



OESTERREICHISCHE NATIONALBANK

# FINANCIAL MARKET STABILITY REPORT

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**Publisher and editor:**

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**Editor in chief:**

*Wolfdietrich Grau, Secretariat of the Governing Board and Public Relations*

**Coordination of content:**

*Georg Hubmer, Financial Markets Analysis and Surveillance Division*

*Walter Waschiczek, Economic Analysis Division*

**In collaboration with:**

*Stephan Barisitz, Gabriela de Raaij, Werner Dirschmid, Friedrich Fritzer, Ernst Glatzer,*

*Wolfgang Harrer, Georg Hubmer, Ferdinand Klaban, Gerald Krenn, Wolfgang Müller,*

*Fritz Novak, Burkhard Raunig, Thomas Reininger, Franz Schardax, Martin Scheicher,*

*Wolfgang Schüller, Martin Summer, Karin Wagner, Walter Waschiczek, Michael Würz*

**Edited by:**

*Alexander Dallinger, Economic Analysis Division*

**Translated by:**

*Foreign Research Division*

*Dagmar Dichtl, Eva Gebetsroither, Ingrid Haussteiner, Irene Mühldorf,*

*Ingeborg Schuch, Susanne Steinacher*

**Layout, design, set, print and production:**

*Printing Office*

**Inquiries:**

*Oesterreichische Nationalbank*

*Secretariat of the Governing Board and Public Relations*

*Otto-Wagner-Platz 3, A 1090 Vienna, Austria*

*Postal address: P.O. Box 61, A 1011 Vienna, Austria*

*Telephone: (+43-1) 404 20, ext. 6666*

*Fax: (+43-1) 404 20 6696*

**Orders:**

*Oesterreichische Nationalbank*

*Mail Distribution, Files and Documentation Services*

*Otto-Wagner-Platz 3, A 1090 Vienna, Austria*

*Postal address: P.O. Box 61, A 1011 Vienna, Austria*

*Telephone: (+43-1) 404 20, ext. 2345*

*Fax: (+43-1) 404 20 2399*

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## **Financial Market Stability**

### **An Economic Policy Challenge**

Since the inception of Economic and Monetary Union (EMU), the Oesterreichische Nationalbank (OeNB) has contributed to a common stability-oriented monetary policy within the Eurosystem. The Eurosystem now faces the challenge that central banks have come to bear ever greater responsibility for financial sector stability. Financial market stability has become a key economic policy issue for many reasons: For one thing, economic policymakers have had to cope with more serious and more frequent financial crises in the past decade than ever before. For another thing, given the risen volume of money flowing through financial markets, financial market stability has gained significance for national economies, as an efficient, smoothly operating financial system is an elementary pillar of economic growth, output and employment. Finally, a stable financial system is a prerequisite for more efficient capital allocation: it helps contain the cost of financial services, it makes it easier to achieve a balance between investors' and borrowers' preferences, and it provides more risk-hedging opportunities.

Even though Austria has become part of a larger monetary union, it still retains many of the features of a small open economy. Austria's product markets – and even more so its financial markets – are highly dependent on developments abroad. Amid the progressive worldwide integration of financial institutions in particular and of financial markets in general, financial market stability has become a key domain for which the OeNB bears responsibility.

Against this background, the OeNB is presenting its first Financial Market Stability Report to a general readership. This Financial Market Stability Report analyzes the risks inherent in financial market developments and financing structures. As the issue of stability on financial markets can be examined from many analytical perspectives, a broad approach was chosen for this report. Nevertheless, the topics reviewed in this first issue cover only a selection of the questions related to financial market stability. The OeNB intends to continuously expand and deepen its analysis of financial market stability and to publish the results semiannually in this report.

The concept of financial market stability has not been defined precisely in the literature and is quite difficult to put in a nutshell. One major reason why financial market stability remains a rather elusive concept is that it is hard to systematically predict the individual causes of deviations from “stability” – notably financial crises – and that the assortment of explanations for these individual causes is not suited to drawing a universally applicable conclusion. In the abstract, financial market stability is tantamount to systemic stability – to the state on financial markets in which capital is allocated in an optimal fashion and in which the financial system is stable enough to withstand minor crises without outside intervention. Of course, economists disagree on what the conditions are under which a financial system is stable enough.

On the one hand, economic concepts which espouse rational expectations assume that financial markets are intrinsically efficient. According to such models, prices, rates and yields on financial markets should faithfully

reflect the impact of current and future determinants and conditions. Adherents of such theories assert that there can be no immanent undesirable trends, and that problems affecting the economy as a whole could therefore not arise on financial markets. Much rather, world financial markets react sensitively to misjudgments in national economic policymaking and, as they process information rapidly, contribute to transparent economic policymaking.

On the other hand, above all more recent theoretical concepts and empirical methods stress that financial markets might in many respects be inefficient. At some times, for example, market players may overreact to price changes, whereas at others they barely take price-relevant information into account or even ignore it in their decision making. Hence, price data on financial markets do not necessarily have to coincide with the development of fundamentals. Much rather, financial markets are prone to flawed development and are increasingly marching to the beat of their own drummer. In the course of time, the significance of price determinants has clearly shifted. While macroeconomic fundamentals represented the predominant influence on financial market operations in the 1960s and early 1970s, they have been widely replaced by expectations and even by irrational factors such as trust, as exemplified by herding behavior. Consequently, the development of financial market prices has become more and more difficult to predict, and volatility, e.g. of exchange rates or of prices on stock exchanges, has increased. On the whole, financial markets appear to have become more vulnerable to speculative exaggeration, an assumption confirmed by events actually unfolding on financial markets.

With the enormous expansion of capital volumes moving through liberalized financial markets in the past decade, central banks with their specific remit face greater economic policy challenges. To be able to exercise this responsibility prudently, central banks require continuous sound micro- and macroeconomic analyses of the financial sector and of its links to the real economy. Hence, this Financial Market Stability Report focuses on the financial system's structural features and on the areas in which financial systems and financial market developments intersect with the real economy.

Changes on financial markets and the challenges they create must be competently analyzed, and economic policymakers must be thoroughly informed about them. The OeNB's Financial Market Stability Report is designed to present some of the results of analyses performed within the Bank to the general public with an eye to fostering widespread awareness of the issues involved and to contributing to the ongoing discussion about developments on financial markets. To wit, problems accompanying specific developments must be clearly identified, financial market policy objectives explained and the public made sensitive to micro- and macroeconomic risk.

There are very close ties between financial market stability and macroeconomic and economic policy stability. As instability on financial markets can be very costly, the interaction of financial markets and the real economy must be monitored closely.

Financial accounts statistics, which the OeNB compiles for Austria, are suited to providing a comprehensive overview of the financial situation of the

main lenders and borrowers (households and enterprises) at the macro-economic level.

Of course, a feature typical of Austrian finance is its banks' huge investment in Eastern Europe and Austria's strong trade, direct investment and financial ties to these countries. In this report, the OeNB can draw on its internationally recognized competence on Eastern Europe, that is, its knowledge about the Central and Eastern European Countries' (CEECs') economies and institutions.

The OeNB's first Financial Market Stability Report examines the following key issues and developments:

- The Austrian financial market has become strongly integrated into international financial markets; its stability is increasingly contingent on global developments. Banks and institutional investors, as well as households, are investing an expanding share of their capital abroad.
- Austria must keep track of the high volatility on bourses around the world because the rising share of investment in foreign stocks has repercussions on the Austrian financial market.

In Austria, the value of investments in stocks and real estate has increased only minimally in recent years. Therefore, unlike in a number of other countries, these assets incur very little risk for financial market stability in Austria.

- Capital market growth would be desirable in Austria and is actively supported by the OeNB. A deep, liquid capital market provides enterprises with better financing and is more attractive for investors. What is more, a strong and dynamic capital market makes it easier to exploit long-term growth potentials.
- A gap opened up between yields on corporate bonds of different quality in the year 2000. This gap may well indicate that financial market players are more judicious in their assessment of credit risk in the euro area than they were at the beginning of 2000. Investors sharply revised their assessment of the telecommunications sector in particular, and of New Economy companies in particular.
- The provision of finance by banks as the traditional intermediaries has declined within the overall structure of funding. While banks still play an important role in corporate financing in Austria by international standards, this role has diminished in recent years.
- Conversely, institutional investors have expanded their holdings massively in recent years. Yet, their assets still trail the levels common in most other industrialized nations. At the same time, institutional investors' holdings have shifted strongly in favor of stocks and foreign assets.
- Developments in the CEECs are becoming more important in gauging financial market stability in Austria. Apart from the growing foreign trade and direct investment links with Austria's neighbors to the East, Austrian banks' direct exposure has also risen perceptibly since 1999. Austria has invested heavily in Central and Eastern Europe, and Austrian banks rank among the largest investors in the region. Austrian banks

- managed to make high profits in Central and Eastern Europe, yet their risk profile has changed substantially.
- Banks' interest income has fallen markedly since the mid-1990s. Noninterest income, such as foreign exchange commissions for foreign currency loans or fees for securities accounts, has augmented considerably. As a result of this development, Austrian banks have become more exposed to market risk than in the past.
  - The massive rise in foreign currency lending to companies and households has become an important feature of Austrian banks' business in recent years. From the banks' perspective, this change has occasioned higher profits; the interest rate and exchange rate risks are borne largely by the borrowers. However, the risk of default by debtors has increased the risk potential of such operations.
  - Households' debt ratio is low in Austria and involves little risk. In an international comparison, Austria ranks among the lower middle group of countries in terms of the debt-to-equity ratio. However, the high proportion of foreign currency debt by international standards basically involves higher risk than other debt, given its contingency, for example, on exchange rate developments.

In addition to the reports section, studies are designed to provide in-depth insights into specific topics related to financial market stability. In the study section, the first Financial Market Stability Report reviews the development of financial markets in selected Central and Eastern European countries, securities settlement in Austria, stress testing at Austrian banks and the difficulties involved in drawing up financial market forecasts.

The OeNB's Financial Market Stability Report generally emphasizes preventive measures that institutions need to take. As the Bank for International Settlements (BIS) stated in its Annual Report only a few years ago, "It is a sad truth in the postwar world that most initiatives to reinforce international financial cooperation have been taken under the pressure of some kind of financial crisis."

Based on this assessment, the main task of modern central banks consists in preventing crises, a task which will become even more important in the future. We are called upon to create an institutional framework suited to reducing the vulnerability to financial market fragility and to providing adequate protection from exogenous financial market shocks. The risk of aberrant developments on financial markets must be identified quickly enough for market players and economic policymakers to take appropriate action.

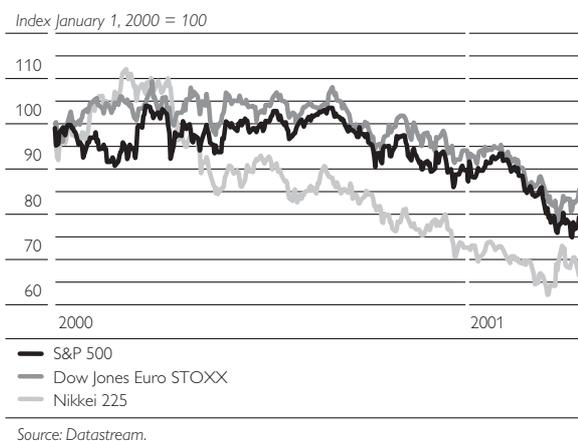
This is precisely where financial market stability reports come in. Although Austrian financial markets have a low risk potential in a worldwide comparison, it is crucial to take a systematic and preemptive approach to these issues. Hence, the primary aim of the OeNB's Financial Market Stability Report is to contribute to a more general comprehension of the challenges financial markets face today.

## International Financial Markets

Editorial close:  
April 12, 2001

This chapter reviews the most important developments in the international financial markets since the beginning of 2000, focusing on the analysis of financial markets in the euro area and the United States. It provides a summary of current developments followed by an overview of potential risks.

### Stock Markets (Part 1)



### Stock Markets (Part 2)



### Current Developments

#### Global Decline in Stock Prices

The second half of 2000 was marked by a slump in stock prices. From January 2000 onward, the Standard & Poor's 500 (S&P 500), the Dow Jones Euro STOXX and the Nikkei 225 dropped by 15% to 35%. By mid-2001, the Nasdaq Composite Index and the Neuer Markt's Nemax had tumbled by almost 50% compared to early 2000. Falling stock prices went along with reduced profits and profit warnings. Evidently, the economic slow-down in the U.S.A. has had a major impact on stock price developments, but the sharp decline must also be viewed against the backdrop of the price rallies in the past few years. The increase in market values was particularly pronounced on the Neuer Markt in Frankfurt, where New Economy stocks surged 800% between July 1997 and March 2000. This was the time when most markets reached historic highs. After that, the Nemax plummeted to a quarter of its peak value, and the first listed companies filed for bankruptcy.

An analysis of price developments in the Dow Jones Euro STOXX sectors shows that telecommunications and technology stock prices had dropped most markedly – 30% to 50% – since early 2000, while health, energy and food stock prices were on the increase.

In this context, price changes in the banking sector provide an interesting contrast: The chart "Relative Price Changes in the Banking Sector" depicts the performance of the Dow Jones Euro STOXX financial sector index: In certain periods, it ran counter to the general development as represented by the broad stock indices. Until the

third quarter of 2000, bank stocks gained while other prices were down. Therefore, markets did not expect (at the editorial close) that euro area banks had to anticipate declining profits, i.e. the operating performance of the banks included in the Euro STOXX sector index was rated largely positively.

### Correction of Stock Valuations?

There is no unanimity among market participants on the extent to which overvaluations, especially of technology stocks, have been corrected by the slump in stock prices. At present, it is hard to ascertain whether the bubble, i.e. the increase in financial market prices based on improvements of fundamentals, has fully burst. Such marked price changes in such a short period of time have rarely occurred, therefore it is only logical to question the current stock market valuations.

The price/earnings (P/E) ratio is often used as a measure to value stock prices.<sup>1)</sup> The higher the ratio, the higher the stock's valuation. Based on the estimated profits for the business year 2000, the P/E ratio in the euro area was 20, 24 in the U.S.A. and 50 in Japan. Evidently, the ratios in the U.S.A. and in the euro area are very similar. Since the early 1980s, the ratio has been fluctuating between 10 and 35, with the latter value, which the U.S.A. reached some two years ago, being the highest so far. Since then, the sharp decline in prices markedly diminished stock valuations. Historically speaking, the valuations are still exceptionally high, considering that in the 1980s, the P/E ratio came to 10 to 15. Interestingly, Japanese shares are still highly valued.

### Persistent Crisis in Japan

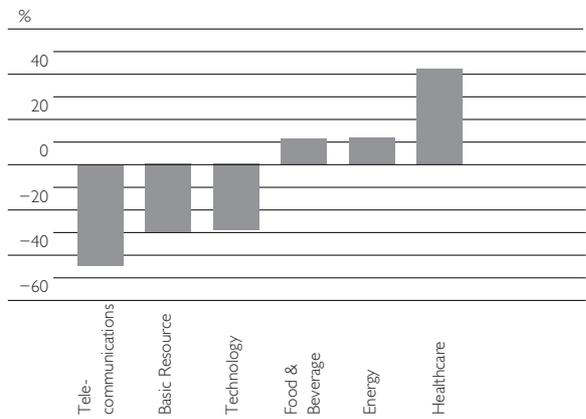
The developments in Japan are clearly in a different league than the "irrational exuberance"<sup>2)</sup> in the U.S.A. and in Europe. Japan has been troubled by a severe economic and banking crisis. In 2001, the Nikkei 225 hit a new 16-year low. This slump particularly affected the reorganization of the undercapitalized banks, as these have large stock portfolios. The banks' value adjustments have aggravated the credit crunch even further. So far, neither the expansive fiscal policies, nor the central bank's monetary policy have stimulated growth or put an end to deflation. Standard & Poor's (S&P) has now downgraded the rating of Japanese bonds to AA+, after Moody's had downgraded them to Aa2 as early as in 1998. The loss of the AAA rating proves that the situation has become serious. Sustainable reforms, especially the restructuring of undercapitalized banks, are key to putting the Japanese economy on a path to recovery. Although

1 The P/E ratio is defined as the current share price of a company divided by its earnings per share. This simple gauge shows how many times a company's earnings per share go into the share price. To obtain the P/E ratio of a stock index, it is necessary to calculate the mean of all individual shares' value taken together.

2 See Shiller, R. J. (2000). *Irrational Exuberance*. Princeton University Press.

### Relative Price Changes

#### in the Dow Jones Euro STOXX from January 1, 2000

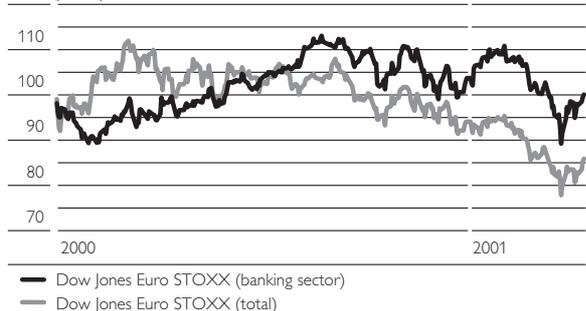


Source: Datastream.

### Relative Price Changes

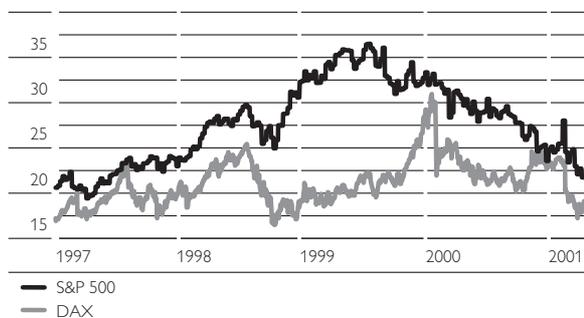
#### in the Banking Sector

Index January 1, 2000 = 100



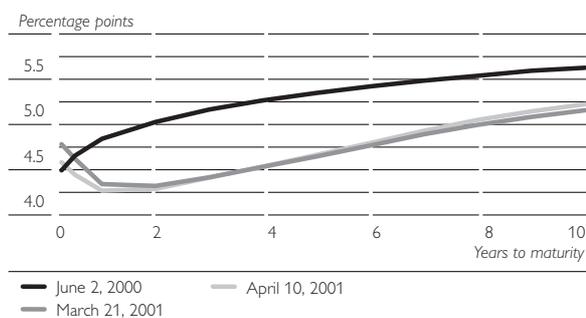
Source: Datastream.

### Price/Earnings Ratio



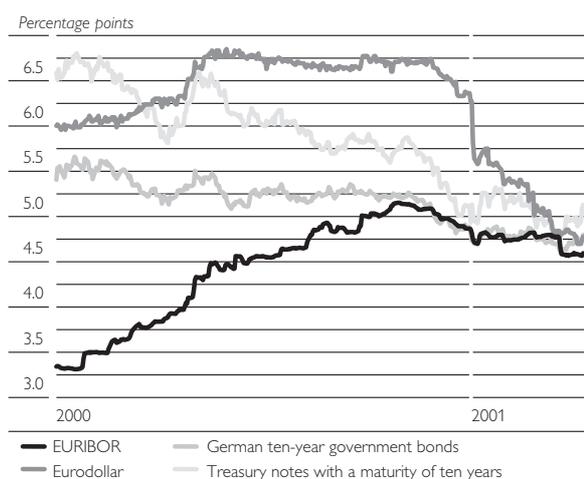
Source: Datastream.

### Euro Yield Curve



Source: Datastream.

### Interest Rates in the Euro Area and the U.S.A.



Source: Datastream.

of one to ten years serve as the data base. Owing to changes in demand for U.S. Treasury notes, U.S. dollar interest rate swaps are being increasingly

Japan has been mired in crisis for several years, financial markets in the euro area have not been impacted noticeably so far.

### Developments in the Emerging Economies

Interestingly, the Emerging Market Index (Morgan Stanley Capital International), mirroring stock price developments in the emerging economies, and the Nasdaq Composite Index (see chart “Stock Markets, Part 2”) show a positive correlation, indicating that the American markets have strong repercussions on stock markets in Latin America, Asia, Eastern Europe, Africa and in the Middle East. The ramifications of the crises of 1997 and 1998 are still widely felt in these regions. At present, attention focuses on the situation in Turkey. The Turkish banking system has shown signs of weakness for years, with the amount of bad loans mounting dramatically. Furthermore, it is impossible to predict when the macroeconomic environment will improve, or, in particular, when hyperinflation will be reined in. Political turbulence in February 2001 exacerbated the financial crisis, which culminated in the devaluation of the Turkish lira by some 30 percentage points.

### Falling Interest Rates in the U.S.A.

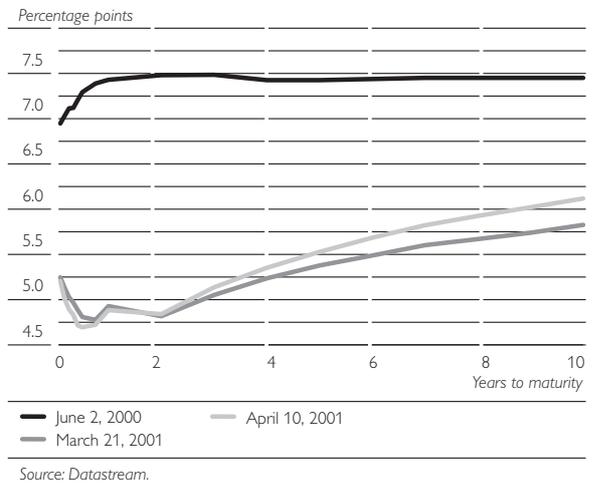
Since November 2000, the development of short and long-term euro and U.S. dollar rates has been marked by expected interest rate cuts. The Federal Reserve loosened its monetary policy five times in 2001, cutting the federal funds rate by 250 basis points.<sup>1)</sup> The scope and time of the first interest rate cut came as a surprise to market participants. At the cutoff date, further steps in this direction could not be ruled out. The current spread between short and long-term interest rates is very small.

The zero coupon yield curve depicts the interest rate and inflation expectations in the entire euro area and in the U.S.A. EURIBOR/Eurodollar rates for maturities of up to 12 months and EURIBOR/Eurodollar swaps with a maturity

<sup>1</sup> Until May 2001.

used as a benchmark. It is more convenient to use swaps to illustrate interest rate expectations in the euro area, as the interbank market is fully integrated. By contrast, there are still substantial differences between the government bond markets of euro area member states. Between October 2000 and mid-April 2001, the yield curves in both regions changed markedly. Since June 2000, the curvature and the slope of both curves have changed. The interest rate cuts by the Federal Reserve and the negative outlook for the American economy are two of the underlying reasons for yield curve shifts in both regions. Moreover, expectations of new interest rate cuts by the Eurosystem may also have had an impact on the euro yield curve. Since the three-month rate is higher than the two-year rate, the current euro yield curve is inverse up to a maturity of two years. The current U.S. dollar yield curve is also inverse at the short end. This implies that the economy is expected to slow down for two to three years and that interest rate cuts on the euro and the U.S. dollar interbank markets are deemed likely. Afterwards, the yield curves in both regions point towards higher interest rates.

### U.S. Dollar Yield Curve



### Sharp Increase of International Financing

Data provided by the Bank for International Settlements (BIS) help illustrate other key developments in the international financial markets. The BIS statistics<sup>1)</sup> provide insight into the structure and dynamics of deposits and loans:

- 2000 saw a substantial increase in overall activity in the international banking market. Interbank loans expanded by USD 68 billion. At the same time, banks increasingly purchased securities from Europe and the U.S.A. Deposit flows from oil-exporting countries and developing countries to banks augmented considerably.
- The lion's share of credit extended to emerging economy countries went to Brazil, Argentina and Turkey. The latter enlarged its foreign debt by USD 2.5 billion. Russia experienced the largest contraction in claims among emerging market countries – over USD 3 billion – most of which was related to the finalization of a debt restructuring agreement between Russia and its commercial bank creditors.
- According to the BIS data, activity in the international syndicated credit market expanded significantly, which can be traced to a threefold increase in syndicated lending to telecommunications firms. Syndicated credits arranged for telecoms firms totaled USD 256 billion in 2000. The bulk of these loans was extended in euro by euro area-based banks via London. Substantial amounts of syndicated credits continue to be

<sup>1</sup> See BIS Quarterly Review, March 2001.

arranged to support mergers and acquisitions (M&As). USD 214 billion were made available for M&As in 2000. Finally, the statistics show that Turkish banks continued to arrange a number of syndicated loans.

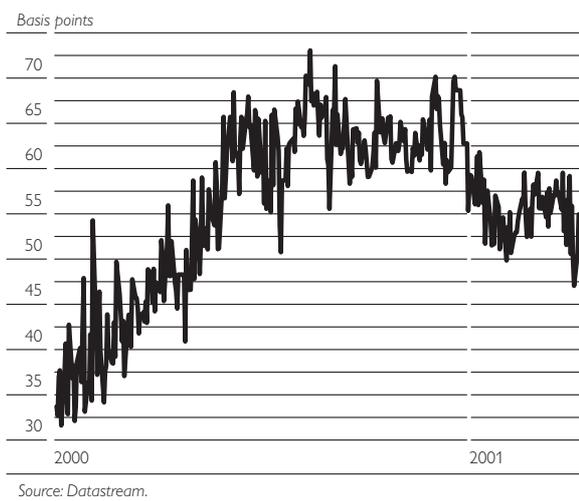
### Risk Factors in Financial Markets

At present, financial market stability in the euro area may be challenged above all by the following four risk factors: First, the situation in the U.S.A. is a potential risk, involving, in particular, uncertainty about the scope and the duration of the slowdown in growth. According to market participants, economic conditions in the U.S.A. have a large impact on economic developments in the euro area. The current valuation of American stock markets must also be considered in this context. Second, the uncertain future operating performance and the tense financial situation of telecommunications firms are risk factors that have to be taken into account. Third, Japan has been faced with financial sector predicaments and deflation for several years now. Fourth, emerging market countries may be hit by crises like the ones in Turkey or Argentina.

These risk factors can cause instability in euro area financial markets by setting off the following mechanisms:

- Contagion effect: the transmission of shocks to the capital markets;
- Potential failures of a system-relevant bank because of losses generated by market or credit risk exposure;
- Real effects: higher financial costs, plummeting investment and exports, wealth effects for household assets.

#### Swap Spread in the Euro Area



The following section examines key macroprudential indicators of credit, liquidity, and market risk in international financial markets. Operational risk is the fourth risk category. It is the overall risk of business activity and is independent of market and economic developments. Operational risk is not taken account of in the systematic coverage of financial system fragilities.

#### Indicators of Credit Risk

Credit risk is the risk of a counterparty's deteriorating creditworthiness and/or – finally – its inability to meet its obligations. This risk category measures losses from default of a counterparty, or, more generally speaking, from the deterioration of its creditworthiness, e.g. after

its rating has been downgraded. For euro area-based banks, credit risk is the most important risk of business activity. Loans in the banking book<sup>1)</sup> are the largest source of credit risk. In the trading book, credit risk takes the form of

<sup>1</sup> The banking book is part of the banks' portfolio of instruments for longer-term investment or hedging purposes (e. g. loans), whereas the trading book holds instruments for shorter-term gain (e. g. proprietary securities trading).

high-risk securities in credit trading and derivative transactions on the interbank market, which involve the risk of a counterparty's default. The spreads between risk-free government bonds and interest rate instruments with default risk are widely used indicators of credit risk.<sup>1)</sup> Risk analysis focuses on large debtors, that is companies, supranational organizations and governments. The yield differentials between instruments of different issuers are determined by the differences in creditworthiness, as they are adjusted for general interest rate changes by using the yields of government bonds. Therefore, the differentials mirror current expectations of future default rates. The size of the various interest rate instruments' spreads can be interpreted as the market opinion on the counterparty's default probability. The higher the gaps are for a counterparty, the higher the risk premium. This additional yield compensates for the existence of a significant probability of default. In the U.S.A., default rates increased prior to or during a recession. This implies that interest rate spreads can provide information about the general economic climate. Since bank lending rates are not publicly available, the interest rates on the bond market are suitable for estimating the rates which businesses have to pay for their loans (e.g. for syndicated loan facilities).

The analysis of interest rate spreads originated in financial market theory. It shows that an option price model can be used to value corporate bonds. The approach introduced by Merton (1974)<sup>2)</sup> implies that the price of a corporate bond corresponds to the value of a portfolio long in a risk-free asset and short of a put option on the company's assets or the stock price. Hence, the interest rate spread is equal to the premium paid for the put option.

#### Credit Risk Declines Slightly in the Euro Area

The spread between the ten-year German government bond and the fixed rate of ten-year interest rate swaps serves as the most important gauge of credit risk on the euro interbank market. This spread widened by close to 40 basis points over the year 2000 and currently amounts to 55 basis points. The long-term perspective shows that ever since the Russian crisis the differential has not contracted to pre-crisis levels of between 20 and 30 basis points. Over the past few months the Fed's monetary policy measures seem to have exerted downward pressure on the spread. Amid the interest rate cuts, the outlook for the U.S. economy improved, which, in turn, led to a decrease in interbank risk premia.

#### Interest Rate Spreads in the Euro Area



1 See Saunders, A. (1999). *Credit Risk Measurement*, Wiley.

2 See Merton, R. (1974). *On the Pricing of Corporate Debt. The Risk Structure of Interest Rates*. In: *Journal of Finance*, 449–470.

The swap spread is an important indicator, because the corporate bond market has only just started to grow and it is predominantly banks that cater to the segment of nonpublic borrowers. While the corporate bond market is expanding at a fast clip in Europe – not least thanks to monetary union, it is still a fraction of the size of its U.S. counterpart. The U.S. market attracts borrowers covering the entire spectrum of credit ratings and sectors. In Europe, the depth and width of this market is comparably limited. In 2000, the U.S.A. accounted for 46% of worldwide bonds outstanding, which contrasts with the euro area's 20% share. The euro area volume is made up as follows: government 50%, financial institutions 43% and corporates 7% (U.S.A.: 50%, 30% and 19%). J.P. Morgan's representative European Credit Swap Index<sup>1</sup>) comprises 98 corporates (65 industrial companies, 31 from the financial sector), of which 7 companies are rated AAA, 37 AA, 39 A, 7 BBB and 8 are not rated. This index does not contain any Austrian borrowers. The figures above indicate that still relatively few borrowers are engaged on the bond market. Yet, an analysis of this segment is valuable, as it produces additional information on default risk.

The chart "Interest Rate Spreads in the Euro Area" shows the interest rate spreads of the Lehman Brothers Euro Corporate Bond Indices to German government bonds for the ratings Baa, Aa and A. It is evident from the chart that the spreads decoupled. In April 2000, the three rating categories ceased to develop in sync. At that time, which coincided with the onset of the equity market slump, the Baa spreads became divorced from those of the other two categories. Overall, the correlations between borrowers with different credit ratings decreased. This break was also due to the fact that lower-rated borrowers are more exposed to event risk than borrowers with top ratings. The past developments suggest close interdependence between stock prices and bond yields. Concern about negative earnings trends caused stock prices to fall. The worsening debt-to-equity ratio pushed up the affected companies' debt burden. Subsequently, the risk premia on corporate bonds increased. Since the U.S. interest rate cuts, the spreads have shrunk again, with the contraction most pronounced in the highest risk category: the spread in this category dropped by 30 basis points from a peak of 180 basis points. The spread of the rating category A narrowed by 15 basis points. Like swap spreads, credit spreads illustrate the enormous influence the U.S. economy exerts on the euro area's financial markets. If the economy in the U.S. were to worsen, the risk premia on European bond markets would rise.

#### Uncertainties Persist in the Telecommunications Sector

The telecommunications sector currently plays a particularly important role for the analysis of credit risk. Given the high uncertainty about future earnings, the TMT (technology, media and telecommunications) segment is a substantial risk factor. Banks are faced with a clustering of credit risks due to stepped-up lending to companies in this sector. At the editorial close, the major TMT companies were rated as follows:

<sup>1</sup> See also J.P. Morgan (2000). *Introducing the JP Morgan European Credit Swap Index*, Portfolio Research, March.

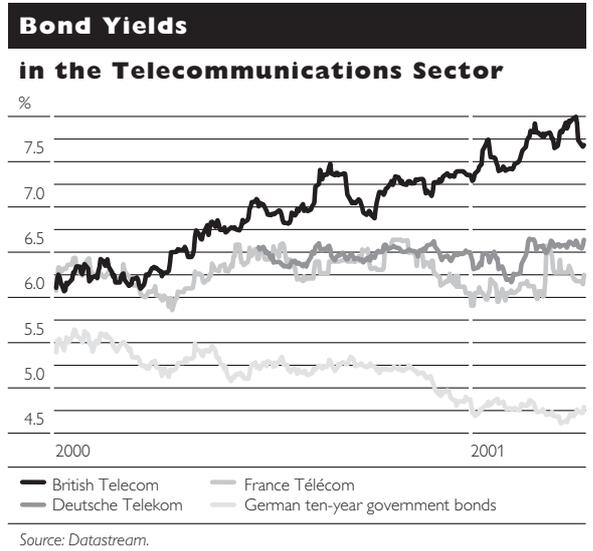
- Deutsche Telekom: Moody's – A2, S&P – A-;
- France Télécom: Moody's – A1, S&P – A;
- British Telecom: Moody's – A2, S&P – A;
- KPN: Moody's – Baa2, S&P – BBB+;
- Vodafone: Moody's – A2, S&P – A.

The credit ratings assigned by Moody's and S&P attest to the considerable risk potential inherent in this segment. The UMTS auctions in particular put telecom companies under an enormous financial strain. As a consequence, they issued equities, took recourse to syndicated loan facilities, took out bridge loans or floated bonds. A specific provision, which applies to many bond issues by telecommunications companies, stipulates that the company raise the coupons if its rating drops to Baa/BBB. This adds extra cost to the firms' debt. Downgradings seem to be in the offing, since the financial squeeze many firms are faced with is not expected to ease. To finance further investments in UMTS technology, some companies planned to sell shares on the stock exchange. Since this strategy did not yield the desired results when France Télécom staged an initial public offering of Orange, telecom companies are likely to find raising capital more difficult in the future. The chart "Bond Yields in the Telecommunications Sector" shows the yields on bonds issued by Deutsche Telekom, British Telecom and France Télécom. Given the risk involved, all these bonds offer interest rates of between 6% and 8%. This yield outperforms that of German government bonds by 130 to 300 basis points. In other words, the bond markets and rating agencies appraise this sector as having a considerable risk potential.

Suffice it to note at this point that from today's perspective it is only possible to draw up rough forecasts about the earnings prospects of telecommunications companies, which is also true of New Economy players and their paper. All told, the euphoria about the entire TMT sector has cooled off, as was also laid out in the first section.

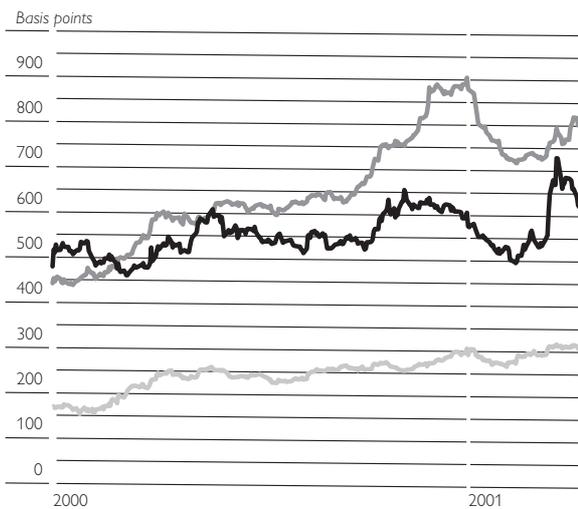
#### Credit Risk Is on the Rise in the U.S.A.

U.S. markets trade not only in interest rate swaps and bonds by companies with high or medium credit ratings, but also in high yield bonds, i.e. bonds issued by companies rated Ba and lower (junk bonds). Another, frequently used gauge of credit risk is the yield spread of Latin American bonds. The charts "Swap Spread in the U.S.A." and "U.S. Dollar Interest Rate Spreads" show the yield spreads of U.S. dollar interest rate swaps with a ten-year maturity, U.S. corporate bonds rated Baa, U.S. high yield bonds (Merrill Lynch High Yield Index) and Latin American bonds (Lehman Emerging Americas Bond Index). The gaps between the yields of the various debtors are distinct. Swaps show the lowest spread against Treasury bonds and junk bonds the highest. The corporate bonds rated Baa and the Latin



**Swap Spread in the U.S.A.**

Source: Datastream.

**U.S. Dollar Interest Rate Spreads**

— Latin America  
 — U.S. dollar high yield  
 — Baa

Source: Datastream.

American bonds are in between. At the editorial close, the order was just the opposite of that during the summer 1998 crisis. Then the yield spread of Latin American bonds had amounted to 120 basis points. Interestingly, swap spreads are higher in the U.S.A. than in Europe. The spread registered in the euro area is about 60 basis points, while the U.S. spread stands at 90 basis points. The U.S. dollar spread hit a high of 140 basis points in the year 2000, pushed up by the declining yields on government bonds as budgets were in surplus. With the supply of U.S. Treasury bonds decreasing and demand remaining constant, prices continued to rise, so that the yields dropped.

The development of corporate bond spreads, notably of investment-grade bonds rated Baa and speculative high yield bonds is particularly interesting. These two rates are indicative of the current external financing costs companies with varying credit ratings incur on the bond market. They thus provide many clues about possible defaults on the corporate bond and financial bond market. The marked increase in junk bond yields is especially noteworthy, as is their pronounced reaction to the Fed's first interest rate cut of early 2001, which triggered a decline in spreads by 100 basis points. The loosening of monetary policy thus had the greatest impact on lower-rated borrowers. Latin American bonds and corporate bonds rated Baa show a similar effect. The debt burden of debtors of medium and low credit-worthiness has therefore been reduced slightly. Before the interest rate cuts many debtors with medium and lower ratings were active on the short end, raising funds on the money market.

The swap spread contracted by some 20 basis points. The future path of these differentials hinges on whether the U.S. economy is headed for a hard or a soft landing. Market participants expect the spreads to decrease further if the economy deteriorates only slightly. The risk premium implied in swap rates will be influenced especially by the developments in the banking sector.

**Credit Risk Is Up in Turkey**

Since Turkey at present figures prominently among the emerging economies in the EU's periphery, analyses have been focusing on Turkish bonds traded abroad and comprised in the Lehman Brothers Bond Index. The spreads have risen sharply. From the investor's point of view, exchange rate risk impacts

the risk premium considerably because of the devaluation. The yields on Turkish paper denominated in U.S. dollars stood at 16% at the editorial close. During the 1998 financial turmoil they had peaked at 19%. In 2000, when the magnitude of the banking sector's problems became public, bond rates plummeted. Therefore there is an urgent need to push ahead with the restructuring of the financial sector.

### Liquidity Risk Indicators on a Slight Uptrend

In analyzing the yield spreads of different issuers, analysts must bear in mind that the spread of a particular issuer or type of issuer contains the following components in addition to credit risk:

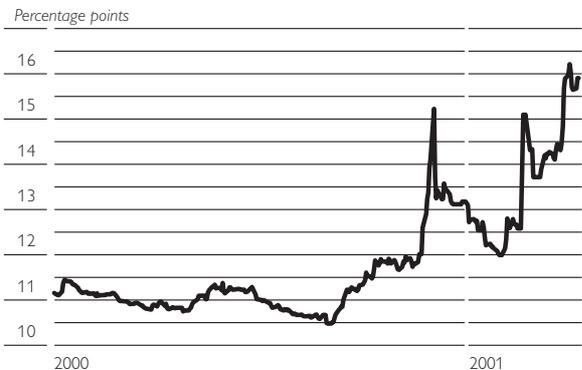
- the issuer's sensitivity to interest rate risk;
- liquidity risk;
- special factors for yields on benchmarks, e.g. shortened supply of government bonds.

Liquidity risk is especially critical.<sup>1)</sup> It refers to the inability to reduce positions in a timely fashion once a market faces disturbances.<sup>2)</sup> Such a development was observed during the crisis in the summer and fall of 1998.

In the U.S.A. liquidity risk is quantified using the yield differential of "on the run" and "off the run" bonds<sup>3)</sup> as a proxy. As the latter are traded less frequently, the yield gap allows for an estimation of liquidity risk. In the euro area it is not easy to implement this methodology directly. For data reasons, liquidity risk cannot be measured directly. There are, however, indirect measures of liquidity risk, such as the differential between the zero coupon rate of the yield curve and the yield on the respective benchmark bond. This gap, which is not affected by overall interest rate developments, is mainly determined by liquidity.

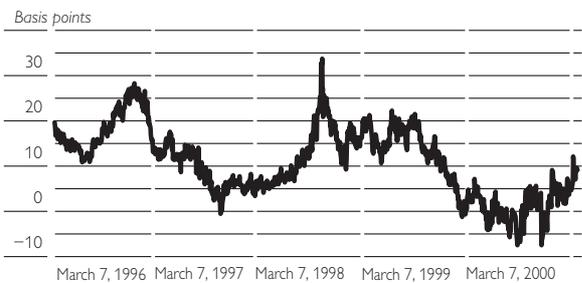
The chart "Liquidity Premium on the German Bond Market" shows the interest rate differential for German bonds. The jump of October 1998 stands out clearly. It reflects investors' "flight to quality," a phenomenon evident at times of sliding rates, when investors tend to opt for comparably safe government bonds. Most recently, this indicator has started to edge up somewhat.

### Turkish Government Bond Yields



Source: Datastream.

### Liquidity Premium on the German Bond Market



Source: Datastream.

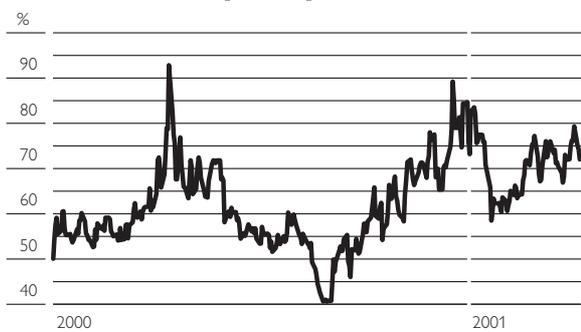
1 See J. P. Morgan (1999). *Valuing Market Liquidity*, Fixed Income Research.

2 The greater the liquidity of a market, the smaller its liquidity risk. See also the chapter "Financial Markets in Austria," section "Bond Market."

3 A bond acting as the current benchmark and its predecessor.

### Implied Volatility

#### for the Nasdaq Composite Index



Source: Datastream.

