considered simultaneously here. Consequently it is important to cross-check the capital requirements established with an adding-up approach against the requirements established with an integrated approach.

Breuer et al. (2007) find the following risk capital values for pure market risk, pure credit risk and integrated risk, respectively, and consolidate these values into an inter-risk interaction index I_{rel}:

Rating	α	RC(Δm)	RC(Δc)	RC(Δv)	I_{rel}
BBB+	10%	1,059	0	1,193	1.13
BBB+	5%	1,234	0	1,522	1.23
BBB+	1%	1,576	0	3,056	1.94
BBB+	0.5%	1,698	1	4,641	2.73
BBB+	0.1%	1,951	3	16,076	8.22
B+	10%	1,102	795	2,711	1.43
B+	5%	1,285	1,022	4,420	1.92
B+	1%	1,641	1,523	11,201	3.54
B+	0.5%	1,768	1,730	15,658	4.48
B+	0.1%	2,032	2,257	32,568	7.59

The rating classes refer to the individual loans in the portfolio and α refers to the various quantiles of the loss distribution.

These are dramatic effects. Depending on the quantile, the true portfolio risk under the traditional approach would be underestimated by a factor 1.5 to 8. These strong effects clearly reflect a malign interaction of market and credit risk which cannot be covered by providing separately for market and credit risk. Holding separate risk capital for market and for credit risk is by far not sufficient to cover the true integrated risk capital. This does not

come as a surprise. The main risk of foreign currency loans, namely the danger of increased defaults triggered by adverse exchange rate moves, is captured neither by market risk nor by credit risk models.

4 Conclusions

In this paper we challenge the traditional regulatory approach of separating risks into the familiar categories of market and credit risk. We argue that this approach is conceptually problematic because many portfolios cannot be neatly separated into a market subportfolio and a credit subportfolio. We argue that as a consequence risk assessment and the calculation of regulatory capital can be seriously flawed. Only if a portfolio is separable into market and credit subportfolios, can we be sure that calculating regulatory capital independently for market and credit risk will always provide an upper bound for the necessary risk capital when added up. The current regulatory approach is conservative only for separable portfolios. If portfolio positions depend *simultaneously* on market and credit risk factors, the nature of the risk assessment problem changes. If for such a portfolio market and credit risk are calculated separately, the portfolio valuation is flawed and will lead to a wrong assessment of true portfolio risk. Using the example of foreign currency loans, we show that under the current regulatory concepts we could have a serious underestimation effect of the true risk of such a portfolio.

These results imply that there is no general justification for the presumption that the appropriate regulatory capital for a portfolio subject to market and credit risk is lower than the sum of the regulatory capital calculated separately for these risk categories. It can therefore not in general be argued that banks that have implemented the Basel II capital requirements deserve a capital relief on the grounds that an integrated framework would automatically deliver capital savings not realized under the current approach.

In keeping with our example of the foreign currency loan portfolio, the exchange rate may alternatively be interpreted[2] to be both a market and a credit risk factor. The exchange rate is a market risk factor because it has an effect on the portfolio value in case no defaults happen, but it is also a credit risk factor because it has an effect on the size of default losses.

If a risk factor affects both market and credit risk, one basic assumption of our analysis in section 2 fails: Credit risk factors are not separate from market risk factors. Imposing such a separation amounts to committing a modeling error in either the market or the credit risk model. (This modeling error is related but not identical to the modeling error our analysis reveals in the forced separation of a portfolio into a market and a credit portfolio.)

A proper model of credit risk has to take into account all risk factors which have an effect on default losses. For the foreign currency loan portfolio this means that the credit risk model has to reflect moves of the exchange rate or other "market" risk factors which have an effect on default losses. It usually takes an integrated model to meet this requirement rather than a credit risk model. Similarly, the market price of a position reflects expected default losses, even if default has not yet occurred or may never occur. Therefore a proper market risk model has to take into market value changes caused by

[2] *We thank the referee for this suggestion.*

changes in default probabilities, default correlations or loss-given default – which will in fact only be possible with an integrated model.

In the example of foreign currency loans, counting the exchange rate as either a market or a credit risk factor but not as both will underestimate the other risk. In our analysis we counted the exchange rate among the market risk factors and kept it fixed in the credit risk analysis. This produced credit risk numbers far below the true integrated risk, as a comparison of the columns RC(Δc) for credit risk capital and RC(Δv) for market risk capital shows. In this interpretational framework our results show that an approximate credit risk analysis assuming fixed values of the market risk factors can dramatically underestimate true credit risk if market and credit risk interact.

Both interpretations of our analysis imply that a separate calculation of pure market risk and pure credit risk is not an admissible approximation to integrated risk if market and credit risk interact.

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Walking the Tightrope: A First Glance on the Impact of the Recent Global Financial Market Turbulence on Central, Eastern and Southeastern Europe[1, 2]

Sándor Gardó, Antje Hildebrandt, Zoltan Walko[3]

The Central, Eastern and Southeastern European (CESEE) countries have, to some extent, felt the impact of the international financial market turbulence observed since July 2007. While CESEE markets tended to follow the negative global investor sentiment in general, they performed relatively well compared to other emerging markets. Overall, increases in risk premiums and asset price losses were rather contained in the region, which may reflect a positive impact on investor judgment induced by EU convergence. However, the fact that the financial turmoil had a stronger impact on countries with weaker economic fundamentals and/or insufficient policy credibility shows that correcting overly large economic imbalances remains imperative in a relatively fragile international environment.

JEL classification: G15, O16, O52
Keywords: Financial markets; economic vulnerabilities; Central, Eastern and Southeastern Europe; CESEE

1 Introduction

Supported by loose monetary conditions in the United States, an environment of abundant global liquidity prevailed for over half a decade between 2001 and 2007. In the absence of major inflationary pressures, historically low interest rate levels contributed to a pick-up in credit growth and asset prices (mainly in the U.S.A.), thereby underpinning consumption and investment propensity and a strong economic momentum. However, the benign economic and inflationary conditions masked increasing vulnerabilities that resulted from the mispricing of risk. On this note, the abundant availability of credit (partly driven by banks' proactive lending strategies geared toward higher profits) together with expectations of an ongoing rise in house prices induced many U.S. borrowers with low credit standing (subprime borrowers) to take on adjustable rate mortgages (ARMs) with teaser rates, i.e. temporarily low introductory interest rates. After several years of favorable developments, the downturn in house prices, higher interest payments after the initial low-interest period and the Federal Reserve's monetary tightening stance started to bring about higher default rates on subprime and adjustable rate mortgages. The related fallouts did not, however, remain limited to the U.S. subprime mortgage sector. Given the stepped-up financial innovation and integration in the recent decade, credit and default risks have been transmitted by means of loan securitization and structured products (mainly collateralized debt obligations and asset-backed securities) via the secondary market to other financial market segments (e.g.

[1] *This study covers the following Central, Eastern and Southeastern European (CESEE) countries: Bulgaria, the Czech Republic, Hungary, Poland, Romania and Slovakia (CESEE EU Member States), Croatia and Turkey (EU candidate countries) as well as Russia.*

[2] *Cut-off date for data: March 31, 2008.*

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Refereed by: Annalisa Ferrando, ECB

prime mortgages, corporate bonds, monoline insurers) and participants (e.g. banks, hedge funds, mutual funds and pension funds, insurance companies) all over the world, partly underpinned by rating agencies' overly positive assessment of these structured products.

Negative spillover effects, i.e. large losses at major international financial institutions, a lack of transparency regarding the level and dispersion of banks' involvement in subprime or subprime-related businesses and their exposure to bank-owned special investment vehicles (off-balance sheet items), higher liquidity risks given disruptions on the interbank market, tightening lending conditions and concerns about a potential credit crunch, increased evidence of a substantial adverse impact on the real economy and the continuous reassessment of risk all contributed to a deepening and widening of the current financial turmoil. As a result, at the time of writing, the financial turmoil closely resembles a major global financial and confidence crisis. On this account, central banks all around the globe stepped in on several occasions since mid-August 2007 to address heightened liquidity pressures in order to (i) ease concerns about an emerging credit crunch, (ii) prevent bank failures and (iii) mitigate the adverse impact of the financial market turmoil on the real economy.

The financial turmoil reached the CESEE region in the second half of 2007, which was a record year in many respects – not only with regard to booming economic growth and historically low unemployment rates, but also with a view to high external imbalances (i.e. current account deficit and external debt levels) in some countries of the region as well as gradually rising inflationary pressures (driven by both supply- and demand-side factors). Against this background, the main aim of this study is to assess the impact of the global financial turbulence on CESEE financial markets and to highlight possible areas of macroeconomic and financial challenges. The study is organized as follows: Section 2 gives a brief overview of the potential financial channels through which the recent turmoil might affect the CESEE region. Section 3 provides an empirical overview of recent financial market developments in CESEE. Section 4 discusses the implications of these developments for CESEE by deriving some stylized facts against the background of the prevailing macroeconomic setting in the countries under review. Section 5 reviews the policy responses and implications, while section 6 concludes.

2 Sources and Channels of Financial Spillovers

Against the background of protracted and deepening financial market turbulence at an international scale, it is interesting to see through which financial channels[4] of contagion this development might affect CESEE economies and financial markets. In fact, the current financial turmoil could hurt the CESEE region through various direct and indirect channels. In this study, we look at the three most important financial channels, two of them being direct and one indirect. The first direct channel relates to a plunge in the prices

[4] *Via the real economy channel, disruptions might reach CESEE through slowing domestic demand in the U.S.A. and the related slowdown of euro area exports and thus, ultimately, through decreasing euro area demand for goods and services from the CESEE countries. For more details on the impact of the recent financial market turbulence on the real economy, see chapter "Reports" in this Financial Stability Report.*

of financial assets in the portfolio of CESEE financial institutions, while the second direct channel reflects the deteriorating investor sentiment toward emerging markets in general and CESEE in particular ("portfolio investor view"), manifesting itself in an increase in risk premiums and/or a decline in, or a sudden stop of, net capital inflows into the region (mainly in CESEE countries with a substantial stock of foreign portfolio investments). Moving on to possible indirect financial channels, the third channel relates to a situation in which the CESEE region is hit, first and foremost, by a severe tightening of global credit conditions that affects the region's major creditors ("strategic investor view") and leads to a slowdown in (or, in the worst case, to a sudden stop of) capital inflows and, subsequently, to an increase in liquidity constraints.

Looking at each of these channels in turn, the CESEE region appears to be largely resilient to the first direct channel of financial vulnerability. According to last quarter and full-year 2007 data reported by large CESEE banking market players, local banks' exposure to subprime or subprime-related assets, i.e. asset-backed securities (ABS) and collateralized debt obligations (CDOs), has been negligible to date. Generally, given the low market penetration by complex financial products and the very small number, or absence, of specialized financial intermediaries (e.g. investment banks), CESEE financial sectors are not sophisticated enough to be affected directly by the subprime crisis. Furthermore, in light of banks' drive to realize their expansion strategies in a highly competitive market environment, they prefer to capitalize on the strong momentum of credit markets in the region and on the more profitable local lending business rather than to engage in lower-yielding foreign structured products. Given the still low financial penetration levels and relatively high profit margins throughout the CESEE region, this situation will presumably not change much in the years ahead. In light of foreign banks' dominant market position throughout CESEE, an adverse impact might manifest itself only indirectly, i.e. via the involvement of parent banks in subprime or subprime-related business. But given the fact that the CESEE banking markets are dominated by foreign banks with a strong CESEE focus (and thus presumably a limited exposure to subprime or subprime-related assets) and a long-term commitment toward the region, any noise from this direction seems to be limited as well.

The second direct channel, namely a loss of investor confidence with regard to emerging markets, may hit the CESEE region first and foremost via the bond, stock and foreign exchange markets. An increase in risk aversion toward bond markets would not only make financing (both via local and foreign currency bonds) less abundant and more expensive for governments, but would also cause adverse valuation effects for local financial institutions, which in several countries hold large volumes of government bonds. A major equity market slump could potentially have a negative impact on the real economy by inducing higher savings (to "rebuild" the suffered loss in wealth), reducing consumption propensities and slowing investment activity as a result of the postponement of planned capital increases via the stock market. However, in light of foreign investors' predominance on major CESEE stock exchanges and the still relatively small proportion of shares in households' financial assets, the wealth effects of a major stock market correction in

CESEE and a related slowdown in private consumption appear to be rather limited.[5] Moreover, in predominantly bank-based financial systems, like those in the CESEE countries, corporates have so far only marginally tapped the capital market to raise capital. Finally, a loss of investor confidence toward emerging markets could lead to a more or less pronounced weakening of CESEE currencies, which may not only drive up inflation, but also pose a challenge for the banking sector in countries with sizeable indirect credit risk in the form of foreign currency lending to unhedged domestic borrowers. If a lasting depreciation of local currencies occurred, central banks in the region might be forced to hike interest rates to comply with their primary objectives of price stability, which would in turn further weigh on the individual national economies. It should also be noted that a meltdown of equity and local currency bond prices and a weakening of currencies are not likely to be independent phenomena but might reinforce each other, resulting in an accumulation of losses from different market segments.