### Market Risk Indicators

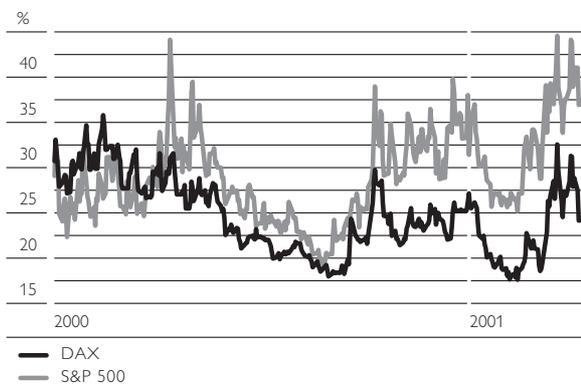
Market risk in banking operations results from dramatic falls in the market rates of securities and derivatives. Banks' exposure derives primarily from proprietary trading, i.e. when banks use their own capital to take up positions in the trading book. For instance, a plunge in share prices may reduce the value of a portfolio substantially. If a bank's losses exceed its funds available, it might suffer a liquidity squeeze. It follows that significant changes in market risk could give rise to instabilities on financial markets. The Capital Adequacy Directive governs the regulatory framework of market risk. Its

provisions aim at keeping the effects of major price movements on banks' portfolios in check. Put differently, they serve to contain the havoc wrought by financial turbulences such as the crisis in Russia.

The volatilities of stock indices, exchange rates or interest rates are common measures of market risk. Volatility refers to the standard deviation, i.e. the dispersion of price swings around the expected value. Implied volatility is extracted from option prices observed on the market by means of an option pricing formula. Since derivative financial instruments represent forward-looking contracts, market participants must anticipate the variances for the period until the instruments expire. In the valuation model, such a forecast is the most important determinant of the price of an option. Implied volatility reflects investors' current expectations about the future dispersion of the equity index, exchange rate or interest rate and allows for an assessment of how much the prices of the respective instruments will fluctuate in the future. Changes in implied volatility may be interpreted as changes in dealers' risk assessment. Like yield curves and interest rate

spreads, implied volatilities are forward-looking indicators. Historical volatility, by contrast, measures the variance of past price changes only.

### Stock Market Implied Volatility



Source: Datastream.

### Volatilities Are on the Rise

On the equity markets the variance of the broad indices in Germany fluctuated between 15% and 30% on an annualized basis in the reporting period, compared to a 20% to 40% range in the U.S.A. The Fed's interest rate cuts prompted but a temporary drop in uncertainty. On the U.S. market the uptick in prices went hand in hand with a fall in volatilities. In April 2001, the variance increased again both in Germany and the U.S.A., which suggests a rise in market risk. The

implied volatility of equity prices recently amounted to 30% in the U.S.A. and 20% in Germany. The implied volatilities registered on the Nasdaq are significantly higher. Over the course of 2000 the variance had fluctuated

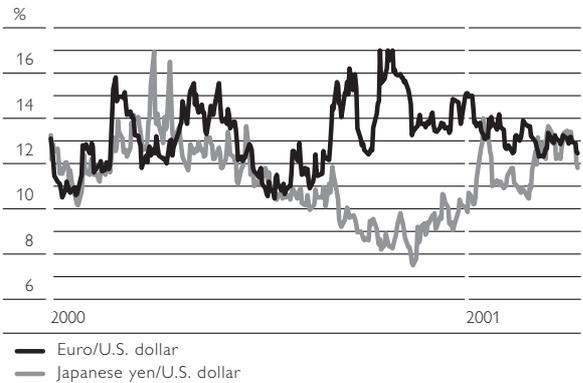
between 40% and 90%; at the editorial close, it came to 72%. These sizeable volatilities mirror the great risk inherent in New Economy share issues and attest to the enormous uncertainty surrounding the valuation of technology stocks. Just like with the DAX and the S&P 500, volatility on the Nasdaq sank in the wake of the Fed's interest rate cuts, but in the weeks before the editorial close a further rise was in the making. This indicates that market participants expect further corrections in the valuations of technology stocks.

On the foreign exchange markets uncertainty diminished in sync with the euro's gain in the fall of 2000. Since end-January 2001 implied volatility has changed only minimally, posting some 12% at the editorial close, both for euro/U.S. dollar and Japanese yen/U.S. dollar exchange rates. Implied volatility had thus declined, compared to the 17% peak (euro/U.S. dollar) of October 2000. Using implied volatility to assess financial market stability is complicated by the fact that technical shifts play a disproportionately large role compared to shifts in fundamentals.

On money markets the implied volatility of the three-month EURIBOR is the key measure of uncertainty. This variance is extracted from options on EURIBOR futures contracts and reflects the uncertainty about the development of the key interest rate. It is therefore a valuable indicator of future fluctuations in banks' financing costs. At the editorial close, the EURIBOR's implied volatility was measured at 12%. Since it had fallen by a remarkable 15 percentage points from January to October 2000, market participants' uncertainty about future interest rate developments seems to have diminished.

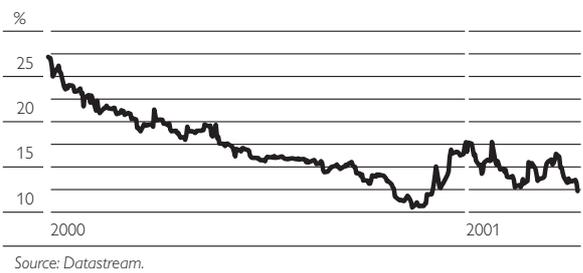
### Foreign Exchange

#### Market Implied Volatility



Source: Citibank.

### Euro Money Market Implied Volatility



Source: Datastream.

## Central and Eastern Europe

### Balance of Payments Risks Likely to Increase in the Medium Term

Since the Central and Eastern European Countries (CEECs) constitute important markets for Austrian banks, their development may have substantial effects on the profitability and risk position of Austrian banks. Therefore, this section provides a qualitative estimate of the likelihood that macroeconomic developments affect Austrian banks' operating results in Central and Eastern Europe.

The depreciation of local currencies against the euro in those CEECs where Austrian banks hold a substantial percentage of their total foreign

exposure reduces both the operating results of banks' subsidiaries in euro and the value of the subsidiary as stated in the parent company's balance sheet. In addition, a depreciation may have various effects on the operating results in the respective local currency, as operating results depend, *inter alia*, on the volume of subsidiaries' open foreign exchange positions, on the extent to which the depreciation changes external trade flows and stimulates the real economy, and on the way these changes affect gross revenues.

Existing, or growing, imbalances in the balance of payments play a decisive role in producing devaluation pressures. A look at the balance of payments structure for 2000 shows that the current account of all countries under review (with the exception of Russia) posted a deficit, which is typical of a catching-up country. All CEECs, however, use investment inflows from net foreign direct investment (FDI) to finance large parts of their current account deficits or, in some cases, even more than offset them.

As further privatization projects involving direct investment are currently in preparation, the CEECs examined here are unlikely to encounter extreme, unfinanceable external macroeconomic imbalances in the near future. In the medium term, however, their potential for high privatization proceeds is likely to contract considerably, enhancing balance of payments-induced risks in these countries.

The Russian balance of payments posted a massive current account surplus (19% of gross domestic product, GDP, in 2000), which has boosted foreign exchange reserves in spite of massive capital outflows. As capital exports have remained high and commodity prices and other special factors (e.g. the possible partial reestablishment of import financing structures, which collapsed in the wake of the 1998 financial crisis) continue to dominate the current account, this situation – and, consequently, the exchange rate of the ruble – is anything but stable. Reducing structural capital exports will certainly require both measures by the Russian authorities (e.g. improving the domestic investment climate) and cooperative efforts by Russia and the OECD countries (e.g. monitoring compliance with restrictions on capital transactions). It is by no means certain, however, whether such steps, even if taken rapidly, would be effective enough to reduce capital exports within the required period of time. Given last year's volume of structural capital exports, the Russian Federation's ability to fully service the debt with the Paris Club it inherited from the Soviet Union is subject to considerable risks. An analysis of Russia's overall debt servicing profile reveals that debt servicing costs will be highest in 2003, as high amounts of euro bonds and MinFin bonds will mature in that year.

### **Absence of Short-Term Capital Outflows Keeps Current Vulnerability Low**

Experience with financial crises in Mexico, Southeast Asia and Russia has shown that (aside from a series of other factors) a high degree of vulnerability caused by short-term capital outflows played an important role in the outbreak of, or contagion with, international financial crises. Based on a number of indicators for the CEECs and for Russia, the following section therefore examines this aspect, which is of particular importance for the

stability of catching-up economies. The main focus will be on these countries' current vulnerability.

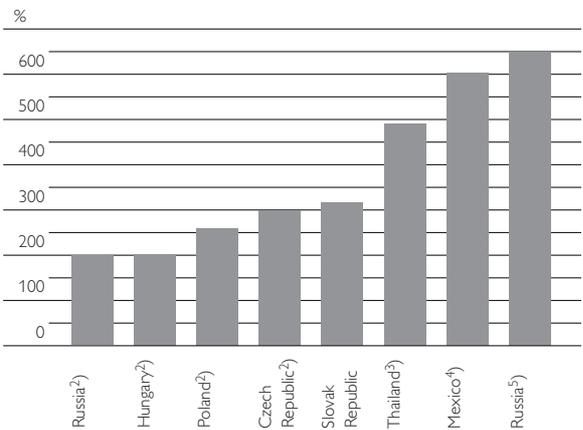
The table "Monetary Aggregate (M2) as a Percentage of Official Gross Reserves" shows the ratio of very broadly defined liquid assets (M2), for which other currencies may potentially be substituted, and gross official reserves held by the central bank. As the chart shows for both the CEECs and Russia, this indicator has recently been clearly lower than the values recorded in selected countries affected by financial crises right before the eruption of the crisis.

Another important indicator is the level of redemption of short-term external liabilities in relation to the central bank's official gross reserves. This percentage clearly remains below 100% in all countries under review, even in Russia (owing to the increase in foreign exchange reserves in 2000). Most remarkably, Slovenia scored lowest, followed by Poland.

It must be mentioned, however, that this ratio does not include short-term redemptions of debt securities in local currencies which are held by foreign investors and must therefore be transferred abroad in foreign currency unless the investor decides on immediate reinvestment. Redemptions of this type amount to around 7% of gross official reserves in Hungary and are likely to reach a considerable volume in Poland.

In addition to these redemption obligations, short-term debt servicing obligations (on external debt in foreign and local currencies) have reached a high level in some countries, in particular in relation to official gross

### Monetary Aggregate (M2) as a Percentage of Official Gross Reserves<sup>1)</sup>



Source: National central banks, IMF, International Financial Statistics on Mexico, Thailand, Russia.

<sup>1)</sup> Reserve requirements for Mexico, Russia and Thailand excluding gold.

<sup>2)</sup> As of December 2000.

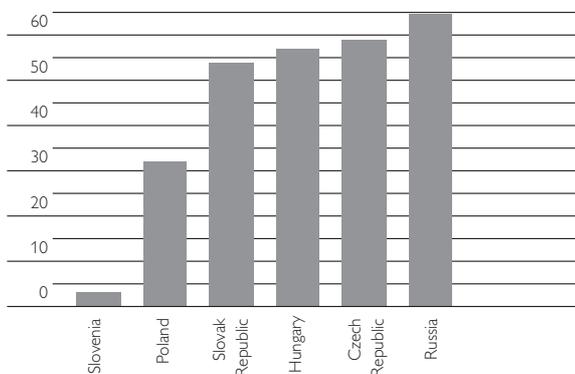
<sup>3)</sup> As of June 1997.

<sup>4)</sup> As of December 1993.

<sup>5)</sup> As of June 1998.

### Short-Term Foreign Debt<sup>1)</sup>

as a percentage of the central bank's official gross reserves (excluding gold)

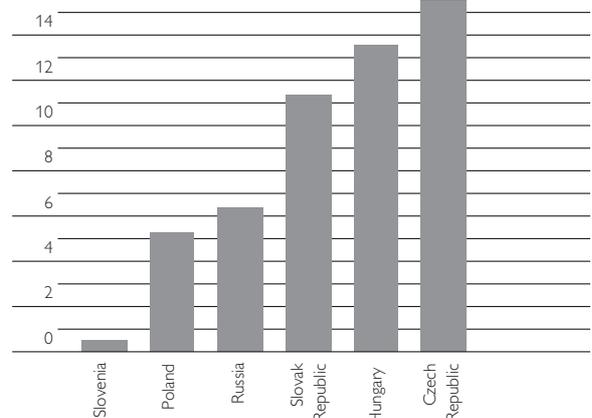


Source: National central banks, OeNB.

<sup>1)</sup> As of September or December 2000.

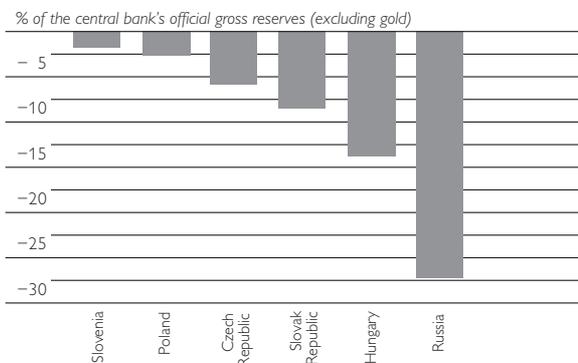
### Short-Term Foreign Debt<sup>1)</sup>

% of GDP

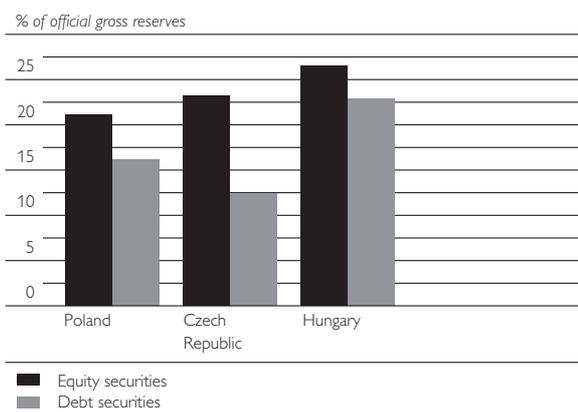


Source: National central banks, OeNB.

<sup>1)</sup> As of September or December 2000.

**Balance on Investment Income for 2000**

Source: The Vienna Institute for International Economic Studies (WIIW), national sources, OeNB.

**Foreign Portfolio Investment<sup>1)</sup>**

Source: BIS, national ministries of finance, OeNB.

<sup>1)</sup> As of December 2000.

reserves. This type of obligation is mainly responsible for the negative balance on investment income in all CEECs, in particular in Slovakia, Hungary and Russia.

The chart “Foreign Portfolio Investment” shows foreign investors’ overall (i.e. short-term and other) portfolio investment holdings in local currency-denominated debt securities and foreign portfolio investment in equity securities, both as a percentage of official gross reserves. Even though this ratio is definitely higher for equity securities than for debt securities, one must not forget that, in most cases, a strong outflow of accumulated equity security holdings usually causes local-currency market prices (equity prices) to slump. The actual risk that foreign exchange reserves would be exposed to in times of crisis is therefore likely to be lower than an assessment based on current market prices might suggest.

Any discussion of the possible risks short-term capital outflows may entail for the sovereign solvency of the examined transition economies must also focus on their currency regimes. None of the central banks in the countries under review follow an exchange rate target with a narrow fluctuation band, which means they are under no obligation to sell official reserves to make up for capital outflows.

At present, the extent of accumulated short-term investment inflows and their destabilizing

potential are relatively low, not least because short-term capital inflows were slowed by capital controls (in particular in Hungary, Poland and Russia).

Altogether, short-term capital outflows (e.g. as a consequence of international financial crises), which may occur in addition to calculable short-term debt servicing, still appear to constitute a relatively low risk for the financial systems in the emerging economies under discussion. The situation may change relatively fast, however.

In Russia, short-term redemptions and the balance on investment income together are still equivalent to almost 100% of gross official reserves, although the latter were clearly on the rise in 2000. By contrast, however, Russia has recorded a high, yet unstable, surplus on trade.

**Banking Sector:****Total Assets Low, Foreign Participation High**

Both in absolute terms and in relation to GDP, central European banking sectors are relatively modest in size.<sup>1)</sup> The total assets of Polish, Slovakian,

<sup>1</sup> In Austria, banks’ assets came to 266% of GDP in 1999 and to 273% in 2000.

Czech and Hungarian (CEEC-4) banks, for instance, amount to less than 40% of the Austrian banking sector's total assets. At the same time, the five largest banks in these countries (except in the Czech Republic) held a smaller market share in the banking sector's total assets than their EU counterparts, who held a market share of 60% in 1999. This difference is even more pronounced in comparison to small EU Member States, where the market concentration is usually above average. Foreign banks have invested heavily in central Europe: In 1999 and 2000, foreign banks held more than 50% of the sector's capital stocks in each of the CEEC-4 except in the Slovak Republic. With Erste Bank der oesterreichischen Sparkassen AG recently taking over Slovenská sporiteľňa, a.s., the large Slovakian bank, and the bank VÚB being scheduled for partial privatization in the near future, ownership structures in the Slovak Republic have begun to correspond more closely to those in the other CEEC-4. Austrian banks are overrepresented in the central and eastern European banking sector, with three Austrian banks (Bayerische Hypo-Vereinsbank/Bank Austria group, Erste Bank der oesterreichischen Sparkassen AG and Raiffeisen Zentralbank Österreich AG) ranking among the ten largest foreign banks with investments in this region.

### Banking Sector – Overall Ratios

December 31, 1999	Banking sector assets		Foreign ownership, share of net assets	Market share of the five largest banks
	EUR billion	% of GDP		
Poland	86.13	59.5	53.1	55.3
Slovak Republic	18.14	94.4	25.5	58.3 <sup>1)</sup>
Czech Republic	69.64	136.9	48.4	62.1 <sup>1)</sup>
Hungary	28.80	64.1	65.3	51.3

Source: National central banks, OeNB, Bank Austria AG.

<sup>1)</sup> June 30, 2000.

### Low Average Sectoral Profitability and Some Outliers<sup>1)</sup>

The banking system's ability to take on risks depends essentially on its profitability. From this perspective, the level of bank profitability (aggregated for the entire banking sector) in the CEEC-4 over the past few years must be described as inadequate except in Poland. The banking sectors of the Czech and Slovak Republics even posted losses in 1998 and 1999. By comparison, in 1999, return on equity (ROE) in the EU banking sector came to 11.7%. In the first half of 2000, the profitability improved in the banking sectors of all the countries under review, but as the figures are provisional six-month results, their informative value cannot be compared to that of revised annual financial statements. According to Hungary's provisional annual financial statements, which were available at the editorial close, the positive trend recorded in the first six months continued in the second half of 2000.

The aggregated figures for the entire sector, however, obscure massive differences between the individual sectors and institutions. This suggests that bank profitability is determined not so much by system-specific factors but by bank-specific factors. According to the view of the National Bank of Hungary<sup>2)</sup> the most successful banks were generally foreign banks which were early to enter the respective market (the majority of Austrian banks

1 The data used in this section have been selected in the attempt to provide the best possible degree of comparability across the countries under examination. Nevertheless, definitions may vary across countries. Data on Hungary for 1998 and 1999 have been adjusted for the losses of three banks (Postabank, MFB and Realbank).

2 See National Bank of Hungary (2000). *The Hungarian Banking Sector. Developments in 1999*. Budapest.

**Return on Equity**

	1997	1998	1999	1st half of 2000
	%			
Poland	22.7	8.1	12.2	16.8
Slovak Republic	..	..	-182.7	- 6.3
Czech Republic	- 2.9	-17.9	- 4.3	6.6
Hungary	12.2	7.7	3.7	15.7

Source: National central banks, OeNB.

the Czech Republic and the Slovak Republic, a number of foreign banks have been successful in these countries.

In 1999, at 60% to 70% of operating revenues, net interest income in the entire CEEC-4 banking sector accounted for a higher share of banks' income than in the EU, where the corresponding figure stood at 54%. While the share of net interest income in operating revenues is on the decline in Poland, it fluctuated sharply in the Czech Republic from 1997 to 1999. In Hungary, this revenue component remained constant over the same period.

**Return on Average Assets**

	1997	1998	1999	1st half of 2000
	%			
Poland	1.8	0.6	1.0	1.3
Slovak Republic	..	..	-3.8	-0.2
Czech Republic	-0.2	-0.4	-0.2	0.4
Hungary	1.1	0.7	0.3	1.3

Source: National central banks, OeNB.

**Net Interest Income as a Percentage****of Gross Operating Income**

	1997	1998	1999	1st half of 2000
	%			
Poland	72.9	70.3	63.7	63.7
Slovak Republic	..	..	..	..
Czech Republic	45.4	67.9	62.8	67.1
Hungary	67.8	71.9	70.4	77.8

Source: National central banks.

between interest spreads and net interest margins. If no interest is paid on a loan, for example, this asset item does not produce any interest income, which would cause the net interest margin to deteriorate, while the interest spread would remain unchanged.

It is particularly striking that the gap between the interest spread and net interest margin is extremely wide in the Czech Republic, while the two values hardly deviate in Hungary. As this result may suggest, the Czech

belong to this group) and domestic banks which were quick to apply restructuring measures. Conversely, foreign banks which were late to enter the market and domestic banks which were late to consolidate posted the worst ratios. This pattern seems to be typical for the other countries under review as well: While state-owned or recently privatized large banks continue to

encounter the most difficulties in particular in

the Czech Republic and the Slovak Republic, a number of foreign banks have been successful in these countries.

In 1999, at 60% to 70% of operating revenues, net interest income in the entire CEEC-4 banking sector accounted for a higher share of banks' income than in the EU, where the corresponding figure stood at 54%. While the share of net interest income in operating revenues is on the decline in Poland, it fluctuated sharply in the Czech Republic from 1997 to 1999. In Hungary, this revenue component remained constant over the same period.

Changing spreads between interest on loans and deposits largely determine the development of net interest income. Nevertheless, an analysis of net interest income and interest spreads should also consider credit exposure, as higher spreads might, inter alia, be attributable to higher credit risks which, in turn, are reflected in a rise in provisions for bad loans.

A comparison of the interest spread (difference between interest on deposits and on loans) and the net interest margin (net interest income as a percentage of average total assets) may serve to understand to what extent credit defaults may erode the spread between interest on loans and deposits.<sup>1)</sup> Because of how they are calculated, the two indicators will produce the same results only under specific circumstances.<sup>2)</sup> However, the ratio of interest-bearing assets to interest-bearing liabilities is the main determinant in the deviation

1 See Demirgüç-Kunt, A., Huizinga, H. (1999). *Determinants of Commercial Bank Interest Margins and Profitability. Some International Evidence*. In: *The World Bank Economic Review*, Vol.13, No. 2, May.

2 The two indicators are likely to produce different results for the same period especially because provisions for nonperforming loans are not normally incurred at the point in time for which the interest spread is calculated.

Republic records the highest and Hungary the smallest volume of nonperforming loans.<sup>1)</sup>

From 1997 to 1999, the gap between asset and liability interest rates contracted in the Czech Republic and in Hungary; the only country where it widened was Poland. Nevertheless, in Poland the net interest rate spread decreased over the same period of time, while it showed no clear tendency in the Czech Republic and in Hungary.

However, 1999 net interest rate spread levels in the Czech Republic and in Hungary still remained below the level recorded in Poland. Compared to other economies in transition, the Czech Republic posted a very low net interest rate spread.

In the CEECs, loan loss provisions account for a larger share of banks' revenues than in the EU (10% in 1999). This cost component is most important, by far, in the Czech Republic, which saw this item decline in 1999 and 2000 as numerous nonperforming loans were transferred from the balance sheets of commercial banks to the state-owned consolidation bank.

In relation to operating revenues, general administrative spending is very much on the rise in all CEEC-4 under review. A sharp increase in investment, e.g. in information technologies, has caused a particularly pronounced uptrend in depreciation. Personnel costs, by contrast, show below-average growth rates in all countries except the Czech Republic. With the exception of Hungary, in the countries under review general administrative spending as a share of banks' operating revenues still remained below the 68% recorded across the EU in 1999.

Therefore, the relatively low profitability of central European banking sectors in general seems to be mainly attributable to the fact that interest income was under pressure while, at the same time, general administrative spending grew rapidly and allowance for loan losses remained high.

Low profitability in combination with relatively strong gains in total assets created pressure on capital adequacy in the central European banking sectors under review. State recapitalization measures, however, improved capital adequacy (in particular in the Czech and Slovak Republics). With the

### Net Interest Rate Spread

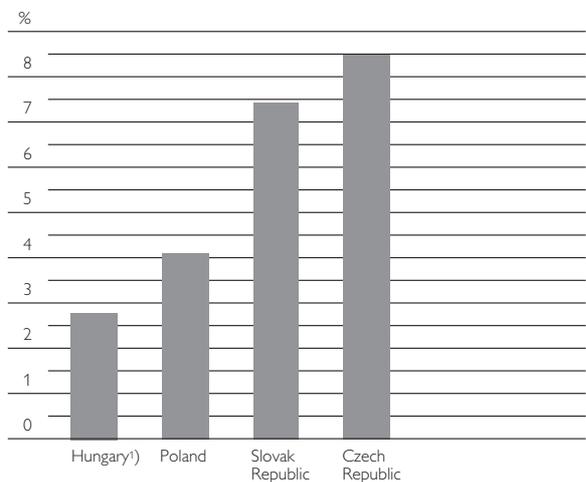
#### Net Interest Income as a Percentage of Average Total Assets

	1997	1998	1999	1st half of 2000
	%			
Poland	4.8	4.6	4.0	4.4
Slovak Republic	..	..	..	..
Czech Republic	1.8	2.9	2.3	2.0
Hungary	3.8	4.3	3.7	4.1

Source: National central banks, OeNB.

### Share of Nonserviced Loans

#### in Total Assets in the 1st Half of 2000



Source: National central banks.

<sup>1)</sup> Share of risk assets (including off-balance-sheet risks).

### Interest Margin: Interest Rate

#### on Lending less Deposit Interest Rate

	1997	1998	1999	1st half of 2000
	%			
Poland	5.7	6.5	7.0	..
Slovak Republic	6.1	2.1	..	..
Czech Republic	5.5	5.1	4.2	..
Hungary	4.6	4.4	3.8	3.6

Source: National central banks.

<sup>1)</sup> Please note that in Hungary revenues on currency forwards are partly recorded as interest income, while the corresponding expenditures are entered under other items.

### Risk Provisions as a Percentage of Gross Operating Income

	1997	1998	1999	1st half of 2000
	%			
Poland	4.4	9.9	13.5	11.2
Slovak Republic	..	..	..	..
Czech Republic	34.0	15.1	- 3.7	-108.3
Hungary	- 1.4	8.1	13.7	1.8

Source: National central banks, OeNB.

### General Administrative Expenses as a Percentage of Gross Operating Income

	1997	1998	1999	1st half of 2000
	%			
Poland	55.6	63.0	65.2	62.5
Slovak Republic	..	..	..	..
Czech Republic	48.6	49.7	56.6	64.3
Hungary	54.5	59.6	68.8	73.7

Source: National central banks, OeNB.

exception of the Slovak Republic, which undertook further recapitalization measures in the course of 2000, capital adequacy in the examined transition economies was higher in 1999 than in the EU (11.8%).

In 1999 and 2000, the profitability of Austrian-owned banks active in these markets was clearly above the market average (see also chapter "Financial Markets in Austria", section "Austrian Credit Institutions"). In the first half of 2000, Austrian credit institutions produced the highest ROE in the Slovak Republic (around 40%), followed by Hungary (around 27%), Poland (just over 20%) and the Czech Republic (around 13%). As the profitability of banks operating in Central and Eastern Europe tends to depend on individual rather than cross-sector factors, the banking sector's profitability, which is relatively low on average, does not necessarily represent a threat to Austrian banks active in this region. The more interest Austrian banks show in

taking over existing large CEEC banks, however, the more emphasis will have to be placed on aggregated sectoral data.

### The Russian Banking Sector Keeps Struggling in the Wake of the 1998 Crisis

The Russian government's discontinuation of domestic debt service and the devaluation of the ruble on August 17, 1998, was a severe blow to the banking system. The large majority of so-called Moscow banks had invested heavily in the rapidly expanding market of high-interest short-term Treasury bills (GKO) and engaged in currency forwards with foreign investors in the mid-1990s; they immediately became illiquid, insolvent and decapitalized during the August crisis. The monetary authorities selectively injected funds to support Sberbank (the state-owned savings bank with a public deposit guarantee) and a number of other institutions, and thus managed to keep bank runs within limits and, by and large, restore the collapsed payment system.

The central bank lacked both the funds and legal instruments for a substantial rehabilitation of the banking system. Almost all banks whose licenses were withdrawn by the monetary authorities were relatively small. The situation of a number of larger, decapitalized Moscow banks did not improve, in fact, it even deteriorated further.

The central bank's efforts to withdraw the business licenses of some of these institutions were repeatedly annulled by court decisions. Soft insolvency legislation favored asset-stripping practices, i.e. transferring assets and customer

### Total Assets

	1997	1998	1999	1st half of 2000
	Annual change in %			
Poland	..	28.7	14.3	16.1
Slovak Republic	..	..	- 3.3	1.8
Czech Republic	..	8.0	6.1	5.9
Hungary	..	17.4	12.1	14.5

Source: National central banks.

relations from defaulting banks to newly founded so-called “bridge entities” while simultaneously leaving liabilities with the “tunneled” old bank. Depositor protection continues to leave a lot to be desired. Wide-spread corruption is also likely to stand in the way of thorough reform. Regulations on banking supervision are widely disregarded.

While most Moscow banks have remained weak, some other credit institutions have shown signs of recovery lately, e.g. banks which receive support from regional authorities and institutions associated with profitable export firms or natural monopolies. These banks certainly also profited when crude oil and commodity prices started to rise again. In 2000, other state-owned credit institutions apart from Sberbank also stepped up their activities and succeeded in gaining market shares to various extents. Today, however, banks are left with only a few domestic sources of income, like carrying out payment transactions and purchasing new government securities.

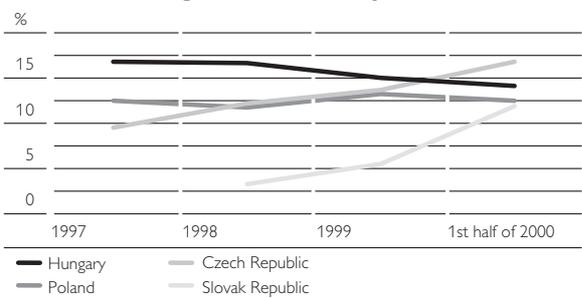
Although the business sector’s financial situation eased in the course of the post-1999 economic recovery, with the share of dubious loans going down as a consequence, credit risk remained high and the volume of loans did not record any substantial growth. In 1999, Russian industry financed no more than 4% of its investment by borrowing from banks. Given the lack of other types of domestic placement of funds, banks have recently begun to rely more and more on low-interest deposit facilities offered by the central bank. Investment abroad, however, appears to be far more profitable, even if existing capital controls restrict outward investment.

In February 2001, Prime Minister Kasyanov received a mandate from President Putin to restructure the government’s shares in commercial and investment banks. In the course of the restructuring process the state is to retreat from its around 500 minority-owned banks and to step up investment in its 23 majority-owned banks.

At the time of the editorial close, foreign-owned banks had not yet begun to play an important role in the Russian banking sector. The hesitant behavior of foreign banks is not so much attributable to the existing regulatory limit to the share of foreign capital in the banking sector’s aggregated total capital of

### Ratio of Capital

#### to Risk-Weighted Assets<sup>1)</sup>



Source: National central banks.

<sup>1)</sup> An international comparison is particularly difficult to make in this area.

## Russia

### Some Data on Inflation Development and the Banking System

	1992	1994	1996	1998	1999	2000
Rate of inflation (CPI, year-end, %)	2,506.0	204.4	21.8	84.4	36.6	20.2
Total number of banks (year-end) <sup>1)</sup>	1,713	2,517	2,018	1,476	1,350	1,311
of which: foreign-owned <sup>2)</sup>	10 <sup>3)</sup>	..	25	32	33	33
Aggregated assets/GDP (%)	88	56	36	23.5	34.9	..
Loans to business/GDP (%)	11.8 <sup>3)</sup>	12.1	7.4	12.7	11.7	..

Source: Bank of Russia, EBRD Transition Report 2000.

<sup>1)</sup> Active banks.

<sup>2)</sup> Foreign ownership exceeds 50%.

<sup>3)</sup> 1993.

12%, but rather to the difficult overall climate. At the beginning of 2000, 32 Russian banks were majority-owned by foreign investors. Their share in banks' total capital amounted to 10.7%. Foreign investors controlled twelve of Russia's top 50 banks (in terms of assets), but only one of the country's ten largest banks.

Foreign credit institutions from Austria, the U.S.A., Germany and Japan were the prime capital investors in the Russian banking sector. Similar to their Russian competitors, a number of foreign banks purchased high quantities of Russian Treasury bills until 1998 and were therefore among the main victims of the August crisis. Foreign banks, however, managed to recover faster than Russian banks, as their parent banks provided financial support.

All in all, the Russian banking sector today is relatively modest in size, undercapitalized and of low profitability, even if compared to that of other countries in transition. In 1999, losses exceeded gains. The banking sector's total assets in 1999 only came to around 35% of GDP (compared to 64% in Hungary and 60% in Poland). In mid-1999, profitability (return on assets) stood at -3%, while return on equity (ROE) came to -33%. These indicators should be interpreted with caution, however, as they are not based on international, but on Russian rules of accounting.

## Austrian Credit Institutions

### Framework Conditions Changed

Since Austria's entry into the EU and the introduction of the euro, the Austrian and other European financial markets have become even more closely intertwined. Cross-border activities have augmented markedly, with delimitations between national banking systems diminishing, a tendency that has been reinforced by supranational mergers. On the whole, Austria has a secure and well functioning banking system, founded on a firm legal basis and safeguarded by a comprehensive safety net. Over the past few years, there have been only a few problems with small banks without systemic relevance. The annual liabilities resulting from bank failures between 1995 and 1998 did not exceed 0.05% of the Austrian banking sector's total assets.

In Austria, banks are still the most important financial intermediaries by far, even though over the past few years, the boom in domestic mutual and pension funds has somewhat diminished their role in financial intermediation. Banking intermediation in Austria, as a proportion of total assets to gross domestic product (GDP), stood at 273% in 2000. The mutual funds increased their assets under management from 18% to 45% of GDP between 1996 and 2000.

Competition in the European banking sector lost none of its momentum in 2000: there was still a strong tendency towards geographical expansion, while technological progress put pressure on banks to reduce excess capacities. Being a part of the rapidly transforming European banking sector, Austrian credit institutions will have to pursue even more profit-oriented policies.

Austria's large banks are increasingly tending to shed their equity interests in industrial, trade, and other enterprises and to focus on their core business. On the other hand, they are seeking to establish themselves as comprehensive suppliers of financial services (including insurance and investment products or savings and loan investment contracts) by founding subsidiaries or forging strategic alliances. E-banking activities have increased significantly, and banks have made considerable investments in information technology. Austrian commercial banks have stepped up their activities in Central and Eastern Europe. They are particularly well positioned in the Czech Republic, the Slovak Republic, Hungary and Poland.

### Continuing Process of Concentration

Two major cross-sector mergers contributed to the process of consolidation and concentration in 2000:

- The integration of the Bank Austria group into Bayerische Hypo-Vereinsbank created a financial institution with a staff of more than 65,000. With total assets amounting to more than EUR 700 billion, over 8 million customers and 2,000 plus branch offices, it is Europe's third largest banking group.

Editorial close:  
April 12, 2001

### Bank Failures in Austria

Bank	Liabilities
	EUR million
1974 Allgemeine Wirtschaftsbank	47
1975 Continentale Bank	10
1977 ATS-Bank	11
1995 Bank für Handel und Industrie	189
1998 Riegerbank AG	74
1998 Diskont Bank AG	89
2000 Trigon Bank	..

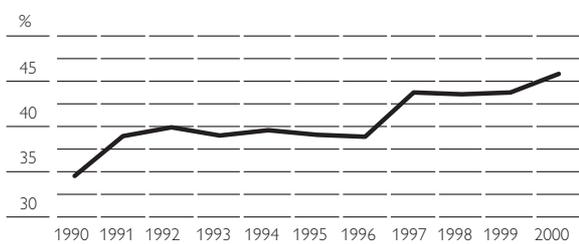
Source: OeNB.

- The complete sale of Österreichische Postsparkasse AG (P.S.K.) to Bank für Arbeit und Wirtschaft AG (BAWAG) in August 2000 marked the privatization of the last Austrian government-owned credit institution. With a joint market share of more than 8%, BAWAG and P.S.K. are now the third largest banking group, after Bank Austria and Erste Bank der oesterreichischen Sparkassen AG.

The once high public share in credit institutions has significantly shrunk over the past few years. The sale of P.S.K. was the last major bank privatization. Also, many of Austria's Laender are gradually reducing their share in state mortgage banks.

### Market Share of the Five Largest Banks

#### in Austria



Source: OeNB, monthly return, unconsolidated data.

This restructuring process has enhanced concentration in the Austrian banking sector, with the top five banks' share in total assets climbing from 35% to 46% between 1990 and 2000. On a consolidated basis (by banking groups), the degree of concentration was 53.2% in 2000, which is roughly equivalent to the European average, while the majority of comparable EU countries, like Finland or the Netherlands, have significantly higher degrees of concentration.

In recent years the number of banking offices has remained broadly stable, at a level that is 5% below the peak of the "branch office boom" in 1992. At year-end 2000, 923 head offices (1999: 951) and 4,556 branch offices – or a total of 5,479<sup>1</sup>) banking offices – operated in Austria (1999: 5,527). International comparisons show that Austria has a very dense branch network. In 2000, the banking density decreased from 1,466 to 1,478 persons per bank (assuming that the number of inhabitants remained constant). In Germany and Switzerland, the banking density amounted to 1,725 and 1,854 persons per bank at the end of 1999.

Interestingly, the new technologies have hardly accelerated the reduction of branch offices in Austria. A growing trend is service differentiation among branch offices, e.g. through the enlargement of service centers or the establishment of e-banking branch offices and self-service areas. The underlying aim is to use the branch office facilities more efficiently and to reduce the floor area, even by subletting office space to heavily frequented businesses. In addition, the large banks are seeking to utilize various distribution channels, such as mobile distribution, direct distribution and the traditional branch offices.

The Austrian banking sector is highly decentralized. Of the 923 head offices, 766, or more than 80%, belong to the three-tiered decentralized sectors (Raiffeisen credit cooperatives: 625, savings banks: 70, Volksbank credit cooperatives: 71).<sup>2</sup>) In the past few years, structural change in the

<sup>1</sup> These figures do not include approximately 2,300 post offices, which also offer banking services.

<sup>2</sup> If, for instance, the largest decentralized sector, Raiffeisen, were graded as a banking group, the number of banks would drop below 300, which would result in a number of banking offices close to the European average.

decentralized sectors often took the shape of mergers within a sector. Of the 26 mergers recorded in 2000, 24, that is more than 90%, took place in the Raiffeisen sector.

The sectoral banking structure is an important reason why Austria has a relatively large number of independent banks by international standards. The sectoral grouping can be considered key to systemic stability. The banks of the decentralized sectors are legally independent entities but nevertheless, they cooperate in many areas of business. They maintain common facilities in a number of areas, ranging from marketing and training to IT and liquidity management. Above all, these banks are a crucial instrument of sectoral risk management, as problems are usually resolved within the sectoral grouping. It is not least thanks to this sectoral grouping that there were no bank failures in the decentralized sectors in the past few decades.

The number of employees in the Austrian banking sector inched up by 296 (or 0.4%) from 74,775 to 75,071 in 2000. In terms of capacity (including a pro-rata share of part-time staff), the banking sector employed 69,457 people in the year under review, a minor decline by 250 employees against 1999.

Aggregated total assets of Austrian-based banks amounted to EUR 562.8 billion in 2000, which marks an increase by EUR 38.2 billion or 7.3% after EUR 43.8 billion (+9.1%) in 1999. The takeover of Bank Austria group by Bayerische Hypo-Vereinsbank in November 2000 and the subsequent merger between Bank Austria and Bank Austria Creditanstalt International AG of course had a massive impact on these figures. Interbank transactions with domestic banks almost halved, whereas both external assets and liabilities increased substantially. The increase in total assets was quite pronounced in 1997 and 1998, stagnated at a high level in 1999 and slowed down somewhat in 2000.

At the end of 2000, an Austrian bank's average total assets were 2.5 times as high as ten years earlier, but still rather modest by international standards.

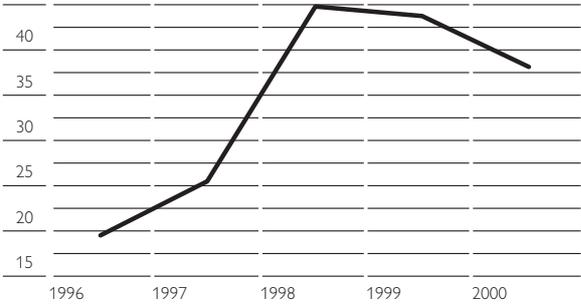
### Increasing Internationalization of Banking

The international business of banks operating in Austria is becoming an important business line. In 2000, financial claims on the rest of the world augmented by EUR 26.5 billion or 20.2%, with the weight of external interbank transactions, which accounted for a share of some 50% in total growth, having been disproportionately high compared to previous years. External liabilities developed along the same lines as external assets,

### Domestic Banks' Total Assets

#### Annual change

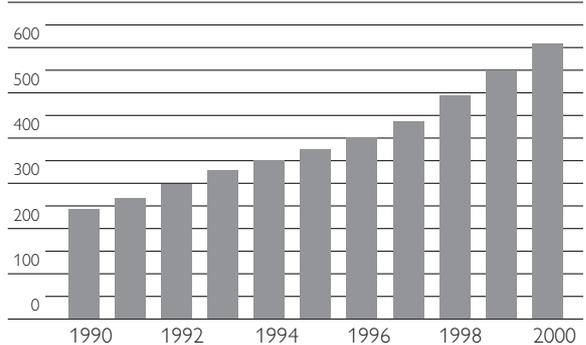
EUR billion



Source: OeNB, monthly return.

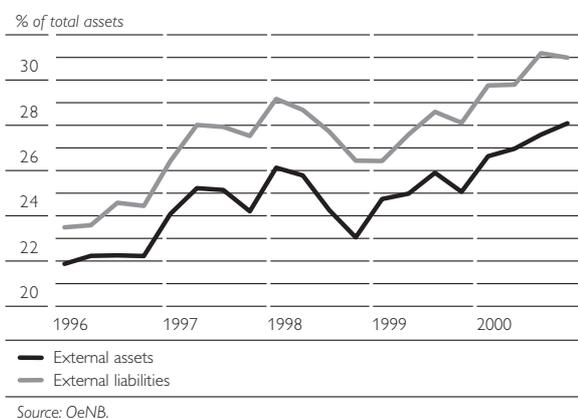
### Average Total Assets per Bank

EUR million



Source: OeNB, monthly return, unconsolidated data.

### External Assets and Liabilities of Credit Institutions in Austria



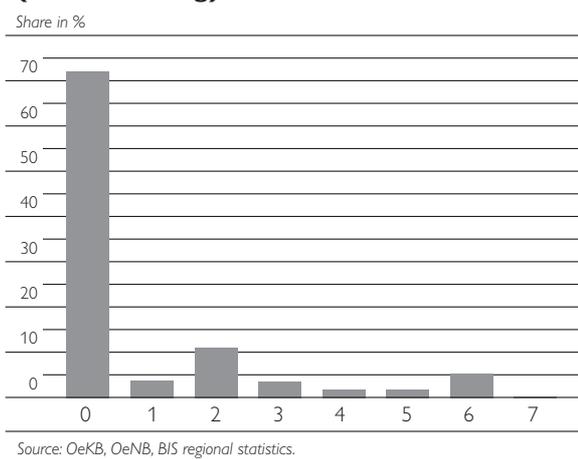
augmenting by EUR 26.8 billion or 18.2%; that is, they also increased more rapidly than in 1999. In December 2000, external assets accounted for 28.1% of banks' total assets, while external liabilities had a share of 30.9%.

The increase in international cross-ownership is reflected both in the rising number of nonresidents holding shares of Austrian banks (e.g. Bank Austria group) and in the banks' stepped-up acquisitions abroad (like the majority takeover of Czech Česká Spořitelna, a.s., and Slovak Slovenská sporiteľňa, a.s., by Erste Bank der oesterreichischen Sparkassen AG). At the editorial close, 18 Austrian-based banks are 100% owned by nonresidents, another 11 banks are

majority-owned by nonresidents. Foreign-owned credit institutions posted total assets of EUR 15.4 billion in December 2000, compared to EUR 13.9 billion in 1999 (excluding Bank Austria); this is no more than a 2.7% share of overall total assets (the share would be 30% with Bank Austria included).

Of the large Austrian banks, excluding Bank Austria group, both BAWAG and Österreichische Volksbanken AG have strong strategic foreign partners, namely Bayerische Landesbank and Deutsche Genossenschaftsbank AG, respectively.

### Banks' Claims by Risk Categories (OeKB Rating)



Moreover, 16 branch offices of foreign banks in Austria do business on the basis of the freedom of establishment provisions and another 167 credit institutions are active in Austria on the basis of the freedom of services provisions.

Geographically speaking, Austrian banks' foreign investment focused on the industrial countries, in particular on the euro area (28%), the United Kingdom, the U.S.A. and Switzerland. Claims on Central and Eastern European countries have been gaining much importance; their share in total external assets is higher in Austria than in any other country reporting to the Bank for International Settlements (BIS). Despite this strong focus on a certain region, the country concentration in the portfolio of foreign assets is not extraordinarily high. The risk classification

used by the Oesterreichische Kontrollbank AG (OeKB) in export insurance can be applied as a rough indicator of the country risk exposure of Austrian banks with foreign assets; it shows that 72% of the countries are rated 0, i.e. countries with the lowest default probability. Fewer than 0.25% were classified in the highest risk category.

### Strong Expansion in Central and Eastern Europe

According to BIS regional statistics,<sup>1)</sup> claims on customers in Central and Eastern Europe came to almost EUR 10 billion in the third quarter of 2000, some EUR 1 billion more than one year earlier. At the same time, at 7.5%, this region's share in total claims changed only little. However, on-balance-sheet lending is only a part of the banks' activities in Central and Eastern Europe.

Austrian banks have increasingly been setting up subsidiaries in Central and Eastern Europe. Some of the Austrian institutions have by now established themselves as the largest foreign banks in the region. It can be expected that domestic banks will take the opportunity of ongoing privatizations in Austria's neighboring countries to continue to acquire stakes in or take over banks in Central and Eastern Europe.

The activities of Austrian banks' subsidiaries are not included in the monthly financial statements. However, since mid-1999 there have been quarterly surveys among Austrian banks on their subsidiaries in Central and Eastern Europe. According to these surveys, the subsidiaries' total assets amounted to EUR 30 billion in December 2000, which equals more than 5% of all Austrian banks' total assets taken together. In other words, Austrian banks' subsidiaries held 5% to 21% of the local market share.

The establishments in Central and Eastern Europe have so far been more profitable than domestic banking markets without necessitating higher bad loan charge-offs. The smaller number of competitors, high demand, a low market penetration of banking services and an ensuing catching-up process holds down competition on the Eastern European banking markets and enables Austrian banks to keep profit margins high. Although the risk of activities in Central and Eastern Europe is currently limited (see chapter "International Developments," section "Central and Eastern Europe"), these risks already impact on the business policies of the major Austrian banks. Explicitly mentioning this development, the rating agencies have rated many Austrian banks lower than their current business situation would imply.<sup>2)</sup> These ratings often do not

### Domestic Banks' Claims

#### on Central and Eastern Europe

September 2000	Volume	Market share <sup>1)</sup>	Ranking
	USD billion	%	
Russia	3.1	7.0	3
Hungary	2.1	13.2	2
Poland	1.9	11.0	2
Czech Republic	1.4	14.7	2
Slovenia	1.0	28.8	1
Croatia	0.8	19.9	2
Slovak Republic	0.6	12.0	3

Source: BIS, OeNB.

<sup>1)</sup> In claims of all countries reporting to the BIS.

### Ratios of Austrian Banks'

#### Subsidiaries in Central Europe

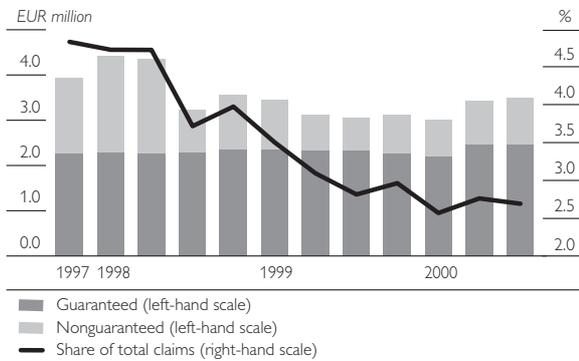
End-2000	Total assets	Market share	Return on Equity	Employees	Offices
	EUR billion	%		Number	
Poland	7.7	12	15	9,839	414
Slovak Republic	2.8	16	28	2,365	98
Slovenia	0.7	5	17	380	12
Czech Republic	15.3	21	3	17,303	749
Hungary	3.5	18	26	2,813	134
By comparison Austria	562.8	..	9.5	69,457	5,479

Source: OeNB.

1 The maturity profile according to BIS regional statistics illustrates Austrian-based banks' and their foreign branch offices' claims and credit commitments vis-à-vis nonresidents (excluding their own offices abroad). These statistics do not include all reporting institutions but only those whose foreign activities account for a hefty share of their overall business activities.

2 See also, for instance, Fitch IBCA (2001). *Austrian Banks are Aggressively Expanding in CEE*. February 1.

### Claims on Russia

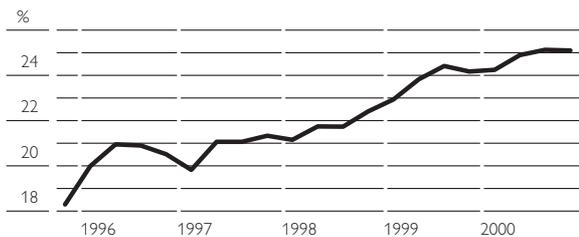


Source: OeNB, BIS regional statistics.

take into account that the Central and Eastern European countries are taking great efforts to adjust their banking systems to European standards.

2.7% of total external assets, or EUR 3.5 billion, according to BIS regional statistics, were claims on Russia. The federal government stands guarantor for EUR 2.5 billion of this amount. The remaining EUR 1 billion in nonguaranteed loans are, to a large extent, trade claims or are secured in another way. Since the climax of the Russian crisis in mid-1998, nonguaranteed claims have contracted by almost two thirds, whereas guaranteed loans have barely changed.

### Overnight Deposits as a Share of Total Deposits



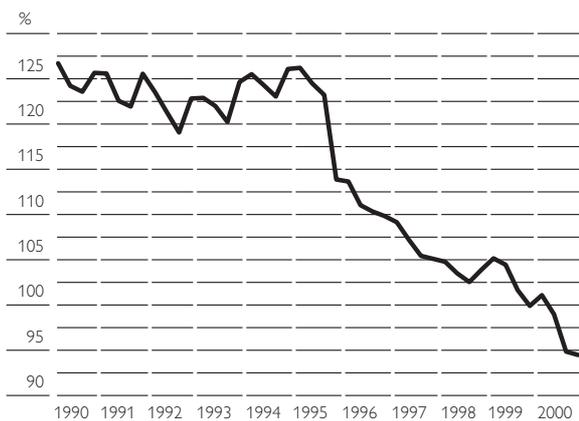
Source: OeNB.

### Increasing Deposit Erosion

The developments over the past few years show that the popularity of savings accounts and the attractiveness of mutual funds are approaching equal levels (see chapter “The Real Economy and Financial Market Stability,” section “Households”): while investment in mutual funds has been increasing, savings deposits have been on the decline. In 2000, savings deposits at Austrian banks shrank by EUR 2.6 billion, or 2.2%, to EUR 120 billion, despite rising interest rates and the ensuing higher interest credited to savings accounts at year-end. Adjusted for interest capitalized on December 31, 2000 (EUR 2.9 billion, including capital earnings tax), savings deposits even contracted by EUR 4.8 billion. In 1999, this type of deposit had expanded by EUR 2.5 billion or 2.1%. These figures reflect the changing investment behavior of domestic non-banks and the continuous trend towards higher-yield investment.

Since the mid-1990s, competition from other forms of investment has been diminishing the share of deposit-taking business in Austrian banks’ total assets; between 1995 and 2000, it dropped from 39% to 31%. Longer-term deposits declined particularly sharply; to some extent,

### Deposits in Percent of Loans



Source: OeNB.

encouraged by stable prices and ensuing low opportunity costs, investors increasingly turned to more liquid deposits. The share of deposits payable on demand<sup>1)</sup> in banks’ overall deposits mounted from 18% to 25% between 1995 and 2000.

<sup>1</sup> Demand deposits and deposits payable on demand.

With deposit growth slowing down, the gap between deposits and loans has been declining steadily: While deposits surpassed loans to private nonbanks by approximately a quarter until 1995, loans exceeded deposits in 2000.

As a consequence, banks have increasingly turned to other sources of funding. Foreign funds raised to back a growing volume of foreign currency loans. While external liabilities came to only half the amount of domestic nonbanks' deposits in 1995, they reached almost the same level as deposits at year-end 2000. Therefore, the refinancing of Austrian banks' claims on domestic borrowers was increasingly influenced by domestic credit institutions' refinancing power in the international financial markets.

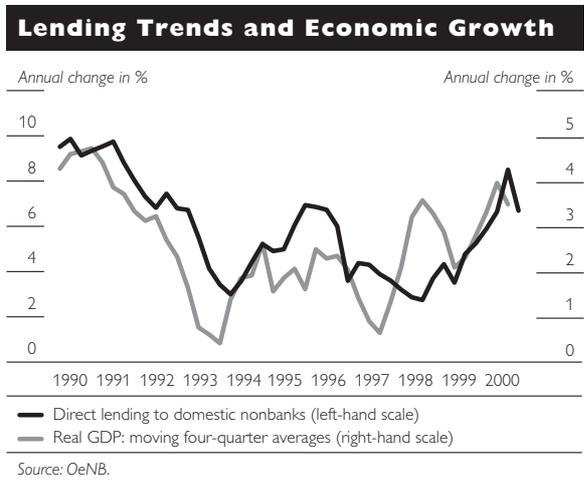
Securities issued by the banks themselves, which more than doubled over the past three years, have made up a growing part of these external liabilities. Securities issued in Austria also climbed at double the pace of nonbanks' deposits. Since 1996, the ratio of banks' issues to deposits increased from almost 50% to some 70%; the share in total assets rose from 18% to 22%.

**Credit Development Mirrors Economic Conditions**

The traditionally close relationship between enterprises and their banker ensures that businesses are granted loans also under less favorable economic conditions. Furthermore, the high degree of competition in banking in Austria improves businesses' access to loans. Austrian enterprises' and households' indebtedness does not indicate that a credit tightening is anywhere near (see chapter "Real Economy and Financial Market Stability," sections "Nonfinancial Corporations" and "Households"). Nor are there signs of a speculative loan expansion. In the past decade, loans to domestic nonbanks grew more rapidly than the Austrian economy on average, but the "edge" of loan expansion on GDP growth has become smaller over the past few years. While ten years ago, loans roughly equaled GDP, lending came to 110% of GDP at year-end 2000. Yet on the whole, loan growth corresponded to economic growth.

Loan growth accelerated significantly as the economy gathered momentum in the course of 2000; in the second half of the year, it exceeded the euro area average for the first time since the start of monetary union, after Austrian banks' lending to business and households in the entire euro area had lagged behind the euro area average in the previous years.

Moreover, for businesses, external funding has increasingly been taking over the role of bank loans, whose significance has diminished over the past few years (see chapter "The Real Economy and Financial Market Stability," section "Nonfinancial Corporations"). This may have altered the average creditworthiness of borrowers. Businesses with a low self-financing capacity would play a comparatively bigger role in banks' credit portfolios.



Furthermore, public sector financing, which had produced continuous, though not above-average, revenues for banks, has been losing importance over the past few years. Between 1996 and 2000, banks' claims on the general government declined by more than EUR 10 billion or by

approximately a sixth. Their share in total assets halved to a mere 9% at the end of 2000. In particular, the central government has increasingly switched to bond-based funding, whose share in central government debt rose from 60% to 80% in the 1990s, whereas the share of bank loans shrank from 30% to 8%. Government securities held by domestic banks have also diminished, since government bonds have been increasingly placed with international investors.

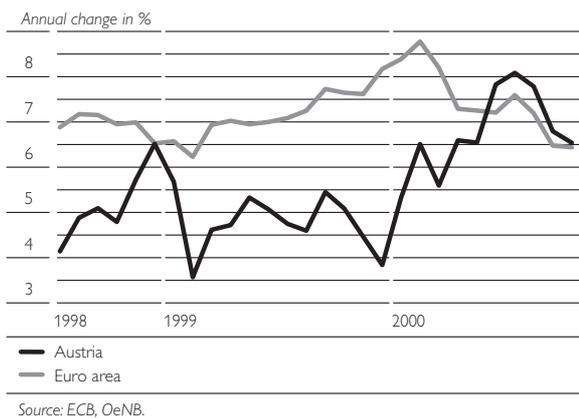
In the past few years, the majority of loans extended to businesses and households were foreign currency loans; between 1995 and 2000, foreign currency loans accounted for almost two thirds of business credit expansion and almost three quarters of consumer credit expansion. While variable rate loans in schillings (euro) shrank by EUR 8 billion between 1995 and 1999, variable rate foreign currency loans surged by almost EUR 11 billion; the latter accounted for 71% of foreign currency loans at year-end 1999.

Since the grown interest sensitivity of credits raises the share of short-term fixed deposits, the banks' interest rate risk has increased significantly less markedly on balance. In other words, this development does not necessarily involve higher risks but can – when an inversion of the yield curve occurs, like in the early 1990s – in fact raise profits if the funding of fixed rate assets with short-term liabilities becomes considerably more expensive.

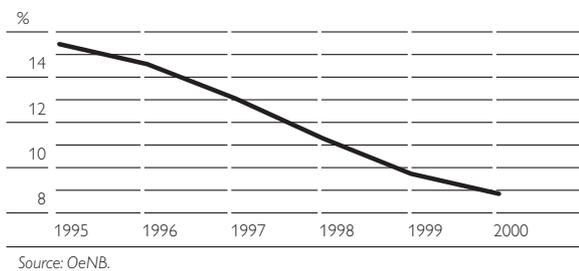
### Foreign Currency Loans: A Broadly Based Boom

1995 marked the beginning of a broadly based boom in foreign currency lending; businesses and households started to take out loans particularly in Swiss francs and, more recently, Japanese yen. This development was preceded by a substantial widening of the interest differential between interest on borrowing in schillings and money market rates in Swiss francs. Between 1990 and 1993, this differential had risen from 0.5% to 2.5% (annual average); in 1995, it was above the

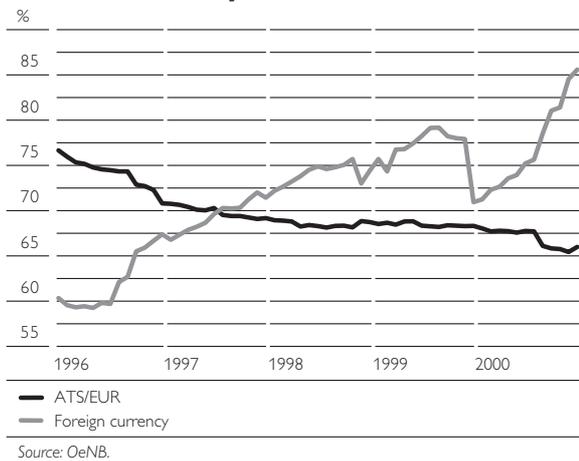
### Lending to Nonbanks in the Euro Area



### Public Sector Financing as a Share of Total Assets



### Variable Rate Loans in Percent of Loans with a Maturity of More than One Year



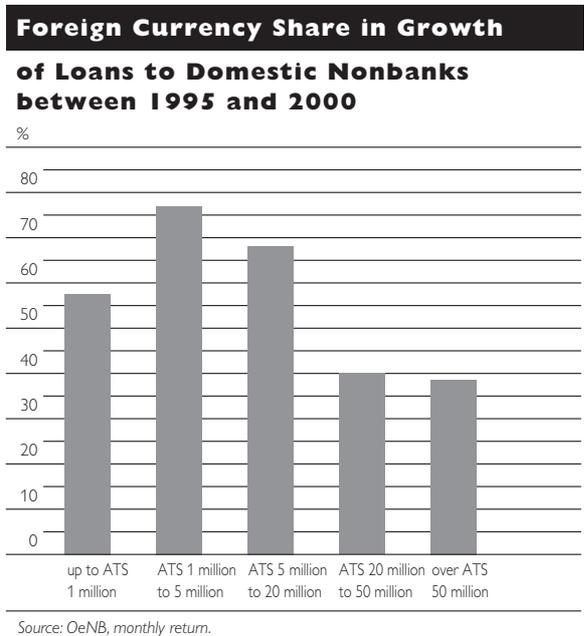
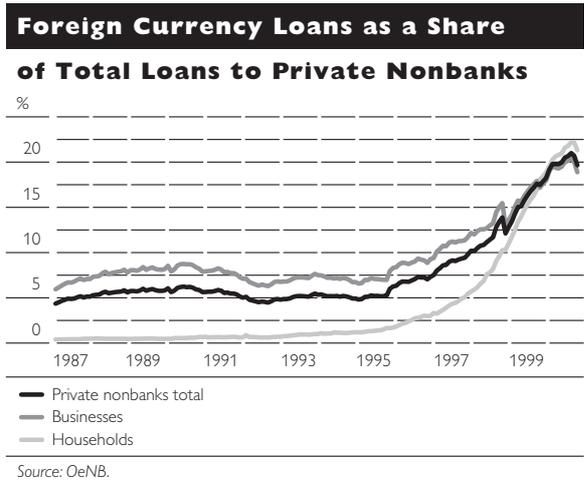
3% mark. Owing to the low short-term interest rates in the currency in which the loan was denominated, this type of loan was used exclusively for domestic lending. On the whole, almost three quarters of the net expansion of Austrian banks' loans to domestic nonbanks were denominated in foreign currencies between the end of 1995 and the end of 2000.

In this period, foreign currency loans nearly quadrupled.<sup>1)</sup> In 2000, some 20% of loans to businesses and households were denominated in foreign currencies; at year-end 1995, only 1.5% of personal loans and 7.8% of business loans were foreign currency-denominated.<sup>2)</sup>

The breakdown of credit expansion by loan size illustrates how foreign currency loans, traditionally a financing instrument for large-scale business investment, have turned into a financing instrument for small and medium-sized enterprises and households. The expansion was particularly strong in the loan category between ATS 1 million and ATS 20 million. Almost 80% of all loans of ATS 1 million to ATS 5 million were foreign currency-denominated.

A similar tendency was observed on the lenders' side: all banking sectors (excluding building societies, which do not grant foreign currency loans, and special purpose banks) recorded a substantial increase in foreign currency loans to businesses and households. At the end of 1995, the share of foreign currency loans in overall business loans was significantly higher at joint stock banks than at the banks of the other sectors, but in the meantime, these differences have become much smaller. The share of foreign currency loans was almost 30% of personal loans at savings banks and at Volksbank credit cooperatives, respectively.

The majority of foreign currency loans are granted with a maturity of up to 20 years but are rolled over every three or six months; the interest rate is linked to the London Interbank Offered Rate (LIBOR) of the relevant currency. In addition, the bank charges an additional 1.5% to 2%, depending on the size of the loan, customer relations, collateral provided, etc. Interest (and principal) payments are due retroactively and have to be made in the currency in which the loan is denominated. In many cases, the borrower can

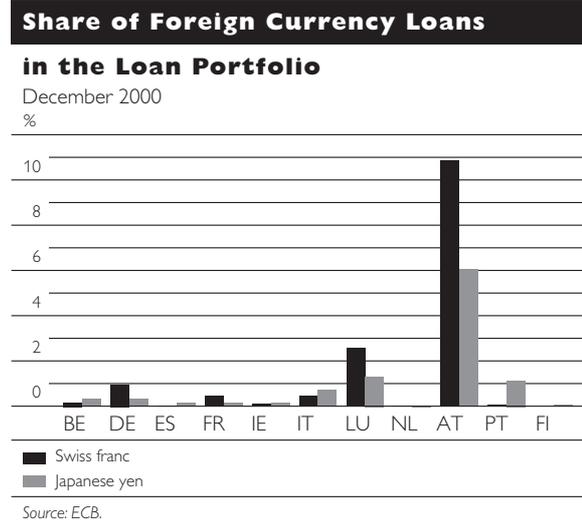


1 Loans in schilling and euro augmented by a mere 6% in the same period.

2 Including the euro's predecessor currencies.

repay the loan before it is due or switch to another currency (including schilling/euro) at the rollover dates.

The share of foreign currency loans' share (especially loans in Swiss francs and Japanese yen) in banks' claims on businesses and households are higher in



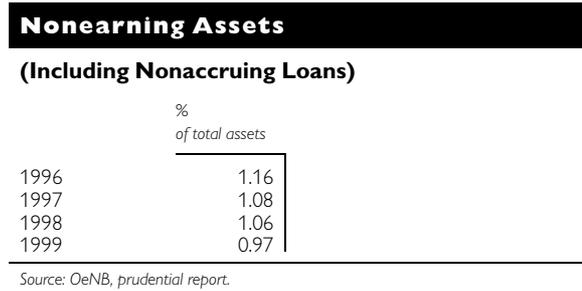
Austria than anywhere else in Europe. Recently, foreign currency loans have become more popular also in other countries of the euro area (however, it must be noted that their share had been far smaller in these countries than in Austria). Especially in Germany, loans in Swiss francs and Japanese yen have been increasing at about the same pace as in Austria.

Foreign currency loans involve interest rate and foreign exchange risks. The increase in yen-denominated loans recorded in 1999 and 2000 can be attributed to a large extent to exchange rate fluctuations. The Japanese yen fluctuated by more than 40% during this period. Also, the Swiss franc appreciated by more than 6% in 2000.

Therefore, interest paid on the foreign currency loans outstanding also augmented. From the bank's point of view, both risks are borne by the borrower. In the case of default, the banks are exposed to foreign exchange risk.

### Credit Quality Remains Broadly Unchanged

Loan loss provisions have remained relatively stable over the past few years, coming to EUR 9.8 billion at year-end 1999 (1998: EUR 10.0 billion; 1997: EUR 9.9 billion). The provisions created decreased to EUR 2.48 billion in 1999, after having climbed from EUR 2.63 billion to EUR 2.91 billion between 1997 and 1998. Austrian banks' need to carry out value adjustments for claims on nonbanks has been declining continuously for years, reaching a new low of just over 3% in December 2000, compared to 3.1% in December 1999.



The prudential report, which contains the external auditors' comments on the auditing process and the general situation of the credit institutions, may help assess the quality of Austrian banks' credit portfolios in detail.<sup>1)</sup> The data for all credit institutions show that nonaccrual and nonearning assets (as a share of total assets) gradually decreased between 1996 and 1999, for the first time amounting to less than 1% in 1999.

A breakdown of loans by risk categories indicates that nonperforming and irrecoverable loans measured by total loans also shrank in the past few years. In 1999, some 3% of total loans were considered to be "problematic,"

<sup>1</sup> The current data of the prudential report of year-end 2000 are available as of July 2001.

which, however, does not imply that all loans classified as “nonperforming” are actually likely to fail. In most cases, the banks can expect that at least part of the debt outstanding will be repaid; also, this classification does not take into account collateral.

**Interest Margins Reflect Intensity of Competition**

The difference between lending rates in Austria and in the euro area is one indicator of the intensity of competition. While interest rates on personal loans are significantly lower in Austria than in the entire euro area, interest rates on commercial loans are somewhat higher. However, it must be noted that the various data collection systems differ, so that interest rate statistics are not fully comparable; besides, different refinancing rates, resulting from the different structures of sources of funds, may impact on the banks’ position on the lending market and thus also on lending rates. The average maturity of loans can also vary from country to country and thus distort the statistics.

The margin between banks’ average contractual rates on new loans and a market interest rate as the reference rate for interest rate setting in the lending business offers an alternative interpretation of the situation.<sup>1)</sup> The interest margins on deposit taking can be calculated in a similar way. Hence, Austrian banks’ spreads for lending both to the business and to the private sector deteriorated in 1999 and 2000. By contrast, spreads for deposit taking improved, which came as a surprise, since a decrease in deposits would actually imply that competition would become fiercer. The improvement may be attributable to the declining average maturity, which, in a normal term structure, reduces deposit rates.

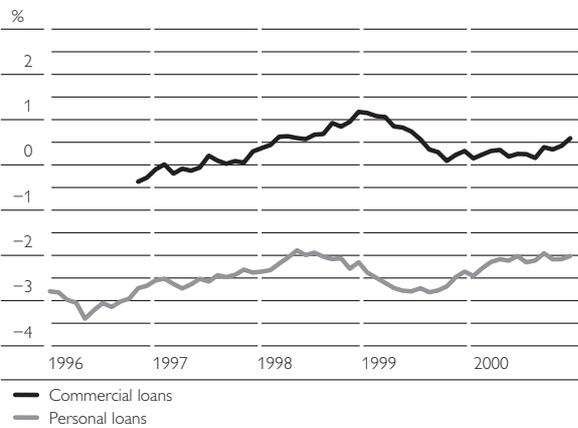
The falling margins in lending can be traced to changes in demand. Until 1999, the narrowing interest rate margins on commercial loans concurred with a downward trend in business credit expansion. Interest margins on personal loans also contracted particularly in 2000, despite lively demand. It can be assumed that increased competition between schilling or euro-denominated loans and foreign currency loans played a key role in this development. Moreover, a large part of banks’

**Problem Loans**

	Nonperforming	Irrecoverable	Share of Credit Volume
	EUR million		%
1996	11,657	2,505	3.46
1997	12,854	2,853	3.62
1998	12,106	2,731	3.14
1999	12,519	2,863	3.01

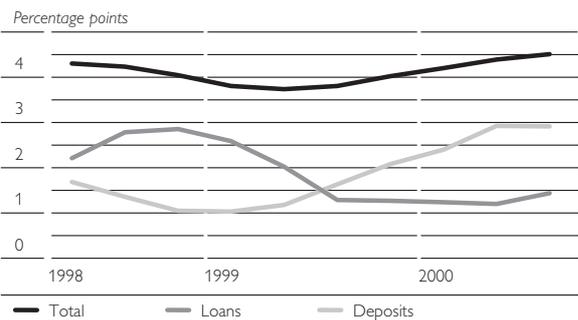
Source: OeNB, prudential report.

**Difference between Banks’ Lending Rates in Austria and in the Euro Area**



Source: OeNB, ECB.

**Austrian Banks’ Margins in Retail Banking**



Source: ECB.

1 See also ECB (2000). EU banks’ margins and credit standards, December.

**Difference between the Ten-Year****Government Bond Yield  
and the Three-Month Rate**

Source: ECB, OeKB, OeNB.

earnings from foreign currency loans is made up of the charge on the rate at which they obtain funds on the interbank market. This charge is not interest income but fee income and is not exposed to interest rate risk (which is entirely borne by the borrower).

The term structure has also impacted on banks' interest margins. The gap between long-term and short-term rates, which had widened considerably in the first half of the 1990s, has narrowed significantly since the mid-1990s. At year-end 2000, the difference between the ten-year government bond yield and the three-month rate was only a quarter percentage point. The reduction of interest rate differentials between the

long end and the short end made maturity transformation less profitable for banks, since banks' asset-side maturities are significantly longer than their liability-side maturities. At end-September 2000, liabilities with a residual maturity of up to one year surpassed assets with the same residual maturity by some EUR 88 billion, while assets with longer residual maturities exceeded liabilities by EUR 114 billion.

In addition, the growing share of (lower yielding) international transactions in total assets has contributed to the decline in total operating income in relation to total assets. In 2000, net interest income in banks' foreign business activities amounted to 0.64% of the total business volume, in domestic operations to 1.43%. This gap can be traced to the differences between domestic and external operations: e.g., in international operations, the share of lower-yielding interbank transactions is much higher than in the domestic business. However, these data significantly underestimate the total share of external operations in net interest income as they do not cover income, from foreign subsidiaries, which are included in equity earnings.

**Improvements in Operating Performance**

Austrian banks' operating performance improved in the financial year 2000 compared to the previous year,<sup>1)</sup> even though, on the whole, the results reached only 1998 levels. The banks' performance improved not least because credit expanded significantly in 2000, after sluggish growth in deposit taking and lending had contributed to the modest increase in interest income in the preceding years. Both rising earnings and falling outlays

<sup>1</sup> Both the unconsolidated data on the basis of the Austrian banks' quarterly reports and the consolidated data confirm the improvement in operating performance. For the past few years, the group financial statements and individual accounts of Austria's large banks have shown substantial deviations; these can be attributed, on the one hand, to the creation of a network of banks abroad, especially in Central and Eastern Europe, and, on the other hand, to the growing number of mergers between large banks by intragroup interbank activities. The different accounting rules of the Commercial Code and of the International Accounting Standards make it very difficult to aggregate and interpret data. The different presentation of consolidated and unconsolidated quarterly data has to be taken into account when assessing the banks' operating performance.

considerably improved operating results, with risk provisions remaining more or less unchanged. All sectors (except for building and loan associations and mortgage banks) have reported enhanced operating performance.

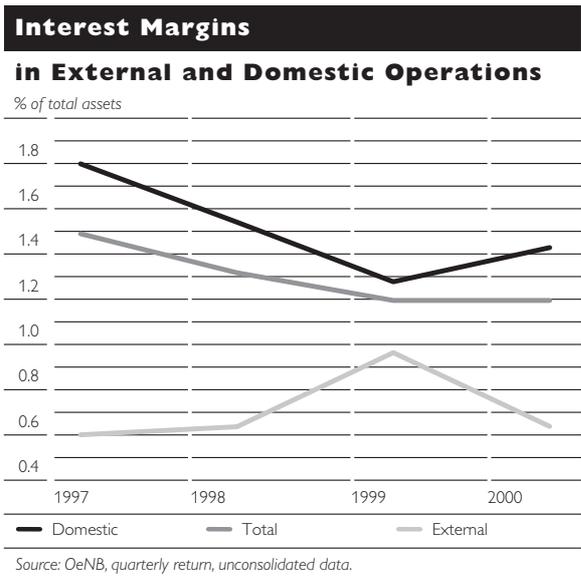
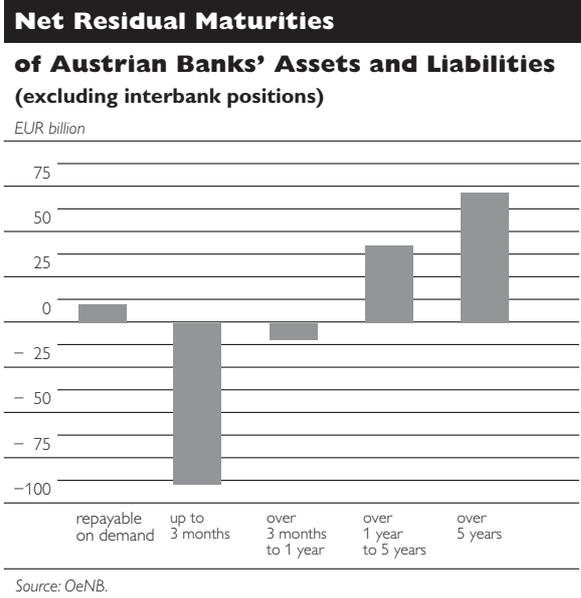
Though net interest income (overall) increased in absolute terms in 2000 (+7.1%), it decreased – if only slightly – in relation to total assets compared to 1999. Since 1993, net interest income in relation to total assets has declined by 0.5 percentage point to 1.2%. The consolidated data provide a somewhat brighter picture, as the activities in Central and Eastern Europe have a favorable impact on net interest income (the unconsolidated data classify the activities in Central and Eastern Europe under equity interests, therefore they are not stated in net interest income). In the deposit business, customers continue to increasingly opt for high-yielding assets (such as shares, mutual fund shares and debt securities).

The fact that growth in net interest income has decelerated significantly compared to total asset growth is key reason for the continuous decline in operating income in relation to total assets since 1993; a modest recovery was recorded only in 2000.

In 2000, non-interest-related income for the first time exceeded interest income. While interest margins in Austria are relatively small compared to those in other European countries, noninterest income measured by business volume was above average in Austria in the past few years.

Fee income surged by more than 75% between 1995 and 2000, which is attributable to the boom in foreign currency loans and to other structural changes, such as the shifting of savings deposits to higher-yield types of investment (e.g. shares and mutual funds). The surplus from net commissions on securities trading has more than tripled since 1995. Net fee income on securities trading climbed by 39.3% or EUR 0.36 billion in 2000, contributing 9.5% to total operating income. Securities-related business seems to be fairly profitable, but it remains to be seen whether this high profitability can be maintained as the products become more standardized and as the number of competitors grows.

The increasing importance of fee income enhances the diversification of banks' revenues. A bank with a wide range of income sources should be able to manage loan defaults more easily when a larger part of their income is non-interest-related. On the other hand, securities commission often



depends on market developments, therefore their growing importance further enhances the correlation between bank income and market risks.

The balance on financial transactions augmented by approximately a third between 1995 and 1998, but from 1999 onward, the impact of monetary union on foreign currency trading became visible. Income on equity and shares in affiliated companies, which also include the revenues from the growing number of (profitable) branch offices in Central and Eastern Europe, also mounted considerably.

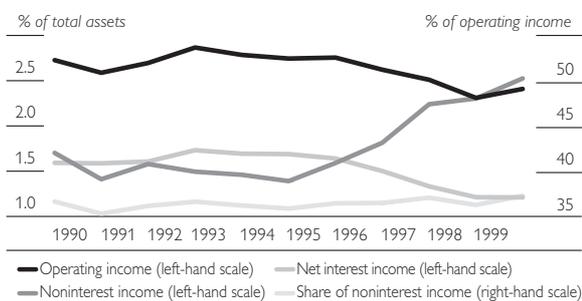
### Key Earnings Ratios

(unconsolidated)

	1996	1997	1998	1999	2000
Net interest income in % of operating income	59.2	57.0	52.7	52.0	49.8
Other operating income in % of operating income	40.8	43.0	47.3	48.0	50.2
Net interest income in % of total assets	1.6	1.5	1.3	1.2	1.2
Cost/income ratio	68.7	69.0	68.1	70.6	66.6
Operating results in % of total assets	0.86	0.81	0.80	0.68	0.80
Return on equity	7.09	7.25	7.51	7.03	9.51

Source: OeNB.

### Operating Income from 1990 to 2000

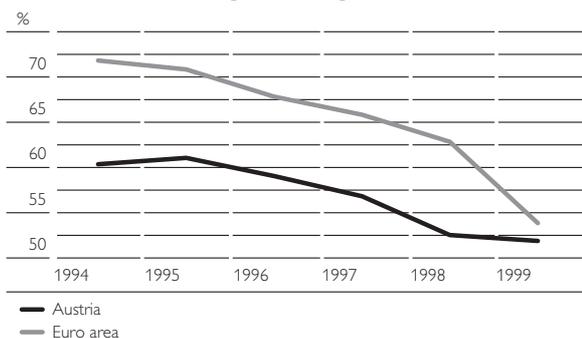


Source: OeNB, quarterly return, unconsolidated data.

In 2000, operating income rose by 12% compared to the previous year, with other operating income contributing most to the overall increase. Only building and loan associations and mortgage banks recorded a decline in operating income (in relation to total assets). Measured by total operating income, the contribution of interest-related business diminished further, with net interest income as a proportion of total operating income amounting to 49.8% in 2000.

While Austrian banks are increasingly faced with profitability squeezes, operating expenses in relation to total assets also shrank over the past few years (especially in Raiffeisen credit co-operatives and joint stock banks). The current progress in restructuring and cost-cutting measures in individual banks has also improved the cost/income ratio (i.e. the ratio of costs plus other operating expenses to net revenues), which amounted to 66.6% in 2000. Cuts in staff expenditure were key to this development, whereas other administrative expenses (as a proportion of total assets) remained almost unchanged. Improved total operating income and reduced operating costs (in relation to total assets) generated better financial results. No fewer than 9 of the 30 largest banks report

### Interest Income as a Share of Operating Income



Source: ECB, OeNB.

financial results coming to more than 1% of total assets (1% is considered a benchmark value in the literature).

Overall, risk provisions (estimates for the year 2000) are expected to equal the previous year's level (some EUR 1.5 billion in absolute terms); income from ordinary activities is estimated to total EUR 2.8 billion, which would represent a 47% increase. However, it must also be noted that special factors have impacted on these results (especially revenues from divestitures).

Return on equity (ROE) reflects the ratio between profit or loss for the year and core capital; thanks to the favorable development of the earnings situation, it has improved over the past few years, coming to 9.5% in 2000. The 30 largest banks (according to unconsolidated data) and the entire banking sector record a rate of return of more than 9%. The percentages in the individual sectors (and in individual banks) range from 7.8% to 13%. A comparison with international major banks<sup>1)</sup> shows that according to consolidated data, Austria's banks are approaching the international level. However, not taking into account the substantial improvements in 2000, a comparison with other EU countries dating from 1999 shows that – problems of definition arising in international comparisons notwithstanding – Austria's banks (aggregated) are among the least profitable credit institutions.

### Own Funds Strengthen Risk-Bearing Capacity

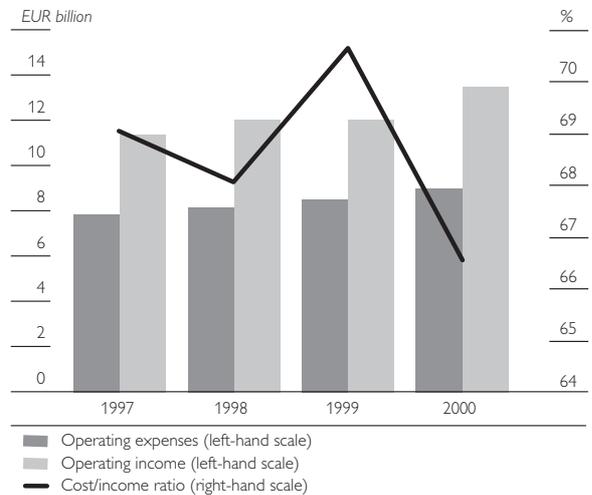
The equity ratio, i.e. the ratio between own funds and assets, is the most important gauge of Austrian banks' risk-bearing capacity. According to Articles 22 and 23 of the Austrian Banking Act, there are three types of own funds in relation to the assessment base<sup>2)</sup>:

- Tier 1 capital: core capital;
- Tier 2 capital: supplementary capital;
- Tier 3 capital: special subordinated capital as a capital charge for market risk.

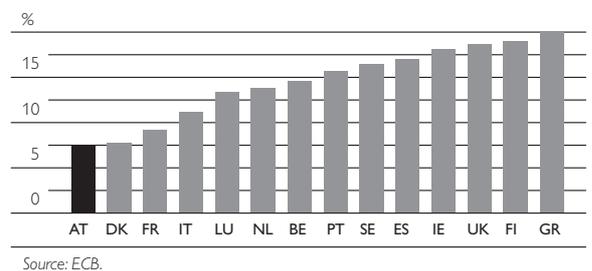
1 Current international figures can be found in the ECB study "Possible effects of EMU on the banking systems in the medium to long term" (February 1999) or in the OECD publication "Bank Profitability: Financial Statements of Banks" (2000).

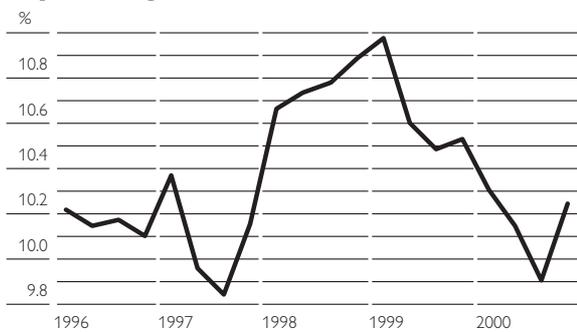
2 The assessment base is the total of risk-weighted assets, off-balance sheet items and the special off-balance sheet activities (excluding capital requirements for the securities trading book, according to Article 22b Austrian Banking Act). Risk weighted assets are assets less risk provisions weighted by risk categories, according to Article 22 (3) Austrian Banking Act. The risk weightings 0%, 20%, 50% or 100% are in line with the Solvency Ratio Directive of the 1988 Basel Accord.