The third channel, a severe tightening of global credit conditions with the ultimate result of a slowdown of capital inflows to CESEE, might affect CESEE economies and financial markets in manifold ways: First, heightened liquidity pressures might – via a pick-up in global interest rates or credit spreads – drive up the financing costs of external debt (both private and public), which is high and rising in many countries of the region (price effect). The drying-up of capital inflows into the region (quantity effect) could further exacerbate the rise in funding costs (of both external and domestic debt), cause exchange rate depreciation and would most likely also necessitate an adjustment in consumption and/or investment volumes. However, the risk of a sharp slowdown or reversal of capital inflows into the region seems limited at present, given the large share of stable capital flows, i.e. FDI and intercompany loans.

In this context, it is of relevance that the banking sectors in the CESEE region are predominantly foreign owned. Thus, it cannot be excluded that in a worst case scenario, parent banks would be forced to cut back lending altogether (instead of geographically reallocating funds), which would, in turn, also adversely affect their CESEE subsidiaries for which they represent one of the main refinancing sources. Consequently, sharply decelerating credit growth could lead to a slowdown in domestic demand (both consumption and investment) and thus in economic growth. Such a development would predominantly hit countries where the expansion of the domestic deposit base cannot keep pace with credit growth, thus causing banks to rely on foreign funding to finance the expansion of domestic lending. Because of common creditor linkages,[6] there could be the risk of regional contagion if one of the foreign banks active in a large number of CESEE countries were to encounter severe liquidity problems. In most cases, however, for-

[5] *Investments in mutual and pension funds, however, which represent an increasing portion of households' financial assets (and are to a significant extent invested in domestic and foreign bonds and equities), do represent a channel through which households may be affected by asset price losses.*

[6] *Funding to the CESEE region concentrates on a small number of foreign creditor countries from Western Europe (most notably Austria, France, Germany and Italy) which are active in a large number of CESEE countries. As a result, disruptions might take different directions: from headquarters in one country to subsidiaries in several countries or from one of the (larger) subsidiaries to subsidiaries elsewhere via headquarters.*

eign banks consider their operations in the CESEE region to be of a long-term strategic nature. Therefore, it is reasonable to expect that parent banks will try to sustain business activities in CESEE to benefit from the opportunities arising from the region's catching-up potential in terms of the scale and scope of banking activities and from generally higher (risk-adjusted) margins. Against this background, a substitution effect in favor of CESEE countries (even at the cost of parent banks' home markets) is possible, should foreign parent banks be forced to ration credit at a group level.

Still on this third channel, increased liquidity constraints could hamper the financing of real estate projects. A substantial change in demand and supply conditions on the real estate market might, in turn, contribute to a collapse of real estate prices, which could have detrimental effects on both consumption and investment.[7] However, for the time being, there is no clear evidence of an emerging house price bubble in CESEE, despite the rapid growth in real estate prices observed in recent years (particularly in Bulgaria and Romania). Consequently, at present a boom-bust scenario in CESEE housing markets appears to be rather limited. In fact, the still prevailing mismatch between housing demand and supply in CESEE and other transition-specific factors[8] (e.g. the poor quality of existing housing stock) are likely to continue to support the construction industry and economic growth. Notwithstanding this benign baseline scenario, it should be noted that there have been signs of a correction of house price dynamics in those CESEE countries or regions (coastal areas, capital cities) where house prices had been increasing most rapidly over the past few years.

3 Financial Market Developments: Country-Specific Factors Matter

The CESEE countries covered in this study have been affected to some extent by the international financial turbulence observed since early July 2007, both in terms of prices and volumes. The adverse international developments impacted different financial market segments to differing extents, although country-specific factors (such as exchange rate regimes or market liquidity) imply that the degree of information content in capital market data varies across countries.

3.1 Money Markets

Money market spreads against the euro area remained broadly stable or even decreased in the initial phase of the financial turmoil, but trended upward more or less strongly all over the region since December 2007 (see chart 1). Among the more advanced CESEE countries, Poland and the Czech Republic saw spreads increase by a relatively moderate 89 and 55 basis points, respectively – a development that was to some extent driven by recurring policy rate hikes. In the Czech Republic, money market rates are still below

[7] *For example, demand could slow down if nonresidents shied away from further house purchases due to growing economic uncertainties, or if a hard landing of the domestic economy curbed demand by residents (e.g. through a worsening of the income situation). As for supply-side effects, increasing vacancies in some segments of the housing market (owing to the increasing supply overhang from the recent housing boom) or "fire sales" by borrowers or banks (owing to difficulties in the debt servicing of (mortgage) housing loans) could have an adverse effect on house prices.*

[8] *See Égert and Mihaljek (2007).*

euro area levels; the same holds true for Slovakia, where money market spreads were even down by 59 basis points in the period under review. In Hungary spreads remained unchanged from their July 2007 levels, as a 100 basis points fall in spreads in the second half of 2007 was counterbalanced by a spread increase of similar magnitude in the first quarter of 2008, partly as a result of rising political uncertainty ahead of the referendum of early March 2008 on selected measures of the fiscal austerity package introduced in September 2006.

A more pronounced spread increase by nearly 300 basis points was observed in Romania, however. This development was not only driven by a three-step increase in the policy rate (by altogether 200 basis points) in the first quarter of 2008, but also by a pick-up in risk premiums against the background of the country's high and widening external imbalances. In Bulgaria, money market spreads were up by a noticeable 160 basis points owing to waning investor confidence against the backdrop of rising inflationary and current account pressures. Having decreased considerably in the first three quarters of 2007, money market spreads continued to narrow in Turkey since October 2007 (albeit at a somewhat slower pace), despite policy rate cuts by a total of 200 basis points in the same period. This seems to reflect an increase in risk premiums owing to rising political uncertainty. Croatian money market spreads were down 183 basis points against their unusually high pre-crisis level by end-March 2008.[9] Although Croatian money market rates soared again in January given increased need for liquidity at the start of the new mandatory reserve maintenance period, they normalized soon after fading liquidity demand and Hrvatska narodna banka's repeated reverse repo auctions eased liquidity pressures.

3.2 Local Currency Bond Markets

So far, the impact of the international financial turmoil on interest rate spreads of CESEE local currency government bonds against the euro area has been rather limited (see chart 2). Since the onset of the financial turmoil in early July, global emerging market bond spreads have increased by some 105 basis points on average (based on the JPMorgan Government Bond Index for Emerging Markets – GBI-EM). By contrast, the spreads on Slovak local currency-denominated government bonds remained roughly stable at an average of 20 basis points (against euro area government bonds) in the observation period. A somewhat more pronounced increase of 60 to 70 basis points has been recorded in the Czech Republic (starting at a negative spread of 20 basis points) and in Russia. However, this rise in spreads is still much lower than the one observed in Asia (+90 basis points), Latin America (+132 basis points) or the Middle East/Africa (+116 basis points). Developments in Poland (+100 basis points) were more in line with those in other emerging market regions. Out of the six CESEE countries included in the JPMorgan GBI-EM, only Hungary recorded a rise in government bond spreads (+285 basis points) that was higher than the emerging market aver-

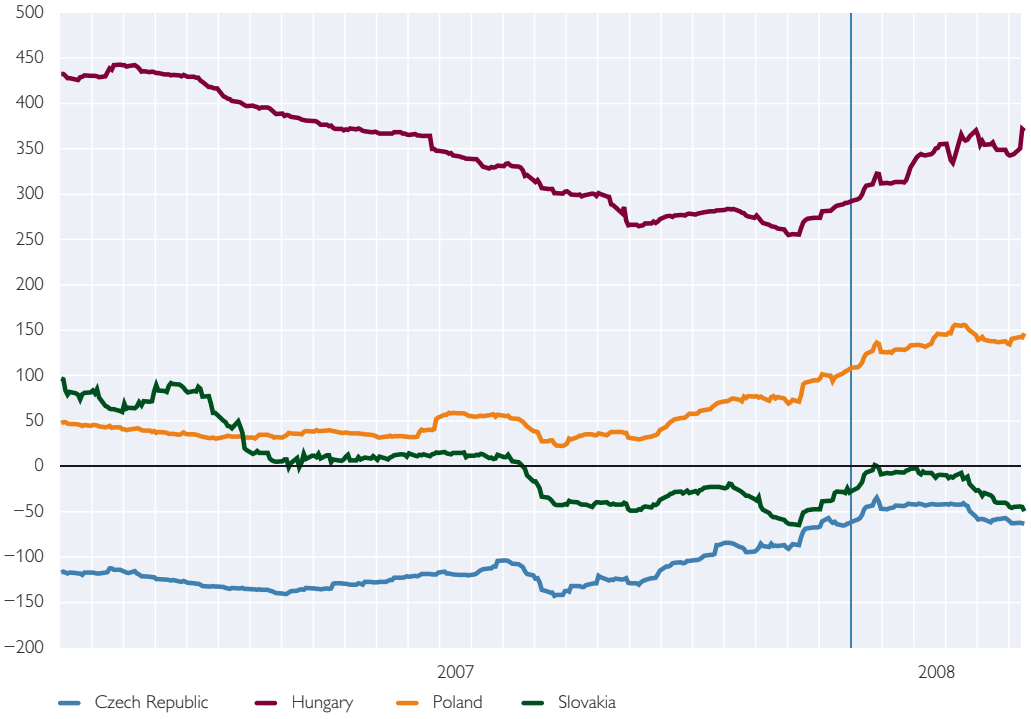
[9] *According to Hrvatska narodna banka (HNB), soaring money market spreads in June and July 2007 were driven inter alia by banks' continued strong lending activity, higher demand for liquidity in the run-up to the issuance of the second tranche of a ten-year kuna government bond in July 2007 and the government's preparations for financing the payment of the third installment of debt to pensioners.*

Chart 1a

Three-Month Money Market Spreads against the Euro Area

Latest observation: March 31, 2008

Basis points



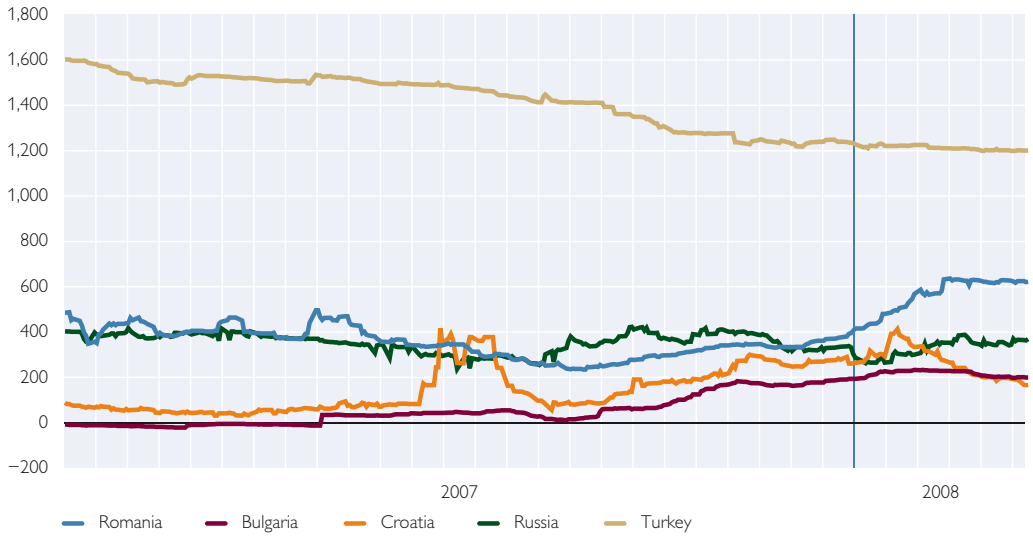
Source: Datastream, OeNB.

Chart 1b

Three-Month Money Market Spreads against the Euro Area

Latest observation: March 31, 2008

Basis points



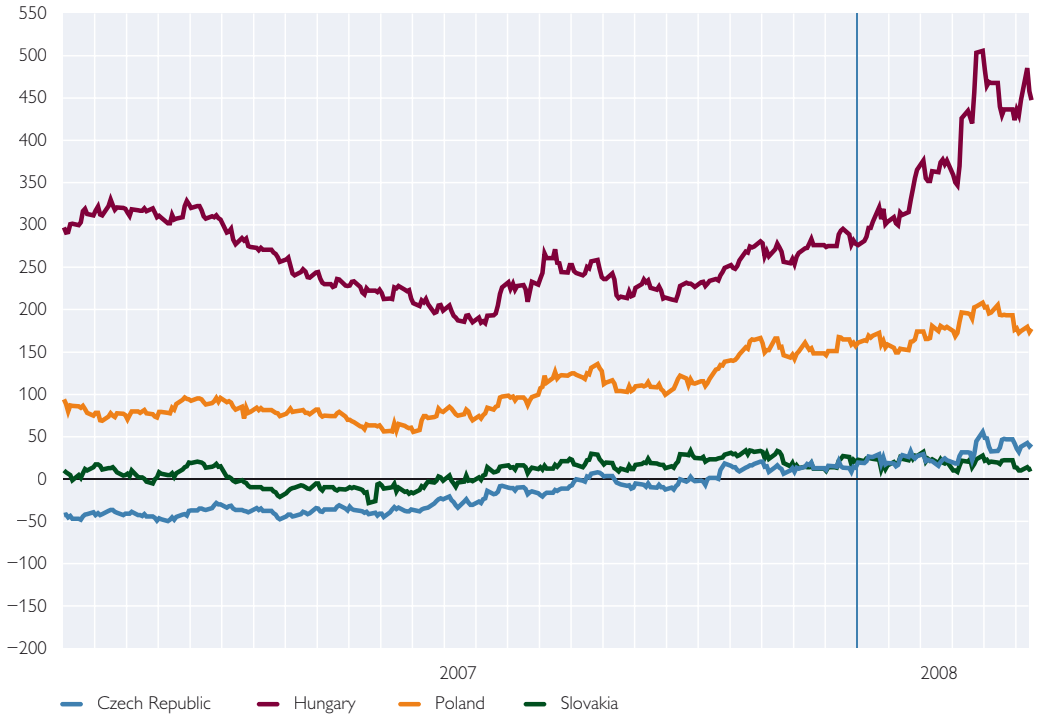
Source: Datastream, OeNB.