### Cost/Income Ratio

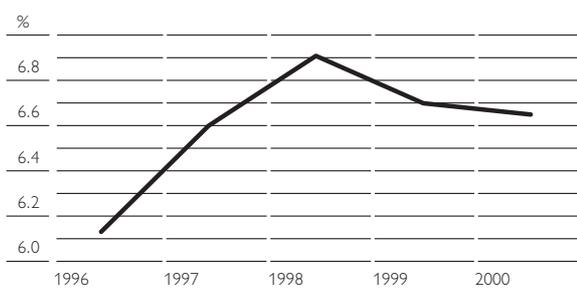


### Return on Equity in 1999



**Core Capital Ratio of Banks****Operating in Austria**

Source: OeNB, monthly return.

**Equity in Percent of Total Assets**

Source: OeNB.

**Equity Ratio**

	1999	2000
	%	
Joint-stock banks and bankers	11.81	12.97
Savings banks	12.12	12.97
State mortgage banks	11.90	11.22
Raiffeisen credit cooperatives	13.36	12.23
Volksbank credit cooperatives	10.79	11.56
Building and loan associations	9.86	9.18
Special purpose banks	26.64	20.65

Source: OeNB, monthly return.

As of December 31, 2000, credit institutions operating in Austria held own funds of EUR 37.4 billion, which is EUR 2.3 billion or 6.5% more than in the previous year. Since the assessment base rose faster than banks' capital base, the (unconsolidated) equity ratio went down by 0.1 percentage point to 13.9%; by international standards, however, this value is still rather high.

Around two thirds of banks' capital consisted of core capital, which augmented by EUR 0.9 billion compared to the previous year. Eligible capital, comprising core capital and supplementary capital from tier 2 and tier 3 capital minus deductible items, stood at EUR 35.9 billion in December 2000 (compared to only EUR 32.9 billion in December 1999).

Though the analysis of the simple ratio between own funds and total assets covers a longer period of time, it does not take into account certain key items (such as changes in the composition of own funds), which limits the scope of interpretation. Statistics show that own funds had climbed steadily until 1998 and dropped slightly to 6.7% (1999) and 6.65% (2000).

The calculation of the equity ratio, which is largely based on the 1988 Basel Accord, was gradually supplemented by including e.g. market risk. Thus, the calculation has become much more complex. The capital ratio, including all requirements and components, came to 13.47% in 1998, slipped to 13.04% in 1999 and again climbed to 13.25% in 2000.<sup>1)</sup>

It is also interesting to note that the development of the equity ratio in the individual sectors was rather varied in 1999 and 2000: The capital

ratio of joint stock banks and bankers, for instance, increased by 1 percentage point, whereas that of special purpose banks decreased by 6 percentage points. All the sectors under review, except for building and loan associations, had an equity ratio of more than 11%.

Overall, Austrian banks' equity ratio can be considered good. The fact that the banks were able to cope with problems arising from activities in Russia and Asia in 1998 by taking out funds from regular returns and by tapping reserves highlighted the adequacy of Austrian banks' risk-bearing capacity.

<sup>1</sup> See also Turner, J. (2000). *Regulatory Capital Requirements for Austrian Banks - A Supervisory Tool Subject to Change*. In: *Focus on Austria 3/2000*, 66-73.

### **Concluding Assessment**

On the whole, Austria has a secure and well functioning banking system founded on a firm legal basis and safeguarded by a comprehensive safety net. Austrian banks' risk-bearing capacity is based on the good equity ratio; the capital ratio of the five largest domestic banks is above the euro area average.<sup>1)</sup> The quality of the credit portfolio has improved over the past few years. As credits and company failures as well as provision requirements are developing along similar lines, economic conditions do not indicate that credit quality might deteriorate in the near future.

However, Austrian banks' earnings a key source of own funds are still modest by international standards, even if there was some improvement in 2000. The operating performance also reflects competition on the Austrian market and the enhanced integration of Austrian banks into the European financial market, which was further reinforced by the cross-border merger of Bank Austria group in 2000. The vigorously expanding activities of Austrian subsidiaries in Central and Eastern Europe have been increasing their contribution to their parent banks' operating results. Their profitability has so far been above the market average, while their credit risk has not increased substantially. These activities are not expected to involve any major risks, at least in the short and medium term.

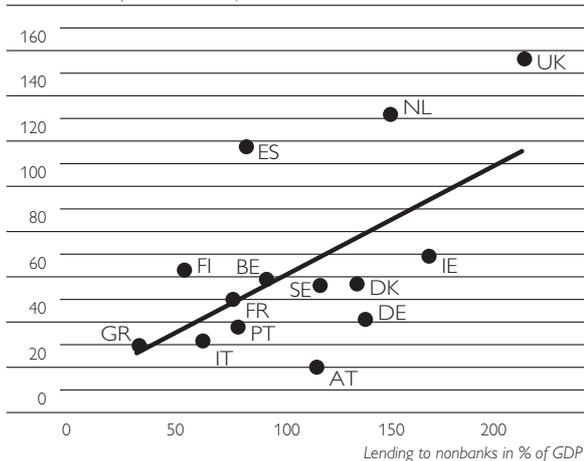
In the past few years, Austrian banks' business was marked by the sharp increase of foreign currency loans (especially in Swiss francs and Japanese yen) to companies and households. As debtors' solvency and exchange rate fluctuations pose substantial risks in this context, this development should be followed closely.

<sup>1</sup> See also Belaisch, A., L. Kodres, J. Levy and A. Ubide (2001). *Euro-Area Banking at the Crossroads*. In: *IMF Working Paper WP/01/28*, March.

## The Stock Market

### Volume of Loans and Stock Market Capitalization

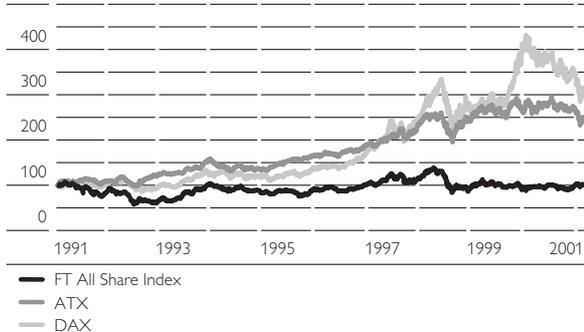
Stock market capitalization in % of GDP



Source: FIBV.

### ATX, DAX and FT All Share Index

Index 1991 = 100



Source: Datastream.

Equity finance does not represent a complete substitute for bank lending; much rather, it is a complementary form of finance. Generally, the more advanced a financial market is, the higher its market capitalization is. Rather like the German market, the Austrian stock market is very small in a European comparison.

The market value of Austrian companies listed on Vienna's stock exchange, Wiener Börse AG, equaled some 15% of GDP, which is far below the European average of about 70% (1999). Austria accounted for merely 0.4% of total stock market capitalization across the EU in 1999. The relatively small size of the Austrian equity market, however, also means that the potential for destabilization is lower than that of larger markets. In countries with large exchanges, turbulences on national stock exchanges spread to the real sector more readily than in economies with a small stock market.

The performance of shares on the Vienna stock exchange does not signal any risk of destabilization: In fact, at the end of 2000, the ATX even dipped below the level it had stood at early in 1990 – a trend unique to Austria. On 15 other Western European bourses, indices advanced by between 250% (Denmark) and over 1,400% (Finland) from 1990 to 1999. The equity indices on the most important European markets – Frankfurt's DAX and the FT All Share Index – gained 340% and 270% respectively over the past decade.

The development of the price/earnings ratio (P/E ratio) also attested to the sagging prices on the Vienna bourse.<sup>1)</sup>

Currently, the P/E ratio of the companies quoted on the Vienna stock exchange is low by international and historical standards. In mid-April 2001, this multiple stood at about 12, far below the high recorded in the third quarter of 1993 (about 25). At the same time, the P/E ratios of DAX and the FT All Share Index companies were roughly 20.5 and 19, respectively. The "undervaluation" of the Vienna stock exchange suggests that rising stock market prices had no important impact on volatility and inflation.

The ATX performed poorly as a result of relatively sluggish demand for Austrian stocks. As Austrian institutional investors do not favor domestic

<sup>1</sup> The P/E ratio is the ratio of a company's share price to its per-share earnings. In general, a relatively high (low) P/E ratio indicates an overpriced or overvalued (an underpriced or undervalued) market.

stocks as an investment vehicle, and the share of private investors' purchases has also remained quite small, nonresident investors are a major force on the Wiener Börse. As balance of payments figures show, at the end of 1999 foreign investors' portfolios comprised Austrian equities (overwhelmingly ATX-quoted stocks) worth about ATS 8 billion on the market. This corresponded to roughly a fourth of the entire market value in Vienna, and about a third of the market capitalization of the ATX. However, foreign pension and mutual funds account for much higher float ownership of some stocks listed on the Vienna bourse.

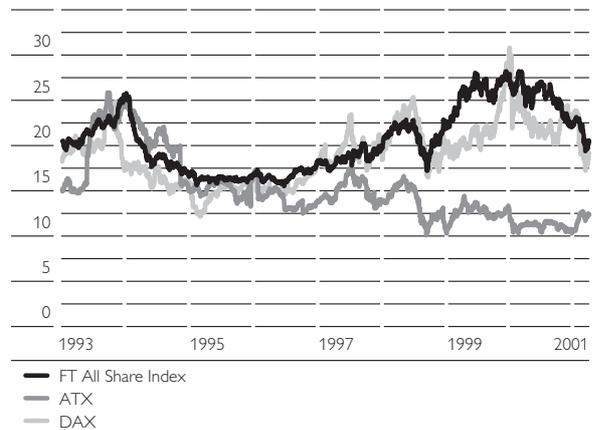
Basically, there is a fairly close link between the development of prices on the Wiener Börse and trading of domestic listed stock held by nonresidents.

Cross-border capital flows can be expected to rise further, at least within the euro area. The question is whether the Vienna stock exchange will benefit from such flows to the same extent as the large markets in the euro area. Equities which would be typical in a portfolio of Austrian stocks are not selected for cross-border euro area portfolios because they are not liquid enough. Likewise, international major indices hardly feature small caps, which is why international investors rarely pick them for their portfolios. In any event, foreign investors' holdings of publicly traded domestic stocks have not augmented perceptibly since the beginning of monetary union, if the short period allows any such statement at all.

While the Austrian stock market depends quite strongly on foreign investors' demand, interestingly enough, it is less exposed to international price fluctuations than other bourses. The clearly lower correlation of the ATX to the main stock indices abroad is evidence of this reduced vulnerability. However, correlations calculated for an extensive time period understate transmission effects during times of crisis. The correlation of the ATX with foreign stock indices even declined in the second half of the 1990s. For the most part, however, this drop was attributable to generally sluggish price gains, which is why the temporary sell-off on stock markets in 1997 remained fairly low-key in Vienna.

**Price/Earnings Ratio**

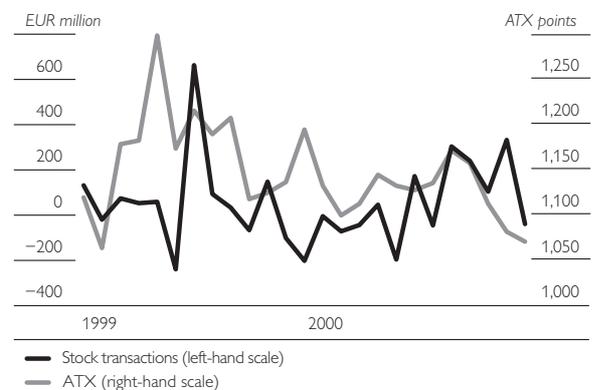
**ATX, DAX und FT All Share Index**



Source: Datastream.

**Nonresidents' Transactions**

**with Domestic Listed Stocks and the ATX**



Source: OeNB.

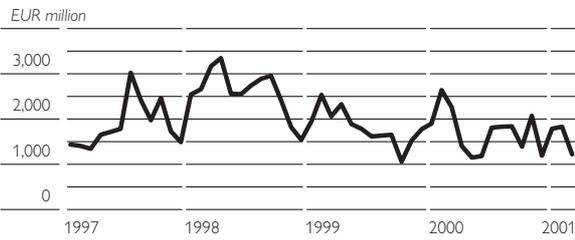
**Correlation between Stock Indices**

**from February 20, 1991 to April 23, 2001**

	AT	DE	US	FR	UK
AT	1.00	x	x	x	x
DE	0.55	1.00	x	x	x
US	0.56	0.96	1.00	x	x
FR	0.41	0.97	0.99	1.00	x
UK	0.59	0.96	0.99	0.91	1.00

Source: Datastream.

**Equity Turnover at Wiener Börse**



Source: Wiener Börse AG.

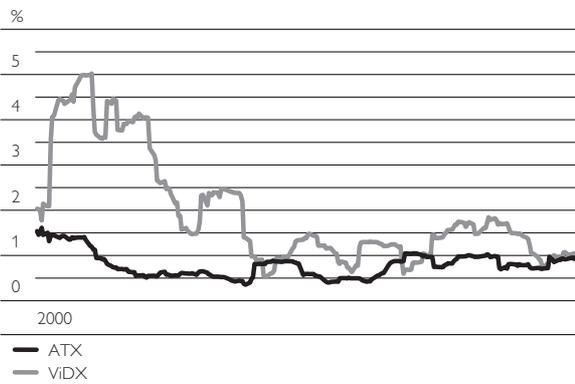
**Number of Days with Absolute Price Changes**

from January 1, 1997 to April 23, 2001

	0 to 2%	2 to 4%	of 4% and over
ATX	1,034	77	10
DAX	926	178	18
FT All Share Index	1,057	65	0
Dow Jones	1,024	88	8

Source: Datastream.

**Historical Volatility of Stock Indices<sup>1)</sup>**



Source: Datastream.

<sup>1)</sup> Volatility calculated as the standard deviation of daily changes over the preceding 30 days.

A prime reason big-time investors rarely opt for Austrian equities is that market capitalization on the Austrian stock market is poor by international standards, and that the market volume of the companies listed on Wiener Börse is also low. In 1999 the average market capitalization of an enterprise listed in Vienna was only some 25% of the EU average, the lowest value of all Member States. In November 2000, more than 50 European stocks grouped in the Dow Jones Euro STOXX index exhibited a market capitalization larger than that of the entire Austrian stock market. Moreover, a smaller share of this low market capitalization per share is tradable than on other European stock exchanges. In 1999 float ownership<sup>1)</sup> of the equities listed on the ATX came to 45%. The float ownership of Austrian stocks listed on the Dow Jones Euro STOXX broad index was about 50% as against 70% for all companies covered by this index. The low degree of float further reduced Austrian equities' liquidity compared to the European average.

With demand weak, the Vienna bourse exhibits poor market liquidity by international comparison, a likely cause for foreign investors' restraint in expanding investment in Austrian stocks. In terms of turnover per listed company, liquidity on the Vienna stock exchange was only roughly a fourth of that in Frankfurt. Even Wiener Börse's linkup to Xetra, Frankfurt's electronic trading platform, in November 1999 did not entail any notable increment in sales.

Despite the lower liquidity in Vienna, the ATX did not exhibit more volatility than far more liquid markets. In fact, the number of days since 1997 in which prices changed by more than 2%

was markedly smaller for the ATX than for the DAX and was roughly comparable to that of the Dow Jones index.

Nevertheless, the volatility of individual securities diverged substantially. Technology stocks, in particular, were far more volatile than standard equities. Between early 2000 and February 2001, the historical volatility of the ATX (measured as the standard deviation of the daily change in the underlying stock price for the 30 preceding days) was clocked at less than 2%, whereas the Vienna Dynamic Index (ViDX) clearly surpassed this mark in the first half of 2000. The roller coaster movements of the ViDX are a result of the extraordinarily dynamic development of technology stocks in

1 Share of stocks held by a number of different investors.

the first quarter of 2000. Since that period, tech stocks have been plummeting.

The level of the ViDX doubled in the first three months of 2000, only to sink slightly below the initial level by mid-April 2001. Prices on the Neuer Markt tumbled even more drastically, contracting to less than half the level of the beginning of 2000 by mid-April 2001. Price up- and downtrends since March 2000 on the European “growth” markets were more pronounced than those on the technology-heavy Nasdaq in the U.S.A.

Crumbling stock prices may impact the private sector by reducing the wealth embodied by stocks, the corporate sector by jacking up its refinancing cost and the financial sector by slashing financial intermediaries’ assets, and may this feed through to the real sector. Considering that financial intermediaries are the main investor in stocks, they represent the premier transmission channel to the real sector in Austria.

### Technology Indices



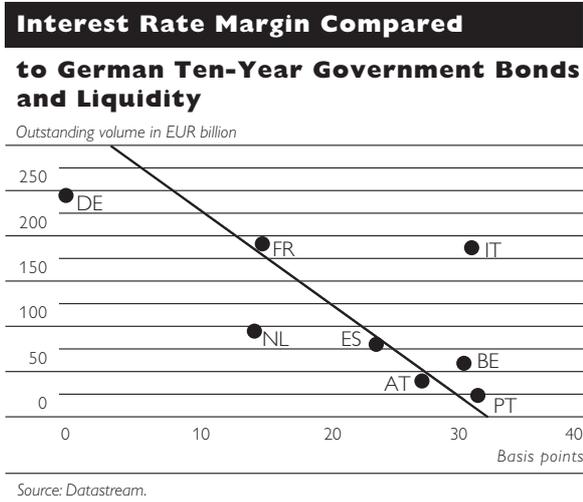
Source: Datastream.

## Bond Market

### Liquidity Determines Interest Rate Differential to Germany

The development of yields influences interest rate risk in banks' portfolios. The most important risk perspective issue is how much of the spreads between Austrian issuers' and EMU benchmark interest rates represent a risk premium due to Austria's comparatively lower market liquidity, lower credit rating or institutional divergences, which leads to market segmentation. The importance of bond market yields extends beyond the bond market. It serves as a reference rate for a wide range of credits, above all subsidized credits, because legal provisions stipulate its use.

Liquidity is certainly a crucial factor in explaining the differences between yields on various euro area government bond markets. Liquidity describes the degree to which individual market participants may perform transactions without triggering price effects on the market. Empirical evidence has shown that the outstanding amount of a bond is decisive for the size of a bond's liquidity premium on the euro bond market. The chart "Interest Rate Margin Compared to German Ten-Year Government Bonds and Liquidity" shows the link between liquidity (measured in terms of the volume outstanding) and average ten-year bond yield differentials between Austria and Germany in 2000. As the simple regression line demonstrates, there is a



connection between the interest rate margin and liquidity – generally, the higher the outstanding volume on a market is, the lower the interest rate spread is to the German market.

However, deviations from the general trend (Italy, the Netherlands) indicate that liquidity alone is insufficient to explain the size of interest rate spreads. Especially in the case of Italy, the AA rating by Standard & Poor's strongly suggests that credit ratings exert a key influence on government bond yields. The Netherlands probably diverge from the general trend because most issues represent additions to outstanding bonds that are reopened to boost their market liquidity. With the interest rate margin to Germany fairly high on average at about 30 basis points in 2000, Austria is in line with the European trend considering its low volume of federal government bonds outstanding.

EMU has stepped up competitive pressure on smaller issuers like the Republic of Austria. With its borrowing requirement low by EMU standards, Austria will hardly issue volumes large enough for a big-league market. Only by amalgamating new federal government bond issues into a single euro issue has it been possible to meet the demand for large issues prevailing on the euro bond market. New tranches of numerous issues of federal government bonds were sold at unchanged terms (coupon, coupon and redemption

dates). This approach has the advantage of both securing a steady foothold on the market and providing for high volumes of bonds outstanding. As a result of these measures to promote liquidity, Austria had just eight government bonds outstanding at the end of 2000, each with a volume of EUR 5 billion or over. While these amounts may be very high by Austrian standards, they are nevertheless dwarfed by euro area volumes.

By far the largest portion of the volume of newly issued government bonds (some 40% to 90%) is purchased by foreign dealers participating in the tender panel. This syndicate consists of 8 domestic and 19 foreign banks. Moreover, the government started to issue bonds using syndication in addition to tender procedures. The lead managers were foreign banks participating in the tender panel.

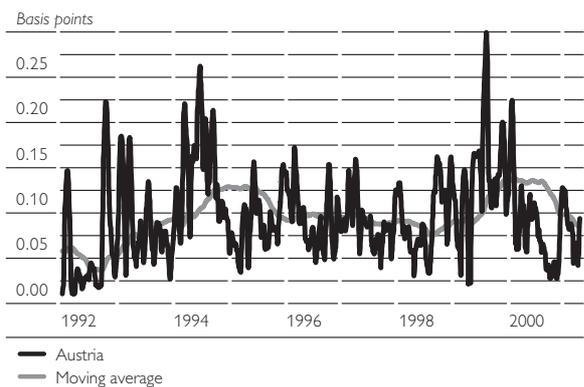
**Volatility of Austrian Secondary Market Yields Hardly Changed**

Both the difference between Austrian bond market yields and EMU benchmark yields and their volatility are important indicators which help assess financial market stability.<sup>1)</sup>

Investors consider the volatility of yields over time a risk and try to achieve an optimal balance between the expected yield and its risk. Mid-1992 and mid-1998, the volatility of the Austrian secondary market yield exhibited a rising tendency. Between 1992 and 1995, several events evoked protracted periods of uncertainty on financial markets. The major events are likely to have been the currency crises gripping the European Monetary System (EMS) in 1992 and 1993 and the uncertainty about the response of U.S. monetary policymakers to the expectation of rising inflation in 1994. The jump in volatility after 1998 can be traced to the currency turmoil in the wake of the Asian crisis in mid-1997 and the intensification of financial market turbulence following the outbreak of the Russian crisis in August 1998. The fluctuation band began to narrow again at the beginning of 2000.

The overall risk of yield fluctuations, however, is minimal. This fact is especially noteworthy considering the continuous integration of financial markets and the over 50% drop in interest rates in the course of the 1990s. The volatility for the entire observation period came to roughly 10 basis points (around the mean of the average yield). A similar

**Historical Volatility for Austria**



Source: OeNB.

**Secondary Market Yield of Government Bonds**

From	Period average %	Volatility
Austria (9 to 10 years)		
1990 to 1994	7.85	0.09
1995 to April 23, 2001	5.65	0.10
Germany (9 years)		
1990 to 1994	7.73	0.11
1995 to April 23, 2001	5.51	0.11

Source: OeNB.

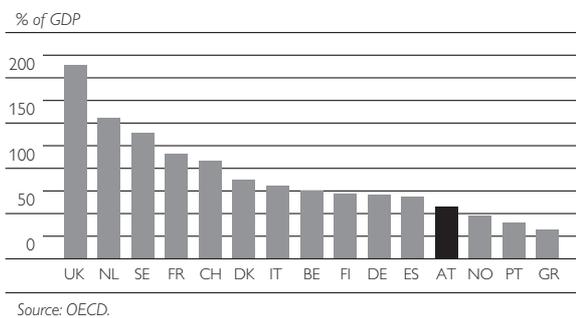
<sup>1</sup> In this report, we examine only what is defined as historical volatility, that is the standard deviation of the daily yield from the mean in a specific month. This indicator allows us to gauge the fluctuations of yields at a specific historical time.

pattern of volatility developments was observed for German secondary market yields on government bonds, both over time and in terms of averages. Hence, it appears logical to assume that the volatility of German secondary market yields is transmitted to Austrian secondary market yields.

## Institutional Investors

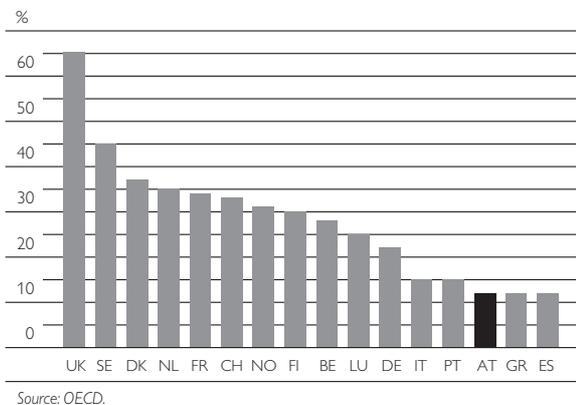
### Institutional Investors'

#### Financial Assets in 1998



### Institutional Investors'

#### Equity Exposure in 1998



The role of institutional investors (insurance companies, pension funds, mutual funds) is not as highly developed as in most other industrialized nations. One key reason is that Austria's pension system is structured as a pay-as-you-go system. In countries with fully funded pension systems, the amount of funds available for investment on capital markets far exceeds that in countries with pay-as-you-go, or unfunded, systems. However, even by comparison to countries in which unfunded systems predominate, the volume of funds placed by institutional investors is low in terms of the country's output – in 1998, institutional investors' financial assets were equivalent to 57% of gross domestic product (GDP).

The structure of investment also differs from that typical of most countries in Europe. Above all, at 12% the share of stocks held by institutional investors fell short of that measured in all other industrial states. Austrian institutional investors concentrated their investment in domestic equities largely on bank and insurance company shares; they held only about 5% of the stocks issued by Austrian corporations outside of the financial sector. While the amendments to the Mutual Fund Act and the Pension Fund Act created the legal prerequisites for pension funds

and mutual funds to invest in riskier assets, like stocks, the actual share of investment in stocks is quite a bit lower than the legal limit.

Nevertheless, the structure of Austrian institutional investors' portfolios has shifted strongly to include more stocks. At the same time, institutional investors' assets have expanded powerfully.

Austrian mutual funds experienced especially dynamic growth in the past few years. Whereas this category's assets had amounted to a mere 21% of savings deposits, holdings burgeoned to an equivalent of 77% at the end of 2000. Not just private households, but also enterprises resorted increasingly to purchases of mutual fund shares as an investment vehicle: Funds targeted at nonretail investors accounted for around one fifth of the total volume of mutual funds' assets. A growing share of pension funds' assets are also administered in the form of mutual funds. In fact, mutual funds specially

created for institutional investors held a somewhat larger volume of funds than mutual funds specifically tailored to nonretail investors.<sup>1)</sup>

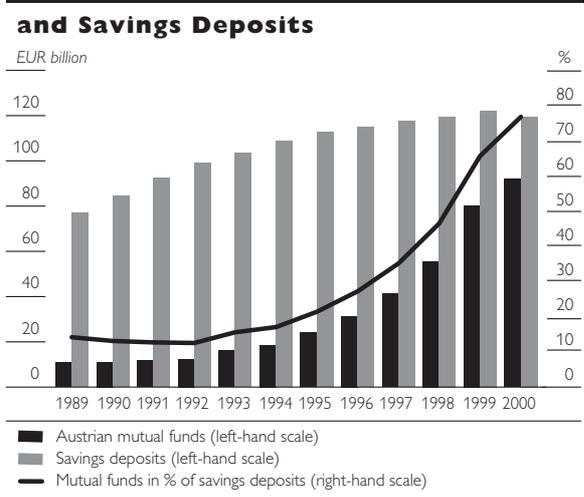
Investment in stocks surged particularly strongly, with mutual funds having nearly doubled their holdings of stocks since 1995 to approximately 20% of assets. Only a minimal portion consisted of Austrian stocks, however: Austrian equities accounted for just EUR 1.3 billion or 7.9% of net new investment in stocks from 1995 to 2000. The share of foreign equities held by mutual funds climbed from 53% in 1990 to 91% in 2000.

The effects sliding stock prices may have on mutual fund assets became tangible in the fourth quarter of 2000: The bear market of the last months of 2000 nearly halved the gain in the volume of stocks and equities built up until September.

Insurance companies, too, shifted more of their investment into stocks and equities in recent years. From 1995 to 2000 the proportion of Austrian stocks in investment assets widened from 11% to 23%, the share of foreign assets augmented from 5% to 21%. Conversely, holdings of bonds and loans diminished in absolute terms. As in the case of banks, public sector financing lost ground in recent years: while 42% of the insurance sector's holdings consisted of federal government securities or insurance lending to the public sector in 1995, this share had contracted to less than a fourth by the end of 2000.

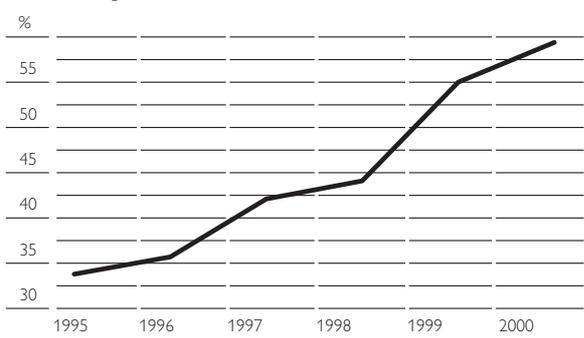
To some extent this reorientation reflects the uncertainty which arose in the wake of the low interest rates of recent years about the actual rate of return on life insurance policies. The insurance supervisory authority decreed a reduction of the guaranteed minimum rate of return to 3.25% from July 1, 2000. The rising volume of fund-based life insurance reflect the increased emphasis on an (equity) market orientation of life insurance companies.

**Development of Mutual Funds and Savings Deposits**



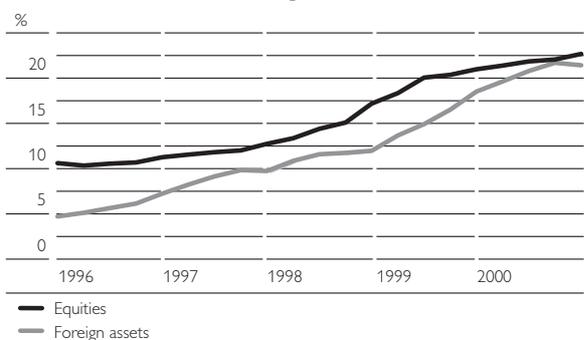
Source: OeNB.

**Share of Austrian Mutual Funds Held by Nonresidents**



Source: OeNB.

**Share of Life Insurance Companies' Assets**



Source: OeNB.

1 Mutual funds invest in mutual funds as well: Funds of funds enjoyed buoyant growth in 1999 and 2000. Roughly half of the rise in total assets in 2000 was recorded in this category.

# The Real Economy and Financial Market Stability

## Nonfinancial Corporations<sup>1)</sup>

### Heavy Reliance of Austrian Businesses on Debt Financing

Editorial close:  
April 12, 2001

The financing pattern of the Austrian corporate sector differs substantially in a number of respects from corporate financial structures in other euro area countries. For Austrian businesses, equity<sup>2)</sup> capital plays a minor role, while the share of debt capital is large by euro area standards.

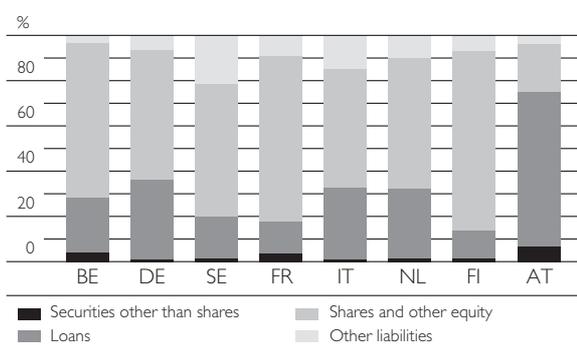
Equity ratios have, however, improved perceptibly at Austrian nonfinancial corporations over the past decade<sup>3)</sup> with the increase stemming first and foremost from internal sources of finance, such as the accrual of reserves and provisions for termination benefits and pensions. In the light of the high self-financing capacity, growth of external funding was significantly lower than the expansion of internal financing.

In Austria, corporate financing has been shifting towards equity financing since the mid-1990s as framework conditions changed amid the integration of the national economy into the European single market and progressing internationalization – as reflected by increasing foreign direct investment – and amid a shift in business promotion schemes from subsidizing loans to offering equity financing support. The ratio of nominal capital<sup>4)</sup> to total assets, which had dropped by half between the early 1980s and mid-1990s, augmented again, albeit not at the same pace as the equity ratio. The ratio of nominal capital to external funds, i.e. the sum total of the par value of shares issued and bank liabilities, likewise increased after having contracted from the beginning of the 1980s to the mid-1990s.

The other side of the medal is that the ratio of bank liabilities to total assets has been on the decline since 1996. From 1990 to 2000 compa-

### Corporate Financial Structure

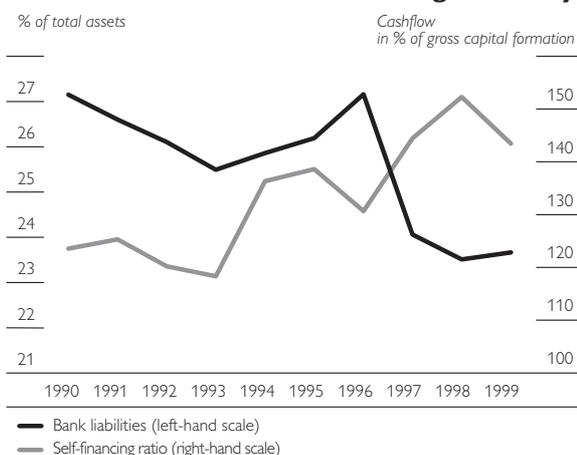
in 1999



Source: Eurostat.

### Financial Ratios

#### of the Austrian Manufacturing Industry



Source: OeNB.

- <sup>1</sup> This section is mainly based on financial accounts data, which are available only from 1995 onward. Figures for 2000 were not available yet at the cut-off date for the report.
- <sup>2</sup> In this context the term equity refers to “shares and other equity, excluding mutual funds shares” as defined in ESA 1995 (European System of Accounts). The ESA 1995 terminology is used in the tables and charts.
- <sup>3</sup> According to the financial ratio analysis published by the OeNB, the equity-to-assets ratio of manufacturing companies rose from 24.5% in 1990 to 31.6% in 1999; the risk-weighted equity ratio, which basically covers equity capital plus provisions, increased from 31.7% to 44.1% over the same period.
- <sup>4</sup> Nominal capital comprises only the paid-up capital or capital stock or partnership interests. Nominal capital does not include share premiums – derived above all from capital increases – which are recorded under reserves. It follows that the nominal capital as such and any ratios derived thereof are not fully conclusive.

nies raised EUR 19 billion on the stock exchange via capital increases and initial public offerings, which corresponded to approximately 4% of gross fixed capital formation.<sup>1)</sup> However, this ratio fluctuated widely, i.e. in the 1% to 7% range, throughout the stated period. In 1997 and 1998, for which international comparisons are available, Austria thus had ratios similar to those of Germany or Italy.

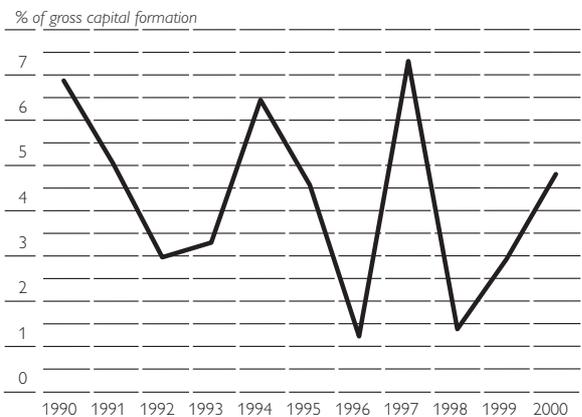
Turning to debt securities as a source of funding, the issuance of bonds<sup>2)</sup> has surged since the mid-1990s. According to financial accounts data the amount of Austrian corporate bonds outstanding almost doubled between 1995 and 1999, augmenting to EUR 14.5 billion from EUR 7.7 billion. Foreign demand was strikingly high. While in 1995 nonresident investors held Austrian bonds worth EUR 3.6 billion, foreign holdings had tripled to more than EUR 10.9 billion by 1999.<sup>3)</sup> The same period saw a decline in domestic demand for corporate bonds, with Austrian holdings of Austrian bonds shrinking from EUR 4.1 billion in 1995 to EUR 3.5 billion in 1999.

The most important debt financing source of Austrian businesses continued to be loans granted by banks and, on a lesser scale, loans extended by the public sector and foreign investors.<sup>4)</sup> In 1999 bank loans accounted for approximately 70% of all corporate liabilities. Above all, it is small and medium-sized enterprises that rely on loans for funding: At the end of 1999, the bank liabilities of

small businesses in the manufacturing industry amounted to as much as 31% of total assets, while the like figure for large enterprises came to about 22%.

One of the reasons for the relatively big role of loans in the corporate financing pattern in Austria is the predominance of small and medium-sized businesses. While the size structure of the corporate sector does not differ

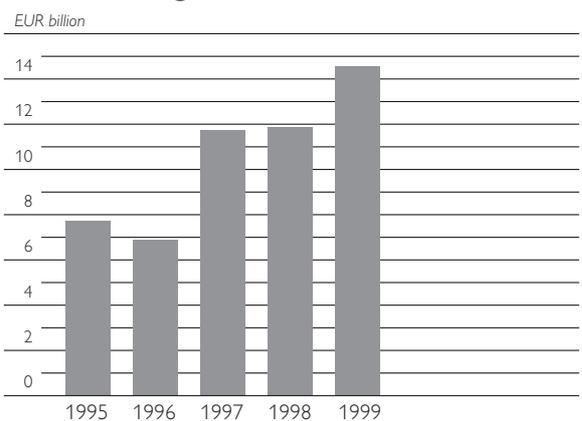
### Capital Raised on the Stock Exchange



Source: OeNB, Statistics Austria.

### Austrian Corporate Securities

#### Outstanding



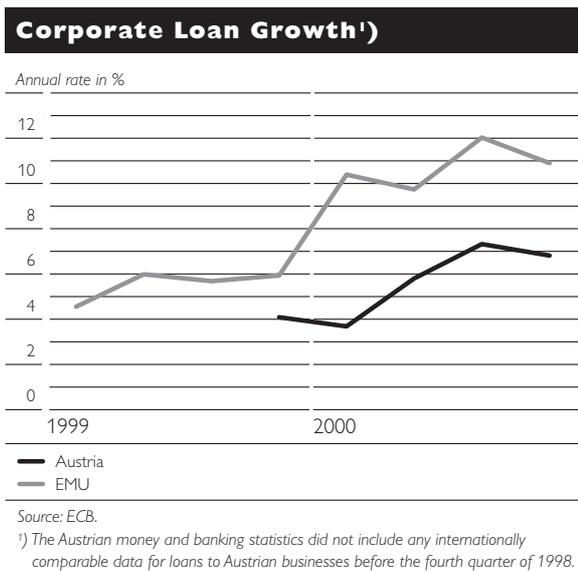
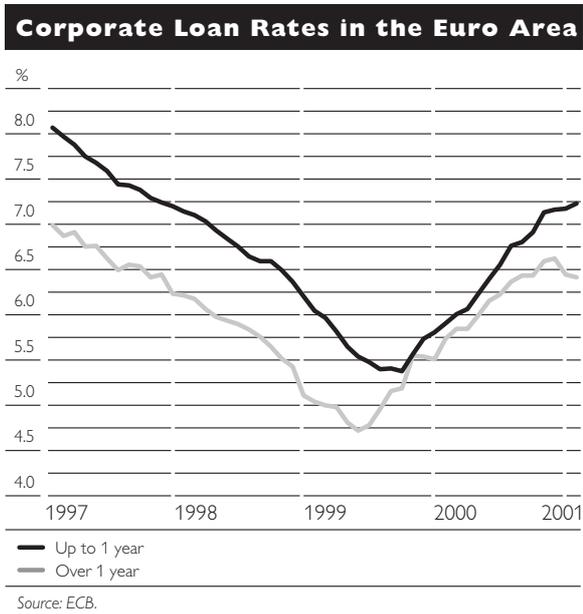
Source: OeNB, Financial accounts.

1 Considering that in the period from 1996 to 1999 stocks worth close to EUR 1 billion were floated not on the Vienna stock exchange but on foreign exchanges (EASDAQ, Neuer Markt Frankfurt, Switzerland), the contribution of issuing activity to gross fixed capital formation over that period was in fact roughly ½ percentage point higher.

2 In this context the term bonds refers to "securities other than shares" as defined in ESA 1995. The ESA 1995 terminology is used in the tables and charts.

3 According to the balance of payments, the bulk of the increase in foreign bond holdings in 1999 is, however, attributable to changes that are not related to transactions, such as market valuation gains.

4 The majority of public sector loans to businesses are extended under intermediary funding programs ("Rechtsträgerfinanzierung"), with the central government issuing bonds to relend the proceeds under unchanged conditions to public-owned entities, which are responsible for servicing the debt themselves.



liabilities to the upside. Adequate capital ratios and sufficient profitability enabled banks to cope with the big bankruptcies of the past few years.

that much between Austria and the EU, the absolute number of larger enterprises is comparatively small in Austria because it is a small economy.<sup>1)</sup>

In addition, for a long time policymakers relied heavily on loan subsidies and other schemes providing debt financing support in their efforts to promote businesses. These days, fewer and fewer loans are being subsidized, though: At the end of 2000 just 4.9% of all loans (excluding home loans) were subsidized.

### Credit Growth Accelerates

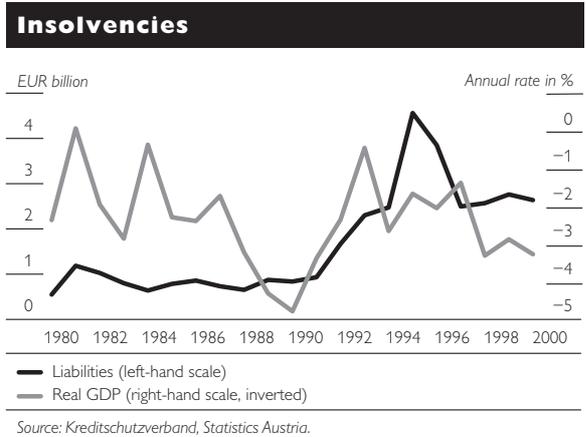
Notwithstanding the rise in interest rates, banks reported brisker corporate demand for loans in both Austria and the euro area in 2000. Among other things, the favorable economic developments in the euro area are likely to have fueled corporate loan demand.

In Austria, as in the euro area, businesses typically fund themselves with long-term loans, which account for approximately two thirds of all bank loans. The rise in interest rates since 1999 and the concomitant narrowing of the interest rate differential between short-term and long-term corporate loans have not had a sustained impact on maturities so far. Since loan demand was more subdued in Austria than in the euro area, the debt burden of businesses from new loans did not rise as strongly. This may have caused banks' credit risk to shrink.

Generally, insolvencies and the economic situation appear to have been negatively correlated since the beginning of the 1990s, even though some large bankruptcies have skewed

<sup>1)</sup> Furthermore, the high significance of bank-intermediated corporate finance can also be traced to institutional aspects. For instance, Austrian insolvency legislation provides for stronger creditor protection than other jurisdictions; hence bank loans are far better hedged.

At present, the risk position of banks vis-à-vis nonfinancial corporations is heavily linked with the loan market. However, given the increasing reliance on equity and on bonds for funding, companies have tended to become less dependent on loan financing. In the longer run this development may cause the credit risk of banks from corporate financing to change markedly. Since particularly companies with above-average creditworthiness tend to tap international bond markets, the quality of banks' loan portfolio may be set to deteriorate. So far, however, banks' risk provisioning would not suggest that such a shift has occurred yet.



## Households<sup>1)</sup>

### Rising Financial Wealth Prompts Structural Change in Financial Markets

The financial wealth of Austrian households has risen markedly over the past few decades. Between 1996 and 1999 household financial assets grew at an average annual rate of 5%, reaching a volume of EUR 261 billion in 1999.

Measured against economic output, this is visibly below the level of other European countries; Belgium and the Netherlands, for instance, report rates that are twice as high.

As bigger wealth allows households to diversify their funds more strongly, new investment options have opened up for them. As a result, the relative importance of “traditional” savings products, such as currency and deposits, in the allocation of financial assets has visibly declined in recent years in Austria, in line with euro area-wide developments. Nevertheless, the share of currency and deposits remains comparatively large by international standards.

While savings deposits are not exposed to a price risk, investments that are subject to market valuation carry a market risk. In recent years households have invested more heavily in life insurance plans and rebalanced their securities portfolios to stocks<sup>2)</sup> and shares of mutual funds.

The shares of directly market-based financing instruments in the allocation of financial assets (stocks and bonds,<sup>3)</sup> mutual funds shares) remained broadly constant between 1995 and 1999.

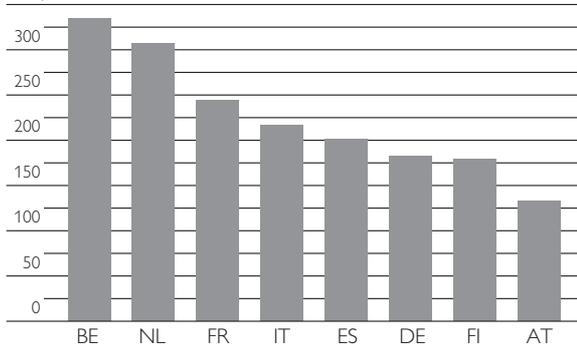
Within securities portfolios, bonds have lost ground since 1995. While in 1995, more than 70% of securities portfolios were invested in bonds, this share had dropped to a mere 30% by 1999. This trend is likely to strengthen in the future.

By contrast, households have substantially increased their exposure to mutual funds shares. In 1999, mutual funds shares accounted for 50% of all securities holdings, up from 20% in 1995.

#### Financial Wealth of Households

in 1999

% of GDP

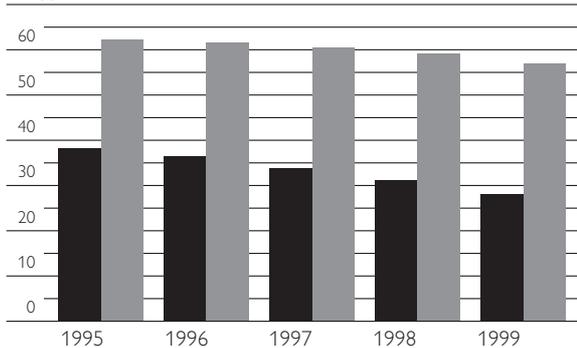


Source: Eurostat.

#### Currency and Deposits

of Households

% of financial assets



■ Belgium, Finland, France, Germany, Italy, Netherlands, Spain  
■ Austria

Source: Eurostat.

1 This section is mainly based on financial accounts data, which are available only from 1995 onward. Figures for 2000 were not available yet at the cut-off date for the report.

2 In this context the term stocks refers to “shares and other equity, excluding mutual funds shares” as defined in ESA 1995 (European System of Accounts). The ESA terminology is used in the tables and charts.

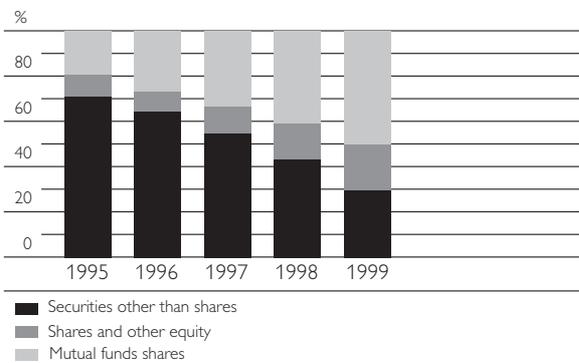
3 In this context the term bonds refers to “securities other than shares” as defined in ESA 1995. The ESA terminology is used in the tables and charts.

Hand in hand with stepped-up investment in mutual funds shares, direct stock holdings by households also surged in recent years. In the survey period the exposure of securities portfolios to stocks doubled to 20%. This dynamic development notwithstanding, Austria trails other euro area countries in international rankings of stock purchases. While Austrian households invested 3.6% of the national income in stocks between 1995 and 1999, the comparable share of other euro area countries was between 15% (Germany) and more than 60% (Belgium).<sup>1)</sup>

Hand in hand with the rebalancing of securities portfolios, the risks underlying households' financial assets have changed as well. The increasing significance of equities – be it through direct purchases of stock or through investment in equity funds – has subjected financial assets to higher volatility. Wealth effects may, therefore, affect households' consumer expenditure more strongly in the future than they have in the past. Such effects are being reinforced through higher investments in foreign stocks, through which investors incur foreign exchange risks unless the euro is the issuing currency. In 1999 foreign stocks accounted for as much as 35% of all equities held by Austrian households. By comparison, the foreign exposure is 7% for shares of mutual funds. The bulk of these investments are probably attributable to the euro area and thus free of foreign currency risk. For instance, just over half of all stocks held by Austrian mutual funds were issued in the euro area. Nevertheless, demand for stocks and mutual funds shares originating from non-euro area countries appears to have risen in recent years. The percentage of financial assets that Austrian households have invested in shares of mutual funds roughly equals the European average. Even though equity funds and balanced funds carry a higher market risk, the market risk underlying stocks and mutual funds shares is much lower in Austria than in other countries.

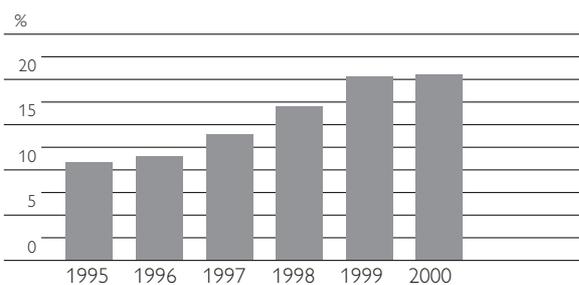
### Securities Portfolios of Households –

#### Asset Allocation



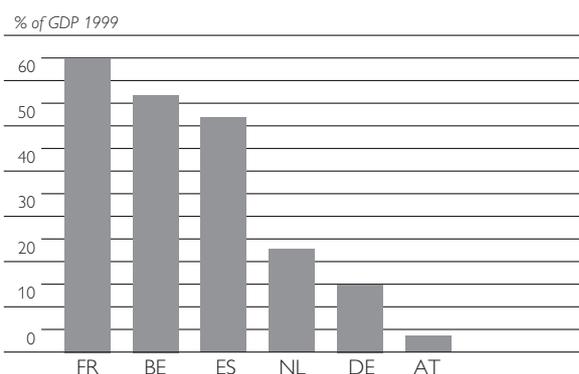
Source: OeNB.

### Equity Exposure of Mutual Funds



Source: OeNB.

### Stock Purchases by Households<sup>1)</sup>



Source: Eurostat.

<sup>1)</sup> Cumulative figures since 1995.

<sup>1)</sup> International data on stocks reflect national characteristics, which make international comparisons somewhat difficult. These factors include how stock assets are valued and whether or not both quoted and unlisted shares are covered.

### Portfolio Investment of Households

in 1999

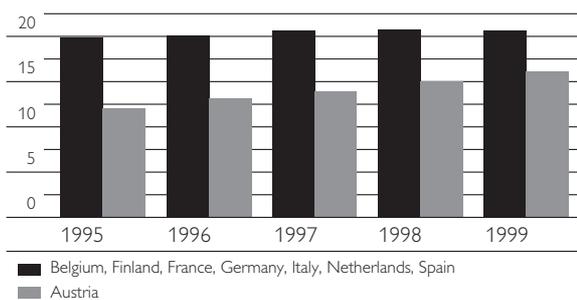
	Securities other than shares	Shares and other equity shares	Mutual funds shares
	% of financial assets		
Belgium	22.0	29.9	13.5
Germany	10.1	16.8	10.5
Spain	1.8	35.8	15.6
France	1.8	39.7	8.7
Italy	17.3	43.3 <sup>1)</sup>	x
Netherlands	2.2	17.6	5.0
Austria	6.8	4.5	11.3
Finland	0.7	69.1 <sup>1)</sup>	x

Source: Eurostat.

<sup>1)</sup> Italy and Finland publish combined figures for shares and mutual funds shares.

### Life Insurance and Pension Fund Investments

% of financial assets



Source: Eurostat.

Increasing amounts of financial assets are being invested in financial instruments with a longer investment horizon, including life insurance and pension fund plans. The share of these two investment forms in Austrian households' financial assets increased from approximately 16% in 1995 to about 20% in 1999. Pension fund schemes in particular attracted substantial amounts of households' financial assets. The accumulation of financial assets in this field is slated to rise as saving for one's own retirement under second and third pillar schemes expands.

These developments have a number of consequences for the risk exposure of financial assets. Money invested in life insurance and pension fund plans cannot be freed up at short notice or only at a cost. Thus, the amount of funds that are rapidly disposable or that can be liquified before a contract runs out is decreasing. This is particularly important for borrowers suddenly having to cope with income losses. The other side of the medal is that long-term investment horizons lessen the significance of short-term volatilities. Consequently, these asset categories should exert no or little wealth effects in times of market uncertainty. Furthermore, the increased accumulation of financial assets in life insurance plans

increases the pool of assets eligible as collateral. This may encourage households to incur debt more readily while offering creditors more reliable guarantees.

As rising income and wealth allow households to diversify their asset allocation more broadly, the vulnerability of financial investments to market and price risks increases. This is true particularly for direct holdings of stock but also for purchases of shares of mutual funds. Higher investment in securities and fixed-term financial instruments lowers the degree of liquidity of households' financial assets. Consequently, a rising portion of financial assets is no longer immediately disposable and available for debt servicing. In periods of rising interest rates this may, for instance, have a negative impact on the default risk of banks as the credit burden rises in general.

Since access to external sources of financing becomes easier the bigger the borrower's financial wealth is, asset growth should broaden the borrowing possibilities of households in Austria. Higher accumulations of financial wealth may prompt households to borrow more readily, since loan collateralization is facilitated and creditworthiness is enhanced in the process.

### Austrian Households Inclined to Borrow More Readily

The indebtedness of households is comparatively low in Austria compared with other euro area countries; at 38% of GDP it was just half as high as in the Netherlands in 1999. Here we have measured household debt on the basis of the liabilities side of the financial accounts of Austrian households, which only reflect their financial liabilities to banks and general government institutions. The overwhelming part of households' liabilities to the public sector stems from home loans.

Demand for bank loans was particularly strong in Austria in 1999 and 2000, exceeding euro area average growth rates. In 2000 demand for loans grew by as much as 11.1%, after having achieved the highest growth rate since the beginning of EMU at 14.5% in the third quarter of the year. Demand for foreign currency loans was particularly buoyant; at the end of 2000 they accounted for approximately 20% of the outstanding loan volume.

In recent years loan growth has significantly surpassed income gains. Consequently, the ratio of bank loans to household disposable income surged from 38% to 45% between 1995 and 1999. In other words, households are posting a rising degree of indebtedness. If this trend continues, the capacity of households to service debt incurred may become impaired.

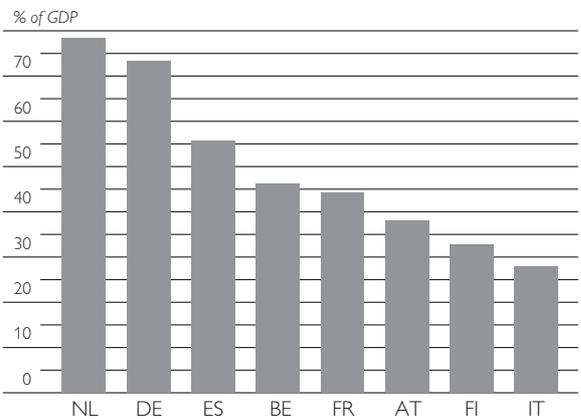
The economic upturn has heightened the appeal of debt financing. The income expectations of households were favorable, and interest rates were low until the second half of 1999. When interest rates rose in the second half of 1999, demand for loans did not subside immediately. Not until the end of 2000 did the growth rate of borrowing by households slow down markedly.

Given the increasing flattening of the yield curve, short-term loans have been replaced by medium- to long-term loans. While in 1997 short-term loans accounted for approximately 15% of the loan volume of households, they made up just 12% of the overall amount in 2000.

Households that took out loans or opted for variable-rate loans in the second half of 2000, on the assumption that interest rates would rise no

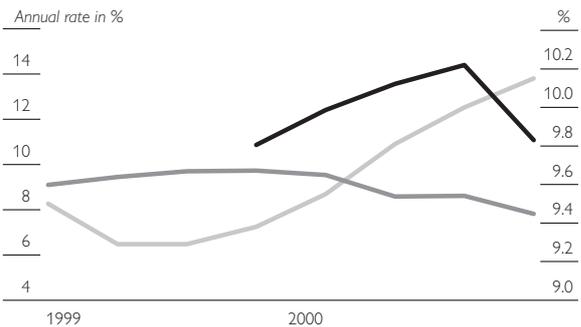
### Liabilities of Households

in 1999



Source: Eurostat.

### Lending to Households<sup>1)</sup>

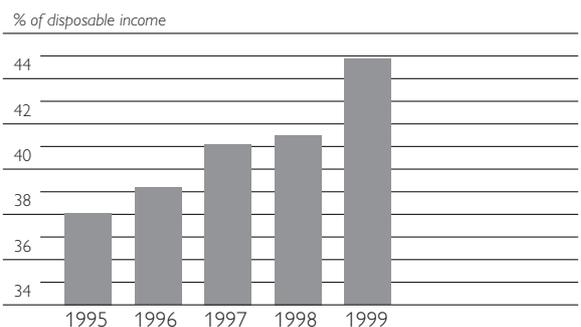


Source: ECB.

<sup>1)</sup> The Austrian money and banking statistics did not include any internationally comparable data on loans to Austrian households before the fourth quarter of 1998.

### Outstanding Bank Loans

to Households



Source: OeNB.

further, may – under current interest rate conditions – constitute a higher default risk. Of all long-term loans taken out, 30% were fixed-interest loans and 70% variable-rate loans. This ratio has remained unchanged in recent months, with foreign currency loans, which are heavily in demand in Austria, typically carrying variable interest rates (see chapter “Financial Markets in Austria,” section “Austrian Credit Institutions”).

The interest rate increase has added to the financial burden of households, having made variable-rate loans and new loans more expensive. This may also reduce borrowers’ capacity to service the debt incurred. While interest rates have remained at a historically low level despite the rate increases, a further substantial rise in interest rates may strain households’ debt servicing capacity. Moreover, expenses for foreign currency loans fluctuated substantially in 1999 and 2000 on account of exchange rate developments.

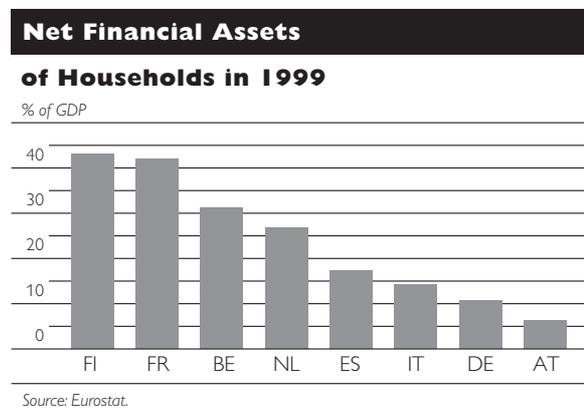
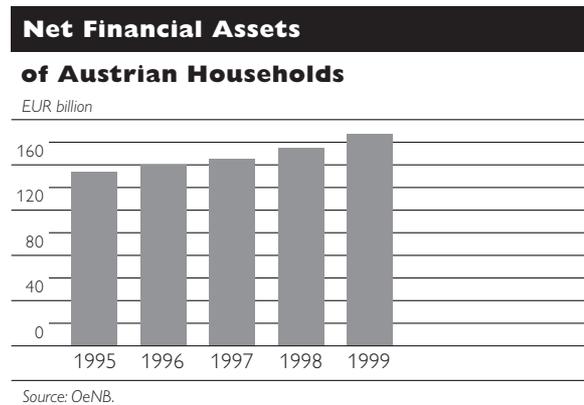
### Net Financial Assets of Households on the Rise

Since the financial liabilities of households have grown more slowly in recent years than their stock of financial assets, their net financial assets (the balance of financial assets over financial liabilities) have expanded. The financial wealth of households is now more than three times as big as overall household

debt. In other words, the indebtedness of households at large is not very high. To properly evaluate household exposure to debt it would be necessary to know the asset and liability allocation by income brackets. Such data are, however, not available for Austria.

A comparison with seven other euro area countries shows that Austrian households hold relatively little net financial assets. Of the countries analyzed, Austria was the only one in which the net financial assets of households did not exceed the annual national income in 1999.

Generally speaking, the debt situation of households in Austria is favorable. Austrian households’ degree of indebtedness puts Austria in the lower middle range in an international ranking. The share of bank loans in disposable income has risen to 45% between 1995 and 1999. With financial assets growing faster than financial liabilities, net financial assets are expanding continually, albeit at a low level compared with other euro area countries. The high degree of foreign currency loans may become problematic, since adverse exchange rate developments may rapidly cause expenses to surge.



## Real Estate Market

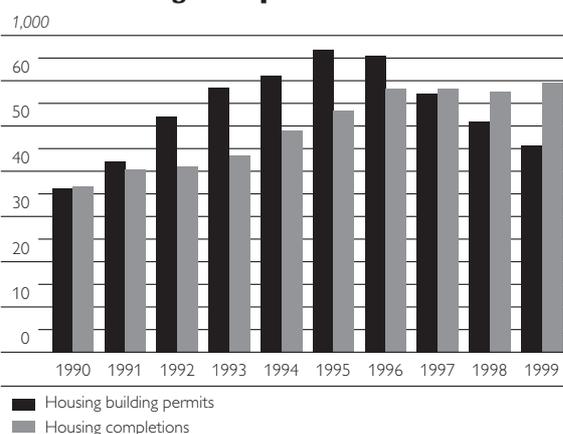
The impact that real estate price movements may have on the stability of a financial market is not negligible. On the one hand, real property is important loan collateral; on the other hand, loans are taken out to finance real estate purchases. Moreover, indirect real estate investment through the purchase of shares in real estate funds is a growing trend. Finally, a number of financial crises have been (partially) caused by real estate bubbles, that is, rises and subsequent falls in the price of real property.

### Decline in Austrian Real Estate Prices Weakening

When at the beginning of the 1990s purchase prices for building lots and apartments boomed and home rental rates climbed, the number of building permits and housing completions was likewise on the rise. Consequently, the market was swamped with new homes, including subsidized owner-occupied homes and publicly assisted rental homes, which in turn depressed real estate prices from the mid-1990s onward. This decline was particularly evident in commercial rental prices, which even dropped below the level of 1990. In some categories the downtrend accelerated further in 1998 and 1999. In parallel, a decline in residential building permits has been observed since 1996, which also fed through to the number of housing completions with a certain time lag.

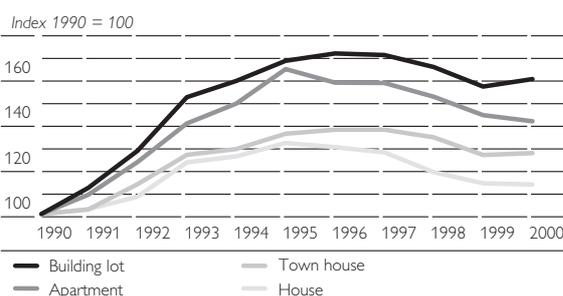
Meanwhile, the downtrend in real estate prices has partially bottomed out. In the Austrian average<sup>1</sup>) only commercial rental prices (–2.4%) and purchase prices for both apartments (–1.9%) and houses (–0.5%) continued to trend downward in 2000. By contrast, rental prices for apartments and purchase prices for town houses and building lots rose again. Rental prices for business and residential property developed along divergent lines: While prices for residential rental units bounced back slightly, rental prices for office space continued to stagnate for the time being. Office space had been high in demand at the beginning of the 1990s, as a result of which rental prices surged. This triggered excess production and oversupply from 1993 and 1994 onward and drove the vacancy rate up from 1% to 5.8% in 1994. During the two final years of the 1990s the office market was marked by crowding out competition between international chains and traditional retailers on the one hand, and by stepped-up highrise

### Residential Building Permits and Housing Completions



Source: Statistics Austria.

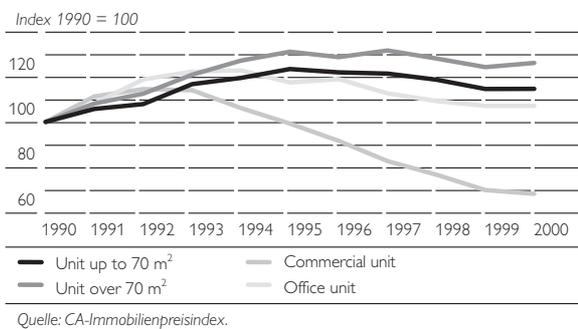
### Purchase Prices in Austria



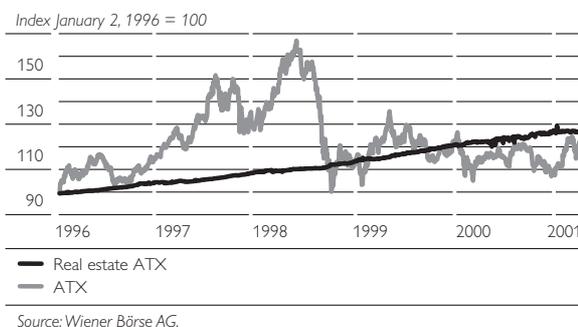
Source: CA-Immobilienpreisindex.

1 The CA-Immobilienpreisindex reflects real estate data compiled annually for the capitals of the Laender.

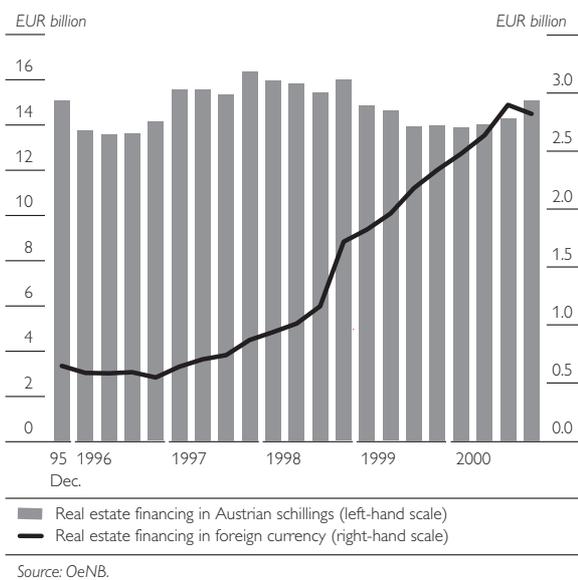
### Rental Home Prices in Austria



### Real Estate ATX and ATX



### Real Estate Financing



building activity on the other hand. Increasing demand caused prices to stagnate. At the same time the office vacancy rate dropped to below 3%, which is incidentally one of the lowest rates in Europe (source: HypoVereinsbank). The years ahead are expected to see new hiring both in the services sector and in the telecommunications and media industries, which should refuel demand for office space.

The number of residential building permits has trended downward since 1996. Housing completions have stagnated at comparatively high levels in recent years. Judging from the net change in existing stock (completion of new buildings minus decrease in residential units through mergers into larger units and demolition) and expected demand (dominated by the trend to second homes), excess supply should continue to rise, if slowly.

The real estate ATX of the Vienna stock exchange (Immobilienaktienindex, IATX), which represents 68% of the capitalization of real estate securities, is marked by high stability and low volatility. The market is under a lot of pressure from investors. This development is slated to continue given the low level of interest rates that alternative investment opportunities carry. However, since the number of adequate investment units is limited, prices are expected to stagnate or drop slightly.

Banks have hardly increased their exposure to real estate financing over the past few years. Similar to developments in the loan business, foreign currency financing has also risen comparatively fast in Austria: From December 1995 to December 2000 the amount of foreign currency financing rose 4.5 times to EUR 2.82 billion (bringing the foreign currency share in lending up to 16%).

Home financing loans (in both Austrian schilling and foreign currencies) came to EUR 0.29 billion on average in December 2000, with the overwhelming part (82%) taken out in foreign currencies.

### Real Estate Markets Go European

National barriers are crumbling also on real estate markets. Demand from both domestic real estate investment companies and German real estate funds has been rising in Austria since 1996. In the 1980s and the first half of the 1990s banks and insurance companies had still dominated the Austrian market.

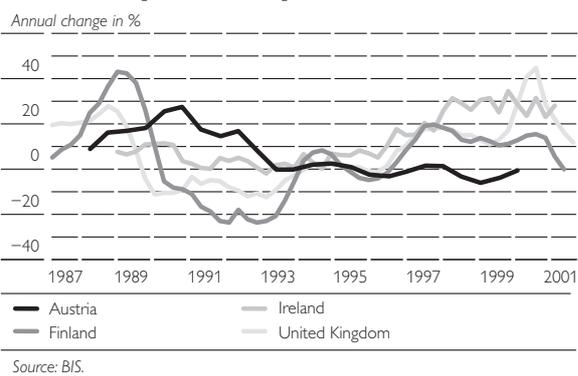
Real estate markets have developed along similar lines throughout Europe. In some countries, such as Finland, Ireland and the United Kingdom, home ownership prices (for houses and apartments) have been rather volatile. In Austria and in the other euro area countries lower volatilities were observed.

Given the increasing need for private retirement provision, demand for home-ownership is strengthening. This part of the housing market is going to play an increasingly bigger role on the real estate market. Across Europe the rates of home ownership are very divergent but generally rising. All over Europe the market for real estate is growing, as both institutional investors and the general government are selling off property and as more inherited property is being put up for sale. In Austria, the Bundesimmobiliengesellschaft, the federal real estate company founded in 1992, has so far generated EUR 1.32 billion from the sale of public real property (budget report 2001).

### Concluding Remarks

With household wealth on the rise, the analysis of the macroeconomic implications of asset prices and of the factors underlying asset price movements has become more important. In the last decade asset prices in Austria did not display developments that would have posed a threat to systemic stability or other risks. The relatively strong boom phase in real estate prices at the beginning of the 1990s flattened after 1993 and ended toward the end of the decade when prices started to drop again. Lately, the trend toward declining prices has come to a halt; partly, prices have started to inch up or have stagnated. Among other things, this development affects the extent of demand for mortgage loans. The direct involvement of banks in real estate financing has hardly risen over the past few years.

#### Real Estate Ownership Prices in a European Comparison



# *Financial Market Developments in Central and Eastern European Countries: A Stocktaking Exercise*

Georg Hubmer,  
Wolfgang Müller,  
Fritz Novak,  
Thomas Reininger,  
Franz Schardax,  
Martin Summer,  
Michael Würz

Editorial close:  
March 2001

## **Introduction**

This paper attempts to give a condensed account of some current facts and issues related to the financial system in five Central and Eastern European countries: Poland, the Czech Republic, Hungary, the Slovak Republic and Slovenia (referred to below as the CEEC-5). The goal is a “stocktaking exercise” after the first ten years of the transition process, highlighting major developments and problems. The paper draws on several sources: From the academic research literature to data and information published by international organizations to data and information we have collected for this project, we have tried to provide the most recent facts whenever possible.

The paper is organized as follows. Section “Financial Sector Transition and Modern Finance Theory” looks at the CEEC-5 economies from a fairly general viewpoint of modern finance theory. It relates some of the central ideas of finance theory to the problems of transition economies, with a special emphasis on discussing the relative merits of a market-based financial system versus a system relying more on financial institutions. The next sections discuss the different parts of the financial system in some detail: Section “The Banking Sector in the CEEC-5” examines the banking sector in the CEEC-5, discussing the history of bank failures and recapitalization programs, privatization, the structure of domestic credit and the efficiency of the banking sector. Section “Capital Markets in the CEEC-5” goes into capital markets, providing information about their size, structure and liquidity as well as foreign participation in the equity market. Section “The Structure of Financial Intermediation in the CEEC-5” reviews the structure of financial intermediation, providing insight into the funding of the private sector and of the public sector. It also briefly describes the risks emanating from domestic capital markets in the CEEC-5. Section “Supervision and Legal Developments in the CEEC-5” contains a country-by-country discussion of supervision and legal developments. The final section, section “The Role of Austrian Banks in the CEEC-5”, assesses the role of Austrian banks in the CEEC-5.

## Financial Sector Transition and Modern Finance Theory

### Introduction

From the perspective of modern economic theory, the financial system fulfills several essential functions for the performance of the real economy. It plays a crucial role in the allocation of resources by channeling funds from households to enterprises, it provides risk-sharing opportunities for households and firms and it helps agents economize on transaction and information costs. While these functions appear to be common to all developed economies, how the financial system is organized varies considerably. While the financial system is strongly based on competitive financial markets in the United States, banks play a predominant role in the German system. Other systems can be viewed as a combination of these two polar cases.<sup>1)</sup> Though there is no widely accepted theoretical framework with which to consistently interpret these differences and to fully understand the relative merits of the various ways in which financial systems are organized, modern finance theory has nevertheless developed ideas which help provide a nuanced picture of the issues. These ideas are relevant to organizing our views on some general issues of the development of transition economies' financial systems. These economies have undertaken substantial efforts during the last decade to build a financial system under the constraints of their legacies from central planning and the initial conditions created by the early policies in the transition process. Below we will give a brief account of some recent ideas of modern finance theory and relate them to problems of financial sector transition.

### Bank and Market-Dominated Finance

While the U.S. financial system is characterized by the strong role competitive security markets play in external financing, bank finance is very predominant in other countries. In fact, banks and financial markets dominate many countries' financial system and consist mostly of markets for public debt. It is, however, an empirically well-established stylized fact that across all these financial systems internal funds are the most important source of finance. This (indirectly) suggests that the banking sector has an important role to play in the external financing of enterprises in transition economies. While internal funds are of predominant importance in the transition economies well, firms are confronted with relatively scarce sources of internal finance due to a lack of accumulated profits. Since capital markets are still relatively underdeveloped, outside financing by banks has to play a preeminent role.<sup>2)</sup> More direct arguments reinforce this conjecture. There is a fairly broad consensus in modern finance theory that financial institutions and intermediaries, in particular banks, help solve market failures and play a compensating role for the limitations of financial markets.<sup>3)</sup> These

1 See Allan, F. and Gale, D. (2000).

2 See Schmitzer, M. (1998).

3 See Allan, F. and Gale, D. (2000); Freixas, X. and Rochet, J. J. (1997); Mishkin, F. (2000).

limitations result from frictions such as market incompleteness, transaction costs, externalities and informational asymmetries. Since financial markets in transition economies are relatively young, despite the spectacular developments that have taken place in the last ten years, there is reason to believe that some of these market frictions are still fairly strong there.<sup>1)</sup> Thus the role of banks and financial institutions is relatively important. This suggests that policymakers should devote considerable effort to developing the performance of the banking sector, though not as an alternative to developing financial markets. The picture of the financial system that emerges from modern finance theory is that it is a complex system of markets and institutions, both of which fulfill often complementary functions. Since banks and intermediaries also have a key function in making markets for securities, the development of the banking sector will, for instance, boost the development of security markets.

### **Intermediated Finance, Delegated Monitoring and Information**

The modern theory of financial intermediation views banks as institutions mitigating problems of asymmetric information between firms and financiers by acting as delegated monitors of firms. Monitoring activities include the screening of projects in a situation of ex ante uncertainty about quality (adverse selection), the prevention of opportunistic borrower behavior during the implementation of a project (moral hazard) and auditing borrowers who fail to meet contractual obligations. Modern intermediation theory argues that banks have advantage a comparative to other financial intermediaries and markets in dealing with asymmetric information. While markets can be very efficient aggregators of information, their information role is characterized by a free rider problem. If the market aggregates and reveals information, nobody has an incentive to collect it. Markets may therefore underinvest in information. Banks have more incentive to gather information about firms. They can pursue their task as delegated monitors in several ways, either by protecting their credits with collateral or by entering into a directly control-oriented way of financing. Since the legal systems in transition economies still make it relatively difficult and expensive to seize collateral goods in case of default and since the markets for these goods are highly illiquid due to strong insider control, transition banking must pursue its delegated monitor function by exercising control-oriented modes of financing.<sup>2)</sup> Hence it is decisive that transition economies strengthen the monitoring incentives and capabilities of banks to facilitate the financing in particular of small and medium-sized enterprises. There is another economic theory argument why the informational role of banks is an important complement for the development of markets. Allan and Gale (2000) have pointed out that intermediaries are essential for exploiting complex financial markets. Intermediaries make it possible for individuals to gain some of the benefits that financial markets can provide without having to bear the

<sup>1</sup> See for instance *European Bank for Reconstruction and Development (1998)*.

<sup>2</sup> See *Schnitzer, M. (1998)*.

(sometimes extraordinary) informational costs. Intermediaries have a comparative advantage not only because they can benefit from economies of scale in information production but also because they can repackage securities in a way that requires less information to evaluate. Furthermore, they can implicitly insure their customers against uncertainty in trading unfamiliar securities. Here we again have a role for complementary functions that suggest that the development of the information processing capabilities of financial intermediaries in transition economies will ultimately accelerate at the same time as the development of security markets.

### **Competition, Risk-Taking Incentives and Financial Market Stability**

The modern theory of finance has stressed incentive problems related to capital structure. One important incentive problem is connected to the combination of debt and limited liability. Since the cash flows of owners under limited liability cannot become negative, leveraged owners have all the gains from success but can pass on losses to the lenders. Therefore, they have an incentive to take more risk than Pareto optimal risk sharing between the owners of a firm and its lenders would require. The incentive effects of this legal construction are particularly strong in banking because banks have a capital structure consisting largely of debt. This issue is particularly relevant to transition economies that open up to foreign capital and at the same time lack sufficiently developed supervisory and regulatory structures to attenuate these incentive problems. An open capital account and unrestrained interbank borrowing allow banks to engage excessively in risk shifting. These risk-shifting incentives may even be exacerbated when a generous financial safety net providing explicit or implicit government guarantees is in place. Risk-shifting incentives are also exacerbated by increased competition resulting from lowered profit margins or fights for market shares. It has long been recognized in the finance literature that there might be a certain tension between increased competition and financial stability.<sup>1)</sup> A competitive financial system characterized by financial markets and an unconcentrated banking sector can sometimes conflict with the stability of a system based on a few dominant institutions. Such a tension can lead to difficult tradeoffs. This also stresses the important role of a complementary legal infrastructure and a regulatory framework that can partially provide the benefits of competition without at the same time exacting an excessive price in the form of increasing financial system instability.

### **Ownership, Control and Corporate Governance**

Though classical finance theory views the corporate sector as a main beneficiary of financial markets, modern finance theory has pointed out that it is perhaps more adequate to see the corporate sector itself as an important part of the financial system. This sector provides many securities that are traded, and the return of these securities in turn depends on the

<sup>1</sup> See Allan, F. and Gale, D. (2000).

performance of the corporate sector.<sup>1)</sup> The financial system plays an important role for corporate governance because it determines control rights. Another reason which supports the view of the corporate sector as part of the financial system is that internal funds are crucial for the financing of enterprises. This importance is very hard to explain for classical finance theory, because in a world of complete, frictionless markets there is no need for internal finance. This empirically important role by itself can be seen as an indicator for frictions in real-world financial systems. There are several explanations for the role of internal finance. Basically it is argued that asymmetric information and incentive problems limit the amount of external finance firms can raise. The firm in this view is regarded as a “financial institution” that can overcome the limitations of markets much like an intermediary can. As we have argued previously, firms in transition economies have relatively scarce sources of internal funds because they had little opportunity to accumulate profits. However, sources of profit have been increasing impressively in the past years. Thus it can be expected that firms will play a growing role in the financial system in the future.

### **Conclusion**

We have given a brief (and selective) account of some ideas of modern finance theory to explore their relevance to transition economies’ recent problems. One basic concept underlying all of these remarks is that the financial system consists of markets and institutions, with institutions assuming functions (imperfect) markets cannot provide. We have emphasised that the development of financial institutions and the banking sector in transition economies plays a decisive role for the development of financial markets. We have also pointed out that prudent economic policymakers have to be aware that competition policy can conflict with the goals of financial stability, and that there can be difficult tradeoffs sometimes. Hence reaping the benefits from competition in the financial system for the economy as a whole without paying too high a price in terms of financial instability requires a suitable legal and regulatory infrastructure. Finally, we have pointed out that firms will play an increasingly prominent role as financial institutions in transition economies’ financial systems.

1 See Allan, F. and Gale, D. (2000).

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## The Banking Sector in the CEEC-5

### The Legacy of Central Planning , Early Reforms and Early Bank Failures

Under central planning the financial system was little more than a bookkeeping mechanism for recording the authorities' decisions about the allocation of resources among various sectors and enterprises. At the onset of transition the following key reforms were implemented:

- a two-tier banking system was introduced,
- sectoral restrictions on specialized banks were lifted,
- privately owned banks were admitted,
- foreign banks and joint ventures were granted access,
- the licensing policy for most kinds of banking business was liberalized,
- the legal framework and supervisory system were liberalized.

The liberal licensing policy together with shortcomings in the legal framework and supervisory system gave rise to the establishment of a large number of newly founded banks which often engaged in unsound practices. The state-owned commercial banks (which emanated from the old mono-bank system) in turn, suffered from an inherited burden of bad loans. Banking systems generally lacked capital and banking skills. These deficiencies coupled with the uncertain economic environment prevailing at the beginning of transition resulted in the quick accumulation of bad loans and – finally – in a number of banking crises.

### Recapitalization Programs

Although not all countries under review experienced fully-fledged banking crises, all undertook large-scale bank-recapitalization programs, mostly from 1993 to 1996. While Hungary, Poland and Slovenia succeeded in stabilizing their banking systems with the help of these programs by 1997, the Czech Republic and the Slovak Republic faced continuing problems. The Czech Republic had to put up additional public funds to prepare the country's largest banks for privatization, at a total fiscal cost of 12.3% of (1999) GDP since the reforms were launched. While some funds may be recovered (e.g. by privatization revenues for Komerční Banka), the figures presented in the table "Fiscal costs of bank recapitalization" do not include the yet unknown costs of the recent failure of Investiční a Poštovní banka (IPB). The Slovak

Republic was last in recapitalizing its banks, and costs are among the highest in the region. However, the figures presented below for the Slovak Republic represent the total amount of bad loan transfers from commercial banks to state institutions, and thus are not directly comparable with the other figures, because some costs probably will be recovered, since not all of these loans will be entirely lost. In terms of total costs, Poland was most successful, as the costs of bank recapitalization were below 2% of (1999) GDP. Poland's success is attributable to the design of the recapitalization program, which provided the least incentive for moral hazard, but also to the relatively small size of the Polish banking sector in relation to GDP.

### Fiscal Costs of Bank Recapitalization

	Czech Republik	Hungary	Poland	Slovak Republic <sup>1)</sup>	Slovenia
The main part of the recapitalization program was completed year	1997	1994	1996	2000	1997
Fiscal costs up to the year indicated above in % of GDP in that year	8.9	7.2	1.6	14.3	2.5
Fiscal costs of the recapitalization program up to the year 2000 in % of GDP in 1999	12.3	6.5	1.5	14.3	2.0

Source: National central banks, Kawalec, S. (1999), OeNB.

<sup>1)</sup> Figures are not directly comparable (see text).

### Privatization

Progress in bank privatization differs among the CEEC-5. At the end of 1999, state banks held only 9% of the sector's assets in Hungary, followed by 23% (exclusive of Česká Spořitelna and Komerční Banka) in the Czech Republic. In Poland the state's stake stood at 25%, while it was significantly higher in Slovenia (42%) and in the Slovak Republic (51%) in 1999<sup>1)</sup>. Privatization efforts appear to have been a (direct) response to (continued) problems in running the banks in the Czech Republic, the Slovak Republic<sup>2)</sup> and to some degree in Hungary, while in Poland and Slovenia the time span between recapitalization and privatization is larger.

### The Structure of Domestic Credit

The change in the structure of domestic credit is characterized by a strong cutback of *central bank* lending to the *government* in Poland and Hungary. In the Czech Republic, central bank credit to the general government has been zero since 1996, down from around 4% of GDP in 1993. In Slovenia, it has been roughly zero since 1992.

After having risen from 1992 to 1995, *commercial banks'* lending to government declined in Poland and Hungary from 1995 onward because the countries pursued cautious fiscal policies and because the role of direct

1 See European Bank for Reconstruction and Development (2000)

2 The Slovak Republic took concrete steps to privatize the country's two largest banks in 2000 and 2001.

financial intermediation between (foreign) nonbanks and the government grew.

From 1995 to 1998, this development helped boost bank lending to the *corporate sector* in Poland and Hungary to a level of about 18% of GDP, which, however, was still less than in 1992. In Slovenia, bank lending increased to roughly the same level (18% to 20% of GDP), while it declined in the Czech Republic in 1998. This decline was caused by the structural bad-loan problem and by the even more restrictive turn in monetary policy in 1997 and 1998. Lower bank lending contributed to the recession in 1998, which in turn reinforced the decline in lending. A comparison of lending to households between those countries reveals a quite divergent pattern.