Chart 2a

Spreads on Local Currency Government Bond Yields against the Euro Area

Latest observation: March 31, 2008

Basis points[1]



Source: Bloomberg, OeNB.

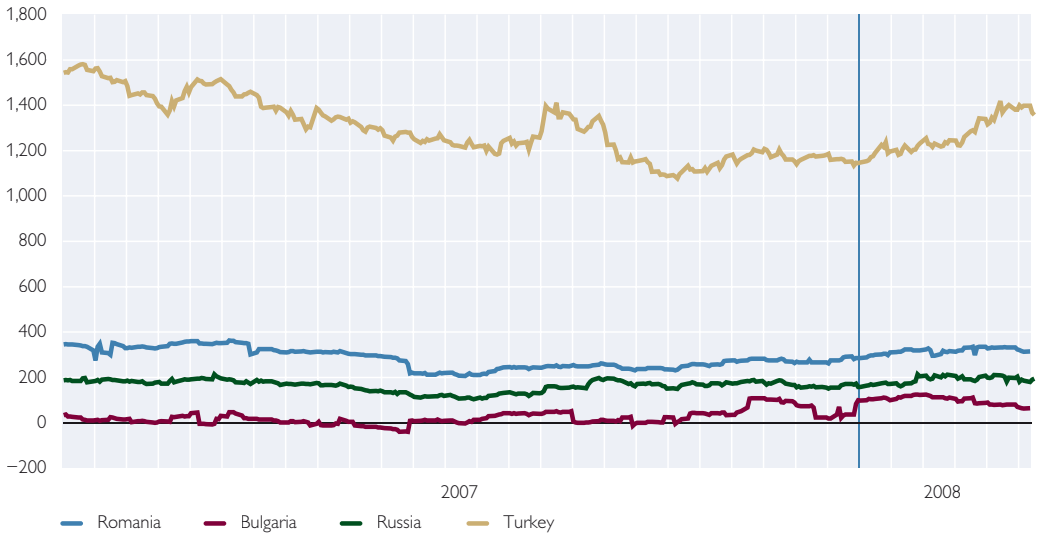
[1] *Country subindices of JPMorgan GBI-EM.*

Chart 2b

Spreads on Local Currency Government Bond Yields against the Euro Area

Latest observation: March 31, 2008

Basis points[1]



Source: Bloomberg, Eurostat, OeNB.

[1] *Country subindices of JPMorgan GBI-EM for Russia and Turkey, Eurostat data for Bulgaria and Romania.*

age.[10] The spreads on Turkish lira-denominated government bonds increased by 150 basis points during the review period, but the picture changes somewhat with end-October 2007 taken as a base date. Having narrowed substantially between mid-September and mid-October 2007, spreads were some 290 basis points higher at the end of March 2008 than at end-October 2007. Spreads in Romania and Bulgaria were up by some 65 and 110 basis points, respectively – figures that are below, or in line with, global emerging market averages.

3.3 Foreign Currency Bond Markets

Since the beginning of the financial turbulence, the increase in the spreads on euro-denominated sovereign eurobonds issued by the Czech Republic, Slovakia and Poland has been significantly smaller (15 to 35 basis points) than that in the average emerging market spread (75 basis points, JPMorgan Euro EMBI Global Index). The rise in the spread on Hungarian eurobonds was slightly less pronounced (5 basis points) than that of the average market spread. However, the spreads on Bulgarian, Croatian, Romanian and Turkish eurobonds widened more strongly than the average emerging market spread (by 15, 25, 30 and 35 basis points, respectively). Spreads on Russian U.S. dollar-denominated eurobonds widened by 100 basis points, less pronouncedly than the overall market (143 basis points, JPMorgan EMBI Global Index). Common to all countries is the significant pick-up in spreads on euro-denominated sovereign eurobond yields since end-February 2008, with the most pronounced increases observable in Turkey, Hungary and Bulgaria (see chart 3). Rising political and/or economic risks and – in the case of Hungary and Bulgaria – downgrades of the rating outlooks on long-term foreign currency debt by major rating agencies presumably underpinned this development.[11]

Despite temporary declines, five-year credit default swap (CDS) spreads have widened markedly since end-June 2007, in particular since mid-December 2007 (see chart 4).[12] Similarly to the developments seen in the case of eurobond spreads, Czech, Slovak and Polish CDS spreads were affected the least by the financial turmoil: Their relatively modest 45 to 65 basis point rise most likely resulted partly from rating upgrades in all three countries at end-February and in early March. More prominent increases were observed in Russia (+105 basis points) and Croatia (+115 basis points). Again, CDS spreads rose particularly strongly (by 160 to 185 basis points) in countries with large macroeconomic imbalances, i.e. Hungary, Bulgaria, Romania and Turkey. A

[10] *When comparing government bond spreads against the euro area in European and non-European emerging markets, it is important to bear in mind that non-European emerging market bonds (denominated in local currencies) may be benchmarked against U.S. bonds rather than against euro area bonds. Given the significant decline in the spread between U.S. and euro area government bond yields, the increase in bond spreads against euro area bonds may hence understate the increase in risk premiums in those bonds that are benchmarked against U.S. bonds.*

[11] *In early 2008 Fitch revised the rating outlook for Bulgaria downward from stable to negative and Standard & Poor's downgraded the outlook for Hungary from neutral to negative. Similarly, Standard & Poor's and Fitch downgraded Romania's outlook from stable to negative in November 2007 and January 2008, respectively. By contrast, rating agencies upgraded the country rating for the Czech Republic (to A (Standard & Poor's) and to A+ (Fitch)) and the outlook for the Slovak Republic (from stable to positive (Standard & Poor's)), Poland (from stable to positive (Standard & Poor's)) as well as Russia (from stable to positive (Standard & Poor's)).*

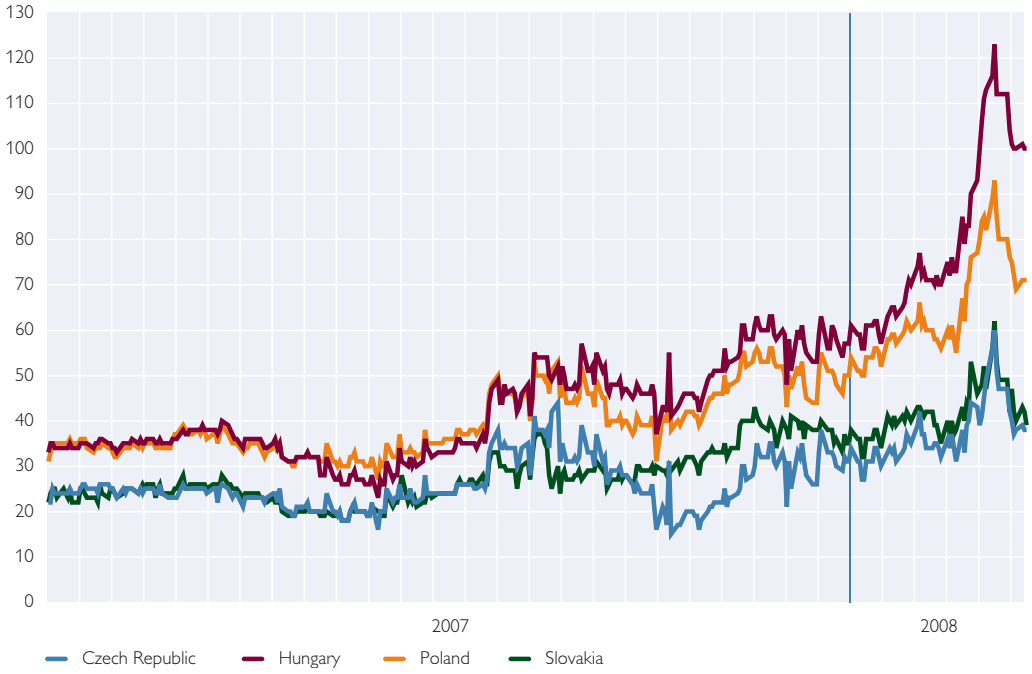
[12] *However, it should be noted that in times of turbulence reduction in market liquidity for this instrument may impair the information content of CDS pricing.*

Chart 3a

Spreads on Euro-Denominated Eurobond Yields

Latest observation: March 31, 2008

Basis points[1]



Source: Bloomberg, OeNB.

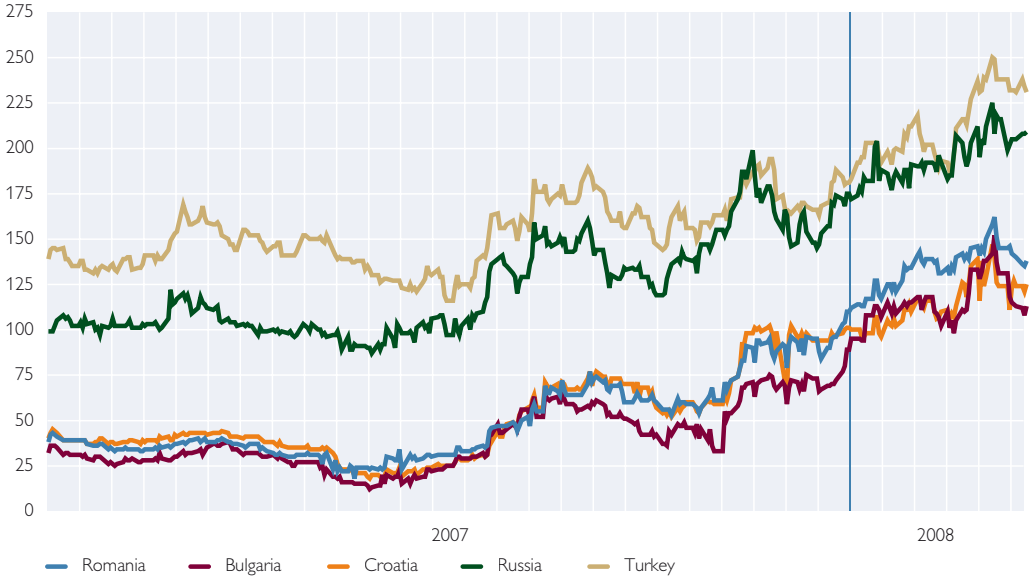
[1] *JPMorgan Euro EMBI Global Index.*

Chart 3b

Spreads on Euro-Denominated Eurobond Yields

Latest observation: March 31, 2008

Basis points[1]



Source: Bloomberg, Eurostat, OeNB.

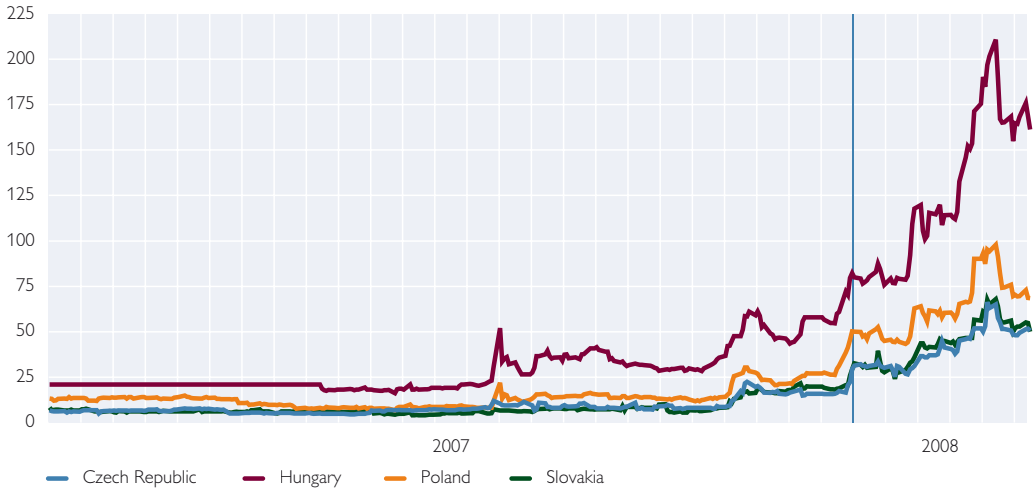
[1] *JPMorgan Euro EMBI Global Index, for Russia JPMorgan EMBI Global Index.*

Chart 4a

Spreads on Sovereign Five-Year Credit Default Swaps

Latest observation: March 31, 2008

Basis points



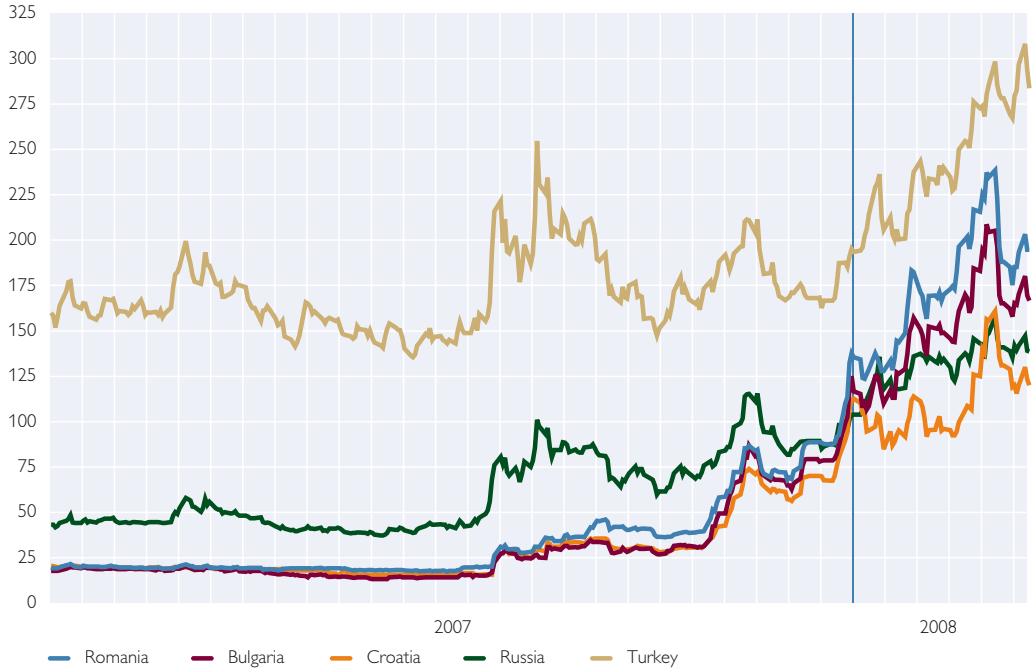
Source: Datastream, OeNB.

Chart 4b

Spreads on Sovereign Five-Year Credit Default Swaps

Latest observation: March 31, 2008

Basis points[1]



Source: Datastream, OeNB.

[1] *Data on Bulgaria and Russia are based on the U.S. dollar.*

comparison with other emerging countries does not allow for clear conclusions, as CDS spread developments e.g. in Thailand (+72 basis points), China (+69 basis points) and Brazil (+100 basis points) were more favorable than in many CESEE countries, while those in other emerging countries were in line with CESEE developments (e.g. in South Africa: +180 basis points) or less favorable (e.g. in Argentina: +344 basis points).

3.4 Stock Markets

CESEE stock markets have to a large extent followed developments in global equity markets, which have been hit by several waves of stock market corrections since mid-2007 (see chart 5). The most pronounced setbacks occurred in July and November 2007 as well as in January 2008. Although the region suffered sharp corrections in equity prices in recent months, by international comparison CESEE stock markets have weathered the global equity market turbulence fairly well. Despite a high degree of intraregional heterogeneity, the stock indices in the CESEE region (as captured by the MSCI EM Eastern Europe (MSCI EMEE) index) performed much better than leading stock indices in the U.S.A. or Europe. In the period under review (June 29, 2007 to March 31, 2008), the MSCI EMEE index even recorded a minor increase of 0.6% based on the reference date, while the Dow Jones Industrial Average fell by 8.5% and the EURO STOXX suffered a loss of over 20% during the same period. But CESEE stood its ground in an emerging market context as well. On this note, stock market developments in CESEE were not only in line with those in global emerging markets (+0.7%), but also superior to those in Emerging Asia (–0.4%) and the Middle East/Africa (–0.1%). Among world emerging markets, only Latin America (+5%) seems to have performed somewhat better than CESEE.

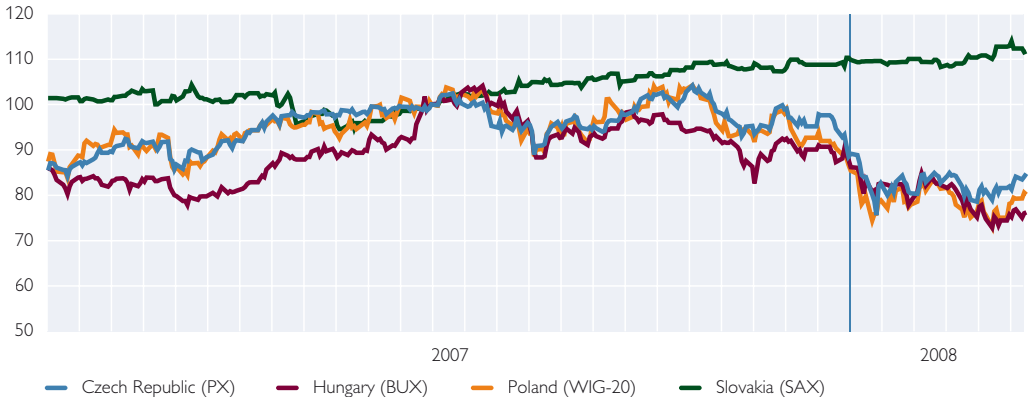
Stock market developments within the CESEE region diverged in recent months. The Slovak stock exchange has weathered the financial turmoil practically unscratched and even recorded a small increase by 3.3% since the beginning of 2008 – most likely owing to positive investor sentiment regarding the country's prospective entry into the euro area in 2009. At the same time, Bulgaria, Croatia, Romania and Turkey witnessed the most pronounced downward corrections, all suffering equity price losses of 25% to 30%. While growing political uncertainties seem to have enforced this development in Turkey, the current setback in Croatia should be seen in the context of recent years' stock market rallies. Bulgaria and Romania seem to have felt the adverse global investor sentiment the most, with investors becoming increasingly cautious given high and rising domestic and external economic imbalances in both countries. Stock market prices in the Czech Republic, Hungary and Poland have contracted by an (unweighted) average of 15% since January 1, 2008 – a loss which is somewhat higher than the one registered by the Dow Jones Industrial Average in the same period, but comparable to or smaller than those seen in other emerging markets (e.g. Emerging Asia) and Western Europe, respectively. The drop in the Russian RTS index was even less pronounced (–10.3%), with the current boom in raw materials in part backing the Russian stock market.

Chart 5a

Stock Market Indices

Latest observation: March 31, 2008

June 29, 2007 = 100



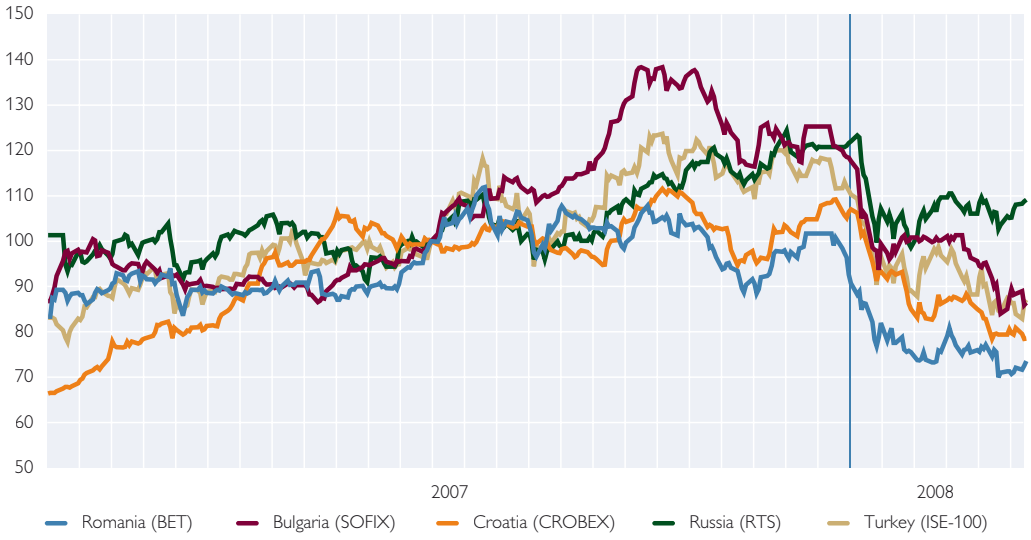
Source: Datastream, OeNB.

Chart 5b

Stock Market Indices

Latest observation: March 31, 2008

June 29, 2007 = 100



Source: Datastream, OeNB.

3.5 Foreign Exchange Markets

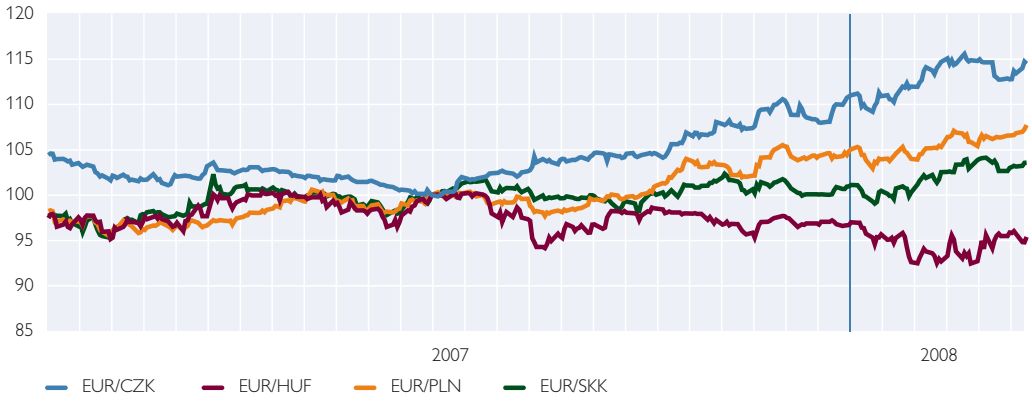
In line with stock market developments, CESEE currencies have been affected by the international financial market turbulence in three major waves since the onset of the turmoil (see chart 6). Since end-June 2007, the Romanian leu, the Turkish lira and the Hungarian forint have suffered the strongest impact, having lost around 16.3%, 14.2% and 5.2% against the euro, respectively, by the end of the first quarter of 2008. Adverse country-specific factors, such as political uncertainty (Turkey) and/or more or less pronounced economic imbalances (e.g. Hungary, Romania), made these countries particularly vulnerable to exchange rate corrections.

Chart 6a

Development of Exchange Rates against the Euro[1]

Latest observation: March 31, 2008

June 29, 2007 = 100



Source: Eurostat, OeNB.

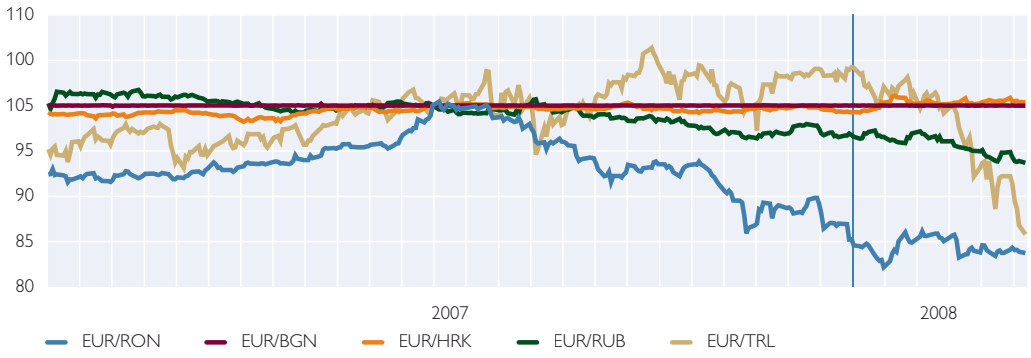
[1] An increase in value means a nominal appreciation.

Chart 6b

Development of Exchange Rates against the Euro[1]

Latest observation: March 31, 2008

June 29, 2007 = 100



Source: Eurostat, OeNB.

[1] An increase in value means a nominal appreciation.

However, especially the Romanian leu and the Turkish lira had undergone sizeable nominal appreciations over the twelve months to mid-2007. In Hungary, despite high exchange rate volatility, downward pressures on the forint seem to have eased following the adoption of a free floating exchange rate regime as of February 26, 2008. The Russian ruble lost around 6.6% against the euro in the period under review, while it appreciated by about 8.7% against the U.S. dollar, its major reference currency, and thus kept appreciating slightly (by some 2%) against its currency basket.[13] By international

[13] It should be noted, however, that in mid-August – given heightened liquidity pressures in the Russian banking system – the Bank of Russia provided liquidity support to banks totaling some USD 20 billion and supported the Russian ruble by repeated foreign exchange rate interventions.

comparison, any exchange rate losses (against the euro) of CESEE countries have been considerably smaller since the onset of the financial turmoil than those suffered by other emerging markets.[14]

Remarkably, the Czech koruna, the Polish zloty and the Slovak koruna have withstood the regional downward pressures, and have even gradually appreciated (more or less strongly) since early July 2007. In the case of the Czech Republic, this appreciation is likely to have been the result of the Czech koruna's role as a funding currency of carry trades and the ensuing unwinding of such trades during the financial market turbulence. The monetary tightening seen in the observation period might have added to this development as well. The Polish zloty has appreciated considerably since October 2007, in line with increased foreign investor confidence driven by the prospect of a more liberal economic course following a change in government. Similarly the Slovak koruna has strengthened considerably since end-January 2008, mainly on the back of market expectations regarding a possible revaluation of the Slovak koruna's ERM II central rate in the run-up to the country's targeted entry into the euro area at the beginning of 2009. Under their prevailing exchange rate regimes, the Croatian kuna (tightly managed float with the euro as an anchor currency) and the Bulgarian lev (currency board against the euro) remained practically unaffected by the global financial market turbulence.

Chart 7

Claims of BIS Reporting Banks on Developing Countries

Financial flows, USD million

Source: BIS.

[1] Emerging Europe includes the Baltics, Southeastern Europe, CIS Europe and Turkey.