### Domestic Credit (including Foreign Exchange Credit) of the Banking System

	Poland		Hungary <sup>1)</sup>		Czech Republik		Slovenia	
	1992	1998	1992	1998	1993	1998	1992	1998
	<i>Average in % of GDP</i>							
Total	31.4	33.0	60.9	34.6	65.6	63.4	17.4	34.7
Net credit to public	12.1	10.6	28.6	12.5	1.3	1.8	- 0.3	5.8
Credit to corporate	18.4	18.1	22.8	18.0	55.6	55.5	16.0	20.0
Credit to households	0.8	3.8	9.5	3.6	8.7	6.1	1.6	8.4

Source: National central banks, WIW, OeNB.

<sup>1)</sup> Excluding external debt for the government channeled through the central bank (as the external debt of the governments is not included in case of the other countries, either).

The ratio of resident commercial banks' lending to the corporate sector to total gross fixed capital investment has fallen from 25% to 35% to 10% to 19% since the early 1990s. This is probably attributable to not just one, but several partly interrelated factors:

- the improved self-financing capacity of companies,
- resident commercial banks' improved lending control and risk assessment,
- an insufficient increase in resident banks' lending capacity<sup>1)</sup> and
- high real lending rates.

### Credit to the Corporate Sector by the Banking

Poland		Hungary		Czech Republik		Slovenia	
1992–1994	1996–1998	1990–1991	1996–1998	1993–1994	1996–1998	1992–1994	1996–1998
<i>Change in % of gross fixed capital investment</i>							
25.2	18.7	25.4	19.0	34.4	10.6	29.7	14.0

Source: National central banks, WIW, OeNB.

The parallel considerable increase in nonresident banks' cross-border lending<sup>2)</sup> indicates that lending by resident (domestically or foreign-owned)

<sup>1)</sup> In particular, the traditionally large banks do not seem to have improved the efficiency of their internal organization of credit allocation sufficiently, resulting at times in disproportionate credit restrictions.

<sup>2)</sup> See section "The Structure of Financial Intermediation in the CEEC-5."

commercial banks did not sufficiently meet the growing investment needs of an economy striving to catch up with the European Union. In addition, it has to be noted that an increasing part of gross fixed capital investment was financed by intercompany loans extended by the foreign parent company.

Deposits are mostly held in domestic currency. The share of foreign currency denominated deposits is somewhat larger in Slovenia, probably because of the history of high inflation in former Yugoslavia and soon after independence. In general, the share of foreign currency denominated deposits shows a declining trend in the long-term, reflecting an increasing trust in the local currency. Temporary increases in the share of foreign currency denominated deposits seem to have been connected with times of economic turbulence (e.g. in Hungary in 1995 and the Czech Republic in 1997).

### Foreign Exchange Deposits of Nonbanks

End of period	1993	1994	1995	1996	1997	1998
	% of money supply including foreign exchange-deposits					
Poland	28.8	28.5	20.4	17.3	17.5	15.2
Hungary	17.0	18.4	23.6	21.1	19.4	18.8
Czech Republik	8.0	7.0	8.4	7.6	11.4	11.1
Slovenia	46.8	35.9	36.1	35.9	31.0	27.2

Source: National central banks, OeNB.

### Banking Sector Efficiency

Real lending rates have been rather high, in particular as measured against industrial producer price inflation. CPI-deflated deposit rates have been rather low. This seems to have been mainly the consequence of the use of high minimum reserve requirements with little or no compensation as an important tool of monetary policy and of the rather weak competition between banks in the retail business. (The fact that the deposit rates are particularly low in the Czech Republic is probably due to the lack of efficiency in the banking sector, in particular the burden of bad loans.)

The margin between lending and deposit rates declined significantly from 1994 and 1995 to 1997 and 1998 in all CEECs under study. This can be attributed to foreign strategic takeovers of (stakes in) domestic banks and to the intensified competition due to market entrances and foreign cross-border lending.

Banking sector profitability is generally rather low for a number of reasons, in particular increasing competition and decreasing margins, relatively higher funding costs of domestic (versus foreign-owned) banks and – above all in the Czech Republic and the Slovak Republic – still relatively high burdens of bad loans. In the first half of 2000,<sup>1)</sup> profitability was highest in Poland (return on assets, ROA 1.31%,

### Lending Rate to Nonbanks minus Deposit Rate

	1994–1995	1997–1998	1999
	Difference in percentage points of the annual average of rates in % p. a.		
Polen	11.0	6.1	7.0
Hungary	6.8	3.7	3.9
Czech Republic	5.9	5.3	4.2
Slovenia	5.1	4.5	3.9

Source: National central banks, OeNB.

<sup>1)</sup> For Hungary only figures for 1999 are available.

return on equity, ROE 17.95%) and in the relatively protected Slovenian banking sector (ROA 1.19%, ROE 12.2%).

In 1999, the growth of the capital base (+14.7%) matched the growth in assets (+14.3%) only in Poland (excluding recapitalization measures in the Czech Republic and the Slovak Republic), resulting in pressure on capital levels in the other countries. While capital adequacy ratios in general still exceed levels prevailing in Western European countries, the higher levels of risks in these banking sectors have to be taken into consideration, too.

### Banking sector indicators

	Czech Republic <sup>1)</sup>	Hungary <sup>2)</sup>	Poland <sup>3)</sup>	Slovak Republic <sup>4)</sup>	Slovenia <sup>5)</sup>
Banking assets (December 31, 1999), total, euro billion	69.64	28.80	86.13	18.14	13.51
Banking assets, total % of (1999) GDP	136.9	64.1	59.5	94.4	73.9
Nonperforming loans (June 6, 2000), share in total assets	9.4	37	4.6	8.3	5.2
Return on average assets (June 6, 2000)	0.35	0.55	1.31	- 0.16	1.19
Return on equity (June 6, 2000)	6.56	6.00	17.95	- 2.25	12.20
Foreign ownership, share in equity (December 31, 1999)	48.40	65.30	53.12	25.54	11.30
Percent of total assets held by given number of banks (December 31, 1999)	61	51	68	48	82
	4 banks	5 banks	10 banks	3 banks	10 banks

Source: National central banks, OeNB.

<sup>1)</sup> Percent of total assets held by given number of banks as of June 6, 2000.

<sup>2)</sup> All figures as of December 31, 1999; Nonperforming loans: Percent of risky assets including off-balance-sheet items.

<sup>3)</sup> Nonperforming loans, ROA, ROE: commercial banks only.

<sup>4)</sup> Percent of total assets held by given number of banks, foreign ownership as of June 30, 2000.

<sup>5)</sup> Slovenia: Nonperforming loans: Percent of risky assets including off-balance-sheet.

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## Capital Markets in the CEEC-5

The capital markets in the CEEC-5 comprise both the equity markets as well as markets for debt securities denominated in local currency (LCY).

### The Establishment of Equity Markets

The development of equity markets in the CEEC-5 was driven mainly by the privatization process. In terms of market capitalization equity markets developed most rapidly initially in countries where mass privatization schemes were initiated, in particular in the Czech Republic, the Slovak Republic and to some degree in Slovenia. Market infrastructure and regulation was often put in place after the establishment of a rudimentary market. In Poland and Hungary infrastructure and an extensive regulatory framework was established first, and new listings gradually entered the market. The latter approach proved more successful, which is reflected in the higher liquidity and better performance of stock indices in Hungary and Poland. The Czech, Slovak and Slovenian equity markets exhibit a more fragmented structure with a comparatively large number of small companies with low liquidity. Besides, Hungarian and Polish companies tended to be at a more advanced stage of restructuring than their peers in the other countries when they were listed, which had a positive impact on the development of the respective stock prices.

### The Establishment of Markets for LCY Debt Securities

The emergence of these markets was linked mainly to the management of public debt and the process of macroeconomic stabilization. The securitization of loans denominated in local currency went in parallel to the declining importance of the central bank as a creditor to the public sector. It should be noted that the following sections on markets for debt securities denominated in local currency focus on publicly issued debt securities and do not include privately placed debt securities.

### The Size and Structure of Securities Markets

The ranking of the CEECs by the *capitalization* of their *equity markets* differs when measured in terms of total or free-float capitalization and when measured in absolute or relative terms. Thus at the end of 1998, Poland had the highest total equity market capitalization in absolute terms (USD 20.7 billion), while Hungary took the first place in terms of the free-float market capitalization (USD 7.5 billion). Both as total and, in particular, as free-float capitalization, Hungary clearly exhibited the highest market capitalization in relation to GDP (29.5% and 15.7% of GDP, respectively).

Compared to the equity markets of most developed market economies, the equity markets in CEECs are, however, still small in relation to the size of the economy (U.S.A.: 163.4% of GDP; Germany: 51.3%) and – as a matter of fact – even more so in absolute terms.

Within the CEE equity markets, trading of shares takes primarily place on the main market segment of the stock exchange, where the most liquid blue-chip companies are listed. The share of the main market segment in

total turnover lies between 72% (Prague) and close to 100% in total turnover.

Almost all the benchmark equity indices calculated by the stock exchanges concentrate on the blue-chip companies of the main market segments, but wider indices (including equities of the secondary market segment) also exist. Within these benchmark indices, the five highest capitalized shares had a cumulative weight of at least 53% (Warsaw). They are mostly (adjusted) market capitalization weighted price indices, only the Budapest index (BUX) is an adjusted total return index. Minimum listing requirements of CEE stock exchanges are quite different, the Budapest Stock Exchange being the most restrictive, followed by Warsaw.

The market capitalization (at face value) of *publicly issued debt securities denominated in local currency (LCY)* in absolute U.S. dollar terms largely mirrored the absolute size of the total economy at the end of 1998 (e.g. USD 14.2 billion of long-term securities for Poland, USD 1.2 billion of long-term securities for Slovenia).

<b>Market capitalization</b>				
End of 1998	Poland	Hungary	Czech Republic	Slovenia
	USD million			
Equity markets				
Total	20,674	14,047	13,941	3,505
Free float	6,588	7,473	3,031	..
	% of GDP			
Total	13.1	29.5	25.3	18.0
Free Float	4.2	15.7	5.5	..
	USD million			
Debt securities denominated in LCY				
Short-term	8,252	4,777	3,315	50
Long-term	14,179	7,275	8,422	1,175
	% of GDP			
Short-term	5.2	10.0	6.0	0.3
Long-term	9.0	15.3	15.3	6.0

Source: National sources.

However, the market capitalization (at face value) of publicly issued LCY – debt securities relative to GDP reveals that Poland (short-term securities 5.2% of GDP, long-term securities 9.0% of GDP) clearly lagged behind the Czech Republic (6.0% and 15.3% of GDP, respectively) and Hungary (10.0% and 15.3% of GDP, respectively) at the end of 1998.

The smaller size of markets for LCY debt securities (relative to GDP) in CEECs in comparison with the most developed market economies is attributable to the lower public debt burden in CEECs and to the higher (inherited) share of foreign currency denominated debt in total public debt.

Concerning the *issuer structure*, bonds of the central government are predominant in Poland and Hungary while they constituted only 28% of the capitalization of all bonds in the Czech Republic at the end of 1998.

Regarding the maturity structure of the outstanding debt securities, it is noteworthy that the volume of long-term paper was clearly larger in all countries at the end of 1998, reflecting the success of financial stabilization and disinflation.

Comparing the secondary markets for equities and for LCY denominated debt securities, the total capitalization of the equity market was bigger than the market capitalization (at face value) of publicly issued LCY debt securities in most countries except Poland. However, the free-float market capitalization was clearly lower in all countries.

### Liquidity of Securities Markets

Hungary stood out with the highest *equity turnover*, which had doubled from 1997 to 1998 to reach more than USD 16 billion. As a percentage of nominal

GDP, the top position of the Hungarian equity market is all the more impressive, having reached 33.9% in 1998.

Poland had the highest *turnover of LCY debt securities* in absolute terms (USD 120.7 billion). Related to nominal GDP, Hungary and the Czech Republic have the highest turnover of LCY debt securities, with levels of around 90% of GDP.

As to the *maturity structure*, Hungary had the lowest share of T-bill turnover in the total turnover in publicly issued LCY denominated debt securities. This exceptional situation in Hungary may probably be explained by the following facts:

- as opposed to Poland, for instance, the Hungarian T-bill market is not open to foreign investors, while the T-bond market is accessible to them;
- in general, the T-bond market in Hungary already constitutes an institutionally more developed alternative for domestic investors than that in Poland, for instance.

We can compare the *liquidity* of the capital markets using market turnover and market capitalization. With foreign trading activity strong, the Hungarian equity market was clearly the most liquid market if measured by the turnover ratio based on both total market capitalization and free-float market capitalization.

The liquidity of the Hungarian equity market was even comparable to that of the U.S. equity market, as total equity turnover amounted to 110% of market capitalization in Hungary in 1998 compared to 106% of market capitalization in the U.S.A. in 1999.

Comparing the secondary markets for equities and for LCY denominated debt securities, the market liquidity (as measured by the turnover ratio) was considerably higher in the debt market, except in Slovenia. What is more, the LCY bond market (i.e. the segment of longer maturities within the market for LCY debt securities) was more liquid than the equity market, even if the liquidity of the latter is based on the (lower) free-float market capitalization.

The T-bill market was generally far more liquid than the bond market, except in Hungary.

### Foreign Participation in the Equity Markets

At first glance, the share of the stock of foreign *portfolio* investment in total market capitalization does not seem to be particularly high in the CEECs, as it ranges between 4% and 27%.

However, it should be noted that the total market capitalization includes all strategic stakes as well. Unfortunately, a breakdown of the ownership structure of the total capital of all the listed companies exists only for

### Secondary Market Turnover

(Single counted, 1998)	Poland	Hungary	Czech Republic	Slovenia
Equity markets				
USD million	8,917	16,135	5,348	866
% of GDP	5.7	33.9	9.7	4.4
Debt securities denominated in LCY				
USD million	120,694	42,381	51,373	96
% of GDP	76.5	89.0	93.1	0.5

Source: National sources.

### Market Liquidity

1998	Poland	Hungary	Czech Republic	Slovenia
<i>Turnover in % of annual average total capitalization and year-end free-float capitalization</i>				
Equity markets				
Total	54	110	38	32
Free-float	135	216	176	..
<i>Turnover in % of annual average market capitalization</i>				
Debt securities denominated in LCY				
Short-term	1,079	253	1,121	10
Long-term	233	465	278	9

Source: National sources.

### Market Participant

#### Foreign Portfolio Equity Investment

	Poland	Hungary	Czech Republic	Slovenia
	% of total market capitalization			
End of 1998	24.0	16.5	27.2	4.1

Source: National sources.

### Ownership Structure of Listed

End of 1998	Hungary
	%
Government	11.1
Personal investors	10.3
Nonfinancial firms	2.8
Institutional investors	4.0
Commercial banks	0.7
Foreign investors	71.2

Source: National Bank of Hungary.

### Foreign Share of Secondary Market

Minimum estimate, annual average 1998	Poland	Hungary	Czech Republic
	%		
Equity markets	49	57	55

Source: National sources.

Hungary, where the share of *total* foreign investment in these companies, comprising both direct and portfolio investment, was about 71%, and the share of the government amounted to 11%.

Under the assumption that all *private domestic* equity investment (by households and by companies) can be regarded as *portfolio* investment (i.e. nonstrategic holdings), foreign portfolio investors held about half of *total portfolio* investment in the Hungarian equity market at the end of 1998, although their share in the total market capitalization was no more than 16.5%.

We can estimate the share of foreign portfolio investors in the total *turnover* of the equity market in Poland, Hungary and the Czech Republic as being clearly above 50%.

In addition, trading in CEE equities takes place not only on the local stock exchanges, but also on foreign stock exchanges, either in form of ordinary shares or mostly in form of depositary receipts (DRs). Because of their specific advantages to both CEE companies and investors, trading in DRs has gained considerable importance. For CEE companies, DRs offer the advantage of enhancing the liquidity of their shares, widening their investor base as well as of

improving their corporate image. As DRs are denominated in U.S. dollars and traded on an international exchange, their advantages for institutional investors are related to their better liquidity, the absence of conversion costs and to familiar market practices.

Assessing trading in CEE equities on both local and foreign stock exchanges, it is fair to state that trading in CEE equities is overwhelmingly done by foreign portfolio investors.

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## The Structure of Financial Intermediation

### in the CEEC-5

#### Funding of the Private Sector

##### International Comparison of the Private Sector's Funding Sources

The volume of domestic credit to the private nonfinancial sector provided by resident banks tends to be lower in the CEECs (20% to 30% of GDP in 1998) than in Portugal and Spain, the Southern European catching-up economies within the EU (65% to 85% of GDP in 1998). The main exception is the Czech Republic, where the ratio was 62%. However, it has to be stressed that the yearly average amount of classified loans was about 15% of GDP in the Czech Republic, as against 4.4% in Hungary and 2.8% in Poland. If we take into account the specific loan provisions at the time, the remaining net volume of classified loans was 9% of GDP in the Czech Republic and 3.5% in Hungary. These classified loans include as the lowest-ranked category so-called bad loans, or loss loans, which amounted to 8% of GDP in the Czech Republic, 0.6% in Hungary and 1.0% in Poland.

The volume of cross-border loans (excluding trade credits) nonresident banks granted to private nonbanks amounted to 4% to 13% of GDP in the CEECs, while it was 5% to 10% in Portugal and Spain in 1998. While these volumes are clearly lower than the volumes of domestic credit, their growth rates are significantly higher than the growth rates of the domestic credit in the CEECs, substantially increasing their ratio to GDP. This has certainly been linked to the liberalization of medium- and long-term capital flows. On the other hand, the corresponding ratios to GDP even declined in Portugal and Spain, while their domestic credit ratios to GDP sharply increased.

The volume of cross-border liabilities of resident commercial banks was by far higher in Portugal and Spain (28% to 50% of GDP) than in the CEECs (3% to 18%) in 1998. In Portugal and Spain, these liabilities consisted above all of short-term capital. Correspondingly, the Czech Republic, which has had the most liberal regime for capital flows (including short-term capital) for several years, showed by far the highest ratio among the CEECs (18%). In Portugal and Spain, these ratios have increased dramatically after the liberalization of short-term capital flows at the end of 1992.

#### International Comparison of Domestic and Foreign Funding

##### to the Private Sector 1998

Annual average 1998

	Poland	Hungary	Czech Republic	Slovenia	Portugal	Spain	Greece
<i>Outstanding volumes in % of GDP</i>							
Credit to the private nonfinancial sector by resident banks	21.9	21.7	61.6	28.4	84.1	65.1	25.9
Cross-border loans to private nonbanks (excluding trade credits)	3.8	6.2	13.0	6.9	10.2	5.1	..
Cross-border liabilities of resident commercial banks	3.0	10.7	18.4	6.3	50.2	28.2	31.4

Source: National central banks, IMF, WIW, OeNB.

To sum it up, in our view the liberalization of short-term capital flows led to a huge inflow of short-term capital to refund resident banks in Portugal and Spain. This fueled the growth of domestic credit to the private nonfinancial sector, which – inter alia – led to a partial substitution of cross-border loans taken out abroad by the private nonfinancial sector. In contrast, most CEECs have not yet fully liberalized short-term capital flows, and the CEEC which did so early and comprehensively, the Czech Republic, showed a pattern different from that of Portugal or Spain. There, domestic credit growth does not seem to have been enhanced by the inflow of short-term capital to banks, and cross-border loans grew in parallel to that inflow. This indicates that the domestic banking system could not efficiently handle the additional funding to successfully compete with cross-border loans to private nonbanks. Moreover, this development also has to be seen in the context of the burden of bad loans, general microeconomic problems at the corporate level, and the destabilization of the currency regime. Thus, the full liberalization of capital flows was probably premature.

### Comparison of the Channels of Financial Intermediation to Enterprises

Below we relate the changes in the external funding of enterprises to the gross fixed capital investment (GFCI) averages for 1997 and 1998.

#### International Comparison of Financial Intermediation to Enterprises

##### External Corporate Funding Relative to Gross Fixed Capital Investment from 1997 to 1998

Average of 1997 and 1998	Poland	Hungary	Czech Republic	Slovenia	Portugal	Spain	Germany	U.S.A.
<i>Flows or changes in stocks in % of GFCI</i>								
Credit by resident banks	17.0	19.2	6.5	14.4	32.8	19.9	17.0	6.8
Cross-border loans by nonresident banks	6.6	5.3	5.7	6.3	- 2.0	3.1	..	..
Intercompany loans	5.9	6.2	0.0	1.2	0.2	1.5	..	..
International debt securities	1.8	- 0.1	0.1	0.5	0.6	0.0	..	..
Domestic debt securities	1.3	2.3	1.7	0.0	3.5	1.4	..	..
Equity issuance due to capital increases (via IPOs or SPOs)	2.8	0.5	0.0	0.0	7.6	4.8	3.8	14.3

Source: National sources, IMF, WIIW, OeNB.

In the CEECs as well as in selected EU countries (Portugal, Spain and Germany), the change in domestic credit extended by resident banks was the most important source of external funding to enterprises (7% to 33% of GFCI), while it was equity issuance due to capital increases in the U.S.A. (14%). The ratios were mostly between 15% and 20%. The value of 7% for the Czech Republic was extraordinarily low and was linked to the recession. Hence, the predominance of loan-based (“bank-based”) versus equity-based (“market-based”) intermediation exists in both the EU and the CEECs.

In the CEECs, the change in cross-border loans granted by nonresident banks came second (5% to 7% of GFCI), closely followed by intercompany loans of transnational corporations in some countries (Poland, Hungary). In contrast, in Portugal and Spain equity issuance due to capital increases was the second most important source of external financing (5% to 8% of GFCI).

In most CEECs with the exception of Poland, the net issuance of domestic debt securities (0.0% to 2.3% of GFCI) ranked fourth among the categories listed, being higher in most cases than the net issuance of international debt securities (-0.1% to 1.8%). In Poland, equity issuance due to capital increases (2.8% of GFCI) was larger than the net issuance of both domestic (1.3%) and international (1.8%) debt securities.

With the exception of Poland, equity issuance due to capital increases has not yet constituted an important source of external funding in the CEECs. Even in Poland, the achieved level of such funding is clearly lower than in the selected EU countries (Germany: 3.8% of GFCI). However, one has to stress that the equity markets have played an important role as an additional channel for the sale of state stakes in several CEECs.

## Funding of the Public Sector

### The Role of the Equity Market for the Public Sector

Up to now, the most important positive contribution of CEE equity markets to the macroeconomic development of the respective countries consisted in providing a channel through which the state could sell stakes in companies as part of the overall privatization process. Proceeds from such sales reached about 0.9% of GDP in Poland in 1997 and 1998, while they were about 3.3% of GDP in Hungary in 1997. However, there were no sizeable floatations by the Hungarian state in 1998.

### Sovereign Local Currency (LCY) Denominated Debt Securities

The public issue of LCY denominated debt securities gained considerable importance within the (increasing share of) LCY denominated government debt. They were the main or exclusive source of financing budget deficits, while in parallel the inherited stock of LCY denominated central bank loans to the government were cut back drastically. At the end of 1998, the share of publicly issued LCY denominated debt securities in total LCY denominated debt amounted to 69% to 99% in the CEECs except Slovenia.

The share of FX denominated external or internal debt in total public debt fell to 44% to 58% in Poland, Hungary and Slovenia by the end of 1998, while it was far lower in the Czech Republic.

The structure of holders of debt securities has shifted, with the shares of domestic nonbanks and of foreign portfolio investors in the total volume outstanding of publicly issued LCY-debt securities of the central government increasing at the expense of the share of the banking system; central banks held no such securities at the end of 1998. However, commercial banks were still the largest group of investors with a share of 30% to 50%. It is probably only in Hungary that the demand for central government securities is really broadly based and, in particular, directly household-based with a large and rapidly growing share (21%). The share of foreign investors did not exceed 15% in any of the CEECs at the end of 1998.

Central Government Debt				
	1993	1994	1997	1998
	End of period, % of GDP			
Poland	89	68	45	41
Hungary	89	86	63	60
Czech Republik	16	14	10	11
Slovenia	..	..	23	24

Source: National ministries of finance, WIIW.

### Structure of Central Government Debt

By type of debt, end of period	Poland		Hungary			Czech Republik		Slovenia
	1993	1998	1993	1995	1998	1993	1998	1998
	in %							
LCY – publicly issued securities (internal)	15	33	16	20	39	23	87	19
LCY – privately placed securities (internal)	3	5	15	11	9	0	0	18
LCY – other (loans etc; internal and external)	3	4	25	16	7	31	1	11
FX – internal debt (privately placed securities, loans)	7	7	0	1	0	0	0	14
FX – external debt (publicly issued securities, loans)	71	51	44	52	44	45	12	38

Source: National sources, OeNB.

### Holder Structure of Publicly Issued LCY Denominated

#### Debt Securities of the Central Government

End of period	Poland			Hungary		Czech Republic		
	1993	1995	1998	1996	1998	1993	1996	1998
	%							
Domestic nonbanks	14.1	22.9	36.6	54.5	57.1	2.6	31.0	51.3
Personal investors	..	..	..	15.4	21.2	0.4	1.0	1.2
Nonfinancial firms	..	..	..	20.7	14.8	0.6	11.1	5.4
Institutional investors	..	..	..	18.3	21.1	1.6	18.8	44.7
Commercial banks	46.4	67.0	49.0	37.1	30.2	81.1	66.0	43.2
Central bank	39.3	2.6	0.0	5.1	1.9	16.2	0.0	0.0
Foreign portfolio investors	0.2	7.5	14.4	3.4	10.9	0.0	3.0	5.5

Source: National sources, OeNB.

### Risks to the Economy Emanating from Domestic Capital Markets

The ratio of foreign portfolio holdings of LCY denominated debt securities and equities to official foreign exchange reserves provides information about the currency risk incurred by foreign participation in domestic capital markets. In the CEECs, the foreign portfolio holdings of equities amounted to between 18% and 30% of official foreign exchange reserves in Poland, Hungary and the Czech Republic. Foreign portfolio holdings of LCY denominated debt securities amounted to between 8% and 14% of official foreign exchange reserves in those countries at the end of 1998. Overall, we can summarize that the currency risk involved by the foreign portfolio holdings seems to have been at a still controllable level in the analyzed CEECs at the end of 1998.

#### Risk Exposure to Capital Outflows:

##### Foreign Portfolio

End of 1998	Equity	LCY debt securities
	% of official FX reserves	
	Poland	18.8
Hungary	24.9	13.0
Czech Republic	30.3	14.2
Slovenia	4.0	0.0

Source: National sources, IMF, OeNB.

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## Supervision and Legal Developments in the CEEC-5

### Slovak Republic

Responsibility for banking supervision in the Slovak Republic was transferred from the Ministry of Finance to the National Bank of the Slovak Republic (NBS) on January 1, 1993.

The legal framework for the banking system is established by the National Bank of the Slovak Republic Act and the Banking Act. The NBS is independent from the government in setting policy. It has legal powers to issue binding prudential regulations and to verify that financial institutions comply with these regulations.

The responsibility of the banking supervision division is limited to the banking sector. The division comprises three departments with a total of 61 employees (April 1999) in the areas on-site inspections, off-site inspections and licensing.

The new Financial Market Authority was established on November 1, 2000, to undertake state supervision of the capital market and the insurance industry. Its powers and the rules applying to its activities as specified in the Financial Market Authority Act comply with the corresponding standards of the EU and OECD Member Countries.

A commission was appointed in the first half of 2000 to prepare a new Banking Act, which should, inter alia, cover all European banking directives relevant for EU accession. This new Act will regulate banking supervision on a consolidated basis and will include a requirement to monitor market risk.

With the important amendment of the Bankruptcy and Composition Act introduced on August 1, 2000, *inefficiencies in bankruptcy* and *tax legislation* have been removed. The changes introduced provide for the replacement of management and prevent the transfer of capital from an insolvent company without the approval of the bankruptcy administrator. The amendments also provide a reorganization procedure as an alternative to liquidation.

The International Monetary Fund (IMF) believes that the *number of staff* available for on-site examination is *insufficient* and that therefore the frequency of on-site examinations is inappropriate: The NBS conducts eight on-site examinations on average per year, which implies that every bank is examined on-site every three years.

The Transition Report 2000 of the European Bank for Reconstruction and Development assessed the extensiveness and effectiveness of legal rules on banking and securities activities. Legislation for financial markets was perceived as reasonably comprehensive, but could benefit from further refinement in some areas. Banking regulations generally appear to conform to the Basel Committee's Core Principles, although regulations on consolidated supervision have still not been adopted. Regulatory and supervisory support of the law may be inconsistent, creating a degree of uncertainty. Although regulators may have engaged in corrective action against failing banks and securities market practices, enforcement problems appear to exist.

### **Slovenia**

The *Bank of Slovenia* (BoS) is the *primary supervisory authority* of all Slovenian banks and savings banks and issues licenses and permissions for certain banking services. The BoS's supervisory function under the new Banking Law, which entered into force on February 20, 1999, is the responsibility of the Banking Supervision Department. First established in 1992, the Banking Supervision Department had 39 employees in April 1999.

Under the new Banking Law, the BoS has a new competence for the supervision of saving cooperatives and *supervision on a consolidated basis*. The staff of the Banking Supervision Department and the frequency of on-site examinations have been increased.

Slovenia's EU accession will not call for amendments to the 1999 Banking Law, as it was drafted to take account of all relevant EU directives. However, the supervision of nonbank financial institutions is lagging behind.

The following provisions will automatically come into force the day Slovenia becomes a full EU Member State:

- decisions on the authorization of the acquisition of a qualifying holding by a person of a Member State,
- the provision of banking services by banks of Member States in the Republic of Slovenia,
- the exchange of information between the BoS and the supervisory authorities of other Member States.

The new Banking Act also enables foreign banks to establish offices in Slovenia.

The *Bank of Slovenia* has a *special role* in *bankruptcy and liquidation proceedings*. The provision of support to banks in difficulties through a rehabilitation process is not envisaged, but there is a special administration procedure that includes instruments provided by pre-rehabilitation measures. Should a bank fail, the BoS is vested with power to put the special administration in place to maintain the minimum required capital, i.e. when continued operations could threaten the bank's liquidity and solvency.

Investment companies and funds, the stock market and securities brokers are supervised by the independent *Securities Market Agency*. Prudential supervision of insurance companies is provided by the *Insurance Supervisory Authority*, which is part of Slovenia's Ministry of Finance.

The *Slovene banking sector* has *avoided the crises* and calamities that have plagued the banking sectors of the other Central and Eastern European countries. The Slovene banking sector tends to be one of the most profitable and efficient in the Eastern European region,<sup>1)</sup> but still lags behind those in EU, to a large extent because of the lack of competition.

### **Poland**

Since 1989 the *National Bank of Poland* (NBP) has had a legal basis and mandate to supervise banks. The *General Inspectorate of Banking Supervision* (GINB) was established as one of the departments of the NBP.

<sup>1</sup> See section "The Banking Sector in the CEEC-5."

In 1997 the *new Banking Act* and a new National Bank of Poland Act transferred the sole responsibility of the Governor of the NBP for banking supervision (with GINB as the body performing banking supervision) to a new independent body, the *Commission for Banking Supervision* (CBS), which is still physically located within the NBP.

The CBS is composed of seven members: the Governor of the NBP, the Minister of Finance plus one representative, the General Inspector of Banking Supervision, the President of the Bank Guaranty Fund, the Chairperson of the Securities and Exchange Commission and a representative of the President of the Republic of Poland. Under this arrangement, the GINB follows the guidance and direction of the Commission in performing its banking supervisory function. Organizationally, the GINB is still part of the NBP, which decides on its budget and provides funding and other resources, but it is considered an autonomous unit. The GINB comprises five divisions, one of which, the On-Site Examination Division, has a staff of 320 examiners (October 2000).

The *Accounting Act* and the *Auditors Act* of 1994, amended in 2000, helped to bring the country's accounting practices more in line with the international standards as well as with EU directives.

The growing involvement by Polish banks in complex off-balance-sheet transactions and the consolidation of banks into larger financial conglomerates points to the *need for further amendments* to the Accounting Act and the Banking Act.

In its Article IV Consultation of April 2000, the *IMF highlighted the continued improvements* in Poland's already strong banking supervision and legal framework. In the light of the increasing amounts of fixed capital investment channeled through the banks and the associated large current account deficit, they welcomed the authorities' decision to proceed with a Financial Sector Assessment Program (FSAP) in 2000.

According to the European Bank for Reconstruction and Development Transition Report 2000, the comprehensive financial market legislation generally conforms to minimum international standards. Banking and securities laws appear to be well supported administratively and judicially, particularly regarding the efficient functioning of enforcement measures against failing institutions and illegal market practices.

### **Czech Republic**

The Czech National Bank Act assigns *bank supervision responsibilities* to the *Czech National Bank* (CNB). The Banking Act defines the basic requirements and parameters for licensing, regulation and supervision, as well as establishing a deposit insurance scheme and special procedures for bank liquidation and receivership. The Banking Act provides the CNB with the authority to issue supervisory regulations. The CNB has published a number of provisions, establishing detailed requirements on various aspects of banking supervision.

The CNB's banking supervision department has a staff of 97 employees (end of 1999), who conduct both off- and on-site examinations.

The *Ministry of Finance* is responsible for supervising the activities of *insurance companies* and *pension funds*. The *Securities Commission* supervises securities dealers, investment companies and investment funds. Both cooperate with the CNB on the basis of a trilateral agreement concluded in 1998.

Effective banking supervision requires not only an appropriate regulatory framework, but also vigorous implementation of regulations. Shortcomings in the regulatory framework and lax supervision no doubt contributed to the *failure of many small banks* from 1991 to 1996. But the regulatory framework for bank supervision has been improved considerably, with further *improvements* and expansion of the *prudential rules* in 1998 and 1999.

In the first half of 2000 the Czech Republic amended its *bankruptcy law* partly in response to pressure from the EU. Frequent amendments since 1991 have created a perception that the bankruptcy law is ineffective. Delays in bankruptcy proceedings are a persistent problem in the Czech Republic.

In July 1999 a *new provision on capital adequacy* was approved, requiring banks to set aside capital for both credit and market risk. In *consolidated supervision*, a major gap in the supervision of bank holding companies has been identified. Therefore a new provision has been introduced, allowing the CNB to supervise banks on a group-wide basis if the bank is a subsidiary within a wider financial group. The prudential rules which had been in force until then applied only to banks and did not regulate the overall position of a bank within the framework of its group. A *revision of accounting standards* will enter into force on January 1, 2001, which should enhance consolidated supervision and market risk regulations.

In 1999, work on an *amendment to the Act on Banks* began with the main purpose of achieving *full compatibility* with the EU directives. This amendment was originally expected to enter into force on January 1, 2001. However, this draft amendment *was recently rejected* by the Czech parliament. The draft amendment includes important legal and operational aspects of banking supervision.

Above all, the amendment would create a comprehensive framework for supervision on a consolidated basis, would cover financial and mixed-activity groups not headed by banks as well, and would facilitate effective cooperation with other supervisory authorities, including the conduct of on-site examinations of foreign banks operating in a partner country by the domestic supervisor. It also will incorporate the principle of a unified banking license for foreign bank branches, which will enter into force upon the Czech Republic's accession to the EU.

In the European Bank for Reconstruction and Development Transition Report 2000, the Czech Republic received lower effectiveness scores in the banking sector than many of its EU accession counterparts. Czech banks have been criticized for poor corporate governance, and the EU has reproved the Czech government for problems in implementing prudential regulation.

### **Hungary**

With effect from April 1, 2000, Parliament established the *Hungarian Financial Supervisory Authority* (HFSA). The HFSA is the general legal

successor of the three separate bodies which were responsible for financial market supervision before – the Hungarian Banking and Capital Market Supervision, the State Insurance Supervision and the State Pension Fund Supervision.

According to the OECD, the new agency remains restricted by its *lack of regulatory authority*, and also retains the *limited independence* of its predecessors. It is of vital importance to create a legal basis, constitutional or otherwise, that would allow the HFSA to promulgate regulations and directives. At a minimum, much like a central bank, the agency needs to be given much more independence even from the appearance of political interference in its decision-making process. In addition, it is recommended that judicial processes should in order to increase the accuracy and timeliness of the property registry bare repeating.

However, it could be argued that Hungary has *one of the healthiest banking and financial systems in the Central European region*. Its financial system is essentially privately owned, with public sector participation in the banking system less than 20%, in the insurance field even less. The participation of international banks in the Hungarian system, taking into account its capital base, is more than 65%.

The *legal background* of the Hungarian financial sector and the relevant regulation is largely *in line with the European directives* and standards. According to the HSFA, financial sector regulation is supposed to be in conformity with European regulation by 2002. But aspects of some EU directives (e.g. the single license principle, the level of deposit guarantee schemes and capital adequacy) will not be fully implemented until EU accession is achieved. Hungary has also requested a transitional period of five years to reach the EU minimum level of coverage (EUR 20,000) set out in the Directive on Investor Compensation Scheme.

Hungary, Slovenia and Poland are notable as jurisdictions where perceptions of the commercial and financial markets' *legal reform remain consistently high*.

## Summary

Many bank supervisory authorities in the transition countries are significantly understaffed. A *lack of financial resources* and high staff turnover are two of the primary reasons. But perhaps the most significant problem is *the lack of implementation of internationally acceptable accounting standards*. One worrying consequence of this is that the *lack of requirements for consolidated accounts* makes it difficult for supervisors to adequately assess the level of interaffiliate lending and relationships between banks.

A particular challenge in the effective implementation of banking laws and regulations is the *resolution of troubled banks*. While several countries are to be commended for their use of prompt and corrective action, the use of enforcement proceedings also points out some of the problems that exist with respect to prudential regulation. In particular banking supervisors may *lack the autonomy and political independence* to implement corrective action.

Generally, there seems to be a trend for legal effectiveness in the transition countries to increase. The enforcement of commercial laws,

however, remains less effective. Thus, many jurisdictions appear to have a more stable legal framework but in fact the implementation of *bankruptcy, pledge and company laws still requires further refinement.*

Several transition countries *amended their entire banking supervisory structures* to strengthen their supervisory capacities. In the past few years several countries have also enacted *new bankruptcy legislation.* A number of these countries have recently strengthened their policies and practices for the resolution of bank failures and have further aligned banking regulation with international standards, such as the Basel Committee's standards on banking regulation. Some have also seen significant improvements in the functioning of their securities markets. In addition, the Czech Republic has strengthened its bankruptcy laws and to a lesser extent its judicial administration, while Slovenia has further aligned its competition law with that of the EU. There were fewer changes in the area of company law.

EU accession countries have continued to *harmonize* their financial service legislation with relevant EU directives to provide for greater disclosure and transparency in financial markets. There has also been a *greater emphasis on consolidated supervision* across the financial sector by establishing "super-regulatory bodies," which supervise banking, capital markets and insurance sectors, like in Hungary.

More generally, various jurisdictions seem to have amended their laws to streamline court proceedings, strengthen the enforcement of legal judgments and create clearer legal standards and criteria for various types of commercial transactions. The *main improvements required are:*

- the removal of uncertainty about the recognition and enforcement of foreign court judgments,
- the improvement of the general mechanism for the enforcement of civil court judgments,
- the reduction of the time required for court proceedings,
- the reduction of the level of corruption and economic crime,
- the provision of effective international cooperation in the area of banking supervision, especially by removing the obstacles to supervising banks on a consolidated basis.

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## The Role of Austrian Banks in the CEEC-5

### Current Developments in the CEECs' Banking Industry

Given their low degree of financial intermediation, CEEC banks still have good market prospects as well as a high growth potential.<sup>1)</sup> At 69% of GDP, the balance sheet total of all banks in the CEECs clearly trails the like figures for Austria (268%) and the euro area (254%).

The number of banks in the CEECs is also low – 270 banks and 11,500 branch offices – compared to the euro area, where 3,400 banks maintain some 179,000 branches following the consolidation of the credit cooperative sector. The resulting banking density in the CEECs, which stands at 6,200 inhabitants per branch office compared with 1,700 inhabitants per branch in the euro area, thus also needs to catch up to the euro area level.<sup>2)</sup>

Foreign banks increased their market share (as a percentage of total assets) further in all CEECs over the past few years, namely from 20% in 1997 to 32% in 1998. Reaching 41% by the end of 1999, their market share in fact doubled in just two years (!), an improvement attributable above all to extensive privatization efforts. Broken down by individual countries, foreign banks recorded the highest market share in Hungary (51%), followed by the Czech Republic (49%) and Poland (44%), while they are represented to a lesser degree in the Slovak Republic (25%) and Slovenia (10%).

Foreign banks' total assets expanded from EUR 74 billion to EUR 104 billion (+41%) in 1998 and 1999, while the market as a whole grew by a mere 5% to EUR 255 billion.<sup>3)</sup>

With privatization in the CEEC-5 has more or less been completed, the second stage of the consolidation drive is set to begin. It will involve a further increase in M&A activity. However, there does not seem to be a consensus on the future developments in the CEECs, as some Western investors have decided to withdraw from the market, like ABN Amro has from Hungary.

In the CEEC-5 two main groups of foreign banks compete for market share: the market pioneers and the relative newcomers. Austria's commercial banks operating in the CEEC-5 have ranked among the foreign market pioneers since 1987. Interestingly, Erste Bank der oesterreichischen Sparkassen AG (Erste Bank), for instance, has tended to raise its market share by taking over local banks. Austrian commercial banks are well positioned, having established branches in the wake of the opening in the early 1990s.

According to BIS statistics, Austrian banks (excluding subsidiaries and other participations) held EUR 2.11 billion of claims on Hungary, EUR 2.07 billion on Poland, EUR 1.46 billion on the Czech Republic, EUR 1.06 billion on Slovenia and EUR 0.64 billion on the Slovak Republic as at March 2000.

1 For a comprehensive overview of developments in the Central and Eastern European banking industry up to 1997, see e.g. Bank Austria (1998).

2 Other measures also reflect the need to catch up, such as the amount of credits extended (29% of GDP in the CEEC-5 against 85% in the euro area) or private sector deposits (36% of GDP in the CEEC-5 against 67% in the euro area).

3 See also the Bank Austria Creditanstalt International AG (2000).

### **Austrian Banks' Subsidiaries in the CEEC-5**

Austrian commercial banks' total assets in the CEEC-5 ran to approximately EUR 28.5 billion in September 2000. The network of banks, which has been expanded continuously, currently comprises 18 banks with 1,459 branches and a staff of 33,111.<sup>1)</sup>

At about 21%, Austrian banks posted the highest market share in the Czech Republic, where the significant business expansion on the previous quarters was due to Erste Bank's acquisition of Česká spořitelna, a.s. Furthermore, Austrian subsidiaries recorded double-digit market shares in Hungary (around 18%), the Slovak Republic (around 14%) and Poland (around 12%).