[14] In the period under review, the South African rand lost 25.4% in value, while the Argentine peso and the Thai baht depreciated by 16.9% and 14.4%, respectively. Moreover, most CESEE currencies have even recorded much smaller losses than the currencies of more developed economies, such as the Icelandic króna (30.7%) or the New Zealand dollar (–12.8%). In this comparison, it is important to note that the currencies of several non-European emerging countries are benchmarked to the U.S. dollar rather than to the euro and that the comparably steeper depreciation of these currencies against the euro in part reflected the movements of the EUR/USD exchange rate.

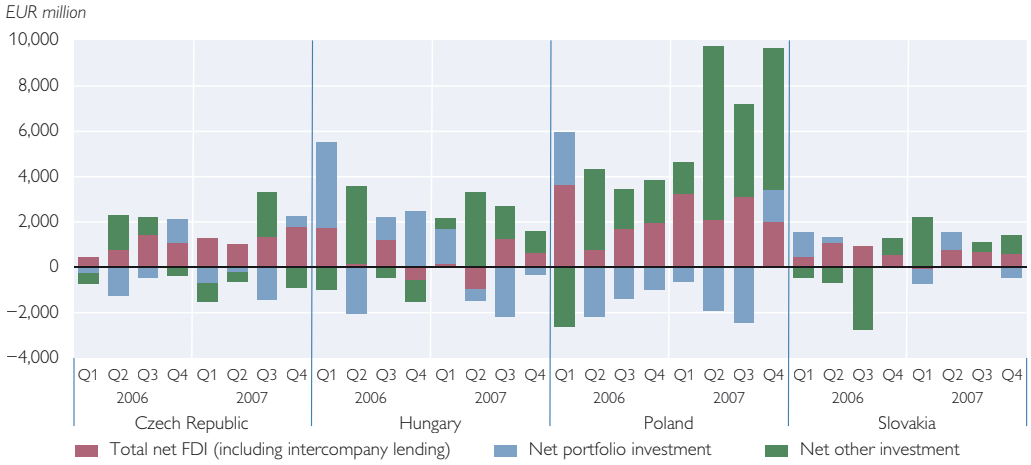
3.6 The Volume of Financial Flows

According to data available from the Bank for International Settlements (BIS) for the first three quarters of 2007 (see chart 7), total financial flows into developing economies have fallen sharply, in terms of volumes, from over USD 200 billion in the second quarter of 2007 to USD 115 billion in the third quarter. However, while financial flows to the Middle East/Africa, Asia-Pacific and Latin America/the Caribbean dropped dramatically in the third quarter of 2007, they increased in Emerging Europe, which received some two-thirds of the total financial flows directed to developing economies.

Available balance of payments data for the fourth quarter of 2007 do not indicate reduced capital inflows (see chart 8) either, even though in some countries a change in the maturity

Chart 8a

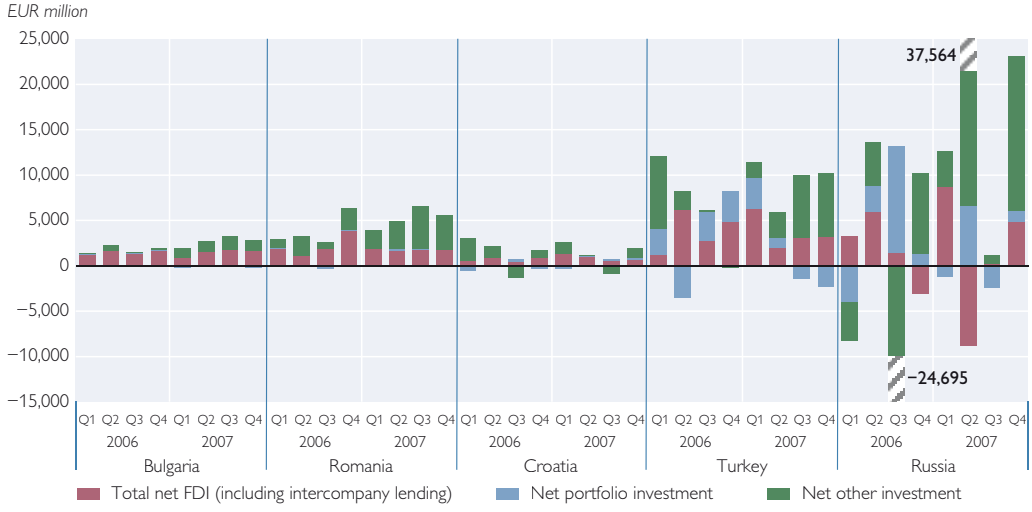
Financial Flows: FDI, Portfolio Investment and Other Investment



Source: National statistical offices.

Chart 8b

Financial Flows: FDI, Portfolio Investment and Other Investment



Source: National statistical offices.

structure of financial inflows was observable given a shift toward more short-term flows. Quarterly data of financial flows (FDI, portfolio investment, other investment) up to the fourth quarter of 2007 point partially to a somewhat higher volatility of financial flows in recent months, albeit following a protracted period of heavy capital inflows. In particular, stronger movements of inflows and outflows of portfolio and other investment were observable whereas net FDI inflows remained more or less unchanged.[15]

4 Implications of Recent Financial Market Developments for CESEE

So far, financial market developments in CESEE do not provide strong indication for a massive worsening in investor sentiment specifically toward CESEE, neither with respect to asset prices nor with respect to volumes. In general, CESEE markets tended to follow the negative global investor sentiment, but performed relatively well compared to other emerging markets. Less pronounced direct economic ties with the U.S.A., the "EU/euro area halo" effect[16] and the sustained good medium-term economic prospects of the region (despite rising economic imbalances in some countries) still seem to bolster investors' confidence in the region. Within the region, countries with the largest economic imbalances and/or insufficient policy credibility as well as countries which had previously experienced strong capital inflows coupled with particularly high asset valuation were affected more than others by the financial turmoil, implying increased differentiation by foreign investors.

Table 1

Key Indicators of External and Financial Vulnerability

	Combined current and capital account balance[1]		FDI coverage of the combined current and capital account deficit in %		Total gross external debt[1, 2]		Reserve assets[1, 2]		Growth of credit to the real sector[3]		Foreign currency lending[4]		GDP[3]		Inflation[5]	
	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007	2006	2007
Bulgaria	−17.1	−20.3	135.1	100.7	80.7	97.3	32.9	38.8	15.4	48.5	45.1	50.0	6.3	6.2	6.1	11.4
Czech Republic	−2.9	−2.4	113.2	173.0	38.1	39.5	20.8	18.4	17.5	22.3	10.4	9.1	6.4	6.5	1.5	5.1
Hungary	−5.3	−4.0	52.5	26.0	91.4	96.5	18.2	16.2	15.7	7.4	49.6	57.2	3.9	1.3	6.6	7.2
Poland	−2.6	−2.6	113.0	148.7	46.5	50.7	12.9	13.9	19.5	29.0	27.0	24.2	6.2	6.5	1.4	3.7
Romania	−10.5	−13.2	85.1	44.1	28.0	27.9	21.8	20.9	45.4	48.1	47.4	54.3	7.9	6.0	4.9	6.8
Slovakia	−7.1	−4.8	95.5	74.9	54.8	54.9	21.6	22.6	21.7	19.2	20.0	21.3	8.5	10.4	3.7	2.3
Croatia	−8.1	−8.4	93.0	101.8	85.6	87.8	25.5	24.8	18.4	13.0	71.7	61.4	4.8	5.6	2.0	4.6
Turkey	−6.1	−5.8	58.0	52.5	37.3	35.0	11.1	10.4	40.9	17.1	13.5	10.6	6.9	4.5	9.7	8.4
Russia	9.6	5.3	−10.0	−9.9	30.3	26.6	31.0	33.7	34.2	40.0	22.1	20.1	7.3	8.1	9.0	11.6

Source: Eurostat, national central banks, national statistical offices.

[1] *% of GDP.*
[2] *End of period.*
[3] *Year on year change in %. The real sector comprises credit to the nonbank nongovernment sector.*
[4] *Share of foreign currency loans in loans to the nongovernment sector in %.*
[5] *December, year on year change in %.*

[15] *In some cases, however, FDI inflows were determined by large privatization projects (e.g. the takeover of the Romanian Banca Comerciala Romana (BCR) by the Austrian Erste Bank Group) that resulted in strong capital movements.*

[16] *See Luengnaruemitchai and Schadler (2007).*

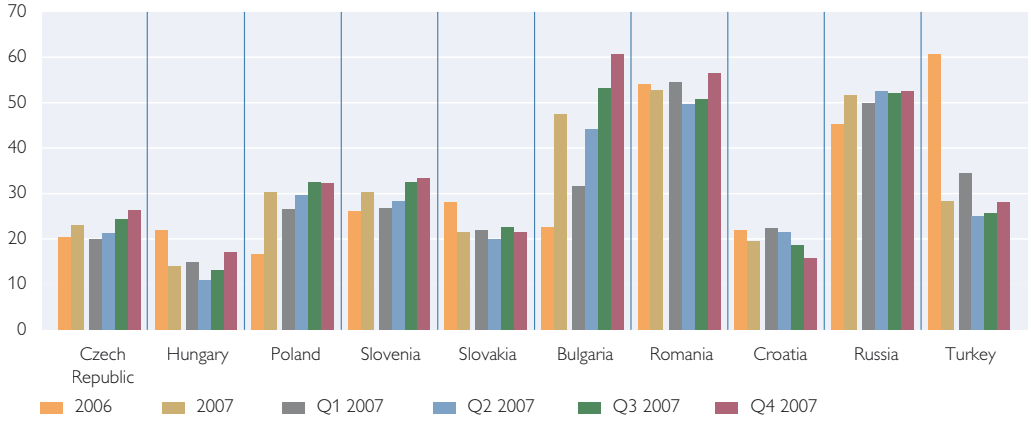
A closer look at key indicators of economic vulnerability (see table 1) indicates that the position of the two Southeastern European EU Member States, Bulgaria and Romania, as well as that of the EU candidate countries Croatia and Turkey is weaker than that of the other countries in the region. Among the Central European economies, Hungary stands out negatively, given its weak growth performance and other less favorable economic fundamentals (e.g. inflation, external position). In these countries high external imbalances in the form of considerable deficits on the combined current and capital accounts go hand in hand with substantial external financing needs. As a result, Bulgaria, Hungary and Croatia have accumulated fairly high levels of gross external debt. Noteworthy, in some countries (particularly in Bulgaria, Hungary, Romania and Croatia) the corporate sector's dependence on external financing sources is relatively strong. In this context, recent downgrades by major rating agencies (e.g. regarding Bulgaria, Romania, and Hungary) could possibly aggravate external vulnerabilities in the respective countries.[17] In addition, given signs of economic overheating in Bulgaria and Romania, domestic economic imbalances are increasing as well, as is manifest from mounting core inflationary pressures, tight labor market conditions, brisk credit growth and (in Romania) lax fiscal policies. Relatively high and increasing foreign exchange reserves, however, indicate sustained capital inflows and can provide significant cushion against external shocks. Similarly, low public debt levels in most countries and a more mature institutional setting (as compared to the early years of transition) might bolster investor confidence in the region.

In the Southeastern EU Member States and in the EU candidate countries, high credit growth – often refinanced by banks abroad (mainly parent institutions) and potentially used for nonproductive purposes like consumption or house construction – has added to domestic and external imbalances. With households and nonbank corpora-

Chart 9

Domestic Credit to Nonbank Nongovernment Residents

Year-on-year change in %, end of period, nominal



Source: National central banks, OeNB.

[17] *See Kim and Wu (2008).*

tions having rapidly accumulated debt over the past few years, possibly based on overoptimistic income expectations, a significant slowdown in foreign financing and the subsequent economic downturn may undermine these expectations and lead to debt servicing difficulties. However, the latest data on the development of credit growth to the private sector do not yet indicate a widespread change in banks' lending behavior in response to the global financial market turbulence. In most countries, credit growth even accelerated in the second half of 2007 in nominal terms (see chart 9). A notable exception is Croatia, where credit growth decelerated gradually in 2007 owing to the additional prudential and administrative measures introduced by the central bank with a view to reducing the country's high and rising external imbalances.

In many countries in addition to cross-border foreign currency borrowing by nonbank corporations the high share of foreign currencies in domestic lending (predominantly euro and Swiss franc) represents a further risk in case of a lasting and substantial depreciation of the domestic currencies. In this respect, only Croatia and Poland seem to have registered some slowdown in foreign currency lending as a consequence of administrative and prudential measures or central bank guidance.

5 Policy Response and Implications

Since CESEE financial markets have so far weathered the recent global turbulence fairly well, none of the central banks of the countries covered in this study (with the exception of the Bank of Russia) had to provide liquidity support to the banking system.[18] Similarly, none of the countries has so far eased its monetary policy stance via interest rate cuts to offset any potential negative effects of the financial turmoil on economic activity. On the contrary, many central banks in the region (e.g. in the Czech Republic, Hungary, Poland, Romania and Russia) have already tightened their monetary policies (see chart 10) in response to re-emerging inflationary pressures over the final months of 2007, while Slovakia kept its key policy rate stable for the time being. A notable exception, however, is the Turkish central bank, which has lowered its policy rate by a total of 225 basis points since mid-2007, albeit starting from a very high base given the relatively tight monetary conditions prevailing since mid-2006. In some countries, monetary conditions have been additionally tightened by exchange rate appreciation (most notably in the Czech Republic, Slovakia, and Poland).

But even if inflation pressures were lower, the scope for monetary policy to accommodate a shock would seem to be modest in many CESEE countries. First, in light of fixed (Bulgaria) or quasi-fixed (Croatia) exchange rate regimes and ERM II participation (Slovakia), CESEE central banks' room for monetary policy maneuvering is limited. Second, in some countries of the region the high degree of currency substitution constrains the effectiveness of the interest rate channel as a monetary transmission mechanism.

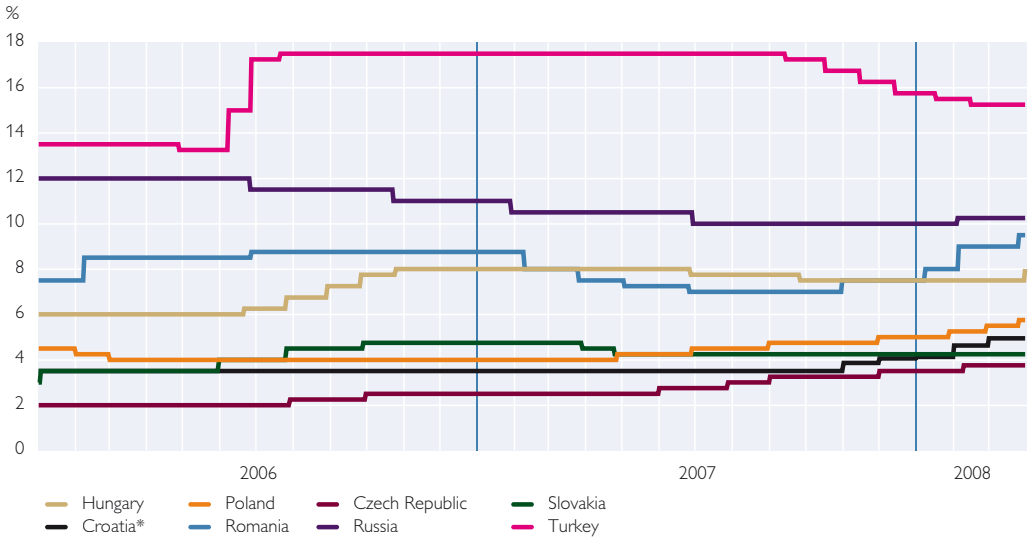
Fiscal policy in the region has not reacted to the current financial turmoil

[18] *Given many Russian banks' heavy reliance on the interbank market and increasingly tight liquidity conditions in the initial phase of the financial turmoil, the Bank of Russia not only provided liquidity support (mainly in August 2007), but also temporarily lowered the minimum reserve rate and reduced the amount of collateral required from commercial banks that use its lending facilities.*

Chart 10

Key Policy Rate Developments in CESEE

Latest observation: March 31, 2008



Source: National central banks.

*Note: *Weighted monthly averages of weighted repo rates achieved at regular reverse repo auctions of the HNB.*

and the worsening of external economic and financial market conditions. Improvements in the fiscal balances in 2007 were largely driven by cyclical developments (i.e. revenue overperformance), while the underlying fiscal stance has tended to be procyclical in most countries. Given large and increasing external and/or internal imbalances in most countries and rather weak structural budget positions in some of them, the room for fiscal policy to cope with increased macroeconomic risks appears to be limited. It should also be noted that there is hardly any room for an income policy stimulus to support consumption, considering recent rapid wage growth which led to an acceleration of unit labor cost dynamics in many of the countries.

6 Conclusion

Major disruptions originating from the U.S. subprime crisis have shaken financial markets worldwide in several waves since July 2007. During these turbulent times, CESEE financial markets have also been affected to some extent by global financial market developments – an indication that CESEE's financial market integration into European and global structures has deepened in recent years. However, given the fact that the global financial turmoil is still ongoing and many underlying real and financial data are published with a more or less considerable time lag, it is not yet possible to fully assess the impact of the financial turmoil on CESEE. Nevertheless, a few preliminary conclusions can already be drawn from recent developments.

For CESEE, the risk of a direct spillover of a U.S. economic slowdown seems rather low. However, if an economic downturn in the U.S.A. caused a marked slowdown in euro area growth, exports and current account positions of CESEE countries would be adversely affected. Risk propagation through financial market linkages could be expected to play a more prominent role and manifest itself in an increase in funding costs and/or a decrease in

financial flows. These risks could be triggered by a further reduction of risk appetite toward emerging markets in general or Emerging Europe in particular, or if foreign parent banks in the mostly foreign-owned banking systems of the CESEE countries were forced to seriously cut back lending. In this respect, the concentration of foreign creditors on a few Western European countries (most notably Austria, France, Germany and Italy) active throughout the region could, in the worst case, drive up the risk of contagion.

Against this background and despite major corrections in all financial market segments, CESEE financial markets so far seem to have weathered relatively well the international financial market turbulence that started in July 2007 and was accompanied by a tightening of global liquidity conditions and the repricing of risk. In general, asset price losses and increases in risk premiums were contained in the region. However, developments were not homogenous, with countries and financial market segments being hit by the turmoil to different extents. In line with expectations, the countries with the largest economic imbalances and/or insufficient policy credibility as well as countries which had previously experienced strong capital inflows coupled with strong rises in asset valuations and buoyant aggregate demand (Hungary, Romania, Bulgaria, Croatia, Turkey and Russia) felt the strongest impact. However, it should be borne in mind that country-specific factors may compromise the information content of capital market data and conceal underlying market pressure. The performance of some market indicators (e.g. spreads on local currency-denominated bonds in Hungary, exchange rate in Romania) suggests that market participants have started to place more emphasis on country-specific signs of economic vulnerability. Thus, if international market turbulence persists or strengthens further, this would exert additional pressure on countries with relatively weaker macrofundamentals. Therefore, bringing back existing (in particular external) imbalances to more sustainable levels in the near future remains a precondition for preventing the loss of investor confidence in a relatively fragile international environment that is characterized by a more permanent reassessment of risks. At the same time, for some countries growing liquidity constraints – as long as the process is orderly and does not turn disruptive – could help contain overheating pressures and thus put economic growth and convergence on a sounder footing and provide an incentive for pushing forward with crucial economic reforms in the face of worsening financing conditions.

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Annex of Tables

Annex of Tables

Cutoff date for data: May 16, 2008

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

	2004	2005	2006	2007	2004	2005	2006	2007
	Year				2nd half			
	Period average (per EUR 1)							
U.S. dollar	1.24	1.24	1.26	1.37	1.25	1.21	1.28	1.40
Japanese yen	134.40	136.86	146.06	161.25	135.75	137.51	149.97	162.87
Pound sterling	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.69
Swiss franc	1.54	1.55	1.57	1.64	1.53	1.55	1.58	1.65
Czech koruna	31.90	29.78	28.34	27.75	31.36	29.49	28.18	27.37
Hungarian forint	251.68	248.06	264.20	251.31	247.37	248.71	267.71	252.35
Polish zloty	4.53	4.02	3.89	3.78	4.33	3.96	3.90	3.72
Slovak koruna	40.02	38.59	37.20	33.77	39.74	38.57	36.84	33.50
Slovenian tolar[1]	239.06	239.56	239.60	239.64	239.06	239.56	239.60	239.64

Source: Thomson Financial.

[1] *From January 1, 2007: irrevocable conversion rate against the euro.*

Table A2

Key Interest Rates

	2004		2005		2006		2007	
	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31
	End of period, %							
Euro area	2.00	2.00	2.00	2.25	2.75	3.50	4.00	4.00
U.S.A.	1.25	2.00	3.25	4.25	5.25	5.25	5.25	4.25
Japan	0.002	0.002	0.001	0.004	0.027	0.275	0.610	0.46
United Kingdom	4.50	4.75	4.75	4.50	4.50	5.00	5.50	5.50
Switzerland[1]	0.00–1.00	0.25–1.25	0.25–1.25	0.50–1.50	1.00–2.00	1.50–2.50	2.00–3.00	2.25–3.25
Czech Republic	2.25	2.50	1.75	2.00	2.00	2.50	2.75	3.50
Hungary	11.50	9.50	7.00	6.00	6.25	8.00	7.75	7.50
Poland	5.25	6.50	5.00	4.50	4.00	4.00	4.50	5.00
Slovak Republic	4.50	4.00	3.00	3.00	4.00	4.75	4.25	4.25
Slovenia[2]	4.00	4.00	4.00	4.00	3.25	3.50	4.00	4.00

Source: Eurostat, Thomson Financial, national sources.

[1] *SNB target range for three-month LIBOR.*
[2] *Until January 2003: official interest rate; since February 2003: interest rate for 60-day tolar bills issued by Banka Slovenije; from 2007 onwards: see Euro area.*

Table A3

Short-Term Interest Rates

	2004	2005	2006	2007	2004	2005	2006	2007
	Year				2nd half			
	Three-month rates, period average, %							
Euro area	2.11	2.19	3.08	4.28	2.12	2.22	3.35	4.55
U.S.A.	1.62	3.57	5.20	5.30	1.95	3.97	5.40	5.25
Japan	0.09	0.09	0.31	0.73	0.09	0.09	0.44	0.81
United Kingdom	4.59	4.70	4.80	5.95	4.48	4.59	4.97	6.23
Switzerland	0.47	0.80	1.51	2.55	0.62	0.83	1.73	2.74
Czech Republic	2.36	2.01	2.30	3.10	2.60	1.95	2.50	3.52
Hungary	11.29	7.02	6.99	7.88	10.62	6.18	7.74	7.69
Poland	6.20	5.29	4.21	4.74	6.75	4.61	4.20	5.16
Slovak Republic	4.68	2.93	4.32	4.34	4.05	3.02	4.93	4.33
Slovenia[1]	4.66	4.03	3.58	4.28	4.05	4.02	3.54	4.61

Source: Thomson Financial. Source: Thomson Financial.

[1] *From 2007 onwards: see Euro area.*

Table A4

Long-Term Interest Rates

	2004	2005	2006	2007	2004	2005	2006	2007
	Year				2nd half			
	Ten-year rates, period average, %							
Euro area	4.10	3.41	3.83	4.31	4.06	3.30	3.91	4.42
U.S.A.	5.02	4.54	4.88	4.80	5.00	4.50	4.86	4.76
Japan	1.49	1.37	1.74	1.67	1.57	1.39	1.76	1.68
United Kingdom	4.85	4.39	4.45	4.92	4.81	4.25	4.53	4.94
Switzerland	2.74	2.10	2.52	2.93	2.72	2.01	2.55	3.06
Czech Republic	4.75	3.51	3.78	4.28	4.80	3.45	3.88	4.55
Hungary	8.19	6.60	7.12	6.74	8.15	6.34	7.31	6.72
Poland	6.90	5.22	5.23	5.48	6.90	4.93	5.42	5.67
Slovak Republic	5.03	3.52	4.41	4.49	4.97	3.36	4.69	4.64
Slovenia	4.68	3.81	3.85	4.53	4.49	3.73	3.93	4.65

Source: Eurostat, national sources.

Table A5

Corporate Bond Spreads

	2004	2005	2006	2007	2004	2005	2006	2007
	Year				2nd half			
	Period average, percentage points							
	Spreads of 7- to 10-year Euro area corporate bonds against euro area government bonds of same maturity							
AAA	0.20	0.12	0.18	0.27	0.20	0.10	0.19	0.34
BBB	0.84	0.98	1.24	1.26	0.77	1.06	1.25	1.51
	Spreads of 7- to 10-year U.S. corporate bonds against U.S. government bonds of same maturity							
AAA	0.17	0.14	0.33	0.65	0.12	0.17	0.38	0.87
BBB	0.73	0.76	1.03	1.50	0.68	0.81	1.14	1.87

Source: Merrill Lynch via Thomson Financial.

Table A6

Stock Indices[1]

	2004	2005	2006	2007	2004	2005	2006	2007
	Year				2nd half			
	Period average							
Euro area: EURO STOXX	251	294	357	416	252	309	367	417
U.S.A.: S&P 500	1,131	1,207	1,311	1,477	1,134	1,228	1,339	1,492
Japan: Nikkei 225	11,181	12,421	16,124	16,984	11,090	13,399	16,044	16,455
Austria: ATX	1,980	2,996	3,938	4,619	2,124	3,326	3,934	4,601
Czech Republic: PX50	828	1,256	1,479	1,776	885	1,361	1,482	1,814
Hungary: BUX	11,752	19,018	22,515	26,097	12,833	21,130	22,544	27,347
Poland: WIG	24,109	29,568	43,090	58,995	24,841	32,292	46,247	60,473
Slovak Republic: SAX16	213	437	403	422	243	452	400	434
Slovenia: SBI20	4,571	4,676	5,223	9,822	4,774	4,535	5,697	11,544

Source: Thomson Financial.