A ranking of bank subsidiaries (as at December 1999, shareholder structure as at July 2000) shows that Bank Austria – including Bayerische HypoVereinsbank's<sup>2)</sup> subsidiary banks – is the largest international bank in the CEECs with total assets of EUR 11.7 billion and a market slice of 11.2% (of foreign banks' total assets); the Belgian bank KBC ranks second with total assets of EUR 9.7 billion. Next come the Italian bank UniCredito (total assets: EUR 9.3 billion) and Citibank (total assets: EUR 7.9 billion), and Erste Bank is fifth with total assets of EUR 6.7 billion and a market share of 6.5%. Raiffeisen Zentralbank Österreich AG (RZB) ranks eighth (after ING and Commerzbank) and has a 4.1% share of foreign banks' total assets. Österreichische Volksbanken AG comes in 19th (0.7%). Three Austrian banks thus rank among the largest ten foreign banks in the CEECs.<sup>3)</sup>

Česká spořitelna, a.s., is the largest Austrian bank in the CEEC-5 (and the second largest bank in the Czech Republic). Its total assets come to EUR 10.9 billion, and its staff numbers 15,200. The bank maintains 800 branch offices, has a market share of 35% of retail deposits and holds a 50% slice of the personal loans segment. Erste Bank acquired the 52% stake in Česká spořitelna, a.s., at a cost of about EUR 0.6 billion.

PBK (Powszechny Bank Kredytowy), of which Bank Austria holds a majority stake (57%), is the second largest Austrian bank in the CEEC-5 (and the fourth largest Polish bank). In September 2000, PBK's total assets stood at some EUR 4.9 billion; the bank employs a staff of 8,500 at present and operates 350 branches. Bayerische HypoVereinsbank holds a stake of 86% in BPH (Bank Przemyslowo Handlowy), which is the fifth largest Polish bank, has a staff of 6,700 and runs 220 branches. PBK and BPH account for a combined market share of over 15%; a merger of these two banks would result in the second largest foreign bank and the third largest Polish universal bank.

Tatra Banka, in which RZB has a 71% stake, is the third largest Austrian bank in the CEEC-5. With EUR 1.7 billion in total assets, the bank has a market share of 8% in the Slovak Republic (staff: 1,600, branches: 66). In this ranking, Bank Austria's Czech subsidiary (59% stake) is listed in the

1 See the annex for the OeNB (2000).

2 Bayerische HypoVereinsbank's Central and Eastern European subsidiaries are to be incorporated into the Bank Austria group.

3 See also the Bank Austria Creditanstalt International AG (2000), as well *Wirtschaftsblatt* (2000).

fourth place (total assets: EUR 1.6 billion, staff: 940, branches: 16), and its Hungarian subsidiary (90% stake) ranks fifth (total assets: EUR 1.2 billion, staff: 800, branches: 25).

Austria's major banks plan to step up their activities in Eastern Europe further. Erste Bank completed its acquisition of Slovenská sporiteľňa, a.s., only recently and took over a stake of 87.2% in the first quarter of 2001. In the Slovak Republic, Slovenská sporiteľňa, a.s., is by far the largest provider of financial services, employing a staff of some 6,500 in over 540 branch offices. Bank Austria, too, intends to expand its Eastern European banking operations, e.g. once the privatization of Komerční banka begins.

### **Austrian Subsidiaries' Business Activities**

The highly dynamic market in Eastern Europe, where about half the population has yet to open their first bank account, centers on the Czech Republic, Hungary, Poland and the Slovak Republic. The Austrian commercial banks located in Central and Eastern Europe basically offer all types of banking business, including savings plans with building and loan associations, leasing, real estate operations and investment banking. In countries where commercial and investment banking are not combined, investment banking – the market segment with the highest potential in Poland – is catered to by separate investment firms. It is noteworthy that the parent banks' Eastern European business operations, which also comprise the subsidiaries' refinancing, are rather insignificant in volume.

In the years to come, banks intend to focus more strongly on the profitable retail banking sector by targeting high-scale retail customers, improving customer services, providing one-stop financial shopping and opening more branch offices. Well-qualified personnel, a long-term market strategy, judiciously chosen banking locations and products as well as the use of alternative distribution channels will be key to these banks' success.

### **Subsidiaries' Contribution to Operating Results**

A major advantage of doing business in Eastern Europe is the enormous income potential. Subsidiaries in the CEECs contribute importantly to parent banks' operating results. This is true, in particular, of RZB's subsidiaries, which, with a 17% share in the group's total assets, contributed more than 50% to the group's financial result in 1999.

According to data reported to the OeNB, return on equity (ROE) ranged from 7% (in the Czech Republic) to a very high 31% (in the Slovak Republic) as per September 2000, whereas parent banks' ROE was between 7% and 12%. The corresponding figures in Hungary and Poland stood at 26% and 18%, respectively. Taking Česká Spořitelna, a. s., into account, ROE in the Czech Republic fell to 7% in September 2000.

While risk provisions<sup>1)</sup> in the Slovak Republic decreased in the first three quarters of 2000 compared to the previous year, Poland, Hungary and the Czech Republic (including Česká Spořitelna, a.s.) had to face higher risk provisions. Compared to Austria (0.5%), however, the share of risk

*1 Reallocations of value adjustments and direct depreciations.*

provisions in total assets is relatively low: e.g. 0.6% in the Czech Republic, 0.7% in the Slovak Republic and 0.2% in Hungary at the end of 1999. Available figures up to September 2000 suggest, however, that risk provisions (as a share of total assets) might deteriorate slightly in some countries (e.g. Poland and Hungary).

### **Flow of Information and Risk Management<sup>1)</sup>**

An adequate flow of information between the subsidiaries and the headquarters (on-site visits, daily telephone calls) as well as adequate monitoring of the subsidiaries' performance by the parent – in particular by committed staff of the management of equity interest divisions in Vienna – are of crucial importance. The staff training situation is rather bleak in certain business areas in the Central and Eastern European countries: On the one hand, it is extremely difficult to recruit qualified staff for key positions on the local markets, on the other hand staff fluctuation is very high, as skilled staff members are headhunted by competitors.

Group-wide, uniform, central, real-time EDP systems have not been implemented until mid-2000, mostly due to technical or legal problems (among other things, the local banking secrecy provisions are not compatible with the reports required by Austrian law). This hampers timely reporting, the efficient use of credit lines, the control of credit limits in the group, and the uniform recording of liabilities.

On the whole the subsidiaries act independently, which, of course, implies that the local management holds major responsibilities. At the same time, the following control mechanisms have been established (in accordance with international standards):

- local internal audit
- local internal controller or risk manager
- group audit
- group controlling
- external auditor – one of the “Big Five” – and the local banking supervisory authority
- credit control in the parent bank (watchlists)
- credit limits, rating systems of the parent, collateral
- international exposures only after approval by the parent's supervisory board, country limits
- rules of procedure for the subsidiaries (a number of decisions must be approved by the local supervisory board)
- risk management manuals for market and credit risk (rule books and risk manuals)

It is recommended that the provisions of the rulebooks be implemented quickly and thoroughly. Moreover, it is vital that the group audit (which, for instance, has already reached its limits in the credit review process, since the documents provided are in the respective local languages) be strengthened and that the local supervisory board be integrated more closely in the process

<sup>1</sup> The following is based on information provided by various contact persons or obtained from on-site audits at Austrian parent banks.

of eliminating deficiencies. On the whole, it should be stressed that the level of qualification of the group audit staff is high and that the audit reports are well written and contain clear recommendations.

In credit risk management, risk assessment and the monitoring of potentially troubled loans meet the common standards. The full risk potential cannot always be accurately measured since the necessary data are often not available in the form required (reasons: country ceiling; nonevaluation of collateral). Therefore it is sometimes impossible to assess the actual amount of unsecured loans and to determine the potential default risk.

Market risk assessment and – to a large extent – limit monitoring usually takes place at the subsidiary level; reviews are carried out in the group audit process. It must be emphasized that the data reported to the parent banks by the foreign subsidiaries for the purposes of effective control in the risk management process are often dated and of poor quality. In general, it is advisable to invest more funds in modern limit system to be able to use risk return and value at risk limits instead of nominal limits. The methods of market risk assessment and the qualitative criteria for market risk management correspond to the international requirements for large banks, but these methods and criteria are not always applied.

The controlling divisions not only produce quarterly reports on the subsidiaries' activities and support the latter in the budget preparation process, but they are first and foremost responsible for total risk control, supervision and planning. It is recommended, however, that the existing bank-wide risk budget be supplemented by group-wide risk budgets.

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**Annex:**

**Key Figures of Eastern European Commercial Banks**

**Majority-Owned by Austrian Banks**

**Quarterly figures (total) per country since June 1999; rounded figures**

Country	Total assets	Operating results <sup>1)</sup>	Risk provisions	Market share	ROE	Staff	Branches
	EUR million			%		Number	
<b>Poland</b>							
As at June 1999	1,080	5	- 0.15	1	6	9410	34
As at September 1999 <sup>2)</sup>	5,382	77	- 1.02	11	18	9,480	384
As at December 1999	5,558	116	- 2.11	11	8	9,490	364
As at March 2000	6,295	35	- 2.18	12	21	9,572	385
As at June 2000	6,116	63	- 10.46	12	23	9,595	385
As at September 2000	6,677	96	- 23.26	12	18	9,620	385
<b>Slovak Republic</b>							
As at June 1999	1,870	36	- 10.32	10	9	1,932	66
As at September 1999	1,918	53	- 11.85	11	25	1,943	66
As at December 1999	2,286	71	- 16.86	11	40	1,997	77
As at March 2000	2,404	26	- 1.74	12	41	2,224	86
As at June 2000	2,554	42	- 3.42	13	40	2,273	91
As at September 2000	2,656	58	- 6.76	14	31	2,336	93
<b>Slovenia</b>							
As at June 1999	529	3	- 0.87	3	5	295	10
As at September 1999	569	5	- 1.31	3	5	339	10
As at December 1999	594	7	- 0.15	3	9	344	11
As at March 2000	622	2	- 0.51	4	11	348	11
As at June 2000	652	6	- 1.09	4	13	361	12
As at September 2000	687	9	- 1.095	5	11	368	12
<b>Czech Republic</b>							
As at June 1999	2,846	17	- 7.19	4	16	1,427	41
As at September 1999	2,919	33	- 14.90	4	8	1,450	46
As at December 1999	3,134	41	- 18.97	5	9	1,482	46
As at March 2000	3,053	8	- 3.49	5	12	1,629	46
As at June 2000	3,401	14	- 6.83	5	14	1,730	48
As at September 2000 <sup>3)</sup>	15,042	121	- 71.36	21	7	17,955	835
<b>Hungary</b>							
As at June 1999	2,585	28	- 3.71	9	14	2,677	128
As at September 1999	2,595	45	- 4.87	13	24	2,611	135
As at December 1999	3,010	60	- 5.38	14	24	2,550	127
As at March 2000	3,448	21	- 1.89	15	27	2,726	132
As at June 2000	3,445	38	- 5.74	17	28	2,750	133
As at September 2000	3,427	55	- 9.23	18	26	2,832	134
<b>Figures as at September 2000</b>							
Comp. September 1999	28,490	339	-111.70			33,111	1,459
	13,384	212	- 31.90			15,823	641

Source: OeNB.

<sup>1)</sup> Because of Bank Austria's financial statements on IAS basis: annual surplus before tax.

<sup>2)</sup> For the first time including PBK, in which BACA, after the merger with its subsidiary, holds a 57% interest.

<sup>3)</sup> For the first time including Česká spořitelna, a.s.

# Securities Settlement in Austria in a European Context – A Stability-Oriented Review

## **Securities Settlement Systems in Austria from a Financial Stability Perspective**

Georg Hubmer

Editorial close:  
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Since the Austrian Options and Futures Exchange (Österreichische Termin- und Optionenbörse AG – ÖTOB) merged with the Vienna Stock Exchange to form the Wiener Börse AG in December 1997, the latter has been responsible for settling the entire spectrum of organized trading on both the cash and the futures market.<sup>1)</sup>

Vienna's cash market has been linked up to Xetra (exchange electronic trading), the electronic trading platform of Deutsche Börse AG, since October 1999. For futures and options trading and clearing, the Wiener Börse relies on its own system, the fully automated OM-Handelssystem.

The operator of the clearing and settlement system for the cash market of the Wiener Börse, known as Arrangementsystem, is the Oesterreichische Kontrollbank AG (OeKB). In addition, the OeKB runs a fully automated direct settlement system (called DS-System) for over-the-counter (OTC) transactions.<sup>2)</sup>

The Wiener Giro- und Cassenverein, established in 1872, was the first institution worldwide to act as a central securities depository (CSD). Today, the OeKB-operated Wertpapiersammelbank (WSB) serves as Austria's central securities depository (CSD), a role that it has fulfilled since 1965. The holding of securities in a CSD is regulated by the Securities Deposits Act 1969 (as amended), which created a legal framework for the (ownership) rights of custody account holders. The amendment of the Bankruptcy Law in August 1997 lifted the so-called zero hour clause, thus securing the settlement finality of securities transactions. The transposition of the EU's Settlement Finality Directive into Austrian law followed in July 1999.

The OeKB has continually improved securities settlement arrangements over the past few years:

- A fully automated interface was installed between the WSB and the Austrian Real-Time Interbank Settlement (ARTIS) system, the real-time gross settlement (RTGS) system run by the Oesterreichische Nationalbank (OeNB). This interface, which became operational at the beginning of 1999, enables the cash leg of transactions to be settled with intraday finality in central bank money. The implementation of settlement in central bank money is an important milestone from the central bank's perspective, since it eliminates any risk of default underlying transactions settled via commercial banks.
- Furthermore, the number of settlement cycles has been increased. Same-day settlement of securities transactions is now provided until 5 p.m. From a risk perspective, this minimizes financial exposures, because the settlement risk is smaller the shorter the duration of settlement is.
- The OeKB has been making preparations to start implementing a straight-through processing real-time system (X-STP) in the course of 2001. From a central bank perspective the introduction of RTGS systems

<sup>1</sup> For more details see, for instance, the review of the Austrian capital market in OeNB (2000).

<sup>2</sup> Government bonds are typically not traded at the Wiener Börse, and bonds are mostly traded in the interbank market.

ensuring a simultaneous processing of the securities leg and the cash leg of transactions is a significant step toward reducing or eliminating settlement risk.

Under the terms and conditions of the WSB, premature payments of funds or deliveries of securities will not be accepted. Settlement will be effected only at such point when both the securities and the corresponding funds have been deposited on the respective (custody) accounts of the counterparties. To avoid cancellation of a transaction for lack of securities, the WSB offers counterparties the possibility to borrow securities against provision of adequate collateral.

Banks also rely on the WSB system for transferring securities to the OeNB's depository account with the OeKB when putting up the collateral required for monetary policy operations. The WSB makes a key contribution by ensuring the finality of transfer of the securities to the OeNB's depository account. The securities are transferred to the OeNB's pool of collateral in electronic (book-entry) form.

As a specialized credit institution, the OeKB is subject to banking supervision by the Federal Minister of Finance. The Austrian Securities Authority (Bundeswertpapieraufsicht – BWA) established at the beginning of 1998 is responsible for market supervision and monitors the proper settlement of trading on the Vienna stock exchange. With a view to the maintenance of financial market stability, the OeNB also takes a close interest in the smooth functioning of securities settlement.

### **Strong Consolidation Efforts in Securities Settlement across Europe**

With the introduction of the euro and the rise of cross-border transactions, the importance of securities settlement has risen substantially in the past few years. The increasing homogeneity of securities markets fueled by the introduction of the euro, technological progress and the harmonization of regulations across Europe have added momentum to the consolidation process in Europe. Notably competitive pressures exerted by the growing number of cross-border securities transactions and alliances among exchanges, trading places and electronic networks have reinforced the pressure to achieve a higher degree of integration and efficiency in securities settlement systems (SSSs) at the EU level.<sup>1)</sup>

In all of Europe, there are more than 30 clearing and settlement organizations. This fragmentation of securities settlement is attributable to the strong national orientation of most securities depositories. This fragmented market has been shaken up in recent years. An increasing number of providers attempt to exploit economies of scale in settling transactions, that is, to reach a critical mass of transactions in order to be able to offer cheaper services and to better cope with rising competition pressures.

In a first step a *vertical integration* has evolved through the amalgamation of securities trading, clearing, settlement and custody services. Such vertical

<sup>1</sup> For more details see ECB (2000), pp. 53.

integration is well advanced in a number of European countries, including Austria.

In addition, *horizontal integration* deepened through cross-border alliances or mergers particularly in 1999 and 2000. A case in point is the merger between Cedel (Luxembourg) and Deutsche Börse Clearing to Clearstream, or the link-up between the international securities depository Euroclear with the French securities depository Sicovam SA. This will pave the way for cooperation with additional participants, such as Clearnet, the clearing system of the Paris exchange, and the Belgian and Dutch central securities depositories CIK and Necigef.

The European Central Securities Depositories Association (ECSDA), of which the OeKB is a member, favors bilateral electronic links between the various national clearing and settlement organizations. At the cut-off date for this paper, the WSB had established links with Clearstream (Frankfurt, Luxembourg), Necigef (Amsterdam), Euroclear (Brussels), Sicovam SA (Paris) and Monte Titoli (Milano) in the euro area as well as SIS (Zurich) and KELER (Budapest). The WSB intends to implement further links with other CSDs in the EU. Through these links, securities transactions will generally be settled under the same conditions as national transactions.

The ESCB and the OeNB adhere to the principle of noninterference in competition between the individual systems and therefore take a neutral stance on these changes. However, there are strong expectations that the current consolidation efforts will improve efficiency and lower risk exposure, thus resulting in safe and cost-effective settlement structures in the EU.

### **Why Securities Settlement is Important for Financial Market Stability**

Until the mid-1990s little attention was paid to the relevance of securities settlement arrangements for financial market stability. Malfunctioning settlement may, however, have strong repercussions on the smooth settlement of monetary policy operations and on the efficient working of payment systems. Preventing systemic disturbances of markets and payment systems is a necessity. This is why the OeNB, like other central banks, takes a close interest in the safe and efficient settlement of securities transactions.

A securities transaction may be exposed to different types of risk, such as credit risk (counterparty default), liquidity risk (replacement cost) or operational risk (such as limited availability of systems). The major risk in securities settlement is, of course, the settlement risk as such<sup>1</sup>) in other words, the financial risk that a counterparty will fail to perform or belatedly meet a payment or service obligation when the reciprocal obligation has been honored in due time. From the central bank's perspective it is above all the ensuing systemic risk that is important, that is, the risk that the problems of

<sup>1</sup> *The settlement risk is typically observed in foreign exchange (FX) transactions, because of the huge volumes involved. The BIS reports that the daily global FX turnover came to about USD 1,230 billion in 1998. Basically, though, settlement risk may occur with all kinds of negotiable instruments, be it currencies, securities or OTC derivatives.*

one system participant may have effects on other participants, causing payment or performance delays on their part. Through a domino-like spread of financial problems, contagious effects may eventually threaten to cripple the entire financial system.<sup>1)</sup>

Exposures are typically settled the same day (either real time or on a deferred net basis at the end of the day), but may sometimes be left open overnight or, in extreme cases, up to a few days. Such late settlement seriously increases settlement risk, considering the fact that in some cases the maximum exposure may exceed participants' equity.<sup>2)</sup>

Although the probability of a major disruption in the settlement process is often considered to be rather low, there have time and again been cases, such as Herstatt (1974), Drexel Burnham Lambert (1990), BCCI (1991) or Barings (1995), in which notably the cross-currency settlement risk was a major source of banking problems. In particular with a view to their function as a lender of last resort, central banks have a special interest in preventing such problems.

Primarily, though, it is the duty of the financial market participants themselves to reduce settlement risk. In the opinion of the Committee on Payment and Settlement Systems (CPSS) at the BIS<sup>3)</sup> additional legislative or regulatory activities are called for only if the market participants fail to make proper provisions in the first place.

### **International Regulatory Activities in the Field of Securities Settlement**

In particular the Basel Committee on Banking Supervision and especially the CPSS have provided major input to strengthening securities settlement arrangements.

In 1992 the CPSS recommended targeting simultaneous settlement of securities transfers and associated funds transfers with a view to reducing securities settlement risk.<sup>4)</sup> The CPSS identified three possible structural approaches to delivery versus payment (DVP), suggesting that ideally the first model (DVP 1) should be implemented:

- DVP 1: Settling transfer instructions for both securities and funds on a trade-by-trade (gross) basis, with the final transfer of securities occurring at the same time as the final transfer of the corresponding funds.
- DVP 2: Settling securities transfer instructions on a gross basis, with delivery occurring throughout the processing cycle but settling funds

1 Thus the Banque de France states as a major oversight objective for the central bank: "... Securities Clearing and Settlement Systems (SCSS) shall not trigger or spread systemic risk." See Banque de France (2001).

2 For more details see: Basel Committee on Banking Supervision (2000). The prudential regulations treat settlement risk – since it is an integral part of credit risk – as implicitly included in the counterparty's credit risk weights. The new regulatory capital proposals ("Basel II") will lead to a revision of counterparty risk weights.

3 The Committee on Payment and Settlement Systems (CPSS), which is chaired by Tommaso Padoa-Schioppa (ECB), serves as a forum for the central banks of the Group of Ten countries to monitor and analyze developments in payment, settlement and clearing systems as well as relevant policy issues. The BIS hosts the secretariat for the CPSS.

4 See CPSS (1992).

transfer instructions on a net basis, with payment occurring at the end of the processing cycle.

- DVP 3: Settling transfer instructions for both securities and funds on a net basis, with both delivery and payment occurring at the end of the processing cycle.

In the mid-1990s, the CPSS reviewed the increase in cross-border securities settlement.<sup>1)</sup> In 1997 it published the Disclosure Framework<sup>2)</sup>, basically a questionnaire for the review of a securities settlement system's operation and its allocation of risks; it was intended to encourage system operators to improve the transparency of settlement arrangements. The OeKB took up this recommendation and has posted the completed Disclosure Framework questionnaire on its website.

In January 2001 a CPSS-IOSCO<sup>3)</sup> Joint Task Force on Securities Settlement Systems published a consultative report ("Recommendations for Securities Settlement Systems") identifying 18 recommendations for the design, operation and oversight of securities settlement systems. The recommendations relate to the legal framework for securities settlements, risk controls, access conditions, governance, efficiency, transparency, regulation and oversight.

In view of the different institutional arrangements chosen worldwide for securities settlement, the recommendations set out in the consultative report have been designed to cover all kinds of intermediaries involved in the confirmation, clearing or settlement of securities trading (such as local custodians and international central securities depositories (ICSDs), international securities settlement institutions or central securities depositories).

Upon completion of the final report by mid-2001 the competent regulatory and supervisory bodies (securities regulators, central bankers and banking supervisors) are to determine, in cooperation with the private sector, the appropriate scope of national application and to develop an action plan for implementation. The task force hopes that the recommendations will become recognized global standards and written into the relevant laws.

### **Securities Settlement and Financial Stability – The ESCB's View**

Securities settlement is closely linked with payment settlement, since most securities trades also include payment transactions. Hence, the default or credit risk in a payment system can be reduced reliably only if at the same time securities settlement is speeded up and made safer (and vice versa). Since the liquidity in the TARGET<sup>4)</sup> system depends on intraday credit, which the Eurosystem only grants against collateral, TARGET would be blocked if securities were not delivered to the Eurosystem on time.<sup>5)</sup>

1 See CPSS (1995).

2 See CPSS (1997).

3 Currently 164 securities regulators are assembled in the International Organization of Securities Commissions (IOSCO), which is based in Montreal. The objective of IOSCO is to improve regulatory standards in order to maintain efficient and sound securities markets.

4 Trans-European Automated Real-time Gross settlement Express Transfer.

5 See ECB (2000), p. 56.

Against this background the ESCB considers the smooth and secure functioning of the securities settlement framework (particularly large-value payment systems with a bearing on systemic stability) to be very important.<sup>1)</sup> The TARGET system was implemented on the basis of Article 105 of the Treaty establishing the European Community and Article 3 of the ESCB Statute (*“The basic tasks to be carried out through the ESCB shall be ... to promote the smooth operation of payment systems”*) and Article 22 ESCB (*“The ECB and national central banks may provide facilities, and the ECB may make regulations, to ensure efficient and sound clearing and payment systems within the Community and with other countries.”*) TARGET is a real-time settlement (RTGS) system for large-value payments that is capable of ensuring intraday finality of settlement. The OeNB’s RTGS system ARTIS is an integral part of the EU-wide TARGET system. In addition to the operational role of running an efficient and sound payment system, the ESCB plays a role in the oversight of payment systems. As an integral part of the ESCB, the OeNB is thus also involved in overseeing payment systems.

In its “Declaration on the role of the Eurosystem in the field of payment systems oversight” of June 2000, the ECB stated that the national central banks were responsible for overseeing the national payment systems within the oversight framework set by the Governing Council of the ECB.

While the ESCB’s oversight role for securities settlement is not spelled out in its statutes, it follows from the ESCB’s general obligation to safeguard financial market stability. In Austria, and incidentally in a number of other European countries, this oversight role of the central bank has not been formalized.

Since the securities settlement infrastructure is so fragmented and since oversight is within national competences, a strengthening of cooperation between the relevant regulators would be welcome. In the OeNB’s opinion the functions of the various regulatory and supervisory bodies should be communicated even more clearly and euro area-wide harmonization of operations and cooperation among the relevant institutions should be reinforced in the tailwind of the accelerating consolidation process among SSSs. The ESCB only recently initiated activities with the aim of getting a more intensive dialogue going between the competent supervisory bodies of the Eurosystem.

At any rate the Eurosystem has a keen interest in sound and efficient securities settlement, since banks need to provide high-quality collateral in their monetary policy operations and intraday liquidity management. The smooth functioning of securities settlement is essential for the Eurosystem to achieve its monetary policy objectives.

In this respect, a number of minimum requirements have been defined for SSS operators<sup>2)</sup> namely the following nine standards: legal soundness, settlement in central bank money, no undue custody risk, regulation and/or control by competent authorities, transparency of risks and conditions for participation in a system, risk management procedures, intraday finality of

<sup>1</sup> *Secure and efficient payment systems should be governed by universally accepted standards (see CPSS, 2001).*

<sup>2</sup> *European Monetary Institute (1998).*

settlement, operating hours and days, operational reliability of technical systems and availability of adequate backup facilities.

Since 1998 all relevant systems have been thoroughly evaluated by the NCBs and the ECB, and a list of systems eligible for monetary policy operations has been published and is being continually updated. In Austria, the OeKB was found to comply with all requirements.

The Eurosystem's standards were created from a user's perspective, i.e., the Eurosystem as a user of various settlement systems identified certain requirements to avert potential losses. De facto the ESCB's standards have asserted themselves even beyond the collateral market for monetary policy operations. The ESCB's standards have thus gained a relevance for financial market stability in much of Europe. The recommendations submitted by the CPSS-IOSCO Joint Task Force have opened up the opportunity of formalizing harmonized universal standards.

To conduct a single monetary policy, it is necessary to agree on the equal treatment of domestic and foreign securities in the euro area. In order to enable a sound and efficient cross-border transfer of securities, the so-called correspondent central banking model (CCBM) was implemented in 1998: the euro area central banks act as securities depositories for each other to enable counterparties to obtain central bank credit against foreign securities. Market participants have since recognized the CCBM as a reliable system; in 2000 the amount of collateral mobilized via the CCBM has continued to rise. The CCBM will continue to operate until the market has developed comparable alternatives.

The SSSs united in the ECSDA have established a number of bilateral links (see also the section on "Why Securities Settlement is Important for Financial Market Stability" in this study). In the meantime, 62 such links have been assessed by the ESCB and found eligible.

### **Outlook**

The hitherto fragmented market of central securities depositories will keep consolidating; the handling of bigger volumes will make processing more efficient and more cost-effective. This is a necessary and reasonable development, since an efficient infrastructure may contribute substantially to improving liquidity and market depth on financial markets and to reducing operational risks. The OeNB stresses the need to take sufficient account of risk management, particularly because cross-border volumes are mounting and integration is progressing fast.

The consolidation is to promote the establishment of sound and efficient systems without creating additional (contagion) risks; thus, a strengthening of cooperation among both market participants and regulators on a European and on an international scale is called for. The recommendations to be put forth by the CPSS-IOSCO Joint Task Force on Securities Settlement System once the consultative process is concluded, may be a milestone on the road to harmonizing securities settlement and may, in the medium term, be written into international minimum standards.

Within the EU, too, further activities are in the offing. In their report on the regulation of European securities markets (February 2001), the

Committee of Wise Men under the chairmanship of Alexandre Lamfalussy has pointed out that a restructuring of cross-border clearing and settlement arrangements within the EU is necessary.

First and foremost, it is up to the securities settlement institutions and financial market participants to take the initiative and apply technically sound solutions and to use risk-reducing synergy potentials – this will make a major contribution to the maintenance of financial market stability.

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# Stress Testing

## by Austrian Banks

Gerald Krenn

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### **The Role of Stress Testing in Risk Management**

The transposition of the Capital Adequacy Directive (CAD) into Austrian law introduced the term stress testing into the legal risk management provisions applicable to Austrian credit institutions. Credit institutions that keep a large-volume trading book may use internal models<sup>1)</sup> to calculate the regulatory capital required to back both the general and the specific position risk inherent in debt instruments and stocks contained in the trading book as well as in commodities and currency positions. Any internal model is subject to approval by the banking supervisory authority. Stress testing is one of the prerequisites for model approval. In other words, bank regulators consider stress tests to be an effective and necessary tool that complements statistical models for quantifying and monitoring risk. The use of stress testing should not be limited to credit institutions that employ internal models. After all, any credit institution and financial institution may benefit considerably from integrating stress testing into their risk control. The methods underlying stress tests are easy to comprehend and to implement.

### **Why Use Stress Tests?**

The Basel Committee on Banking Supervision (1995) justifies the need for stress testing as follows:

*“Understanding and protecting against the vulnerabilities of a financial company’s risk-taking activities is of course one of the major responsibilities of its board of directors and senior management. Banks’ stress scenarios need to cover a range of factors that can create extraordinary losses or gains in trading portfolios, or make the control of risk in those portfolios very difficult. These factors include low-probability events in all major types of risks, including the various components of market, credit, and operational risks. Stress scenarios need to shed light on the impact of such events on positions that display both linear and non-linear price characteristics (i.e. options and instruments that have options-like characteristics).”*

*Banks’ stress tests should be both of a quantitative and qualitative nature. Quantitative criteria should identify plausible stress scenarios to which banks could be exposed. Qualitative criteria should emphasise that two major goals of stress testing are to evaluate the capacity of the bank’s capital to absorb potential large losses and to identify steps the bank can take to reduce its risk and conserve capital. . . .*

*Stress testing alone is of limited value unless the bank is ready to respond to its results. At a minimum, the results should be reviewed periodically by senior management and should be reflected in the policies and limits set by management and the board of directors. Moreover, if the testing reveals particular vulnerability to a given set of circumstances, the national authorities would expect the bank to take prompt steps to manage those risks appropriately (e.g. by hedging against that outcome or reducing the size of its exposures).”*

Stress tests face credit institutions with four key tasks:

- when identifying the stress scenarios for the trading portfolio, credit institutions must take not only market risk but also other important types of risk into account;
- they must analyze the consequences of the stress scenarios;

<sup>1</sup> Internal models must be based on value-at-risk (VaR) methodologies.

- they must design measures to counter any grave adverse effects;
- they must communicate the results produced by stress testing to the top management, which considers them in adopting its risk policy.

### Stress Tests and Value-at-Risk (VaR)

As mentioned above, stress testing is to complement the internal models (VaR) approach. Why do VaR models call for such complementary measures, and why do stress tests fit the bill?

A VaR model does not shed light on the dimension of heavy losses. This is the first reason why stress testing is required as a complementary measure: stress tests serve to estimate potential extreme losses.

The second important reason why VaR calculations should be combined with stress tests lies in the somewhat skeptical attitude towards the assumptions on which most VaR calculations are based. There are first and foremost two assumptions whose validity is debatable. For one, the markets are assumed to remain constant over a given time horizon. Yet, there have always been breaks in market movements. The objective of stress tests is, among other things, to assess the potential loss resulting from such breaks.

Furthermore, numerous VaR models assume that changes in risk factors are normally distributed. However, changes in financial time series are, as a rule, not normally distributed. Instead, such time series are marked by fat tails. It follows that extreme changes in the risk factors are considerably more likely than is accounted for under the assumption of a normal distribution. The slump in stock prices triggered by the equity crash of 1987, for example, was reflected by 10 to 20 standard deviations. The table “Probabilities of Extreme Changes under the Assumption of a Normal Distribution” shows that such a fall in prices may basically be ruled out under the assumption of a normal distribution.

#### Probabilities of Extreme Changes

##### under the Assumption of a Nominal Distribution

*k standard deviations*

5	once every 6,500 years
6	once every 2 million years
7	once every 1.3 billion years

Source: OeNB.

### Stress Testing – A Scenario Analysis

The concept of stress testing is based on the notion that the value of a portfolio depends on market risk factors, such as equity prices, interest rates and exchange rates. The values of the risk factors characterize the market situation. The risk factors may be combined into one single vector  $r$  describing the market situation.

Stress tests answer the question of “What would happen if a market situation  $r$  suddenly occurred?” The scenario in this case is the sudden emergence of a market situation  $r$ . Scenarios may therefore be identified with market situations and represented by vectors  $r$ . During a financial crisis, market participants are suddenly confronted with a changed market situation. This may have been caused, for example, by a dramatic rise in volatilities: when prices move so rapidly that market participants are unable to restructure their portfolios within the reaction time available, the portfolios have to be revalued on the basis of changed market conditions. The same effect occurs during a liquidity crisis: to market participants, only those

prices are of relevance at which they can rebalance their positions to the extent desired. In illiquid markets, trading close to quoted market prices is impossible. Therefore, a portfolio can be restructured only at a later time and at dramatically different prices.

For stress testing, scenarios are selected according to specific criteria and calculations are made to determine the value of the current portfolio under these scenarios. By comparing these calculations with the current value of the portfolio one can assess the losses that would be incurred if the market suddenly moved to  $r_i$  without allowing a chance for rebalancing the portfolio.

### **Accounting for Liquidity Risk**

The pertinent Austrian legislation requires that liquidity crises be taken into account.

Basically, one can distinguish between two types of liquidity risk: First, a bank may suddenly lack the financial liquidity allowing it to keep holding certain positions. A changed market situation may, for example, suddenly face the bank with the need to make margin payments or to provide additional security. Avoidance of this type of liquidity crisis is the responsibility of asset/liability management. Second, a shortfall in market liquidity may suddenly occur, preventing the bank from closing certain positions. When that happens, it becomes impossible to find a party willing to acquire the relevant item at the quoted market price. In such a situation the position cannot be closed at all or only with an extremely high bid-ask spread. Such a lack of market liquidity may be attributable to several causes: some markets are traditionally illiquid. Other, normally liquid markets, may occasionally suffer liquidity shocks triggered, for example, by unexpected economic or political news. Finally, a market participant's exposure in a specific market may be so substantial that the closing of his positions destroys the liquidity of the market.

Whatever the reason for inadequate market liquidity may be, illiquid markets do not allow any trading close to quoted market prices. Any restructuring of the portfolio – either now or later – will therefore be possible only at dramatically different prices. In a market risk crisis, the situation facing portfolio managers is exactly the same: a dramatic rise in volatility causes prices to change so rapidly that, given their limited reaction speed, they can rebalance their positions to the desired extent only at dramatically different prices. In stress situations, both liquidity risk and market risk have the same negative consequences, namely dramatic changes in the market. To portfolio managers, it makes no difference whether the market suddenly changes overnight and they can rebalance their positions only the next day or whether, in a situation of creeping market changes, they can rebalance their positions only much later because of insufficient market liquidity.

Both situations – liquidity crises and market risk crises – are simulated in stress tests by revaluing a given portfolio against the background of radically changed market conditions. Liquidity stress tests therefore do not require any special methodology.

### **Reporting and Contingency Planning**

Stress tests are used primarily to assess a bank's capital situation and to identify measures designed to minimize risk. In interpreting the results of stress tests the first question will therefore be whether the bank would be able to cope with the losses incurred in a stress scenario. A comparison of the outcome of the stress test with the bank's own capital resources may in some circumstances be misleading, however, as these funds also need to cover risks other than the market risk associated with the trading book. If at the time of market disturbance other losses were incurred simultaneously, the bank might be in trouble even if its own capital would suffice to cope with the market crisis alone. In an alternative approach, the results of stress tests are thus compared with risk capital allocated internally for securities trading.

If, in the event of a market disturbance, any loss incurred is higher than the risk capital allocated for securities trading, the bank needs to take action. In this regard, the plausibility of stress scenarios is certainly a critical factor. If a stress scenario is highly plausible, senior management will take a stress test more seriously than if it considers the stress scenario highly unlikely.

Stress tests gain practical significance only when their results are taken note of and understood by the bodies authorized to call for a reduction of risk exposure. It is important to identify the risk factors that contribute most heavily to losses. Only then is it possible to take well-targeted counter-measures. The bank can thus take up positions that will make a profit when key risk factors are at their worst-case levels.

### **Requirements for Credit Institutions Using VaR Models**

Austrian credit institutions may use internal models to compute regulatory capital requirements only upon approval of the models by the competent authorities. The following section summarizes the requirements for stress testing which are taken into account for the evaluation of internal models.

### **Reporting and Organization**

*Stress tests have to be carried out regularly.* The frequency of stress testing should correspond to the changes in the portfolio. Portfolios which are frequently rebalanced have to be subjected to frequent stress testing. The pertinent legislation mandates at least quarterly stress tests for banks which use an internal model to calculate capital requirements. Additionally, stress testing is required for special situations. The results of quarterly stress tests must be submitted to the supervisory authority. Furthermore, the supervisory authority can request information on special interim stress tests if this is deemed necessary.

*Procedures and responsibilities relating to decisions on when interim stress tests are to be conducted, as well as regarding the selection of stress scenarios, must be laid down in a risk management handbook.*

*Banks must be able to carry out stress tests quickly.* Like any information on risks, the results of stress tests must be quickly available to ensure that the bank can reduce its risk exposure swiftly in response to changing market conditions.

*The risk management handbook has to define what is to be regarded as an alarming stress test result.* In particular, it has to state which reference figures shall be used as a basis for comparison with potential losses found in stress tests. Contingency plans are useless if the circumstances under which they are to be applied are not clearly defined.

*The risk management handbook has to define the measures which a bank needs to take to limit its risks adequately if stress testing reveals weaknesses.* These contingency plans have to provide for measures which the bank will take in response to alarming stress test results. Such contingency plans ensure that stress testing actually serves to reduce risks and to prevent losses.

*The results of stress tests have to be communicated to decision-makers who are in a position to decide on a reduction of risk exposure.* The results of stress tests should be routinely submitted to management and should be communicated periodically to the bank's supervisory board.

A feedback loop should enable managers to question stress test reports and suggest modifications. One way of doing this is to include a special item for this purpose in stress test reports. The purpose is to ensure that management plays a significant role in planning stress tests and is able to interpret the stress test results correctly.

### **Scenario Selection**

*Stress scenarios should describe extraordinary market movements, while at the same time being plausible.* Plausibility means that stress scenarios have to appear credible. If they are not, decision-makers will not attach sufficient importance to stress test results in their decision-making processes. The two requirements of "extraordinary nature" and "plausibility" contradict one another. One way of solving this contradiction is to consider scenarios of varying degrees of extremeness.

*Banks should consider both historical scenarios and their own worst-case scenarios.* Banks might overlook fatal scenarios if they considered only stress scenarios based on historical data. The selection of historical scenarios is based on the assumption that future crises will resemble past crises. The fact that such scenarios already occurred at some point in the past, lends them plausibility and increases their acceptance. The search for worst-case scenarios, however, includes scenarios which have not yet occurred.

*The selection of scenarios must be consistent with the risk profile of the bank.* Due to their different structures, banks' portfolios have different risk profiles. The portfolio plays a central role both in a subjective and a systematic search for worst-case scenarios. Banks should also determine their vulnerability to a collapse of assumptions which are essential for their VaR models and their investment and hedging strategies. This is done through consideration of scenarios which violate such assumptions.

*The identification of scenarios should involve the broadest possible range of departments and hierarchy levels.* Staff with different macroeconomic, country-specific and industry-specific expertise can contribute to the preparation of detailed scenarios. Any search for subjective worst-case scenarios should also involve senior management members. The credibility of the resulting

scenarios draws mainly on the fact that all those involved in their construction agree that the resulting scenarios are plausible.

*Stress tests should be conducted which consider simultaneous changes in several risk categories.* Simultaneous changes in several risk categories may reveal risks which are not spotted in changes involving only individual risk categories.

*Stress scenarios should also take into account aspects of liquidity crises.*

*It is desirable for stress testing to also take into account aspects of credit risk.* In this context, it should be examined whether hedged positions exist which, due to counterparty default, could become subjected to market risk. The market risk exposure of the resulting positions should be analyzed.

*In order to monitor changes of exposure in specific risk areas, certain standard scenarios should be evaluated periodically.* Standard scenarios have to be defined to capture those risk areas where a bank's exposure is greatest. If the bank changes its trading strategy, it may become necessary to introduce additional standard scenarios.

### **Computation**

*Stress testing of portfolios which contain options or other products with nonlinear valuation functions should be based on a complete revaluation of the portfolio.* Linear approximation using sensitivities, such as delta or gamma factors, is not sufficient. These factors are sensitivities of the option value to minor changes in the risk factors. With large risk factor changes, the linear approximation loses validity. Stress tests often look at very large changes in the risk factors. For this reason, they require a full revaluation of the portfolio.

*The same valuation mechanisms should be used for the purpose of stress testing as for the VaR model.* This ensures that stress test results can be compared to VaR results.

*Computation processes should be largely automated.* This will keep the incidence of errors and inaccuracies as low as possible and help to shorten the response time when a stress event occurs. Position data input and valuation must be fully automated. It must be possible to enter scenarios flexibly, and to save them.

*Stress tests have to take into account the impact of the scenarios on the entire trading book.* Stress tests for the banking book, or parts of it, are desirable.

*It should be possible to perform stress tests on any desired subportfolio level.* Such levels could include divisions, trading units, traders or individual instruments. Scenarios used at lower levels should be tailored to the needs of the relevant area.

### **Scenarios Used by Austrian Credit Institutions**

The discussion of the situation in Austria is preceded by a summary of the principal methods for constructing scenarios. When selecting stress testing scenarios, banks basically have to decide whether to account for a specific portfolio or not. Banks may thus construct either portfolio-specific worst-case scenarios or (historical) standard scenarios.