[1] *EURO STOXX: December 31, 1986 = 100, S&P 500: December 30, 1964 = 100, Nikkei 225: March 31, 1950 = 100, ATX: January 2, 1991 = 1000, PX50: April 6, 1994 = 100, BUX: January 2, 1991 = 100, WIG: April 16, 1991 = 100, SAX16: September 14, 1993 = 100, SBI20: January 3, 1994 = 100.*

Table A7

Gross Domestic Product

	2004	2005	2006	2007	2004	2005	2006	2007
	Year				2nd half			
	Annual change in %, period average							
Euro area	2.3	1.7	2.8	2.6	2.1	2.0	3.1	2.5
U.S.A.	3.6	3.1	2.9	2.2	2.3	3.0	3.2	3.3
Japan	2.7	1.9	2.4	2.1	3.2	3.1	2.5	2.7
Austria	2.3	2.0	3.3	3.4	2.0	2.5	2.2	1.9
Czech Republic	4.5	6.4	6.4	6.5	4.9	6.6	6.2	6.4
Hungary	4.8	4.1	3.9	1.3	4.8	4.4	3.8	0.8
Poland	5.4	3.6	6.2	6.5	4.4	4.4	6.6	6.3
Slovak Republic	5.2	6.6	8.5	10.4	5.5	6.9	8.6	11.8
Slovenia	4.4	4.1	5.7	6.1	4.6	3.9	6.2	5.6

Source: Eurostat, national sources.

Table A8

Current Account

	2004	2005	2006	2007	2004	2005	2006	2007
	Year				2nd half			
	% of GDP, cumulative							
Euro area	0.8	0.1	−0.2	0.0	0.7	−0.2	0.2	0.4
U.S.A.	−5.4	−5.9	−6.1	−5.3	−5.8	−6.2	−6.1	−5.4
Japan	3.7	3.6	3.9	4.8	3.6	3.7	4.0	2.6
Austria	2.4	3.0	3.5	4.7	−1.1	0.3	2.1	2.4
Czech Republic	−5.3	−1.6	−3.1	−3.0	−6.5	−3.0	−5.1	−4.4
Hungary	−8.4	−6.8	−6.1	−5.0	−7.7	−6.9	−5.1	−4.6
Poland	−4.0	−1.2	−2.7	−3.7	−2.9	−1.6	−2.8	−3.4
Slovak Republic	−7.8	−8.4	−7.0	−5.4	−8.0	−9.6	−7.3	−6.7
Slovenia	−2.7	−2.0	−2.8	−4.8	−3.0	−3.0	−4.9	−6.5

Source: Eurostat, European Commission, Thomson Financial, 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

	2004	2005	2006	2007	2004	2005	2006	2007
	Year				2nd half			
	Annual change in %, period average							
Euro area	2.1	2.2	2.2	2.1	2.3	2.3	2.0	2.4
U.S.A.	2.7	3.4	3.2	2.8	3.2	3.8	2.9	3.2
Japan	0.0	−0.3	0.3	0.0	0.2	−0.4	0.5	0.2
Austria	2.0	2.1	1.7	2.2	2.2	2.0	1.7	2.6
Czech Republic	2.6	1.6	2.1	3.0	2.9	1.9	1.7	3.8
Hungary	6.8	3.5	4.0	7.9	6.5	3.4	5.5	7.2
Poland	3.6	2.2	1.3	2.6	4.6	1.5	1.4	3.0
Slovak Republic	7.5	2.8	4.3	1.9	6.8	2.9	4.1	1.9
Slovenia	3.7	2.5	2.5	3.8	3.6	2.4	2.4	4.6

Source: Eurostat.

The Real Economy in Austria

Table A10

Financial Investment of Households

	2004	2005	2006	2007[3]	2004	2005	2006	2007[3]
	Year				2nd half			
	Transactions, EUR million							
Currency and deposits[1]	6,048	5,641	6,746	12,810	3,451	2,281	4,277	5,539
Securities (other than shares)[2]	2,490	1,520	1,252	3,751	510	651	634	1,849
Shares (other than mutual fund shares)	962	1,778	2,227	−342	428	213	26	638
Mutual fund shares	2,883	3,761	2,431	−137	931	2,224	644	−701
Insurance technical reserves	4,630	6,375	5,804	3,921	2,037	2,782	2,982	1,381
Total financial investment	17,013	19,075	18,460	20,003	7,357	8,151	8,563	8,706

Source: OeNB.

[1] *Including loans and other assets.*
[2] *Including financial derivatives.*
[3] *Preliminary data.*

Table A11

Household Income, Savings and Credit Demand

	2004	2005	2006	2007
	Year			
	Year-end, EUR billion			
Net disposable income	144.8	151.1	157.5	..
Savings	12.9	14.1	15.3	..
Saving ratio in %[1]	8.9	9.3	9.7	..
MFI loans to households	98.33	111.27	115.48	123.06

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

[1] *Saving ratio = savings / (disposable income + increase in accrued occupational pension benefits).*

Table A12

Financing of Nonfinancial Corporations

	2004	2005	2006	2007[1]	2004	2005	2006	2007[1]
	Year				2nd half			
	Transactions, EUR million							
Securities (other than shares)	2,909	4,252	2,854	4,364	1,871	3,191	1,726	2,942
Loans	4,859	6,749	6,299	13,933	3,869	3,968	2,057	5,821
Shares and other equity[2]	4,592	60,292	5,772	14,306	470	2,738	225	5,589
Other accounts payable	561	560	1,927	298	444	−725	804	−238
Total debt	12,921	71,853	16,852	32,901	6,654	9,172	4,812	14,114

Source: OeNB.

[1] *Preliminary data.*
[2] *Including other equity of domestic SPE held by nonresidents (data are included from 2005 onwards).*

Table A13

Insolvency Indicators

	2004	2005	2006	2007	2004	2005	2006	2007
	Year				2nd half			
	EUR million							
Default liabilities	2,540	2,426	2,569	2,441	1,371	1,392	1,468	1,290
	Number							
Defaults	2,972	3,203	3,084	3,023	1,503	1,651	1,537	1,475

Source: Kreditschutzverband von 1870.

Table A14

Selected Financial Ratios of the Manufacturing Sector

	2004	2005	2006	2007
	Median, %			
Self-financing and investment ratios				
Cash flow, as a percentage of turnover	8.05	7.55	7.55	..
Investment ratio[1]	1.88	0.99	2.11	..
Reinvestment ratio[2]	59.09	45.00	79.10	..
Financial structure ratios				
Equity ratio	15.43	22.87	20.47	..
Risk-weighted capital ratio	20.99	29.43	27.07	..
Bank liability ratio	39.96	32.01	33.29	..
Government debt ratio	9.11	8.64	9.17	..

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

	2004		2005		2006		2007	
	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	636,035	652,758	697,505	725,761	765,258	797,758	859,343	899,538
of which: total domestic assets	441,250	452,306	463,815	479,817	493,966	504,237	518,713	548,533
total foreign assets	194,785	200,452	233,690	245,943	271,292	293,521	340,630	351,005
Interest rate contracts	1.891,262	1.241,189	1.266,274	1.247,825	1.278,429	1.360,613	1.450,249	1.689,633
Foreign exchange derivatives	255,755	216,284	245,677	240,564	264,876	279,686	369,009	346,969
Other derivatives	17,375	8,490	15,916	17,731	21,751	20,103	21,067	19,381
Derivatives total	2.164,392	1.465,963	1.527,867	1.506,120	1.565,056	1.660,402	1.840,325	2.055,983
Total assets on a consolidated basis	×	732,780	789,045	847,627	874,322	927,751	1.037,390	1.073,221

Source: OeNB.

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

Table A16

Profitability on an Unconsolidated Basis

	2004	2005	2006	2007	2004	2005	2006	2007
	1st half				Year			
	End of period, EUR million							
Net interest income	3,530	3,547	3,562	3,568	7,131	7,094	7,170	7,399
Income from securities and participating interests	990	1,125	1,198	1,387	2,076	2,700	2,878	3,521
Net fee-based income	1,671	1,903	2,169	2,453	3,387	3,941	4,301	4,710
Net profit/loss on financial operations	310	333	446	361	607	642	688	290
Other operating income	590	621	686	758	1,255	1,333	1,581	1,592
Operating income	7,091	7,530	8,062	8,527	14,457	15,710	16,618	17,512
Staff costs	2,382	2,418	2,624	2,654	4,859	5,036	5,451	5,468
Other administrative expenses	1,511	1,628	1,706	1,800	3,108	3,332	3,516	3,703
Other operating expenses	780	776	838	843	1,748	1,694	1,828	1,678
Total operating expenses	4,673	4,822	5,168	5,297	9,715	10,063	10,795	10,849
Operating profit/loss	2,418	2,708	2,894	3,230	4,742	5,647	5,823	6,663
Net risk provisions from credit business[1]	1,730	1,610	1,637	1,257	2,094	2,014	1,845	2,012
Net risk provisions from securities business[1]	−579	−101	−723	−404	−1,154	−408	−2,875	−430
Annual surplus[1]	2,824	2,887	3,931	4,702	3,233	3,734	3,957	4,787
Return on assets[1, 2]	0,42	0,39	0,49	0,51	0,46	0,53	0,50	0,53
Return on equity (tier 1 capital)[1, 2]	8,4	8,0	8,6	7,4	9,3	11,1	9,5	8,5
Interest income to gross income (%)	50	47	44	42	49	45	43	42
Operating expenses to gross income (%)	66	64	64	62	67	64	65	62

Source: OeNB.

[1] *Data referring to the first half of the year are expected year-end values.*
[2] *Annual surplus in % of total assets and tier 1 capital, respectively.*

[1] *Since 2007, the International Monetary Fund (IMF) has published Financial Soundness Indicators (FSI) for Austria (see also www.imf.org). The tables below have therefore been expanded to include FSI as computed by the OeNB for banks operating in Austria.*

Table A17

Profitability on a Consolidated Basis

	2004	2005	2006	2007	2004	2005	2006	2007
	1st half				Year			
	End of period, EUR million							
Operating income	×	10,259	11,713	13,929	19,303	21,153	23,993	28,101
Operating expenses	×	6,490	7,225	8,184	12,473	13,389	14,758	17,046
Operating profit/loss	×	3,769	4,489	5,745	6,830	7,765	9,235	11,055
Result before minority interests	×	2,471	3,712	4,087	4,408	5,341	8,696	8,016
Return on assets[1]	×	0.59	0.83	0.83	0.56	0.63	0.94	0.75
Return on equity (tier 1 capital)[1]	×	14.5	17.8	16.7	13.3	14.7	18.7	16.4
Interest margin to gross income (%)	×	63	60	61	64	62	62	64
Operating expenses to gross income (%)	×	63	62	59	65	63	62	61

Source: OeNB.

[1] *Result before minority interests in % of total assets and tier 1 capital, respectively.*

Table A18

Sectoral Distribution of Loans

	2004		2005		2006		2007	
	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31
	End of period, EUR million							
Nonfinancial corporations	108,979	109,924	111,334	108,944	114,171	116,078	118,086	122,003
of which: foreign currency-denominated loans	17,343	16,094	16,109	14,604	14,006	12,586	10,501	9,888
Households[1]	93,984	97,130	100,375	107,561	109,255	111,404	114,931	117,598
of which: foreign currency-denominated loans	27,077	28,461	30,401	33,316	34,395	34,266	33,383	32,276
General government	29,679	31,238	30,192	29,141	29,856	28,662	27,297	26,303
of which: foreign currency-denominated loans	1,588	1,688	2,074	2,160	2,159	1,862	1,489	1,603
Other financial intermediaries	13,505	14,510	15,131	19,365	20,523	22,001	20,758	21,646
of which: foreign currency-denominated loans	1,594	1,667	2,030	3,216	3,491	3,353	3,142	2,930
Foreign nonbanks	55,774	56,434	66,163	69,273	74,014	80,985	88,217	103,983
of which: foreign currency-denominated loans	23,250	22,431	28,140	28,534	29,280	31,378	33,961	38,027
Nonbanks total	301,921	309,235	323,195	334,283	347,820	359,129	369,290	391,532
of which: foreign currency-denominated loans	70,851	70,341	78,754	81,830	83,331	83,445	82,476	84,723
Banks	183,949	182,416	199,908	201,117	218,833	230,320	264,854	263,344
of which: foreign currency-denominated loans	54,593	49,569	58,368	56,915	62,313	62,467	70,077	69,652

Source: OeNB.

[1] *Sector "Households" consists here of the sectors "Households" and "Nonprofit institutions serving households".*

Note: Due to breaks in the time series growth rates vary from the ones indicated in the text, which have been adjusted.

Table A19

Foreign Currency-Denominated Claims on Domestic Non-MFIs

	2004		2005		2006		2007	
	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	86.0	90.1	89.3	89.0	89.3	90.8	89.0	88.7
Japanese yen	7.1	5.6	5.2	3.9	2.8	2.8	2.8	3.6
U.S. dollar	5.6	3.6	4.8	6.3	6.8	5.5	5.4	5.1
Other foreign currencies	1.3	0.7	0.6	0.8	1.1	0.9	2.8	2.6

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

	2004		2005		2006		2007	
	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	3.4	3.3	3.2	3.1	3.1	2.9	2.7	2.4
Nonperforming loans	×	2.7	×	2.6	×	2.1	×	. .
	End of period, % of tier 1 capital							
Nonperforming loans	×	53.1	×	52.6	×	42.1	×	. .

Source: OeNB.

Table A21

Market Risk[1]

	2004		2005		2006		2007	
	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31
	End of period, EUR million and %, respectively							
Interest rate risk								
Basel ratio for interest rate risk, %[2]	7.5	6.1	6.4	6.6	6.3	5.6	5.2	4.5
Capital requirement for the position risk of interest rate instruments in the trading book	514.8	609.8	810.3	703.0	792.6	737.3	980.0	1.082.6
Exchange rate risk								
Capital requirement for open foreign exchange positions	66.1	52.9	97.3	93.3	101.8	75.2	89.1	74.1
Maximum open position in foreign exchange to capital (%)[3]	1.1	2.1	3.4	3.2	2.8	3.8	4.8	1.5
Equity price risk								
Capital requirement for the position risk of equities in the trading book	52.4	43.4	71.1	95.9	94.0	101.0	211.6	180.6

Source: OeNB.

[1] *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. As long as reporting is according to Basel II mutual funds and nonlinear option risiks are included in the data according to their risk categories.*

[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.*

[3] *The maximum open position in foreign exchange refers to the monthly peaks of the 12 currencies to be included in the monthly report. A net position is calculated for each currency across all banks. The absolute values of the net positions are added up across currencies.*

Table A22

Liquidity Risk

	2004		2005		2006		2007	
	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	×	×	69.7	65.4	67.4	66.2	70.1	64.0
Short-term loans and other liquid assets to short-term liabilities	×	×	120.8	115.8	117.7	115.0	118.7	109.9
Liquid resources of the first degree: 5% quantile of the ratio between available and required liquidity of degree[1]	170.5	171.6	171.8	178.6	173.0	152.4	134.4	140.0
Liquid resources of the second degree: 5% quantile of the ratio between available and required liquidity of degree[2]	128.5	121.7	121.7	118.5	118.7	111.5	114.1	110.2

Source: OeNB.

[1] *Short-term loans and short-term liabilities (up to 3 months against banks and non-banks). Liquid assts (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 of liquidity surpassed by 95% of banks on the respective reporting date.*

Table A23

Solvency

	2004		2005		2006		2007	
	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	× 12.2	12.4	11.7	12.4	11.6	12.6	12.1	
Consolidated tier 1 capital ratio	× 8.3	8.7	8.1	8.9	8.1	9.1	8.7	

Source: OeNB.

Table A24

Assets Held by Austrian Insurance Companies[1]

	2004		2005		2006		2007	
	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31
	End of period, EUR million							
Cash, overnight and other deposits at domestic banks	1,744	2,516	2,472	2,570	3,218	2,359	1,867	2,275
Domestic debt securities	9,175	8,909	9,238	9,309	9,840	10,237	10,606	10,684
of which: domestic banks	6,938	7,068	7,519	7,647	8,021	8,415	8,642	8,639
Equity securities and other domestic securities	15,987	17,359	19,387	21,208	21,754	23,575	23,699	24,456
Loans	6,733	6,504	5,933	5,724	4,701	4,305	3,663	3,396
of which: domestic banks	148	161	206	366	407	468	502	547
Domestic equity interests	3,682	3,906	3,928	3,965	4,315	4,448	4,590	5,000
Real estate	3,438	3,361	3,340	3,288	3,118	3,118	3,046	3,040
Foreign assets	19,209	20,691	22,964	25,058	26,439	28,703	31,482	33,268
of which: debt securities	14,979	15,648	17,002	18,230	19,333	20,360	21,161	22,257
Custody account claims on deposits on reinsurers	..	2,260	..	2,163	..	2,136	..	..
Other assets	4,068	3,594	4,361	4,048	5,199	4,192	4,936	4,150
Total assets	65,927	69,100	73,433	77,333	80,339	83,073	85,625	88,005

Source: OeNB.

[1] *Semiannual data exclusive of reinsurance transactions, based on quarterly returns.*

Table A25

Assets Held by Austrian Mutual Funds

	2004		2005		2006		2007	
	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31
	End of period, EUR million							
Domestic securities	35,405	37,341	43,052	47,032	46,422	49,593	49,882	47,304
of which: debt securities	19,058	19,025	20,545	20,350	18,302	17,632	15,892	14,938
equity securities	16,347	18,316	22,507	26,682	28,120	31,961	33,990	32,366
Foreign securities	75,707	80,505	91,473	100,367	102,876	109,306	112,816	105,232
of which: debt securities	53,022	56,821	64,635	68,054	69,482	70,280	71,373	66,473
equity securities	22,685	23,684	26,838	32,313	33,394	39,026	41,443	38,759
Other assets	7,530	7,441	7,984	9,286	10,232	9,961	11,622	13,110
Total assets	118,642	125,287	142,509	156,685	159,530	168,860	174,320	165,646
of which: foreign currency	24,328	24,591	28,085	32,694	32,699	36,797	38,078	35,047

Source: OeNB.

Table A26

Assets Held by Austrian Pension Funds

	2004		2005		2006		2007	
	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31
	End of period, EUR million							
Domestic securities	8,770	9,179	9,744	10,112	10,074	10,742	10,901	10,773
of which: federal treasury bills and notes	0	0	0	0	0	0	0	0
debt securities	121	108	96	98	89	116	147	137
mutual fund shares	8,607	9,019	9,579	9,949	9,921	10,589	10,722	10,603
other securities	42	52	69	65	64	37	32	33
Foreign securities	460	525	727	1,006	1,010	1,224	1,426	1,473
of which: debt securities	15	27	69	74	81	73	91	140
mutual fund shares	417	469	645	906	903	1,113	1,299	1,321
other securities	28	29	13	26	26	38	36	12
Deposits	72	125	95	113	150	173	270	282
Loans	59	83	94	94	99	93	124	158
Other assets	147	170	196	224	220	264	249	238
Total assets	9,508	10,082	10,856	11,549	11,553	12,496	12,970	12,924
of which: foreign currency	236	249	272	312	327	555	601	620

Source: OeNB.

Table A27

Assets Held by Austrian Severance Funds

	2004		2005		2006		2007	
	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31
	End of period, EUR million							
Total direct investment	64.9	92.3	129.4	158.7	228.7	295.6	415.5	598.3
of which: euro-denominated	64.0	89.2	122.5	153.8	223.3	288.4	390.5	579.6
foreign currency-denominated	0.0	×	×	×	×	×	×	×
accrued income claims from direct investment	0.9	×	2.0	3.2	2.4	4.2	4.6	8.6
Total indirect investment	123.5	269.6	382.3	537.8	658.1	832.5	949.3	1.023.8
of which: total of euro-denominated investment in mutual fund shares	122.8	266.6	370.4	490.4	608.1	781.4	877	963.8
total of foreign currency-denominated investment in mutual fund shares	×	3.2	11.9	47.4	50.0	51.1	72.3	60.0
Total assets assigned to investment groups	188.5	362.1	511.7	696.5	886.5	1.128.1	1.364.8	1.622.1
of which: foreign currency-denominated	×	4.9	16.9	49.1	52.4	54.2	92.7	70.8

Source: OeNB.

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

Table A28

Transactions and System Disturbances in Payment and Securities Settlement Systems

	2004		2005		2006		2007	
	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31	June 30	Dec. 31
	Number of transactions in million, value of transactions in EUR billion							
ARTIS/TARGET								
Number	1.8	3.7	1.9	4.0	2.1	4.4	2.4	4.9
Value	4,174.5	8,470.0	5,077.8	10,412.9	5,780.8	11,563.3	6,295.6	13,152.4
System disturbances	4	4	0	8	1	2	3	3
Securities settlement systems								
Number	0.5	1.0	0.8	1.9	1.7	3.0	1.8	2.9
Value	89.8	187.9	157.3	309.8	267.1	448.6	330	599.8
System disturbances	0	0	0	0	0	0	0	0
Retail payment systems								
Number	181.1	377.9	197.4	412.3	216.5	448.5	237.8	491.7
Value	15.4	31.5	15.5	31.1	16.9	35.3	18.3	36.9
System disturbances	12	17	12	41	25	58	3	20
Participation in international payment systems								
Number	3.0	8.8	5.9	12.0	7.5	16.8	10.2	21.2
Value	578.0	1,101.1	562,0	1,127.4	702,2	1,468.8	868.9	1,946.4
System disturbances	11	15	5	8	1	4	1	1

Source: OeNB.

Note: ARTIS/TARGET has been replaced by HOAM.AT/TARGET2 on 19th November 2007.

Notes

Abbreviations

ARTIS	Austrian Real Time Interbank Settlement (the Austrian real time gross settlement system)
A-SIT	Secure Information Technology Center – Austria
ASVG	Allgemeines Sozialversicherungsgesetz – General Social Security Act
A-Trust	A-Trust Gesellschaft für Sicherheitssysteme im elektronischen Datenverkehr GmbH (accredited certification service provider)
ATX	Austrian Traded Index
BCBS	Basel Committee on Banking Supervision (BIS)
BIC	Bank Identifier Code
BIS	Bank for International Settlements
BOP	balance of payments
BSC	Banking Supervision Committee (ESCB)
CACs	collective action clauses
CEBS	Committee of European Banking Supervisors (EU)
CEE	Central and Eastern Europe
CEEC(s)	Central and Eastern European country (countries)
CESEE	Central, Eastern and Southeastern Europe
CESR	Committee of European Securities Regulators
CIS	Commonwealth of Independent States
CPI	consumer price index
EBA	Euro Banking Association
EBRD	European Bank for Reconstruction and Development
EC	European Community
ECB	European Central Bank
Ecofin	Economic and Financial Affairs Council (EU)
EEA	European Economic Area
EFC	Economic and Financial Committee (EU)
EIB	European Investment Bank
EMS	European Monetary System
EMU	Economic and Monetary Union
EONIA	Euro OverNight Index Average
ERM II	exchange rate mechanism II (EU)
ERP	European Recovery Program
ESA	European System of Accounts
ESAF	Enhanced Structural Adjustment Facility (IMF)
ESCB	European System of Central Banks
ESRI	Economic and Social Research Institute, Dublin
EU	European Union
EURIBOR	Euro Interbank Offered Rate
Eurostat	Statistical Office of the European Communities
FATF	Financial Action Task Force on Money Laundering
FDI	foreign direct investment
Fed	Federal Reserve System (U.S.A.)
FMA	Austrian Financial Market Authority
FOMC	Federal Open Market Committee (U.S.A.)
FSAP	Financial Sector Assessment Program (IMF/World Bank)
FWF	Fonds zur Förderung der wissenschaftlichen Forschung – Austrian Science Fund
GAB	General Arrangements to Borrow
GATS	General Agreement on Trade in Services
GDP	gross domestic product
GNP	gross national product
GSA	GELDSERVICE AUSTRIA Logistik für Wertgestionierung und Transportkoordination GmbH (Austrian cash logistics company)
HICP	Harmonised Index of Consumer Prices
HIPC	Heavily Indebted Poor Countries
IBAN	International Bank Account Number
IBRD	International Bank for Reconstruction and Development
ICT	information and communication technology
IDB	Inter-American Development Bank
IFES	Institut für empirische Sozialforschung GesmbH – Institute for Empirical Social Research, Vienna
ifo	ifo Institute for Economic Research, Munich
IHS	Institut für Höhere Studien und Wissenschaftliche Forschung – Institute for Advanced Studies, Vienna
IIF	Institute of International Finance
IIP	international investment position
IMF	International Monetary Fund
ISO	International Organization for Standardization
IWI	Industriewissenschaftliches Institut – Austrian Institute for Industrial Research, Vienna
JVI	Joint Vienna Institute
LIBOR	London Interbank Offered Rate
M3	broad monetary aggregate M3
MFI	monetary financial institution
MRO	main refinancing operation
MoU	memorandum of understanding
NACE	Statistical Classification of Economic Activities in the European Community
NCB	national central bank
OeBS	Oesterreichische Banknoten- und Sicherheitsdruck GmbH (Austrian banknote and security printing works)
OECD	Organisation for Economic Co-operation and Development
OeKB	Oesterreichische Kontrollbank (Austria's main financial and information service provider for the export industry and the capital market)
OeNB	Oesterreichische Nationalbank (Austria's central bank)
OPEC	Organization of the Petroleum Exporting Countries
ÖBFA	Österreichische Bundesfinanzierungsagentur – Austrian Federal Financing Agency
ÖNACE	Austrian Statistical Classification of Economic Activities
POS	point of sale
PRGF	Poverty Reduction and Growth Facility (IMF)
R&D	Research & Development
RTGS	Real-Time Gross Settlement
SDR	Special Drawing Right (IMF)
SDRM	Sovereign Debt Restructuring Mechanism (IMF)
SEPA	Single Euro Payments Area
SPF	Survey of Professional Forecasters
STEP2	Straight-Through Euro Processing system provided by the Euro Banking Association
STUZZA	Studiengesellschaft für Zusammenarbeit im Zahlungsverkehr G.m.b.H. – Austrian Society for Payment System Research and Cooperation
S.W.I.F.T.	Society for Worldwide Interbank Financial Telecommunication
TARGET	Trans-European Automated Real-time Gross settlement Express Transfer
Treaty	Treaty establishing the European Community
UCIT(s)	undertaking(s) for collective investment in transferable securities
ULC	unit labor cost
UN	United Nations Organization
UNCTAD	United Nations Conference on Trade and Development
VaR	value at risk
WBI	Wiener Börse Index (all-share index of the Vienna stock exchange)
WEF	World Economic Forum
WIFO	Österreichisches Institut für Wirtschaftsforschung – Austrian Institute of Economic Research
wiiw	Wiener Institut für internationale Wirtschaftsvergleiche – The Vienna Institute for International Economic Studies
WKÖ	Wirtschaftskammer Österreich – Austrian Federal Economic Chamber
WTO	World Trade Organization

Legend

x = No data can be indicated for technical reasons

.. = Data not available at the reporting date

0 = The numerical value is zero or smaller than half of the unit indicated

Discrepancies may arise from rounding.

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(By Gaal, A. and M. Plank. 1998. In: Focus on Austria 4/1998, OeNB.)
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