### **Historical Standard Scenarios**

Banks frequently use standard scenarios similar to the stress scenarios proposed by the Derivatives Policy Group (DPG)<sup>1</sup>:

- parallel yield curve shifts of 100 basis points up and down;
- steepening and flattening of the yield curves (for maturities of 2 to 5 years) by 25 basis points;
- each of the four permutations of a parallel yield curve shift of 100 basis points concurrent with a tilting of the yield curve by 25 basis points;
- increase and decrease in all three-month yield volatilities by 20% of prevailing levels;
- increase and decrease in equity index values by 10%;
- increase and decrease in equity index volatilities by 20% of prevailing levels;
- increase and decrease in the exchange value of foreign currencies by 6%, in the case of major currencies, and 20%, in the case of other currencies;
- increase and decrease in foreign exchange rate volatilities by 20% of prevailing levels;
- increase and decrease in swap spreads by 20 basis points.

Standard scenarios are mostly geared toward historical maximum changes of the risk factors that were actually observed during past financial disturbances. A comparison of the DPG scenarios shows that these scenarios are partly far removed from the maximum changes observed in the past. Therefore, they should not be regarded as reconstructions of historical crises or as worst-case scenarios.

Austrian banks using internal models are not required to perform stress tests at regular intervals with standard scenarios. Nevertheless, periodic stress tests with unchanged scenarios may be useful in monitoring exposures on an ongoing basis. The same can be said of stress test limits. Such limits specify, for a certain unchanging set of scenarios, the maximum loss acceptable with each scenario and what action to take in case the limit is exceeded.

### **Portfolio-Specific Worst-Case Scenarios**

The search for worst-case scenarios differs from the construction of historical scenarios in two main aspects. First, past crises or scenarios constructed on the basis of historical maximum movements are not necessarily worst-case scenarios. There may well be potential market movements which have not yet occurred, but which would entail worse consequences for a bank's current portfolio than the historical crises which did occur. Nor are historical maximum movements necessarily worst-case scenarios, for certain portfolios may suffer the greatest damage when risk factors move only slightly. In an attempt to identify worst-case scenarios, banks consider not only events which occurred at some point in the past, but also all potential future scenarios. For this reason, worst-case scenarios are also called "forward-looking scenarios."

<sup>1</sup> The DPG is an informal body of representatives of major American banks and investment firms.

Secondly, the construction of scenarios using historical data hardly reflects the characteristics of the bank's portfolio. The current portfolio of the bank is of minor importance in the construction of scenarios from historical data. Conversely, the portfolio plays a central role in defining worst-case scenarios.

Worst-case scenarios may be designed in line with either of two methods: A bank may rely on the experience and economic expertise of staff from as wide a range of fields as possible, who use their knowledge of the market, of the portfolio and of the trading and hedging strategies of the bank in an attempt to identify those market situations which could lead to particularly high losses. This may be called a *subjective search* for worst-case scenarios. But a bank may also use its computers to search systematically for worst-case scenarios. This may be called a *systematic search* for worst-case scenarios. The foremost objective of a systematic search is the reliable identification of the worst-case scenario incurring the greatest loss. Here, it is key to limit the search to scenarios which meet certain minimum plausibility conditions.

### **The Situation in Austria**

The account of the situation in Austria is based on the quarterly stress testing reports submitted by the model users to the supervisory authorities and the information collected during on-site examinations of banks engaged in substantial securities trading.

Austrian banks usually employ standard scenarios geared in part toward historical maximum changes, yet in part also toward the conjecture of future extreme movements. The extent of the changes banks assume under the standard scenarios differs considerably from bank to bank in some risk categories. Banks tend to base their models on greater changes (and thus tougher scenarios) for those risk categories in which their exposure is high in relation to their total exposure. Austrian banks do not yet perform systematic searches for worst-case scenarios. Some banks identify worst-case scenarios by picking the harshest from a given set of standard scenarios.

Parallel yield curve shifts and tilting curves are common as maximum changes for *interest rates*. Banks, as a rule, form country groups which are subject to differing yield curve movements. For instance, parallel shifts of 60 to 110 basis points are applied to advanced economies. Increases and decreases of 8% to 15% in the exchange value of the currencies of advanced economies (emerging economies: 13% to 30%) serve as maximum changes of *exchange rates*. Ranging from  $\pm 10\%$  to  $\pm 30\%$ , the assumed changes to the *equity markets* differ the most among Austrian credit institutions.

Comparing the scenarios with the historical maximum changes actually observed yields the following result: The scenarios applied to the exchange rates of advanced economies correspond fairly well to the historical maximum swings. However, the transition economies of, for example, Russia, South Korea or Mexico experienced more severe exchange rate fluctuations in the past than reflected by the scenarios. What is more, there are great differences between the maximum exchange rate swings of various emerging economies. Banks' country groups do not always capture these

differences. Some banks' scenarios on the *equity* front underestimate the historical maximum changes if the observation is extended to cover the 1987 equity crash. The maximum *interest rate* changes are highest for twelve-month rates. The assumed parallel shifts largely underestimate the movements in this end of the yield curve. However, the maximum changes evident at the long end of the yield curve tend to be smaller than the movements implied by the parallel shifts, which basically offsets the gap in the twelve-month segment. In the case of the United Kingdom, maximum interest rate changes increase steeply once the observation period is extended to cover the crisis that hit the pound sterling in 1992. The resulting drastic changes of pound sterling interest rates were greater than the movements assumed by the banks' scenarios. Furthermore, in emerging economies crises may trigger extreme fluctuations of money market interest rates. Not all banks consider this effect in their scenarios. All in all, underratings in some segments notwithstanding, Austrian banks take a tough approach to selecting scenarios, not allowing for a diversification between risk factors or risk categories: the changes are applied simultaneously to all risk factors.

With model users, the loss incurred in the worst-case scenario, which equals the harshest standard scenario, may be compared to the VaR. Here, it must be ensured that the values refer to the same holding period. For instance, if the scenarios are based on maximum daily changes, the worst-case loss is to be compared to the daily VaR. Such a comparison shows that the worst-case loss exceeds the VaR 10 to 30 times. This likewise bears testimony to the toughness of the scenarios constructed by Austrian banks. Nevertheless, the worst-case losses are covered by own funds. This basically reflects the structure of the Austrian banking business, where banks record a higher volume for lending operations than for securities trading.

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# Backtesting of Density Forecasts

## Background

Traditionally, the forecast evaluation literature has primarily dealt with methods to evaluate point forecasts. However, over the last few years interval forecasts and density forecasts have become very important, too, especially in the field of risk management. In contrast to a point forecast, which by itself contains no information about the associated uncertainty, a density forecast provides a full picture of the possible values that a variable might take at some future point in time. In other words, a density forecast of a random variable is a forecast of the entire conditional probability distribution of this variable for a future point in time. Hence, a density forecast summarizes all the possible information that one can obtain about a forecast.

Nowadays, by far the most important application of density forecasts in finance is value-at-risk (VaR) estimation. VaR is defined as the maximum loss of a portfolio of financial instruments over a given target horizon and a specified confidence interval.<sup>1)</sup> For example, if a VaR calculated at a 95% confidence interval is accurate, then losses greater than that VaR measure (so-called 'tail events') should occur on average only five times in every hundred trading days. VaR has become attractive because it is easy to understand and it provides an estimate of the amount of capital that is needed to support a certain level of risk. Apart from risk management, density forecasts have also come to play a role in macroeconomic forecasting. For example, density forecasts of inflation were evaluated in Diebold, Tay and Wallis (1999), and Clements and Smith (2000) examined density forecasts of output growth and unemployment generated by linear and nonlinear models.<sup>2)</sup>

Until recently, evaluating forecasts of entire densities seemed to be close to impossible. However, in a recent paper, Diebold, Gunther and Tay (1998) were able to demonstrate that a certain transformation of the realizations of a variable to be forecasted produces independent and identically distributed random variables with a uniform distribution over the interval of zero to one if the predicted densities coincide with the "true" densities. This statistical result implies a testable hypothesis that can be exploited for the purpose of density forecast evaluation.

The aim of this paper is to introduce, in a nontechnical style, an extension of the Diebold et al. methodology along the lines of Berkowitz (1999) that makes the statistical evaluation of density forecasts a relatively easy task because the extended methodology produces independent and identically normally distributed data with a variance of one if the predicted densities and the "true" densities coincide. The usefulness of this result rests on the fact that statistical tests related to possibly normally distributed data

Gabriela de Raaij,  
Burkhard Raunig

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1 From a theoretical point of view, as a forecast of a certain quantile of a profit/loss distribution for a given portfolio of financial instruments, VaR itself is an interval forecast and not a density forecast. However, most methods used to obtain these particular interval forecasts are based on forecasts of the entire profit/loss distribution of a portfolio and hence on density forecasts. For a comprehensive summary on VaR, see Duffie, D. and Pan, J. (1997), Dowd, K. (1998) and Jorion, P. (1997).

2 Tay, A. S. and Wallis, K. F. (2000) provide a survey about recent developments in density forecasting in the context of finance and macroeconomics.

are well known and already programmed into most statistical software packages, whereas tests about uniform distributions are nonstandard and often more difficult to implement.

In our empirical application of the new methodology we investigate the properties of one-step-ahead density forecasts for the daily return series of two stock market indices, namely the Standard & Poor's (S&P 500) and the Austrian Traded Index (ATX). We generate these forecasts with equally weighted moving averages (MA), exponentially weighted moving averages (EWMA) and variants of conditional heteroscedasticity models of the GARCH family. All of these models are widely used in the financial industry for forecasting purposes.

Evaluating the quality of the density forecasts generated from these models is interesting for several reasons. First, information is sparse about how such models perform with respect to density forecasting, even though several studies shed some light on the ability of such models to forecast the volatility of financial series (Andersen and Bollerslev, 1998; Loudon, Watt and Yadav, 2000; Brailsford and Faff, 1996; Heynen and Kat, 1994; Alexander and Leigh, 1997). Second, from a practical point of view, it is interesting to compare the forecasting ability of simple MA and EWMA specifications, which are often used for VaR calculations, with more sophisticated GARCH models, which are more difficult to implement.

The distributional assumptions made for particular forecasting models raise important questions, too: Can we make the standard assumption of a normal distribution for our density forecasts, or do we have to base our forecasting models on more complicated statistical assumptions to obtain "good" density forecasts? Finally, it is interesting to assess the in-sample and out-of-sample performance of the different forecasting models because a good fit to historical data does not automatically translate into good out-of-sample forecasting results. Hence, it is advisable to contrast results for particular models achieved over the in-sample period with results obtained over the out-of-sample period to see whether a good in-sample forecasting results are related to good out-of-sample forecasting performance.

The rest of the paper is organized as follows. In section "Methodology" we introduce the density forecast evaluation procedure in more detail. Section "Data and Models" provides a description of the data and an outline of the models on which our predictions are based. In section "Results" we describe the setting of our forecasting experiments, present the results and discuss the in-sample and out-of-sample performance of the different forecasting models with respect to the density forecasts they generate. The last section comprises the concluding remarks.

### **Methodology**

Daily return series of stock indices can be viewed as realizations from a series of conditional densities that are unknown. We apply a methodology based on two integral transformations to evaluate the quality of different forecast models for the conditional densities of stock index return series. To explain the evaluation approach in detail, we have to introduce some notation. Let  $\{x_t\}_{t=1, \dots, m}$  be a time series generated from the series of conditional

densities  $\{f(x_t|I_{t-1})\}_{t=1, \dots, m}$  where  $I_{t-1}$  denotes the information set available at time  $t - 1$  and let  $\{p(x_t|I_{t-1})\}_{t=1, \dots, m}$  be a series of one-step-ahead density forecasts for  $\{x_t\}_{t=1, \dots, m}$ . In what follows we use  $f_t(x_t)$  and  $p_t(x_t)$  as shorthand notations for the true and the predicted conditional densities of the stock index return series.

Assume that a series of one-step-ahead density forecasts  $p_t(x_t)$  has been generated by a statistical model. As demonstrated in Diebold, Gunther and Tay (1998), such forecasts can be evaluated through a probability integral transformation applied to each observed  $x_t$  with respect to its predicted probability density  $p_t(x_t)$ . The probability integral transformation for a single  $x_t$  is given by

$$z_t = \int_{-\infty}^{x_t} p_t(u) du = P_t(x_t).$$

For every realization  $x_t$  we use the forecasted conditional density to calculate the probability that the stock index return is smaller than or equal to  $x_t$ . It can be shown that if a series of one-step-ahead density forecasts coincides with the series of the true densities, then the transformed series  $\{z_t\}_{t=1, \dots, m} \text{ iid } U(0, 1)$ .<sup>1)</sup> Therefore the quality of the density forecasts of stock index returns can be evaluated by testing whether the transformed series follows a uniform distribution on the interval zero – one and is independently and identically distributed.

Diebold et al. suggest various qualitative methods to assess the *iid*  $U(0, 1)$  property. For example, they examine the histogram of a  $z$ -series and correlograms of various powers of a  $z$ -series to assess the quality of density forecasts. They also point out that in contrast to formal statistical tests for *iid*  $U(0, 1)$ , which do not reveal particular reasons for a rejection, graphical tools have the advantage that violations of specific properties like violation of *iid*, violation of uniformity or both, can be detected.

Our goal is to assess the quality of density forecasts with constructive statistical tests which facilitate the identification of possible reasons for rejections and are easy to apply. To this end, we apply an inverse probability transformation (also known as quantile transformation) to the individual  $z_t$ 's. The transformation for a single  $z_t$  is given by

$$n_t = F_n^{-1}(z_t).$$

If  $z_t \sim U(0, 1)$  and we choose  $F_N^{-1}$  to be the inverse of a standard normal distribution function, then  $n_t$  must be distributed  $N(0, 1)$ . This result implies that if the series of  $z_t$ 's is *iid*  $U(0, 1)$ , then the transformed  $n_t$  series is *iid*  $U(0, 1)$ .<sup>2)</sup> Thus, to assess the quality of a series of one-step-

1 For a proof of this result, see Diebold, F. X., Gunther, T. A. and Tay, A. S. (1998).

2 Note that the proposed  $n$ -transformation can also be applied in multivariate cases in a straightforward fashion. However, multivariate density forecast evaluation is beyond the scope of this paper. For details on multivariate density forecast evaluation, see Diebold, F. X., Gunther, T. A. and Tay, A. S. (1998) and Diebold, F. X., Hahn, J. and Tay, A. S. (1999).

ahead density forecasts, we can run statistical tests concerning the *iid*  $N(0, 1)$  properties on the  $n$ -series. Note that for the second transformation any inverse of a distribution function could be chosen. If  $z_t \text{ iid } U(0, 1)$  then the series obtained by the second transformation has the *iid* property and follows the distribution whose inverse was taken for the integral transformation. We have chosen the inverse of a standard normal distribution because it enables us to apply standard statistical tests to check the *iid*  $N(0, 1)$  property of the  $n_t$ -series.

Our tests for *iid*  $N(0, 1)$  of an  $n$ -series are based on the first order autoregressive model

$$n_t = \alpha + \beta n_{t-1} + \varepsilon_t.$$

If  $\alpha = \beta = 0$  holds and the error term  $\varepsilon_t$  is distributed  $N(0, 1)$ , the model collapses  $n_t = \varepsilon_t \sim \text{iid } N(0, 1)$ , which implies correct density forecasts.<sup>1)</sup> In our encompassing model we do not assume normally distributed errors at the outset. An  $n$ -series could pass the tests  $\alpha = 0, \beta = 0, \sigma_\varepsilon^2 = 1$  and still not be normally distributed. Such an outcome would indicate that the  $n$ -series is independently and identically distributed but does not follow the normal distribution. Therefore, we estimate the parameters of the model using OLS and test the normality assumption explicitly. We apply  $t$ -statistics to test individual hypotheses concerning  $\alpha$  and  $\beta$  and chi-square tests to test the hypothesis of a unit variance.<sup>2)</sup> Normality of the  $n$ -series is assessed via the Jarque-Bera test statistic, and we also carry out individual tests for skewness and kurtosis. If the  $n$ -series associated with a forecasting model passes the diagnostic tests outlined above, we take this as an indication of correct density forecasts.

At this point one might argue that a test concerning *iid*  $N(0, 1)$  should consist of a joint hypothesis about independence and normality with mean 0 and variance 1. However, such a test would be uninformative, because it would not reveal the reason for a rejection of the joint hypothesis. Testing certain aspects of the encompassing model separately might prove more valuable in identifying possible reasons for violations of *iid*  $N(0, 1)$  properties. As a case in point, a test result that supports  $\beta \neq 0$  would suggest a violation of independence of an  $n$ -series. A possible reason for such a finding could be a misspecification of the dynamics of the forecasting model. A rejection of normality of an  $n$ -series might indicate problems with the distributional assumptions of a forecasting model.<sup>3)</sup>

1 If a series of normally distributed random variables is uncorrelated, which in section "Data and Models" is implied by  $\beta = 0$ , it is also independent.

2 The classical  $t$ -statistic is not exact for autoregressive models or for non-Gaussian error terms. However, in such cases the use of the  $t$ -statistic can be justified asymptotically and often provides good approximations in finite samples (for a discussion of this issue, see Hamilton, J. D., 1994, pp. 208–217 or Harvey, A. C., 1993, chapter 3). Hence, the  $t$ -tests will still be valid asymptotically if the errors of our encompassing model are not normally distributed.

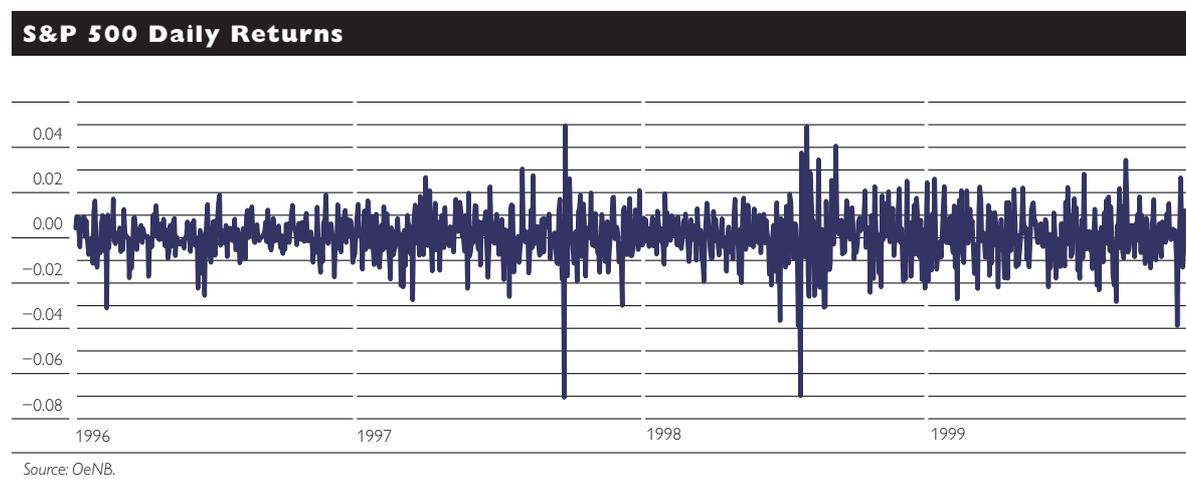
3 Unfortunately, there is no general one-to-one correspondence between a certain type of violation in a transformed  $z$ -series or  $n$ -series and the type of misspecification of the econometric model that is used to generate the density forecasts. Hence, violations in a  $z$ -series or an  $n$ -series should be interpreted as hints for reformulating a forecasting model rather than a definitive solution to a specification problem.

### Data and Models

The analysis of the properties of the statistical forecasting models outlined below is based on daily time series of the S&P 500 and ATX indices. The data set obtained from Datastream covers the period from January 26, 1990 to January 26, 2000 and contains 2,609 observations per index. Daily logarithmic returns are calculated as  $x_t = \ln(p_t) - \ln(p_{t-1})$  where  $p_t$  denotes the level of the index at day  $t$ .

We generate one-step-ahead density forecasts of daily returns using six different models. The first model is based on an equally weighted moving average (MA) of squared returns with a rolling time window. The forecast of the variance of a return at time  $t$  is given by the average squared return over the last 250 trading days. Due to its simplicity this model is widely used in the banking industry for risk management purposes. One serious drawback of this model concerns the point that MA estimates do not account for time-dependent variances.

Since there is much empirical evidence that large changes in financial markets tend to be followed by further large changes in either direction, all other five approaches in some way model the time-dependent behavior of volatility. Figure “S&P 500 Daily Returns” presents daily returns of the S&P 500 stock market index over time. The graph clearly shows the time-dependent evolution of volatility known as volatility clustering.



Hence, the second model is based on the exponentially weighted moving average (EWMA) of squared returns with a smoothing parameter  $\lambda$ . The forecast of the variance of a return at time  $t$  is a weighted average of the previous forecast, using weight  $\lambda$  and of the latest squared innovation, using weight  $(1 - \lambda)$ . The decay factor  $\lambda$ , which governs the persistence of volatility forecasts, could be estimated for every time series individually. Since many banks stick to the RiskMetrics smoothing factor  $\lambda = 0.94$ , we follow them in their choice.<sup>1)</sup> For both, the MA and the EWMA model, we

<sup>1</sup> For further details, see RiskMetrics™ (1996).

assume that the means of the daily returns are approximately zero.<sup>1)</sup> It is furthermore assumed that the returns are conditionally normal with variance  $\sigma_t^2$ . The performance of the density forecasts generated by the MA and EWMA models is especially interesting, as both models are easy to implement and widely used in risk management to obtain VaR measures.

The other forecasting specifications are variants of GARCH(1,1) models. For these models volatility depends also on the latest innovation and on the previous conditional variance. In contrast to the MA and EWMA specifications, which can be applied to the squared returns directly, the coefficients of GARCH models have to be estimated with maximum likelihood methods. For this reason, a choice has to be made with regard to the conditional densities that form the likelihood function, with this choice impacting the functional form of the density forecasts.

For all GARCH models we specify the equation for the conditional mean returns as an autoregressive process to capture aggregation effects and other sources that might induce correlation in the return series. The mean equation is given by a constant and the lagged return.

$$x_t = \omega_0 + \omega_1 x_{t-1} + \eta_t$$

The two coefficients  $(\omega_0, \omega_1)$  of the mean equation determine the conditional mean of the stock index return  $x_t$  and hence the location of a density forecast at time  $t$ . We make two different assumptions about the disturbance term  $\eta_t$ . The choice of the distribution for the disturbance term determines the distribution of the daily stock index returns. For the first variant of the GARCH models, we assume that the error term is equal to the square root of the conditional variance multiplied by an identically and independently distributed standard normal random variable. This specification implies that the generated density forecasts will be normally distributed with conditional mean  $\omega_0 + \omega_1 x_{t-1}$  and the conditional variance  $h_t$ . For the second variant we assume that the error term equals the square root of the conditional variance (scaled by the appropriate degrees of freedom) multiplied by an identically and independently distributed Student- $t$  random variable. Hence, the density forecasts of the returns are distributed as Student- $t$  with the conditional variance  $h_t$  and  $\nu$  degrees of freedom<sup>2)</sup> and conditional mean  $\omega_0 + \omega_1 x_{t-1}$ .

Both GARCH variants take the empirical finding into account that the distribution of most financial returns have fat tails (excess kurtosis). This means that extreme events (large losses or profits) occur more frequently than the unconditional normal distribution would predict. As a direct consequence, risk models that are based on the unconditional normal distribution tend to underestimate the occurrence of large losses. The reason for assuming a Student- $t$  distribution is that although in the GARCH

1 This assumption is often made in practical applications of MA and EWMA models because it is argued that incorporation of the rather noisy estimates of the mean of a daily return series (which are often close to zero) tend to produce inferior volatility predictions. For a discussion of this issue, see Figlewski, S. (1994).

2 See Bollerslev, T. (1987).

framework conditionally normal distributions produce fat-tailed unconditional distributions, often not all of the excess kurtosis is captured under the assumption of conditional normality. Since the Student- $t$  distribution allows for fat-tailed conditional densities, forecasts based on the Student- $t$  distribution might be better able to capture excess kurtosis in the data.

Finally, we have to specify the equations for the conditional variances  $h_t$  to complete the description of the GARCH models. We examine two versions of the variance equation. The first variant is the standard GARCH (1,1) specification.<sup>1</sup>) The conditional variance depends on a constant, the lagged volatility and the latest squared innovation. Positive and negative innovations are, however, treated symmetrically. The other specification is the GJR model proposed in Glosten, Jaganathan and Runkle (1993), which allows for the possibility of asymmetric reactions to news on the stock market. In contrast to the first variant, in the GJR model the impact of positive innovations (or “good” news) on the conditional variance may differ from that of negative innovations (or “bad” news).

## Results

In this section we present and discuss the test results of the quality of the density forecasts as generated by the various forecasting models. We start out by briefly describing the setting of the forecasting experiments. Since we are interested in how well the individual models perform in-sample as well as out-of-sample, we split the data on each daily index return series into two subsamples. The first sample (January 29, 1990 to January 26, 1996) is reserved for the estimation of the parameters of the various forecasting models. The latest 1,044 observations of this sample are also used to study the density forecasting performance of the models over the in-sample period. The other 1,044 observations of the data set, covering the period from January 29, 1996 to January 26, 2000, are used to evaluate out-of-sample forecasts.

The density forecasts of the MA models are based on a rolling window of 250 trading days shifted each day, EWMA density forecasts are obtained from a recursive expression for the daily variance and the in-sample density forecasts of the GARCH models are based on predictions of the conditional means and the conditional variances as implied by the model parameters estimated from the in-sample period data. The out-of-sample density forecasts from the GARCH models are based on coefficients updated once a year using a sample of fixed length containing the latest 1,564 observations available at the time of updating.

Table “Summary Statistics of Return Series” provides a summary statistic on each daily return series for both samples.

### Summary Statistics of Return Series

Series	ATX	S&P 500
Sample 1/29/1990–1/26/1996		
Mean	0.000	0.000
Max	0.076	0.034
Min	-0.075	-0.037
Standard derivation	0.013	0.007
Skewness	-0.097	-0.060
Kurtosis	9.010	5.569
Sample 1/29/1996–1/26/2000		
Mean	0.000	0.001
Max	0.052	0.045
Min	-0.087	-0.071
Standard derivation	0.012	0.011
Skewness	-0.909	-0.483
Kurtosis	8.768	7.645

Source: OeNB.

1 See Bollerslev, T. (1986).

The summary statistics of this table indicate that each of the return series displays a significant amount of excess kurtosis (the kurtosis of a normal distribution is 3) over both samples. Hence, each of the unconditional distributions has fatter tails than the normal distribution, which implies that extreme events tend to occur more frequently than a normal distribution would imply. This result is typical for most financial time series. It should also be noted that over the out-of-sample period all return distributions show greater negative skewness than over the in-sample period.

Tables 2 and 3 illustrate the in-sample and out-of-sample results of our tests to assess the quality of one-step-ahead density forecasts. The second and

**Test Results for Density Forecasts of Daily S&P 500 Stock Index Returns<sup>1)</sup>**

Model	$\alpha$	$\beta$	J-B	$\sigma^2$	sk	k
In-sample period: 1/14/1991 to 1/26/1996						
MA-N	0.076 (0.00)	0.006 (0.82)	261.02 (0.00)	0.911 (0.01)	-0.208 (0.00)	5.143 (0.00)
EWMA-N	0.080 (0.00)	0.035 (0.21) <sup>2)</sup>	436.60 (0.00)	1.105 (0.01)	-0.310 (0.00)	5.754 (0.00)
GARCH (1,1)-N	0.001 (0.97) <sup>2)</sup>	-0.011 (0.69) <sup>2)</sup>	355.48 (0.00)	0.977 (0.28) <sup>2)</sup>	-0.255 (0.00)	5.500 (0.00)
GJR (1,1)-N	0.012 (0.67) <sup>2)</sup>	-0.018 (0.52) <sup>2)</sup>	403.21 (0.00)	0.988 (0.38) <sup>2)</sup>	-0.284 (0.00)	5.653 (0.00)
GARCH (1,1)-t	0.013 (0.64) <sup>2)</sup>	-0.032 (0.26) <sup>2)</sup>	0.06 (0.97) <sup>2)</sup>	0.942 (0.07) <sup>3)</sup>	-0.014 (0.84) <sup>2)</sup>	3.018 (0.90) <sup>2)</sup>
GJR (1,1)-t	0.007 (0.80) <sup>2)</sup>	-0.027 (0.32) <sup>2)</sup>	0.20 (0.91) <sup>2)</sup>	0.953 (0.11) <sup>3)</sup>	-0.009 (0.87) <sup>2)</sup>	3.057 (0.67) <sup>2)</sup>
Out-of-sample period: 1/29/1996 to 1/26/2000						
MA-N	0.080 (0.02)	0.029 (0.36) <sup>2)</sup>	880.33 (0.00)	1.221 (0.00)	-0.632 (0.00)	7.320 (0.00)
EWMA-N	0.064 (0.05) <sup>3)</sup>	0.053 (0.25) <sup>2)</sup>	555.64 (0.00)	1.131 (0.00)	-0.766 (0.00)	6.231 (0.00)
GARCH (1,1)-N	0.008 (0.82) <sup>2)</sup>	0.009 (0.89) <sup>2)</sup>	665.30 (0.00)	1.247 (0.00)	-0.772 (0.00)	6.595 (0.00)
GJR (1,1)-N	0.020 (0.58) <sup>2)</sup>	0.004 (0.89) <sup>2)</sup>	498.86 (0.00)	1.325 (0.00)	-0.727 (0.00)	6.058 (0.00)
GARCH (1,1)-t	0.031 (0.36) <sup>2)</sup>	0.041 (0.18) <sup>2)</sup>	9.51 (0.01)	1.171 (0.00)	-0.198 (0.01)	2.750 (0.10) <sup>2)</sup>
GJR (1,1)-t	0.031 (0.36) <sup>2)</sup>	0.030 (0.33) <sup>2)</sup>	10.77 (0.01)	1.164 (0.00)	-0.224 (0.00)	2.783 (0.15) <sup>2)</sup>

Source: OeNB.

Notes: MA = moving average, EWMA = exponentially weighted moving average, GARCH = generalized autoregressive conditional heteroskedasticity model,

GJR = Glosten, Jagannathan and Runkle (1992) model. N stands for the normal distribution and t denotes a Student-t distribution.

J-B = Jarque-Bera-test statistic,  $\sigma^2$  = variance of n-series, s = skewness, k = kurtosis.

p-values for  $\alpha = 0$ ,  $\beta = 0$ ,  $\sigma^2 = 1$ ,  $S = 0$ ,  $K = 3$ , J-B test statistic in parentheses.

<sup>1)</sup>  $n_t = \alpha + \beta n_{t-1} + \varepsilon_t$ .

<sup>2)</sup> Significant at the 0.05 level.

<sup>3)</sup> Significant at the 0.10 level.

**Test Results for Density Forecast of Daily ATX Stock Index Returns<sup>1)</sup>**

Model	$\alpha$	$\beta$	J-B	$\sigma^2$	sk	k
In-sample period 1/14/1991 to 1/26/1996						
MA-N	0.002(0.96) <sup>2)</sup>	0.176(0.00)	896.06(0.00)	0.915(0.01)	0.009(0.90) <sup>2)</sup>	7.044(0.00)
EWMA-N	-0.021(0.48) <sup>2)</sup>	0.202(0.00)	5.655.72(0.00)	1.164(0.00)	-0.957(0.00)	12.017(0.00)
GARCH(1,1)-N	-0.007(0.79) <sup>2)</sup>	-0.011(0.69) <sup>2)</sup>	4.308.98(0.00)	0.942(0.07) <sup>3)</sup>	-0.686(0.00)	11.761(0.00)
GJR(1,1)-N	0.016(0.56) <sup>2)</sup>	-0.008(0.76) <sup>2)</sup>	2.766.03(0.00)	0.959(0.14) <sup>2)</sup>	-0.568(0.00)	10.014(0.00)
GARCH(1,1)-t	-0.001(0.98) <sup>2)</sup>	-0.020(0.48) <sup>2)</sup>	0.08(0.96) <sup>2)</sup>	0.940(0.06) <sup>3)</sup>	-0.017(0.80) <sup>2)</sup>	3.018(0.90) <sup>2)</sup>
GJR(1,1)-t	-0.002(0.95) <sup>2)</sup>	-0.020(0.48) <sup>2)</sup>	0.03(0.99) <sup>2)</sup>	0.938(0.05) <sup>3)</sup>	0.006(0.05) <sup>3)</sup>	3.019(0.89) <sup>2)</sup>
Out-of-sample period: 1/29/1996 to 1/26/2000						
MA-N	0.017(0.59) <sup>2)</sup>	0.038(0.22) <sup>2)</sup>	2.425.71(0.00)	1.095(0.02)	-0.938(0.00)	10.232(0.00)
EWMA-N	0.020(0.55) <sup>2)</sup>	0.094(0.00)	354.79(0.00)	1.115(0.02)	-0.609(0.00)	5.584(0.00)
GARCH(1,1)-N	0.000(0.99) <sup>2)</sup>	-0.064(0.04)	163.31(0.00)	0.998(0.49) <sup>2)</sup>	-0.512(0.00)	4.646(0.00)
GJR(1,1)-N	0.015(0.63) <sup>2)</sup>	-0.066(0.03)	126.83(0.00)	1.010(0.41) <sup>2)</sup>	-0.452(0.00)	4.449(0.00)
GARCH(1,1)-t	0.021(0.50) <sup>2)</sup>	-0.029(0.34) <sup>2)</sup>	9.36(0.01)	1.037(0.20) <sup>2)</sup>	-0.218(0.00)	2.840(0.29) <sup>2)</sup>
GJR(1,1)-t	0.018(0.57) <sup>2)</sup>	-0.233(0.00)	8.74(0.01)	1.039(0.19) <sup>2)</sup>	-0.203(0.01)	2.809(0.21) <sup>2)</sup>

Source: OeNB.

Notes: MA = moving average, EWMA = exponentially weighted moving average, GARCH = generalized autoregressive conditional heteroskedasticity model,

GJR = Glosten, Jagannathan and Runkle (1992) model. N stands for the normal distribution and t denotes a Student-t distribution.

J-B = Jarque-Bera-test statistic,  $\sigma^2$  = variance of n-series, s = skewness, k = kurtosis.

p-values for  $\alpha = 0$ ,  $\beta = 0$ ,  $\sigma^2 = 1$ ,  $S = 0$ ,  $K = 3$ , J-B test statistic in parentheses.

<sup>1)</sup>  $n_t = \alpha + \beta n_{t-1} + \varepsilon_t$ .

<sup>2)</sup> Significant at the 0.05 level.

<sup>3)</sup> Significant at the 0.10 level.

third columns of the tables report estimates and test results pertaining to the  $\alpha$  and  $\beta$  coefficients of the first order autoregressive model for the  $n$ -series. The other columns contain test results about the distributional properties (normality, variance, skewness and kurtosis) of the various  $n$ -series.

We begin our discussion with the results obtained for the simple MA and the EWMA models. According to the results, both perform rather poorly, in-sample as well as out-of-sample. All  $n$ -series generated from these models clearly fail when tested for a normal distribution, as indicated by the rather large values of the Jarque-Bera test statistics. The additional tests – for a skewness of 0 and a kurtosis of 3 – also yield clear rejections in most cases. The evidence for the  $\alpha$  and  $\beta$  parameters is somewhat mixed, but all in all, the various test results cast doubt on the quality of density forecasts produced with these simple models under the assumption of normality.

We now turn to the results for the more sophisticated GARCH and GJR models. We start with the specifications where we assume normally distributed errors. With regard to the  $\alpha$  and  $\beta$  parameters, the results are somewhat better than those of the simple MA and EWMA models. We cannot reject the hypothesis of zero  $\alpha$  and  $\beta$  coefficients for the  $n$ -series of both models over the in-sample period, which supports the property of independence and zero mean. The same results hold for the out-of-sample period for both models of the S&P 500. For the ATX return series, the models do not pass these tests out-of-sample. The distributional properties of the  $n$ -series are still disappointing. Normality is clearly rejected for all four series over both sample periods.

Note that all  $n$ -series for the models with normally distributed errors display a significant amount of excess kurtosis. Too many realized returns, transformed under the predicted densities, fall into the tails of the  $n$ -distributions. This finding suggests that the rather weak performance of these forecasting models might very likely be attributable to the inadequacy of the assumption of conditionally normally distributed returns. This conjecture is clearly supported by the in-sample results for the GARCH and GJR models with  $t$ -distributed errors. For both indices both models pass all tests at a 5 percent level of significance, implying “good” in-sample density forecasts. It is interesting to note that the incorporation of an asymmetric reaction of volatility to positive and negative returns into the econometric specification does not seem to be crucial. The GARCH- $t$  and the GJR- $t$  models show very similar performances in all cases.

Comparing the test results for the GARCH-N and GJR-N models with the results obtained for the GARCH- $t$  and GJR- $t$  models demonstrates the importance of explicitly testing the distribution of the  $n$ -series. Relying only on tests of  $\alpha$ ,  $\beta$  and the variance of the  $n$ -series without testing for normality, one could accept the hypothesis of correct density forecasts for the GARCH-N or GJR-N models over the in-sample period. However, the additional normality tests indicate that such a conclusion would be incorrect. Without testing for normality we would not have identified that the assumption of normally distributed conditional densities is incorrect.

The out-of-sample performance of the GARCH- $t$  and GJR- $t$  models is not as good as the in-sample performance. No model passes all the tests, but

in many cases the test statistics indicate that the results for these models are much better than for the models where the returns are assumed to be normally distributed. In particular, the values of the Jarque-Bera test statistics for the models with  $t$ -distributed errors are far lower than for the other models. Besides, the kurtosis of the  $n$ -distributions is always close to 3 and in most cases statistically not significantly different from 3. This suggests that the  $n$ -series are not “too far away” from normality. Nevertheless, there is evidence for autocorrelation in the  $n$ -series for the ATX. Moreover, the results indicate that the  $n$ -distributions are negatively skewed. This might be explained by the higher negative skewness of the return distributions observed over the out-of-sample period that the forecasting models do not seem to capture adequately.

### Conclusion

We assessed the in-sample and out-of-sample quality of one-step-ahead density forecasts generated via popular econometric models for daily returns of the S&P 500 and ATX stock market indices. We used a modified evaluation methodology based on a probability integral transformation that implies *iid*  $N(0, 1)$  data if the true and the predicted densities coincide. Combined with a suitable model for the generated  $n$ -series and various statistical tests for *iid*  $N(0, 1)$  derived from such a model, including tests of normality, the procedure can be seen as a valuable statistical methodology complementary to the methods proposed in Diebold, Gunther and Tay (1998) for the assessment of the quality of density forecasts as produced by VaR models and other applications in finance and economics. The experiments carried out produced a number of interesting findings.

The assumption of a normal distribution produced fat-tailed  $n$ -series. This feature of the  $n$ -series disappeared with the choice of the fat-tailed Student- $t$  distribution for the GARCH models. From a practical point of view an important finding pertains to the performance of simple MA and EWMA models: In our forecasting experiments these models, so widely used in risk management, performed rather poorly for the purpose of density forecasting under the standard assumption of conditional normality.

Under the assumption of a conditionally normally distributed error process, the GARCH and GJR models did not perform much better. The density predictions derived from the GARCH and GJR models did, however, improve dramatically when  $t$ -distributed errors were assumed. Over the in-sample period the test results indicate correct density forecasts for both return series and both models.

Although the performance of the GARCH- $t$  and GJR- $t$  models is somewhat weaker over the out-of-sample period, the various tests still point toward a much higher degree of accuracy compared to the other models. The finding of somewhat weaker out-of-sample results compared to the rather good in-sample performance should not come as a surprise. Model parameters which are updated more frequently than in our case may produce better results. Moreover, we did not attempt to find the optimal forecasting model for each return series, which certainly leaves room for improvement by specifying more sophisticated models. One should also keep in mind that a

number of financial crises, such as the Russian and the Asian crises, occurred during the out-of-sample period. Since financial crises are extremely difficult to predict, a data set reflecting several crises is a very hard test for any forecasting model.

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# Legend, Abbreviations

## Conventions used in the tables

- = The numerical value is zero
- .. = Data not available at the reporting date
- × = For technical reasons no data can be indicated
- 0 = A quantity which is smaller than half of the unit indicated
- ∅ = Mean value
- = New series

Discrepancies may arise from rounding.

## Abbreviations

ARTIS	Austrian Real-Time Interbank Settlement	GINB	General Inspectorate of Banking Supervision (Poland)
ARTIS	Austrian Real-Time Interbank Settlement (the Austrian RTGS system)	GKO	Russia's short-term Treasury bill
ATX	Austrian Traded Index	HFSA	Hungarian Financial Supervisory Authority
BIG	Bundesimmobiliengesellschaft	HGB	Handelsgesetzbuch – Austrian Commercial Code
BIS	Bank for International Settlements	IAS	International Accounting Standards
BoS	Banka Slovenije – Bank of Slovenia	IATX	real estate Austrian Traded Index
BUX	Budapest Index	IMF	International Monetary Fund
BWA	Bundes-Wertpapieraufsicht – Austrian Securities Authority	IOSCO	International Organisation of Securities Commissions
CBS	Commission of Banking Supervision	LCY	local currency
BWG	Bankwesengesetz – Austrian Banking Act	LIBOR	London Interbank Offered Rate
CCBM	correspondent central banking model	MA	moving average
CEECs	Central and Eastern European countries	M&A	merger and acquisition
CNB	Česká národní banka – Czech National Bank	Nasdaq	National Association of Securities Dealers' Automated Quotation System
CPI	consumer price index	NBP	Narodowy Bank Polski – National Bank of Poland
CPSS	Committee on Payment and Settlement Systems	NBS	Národná banka Slovenska – National Bank of the Slovak Republic
CSD	central securities depository	Nemax	stock price index on Frankfurt's Neuer Markt
DAX	Deutscher Aktienindex – German Stock Index	OECD	Organisation for Economic Co-operation and Development
DPG	Derivatives Policy Group	OeKB	Oesterreichische Kontrollbank – specialized bank for export financing, central depository for securities
DRs	depository receipts	OeNB	Oesterreichische Nationalbank
DS	direct settlement system	OTC	over the counter
DVP	delivery versus payment	ÖTOB	Österreichische Termin- und Optionenbörse – Austrian Options and Futures Exchange
EBRD	European Bank for Reconstruction and Development	P/E ratio	price/earnings ratio
ECB	European Central Bank	ROA	return on assets
ECSDA	European Central Securities Depository Association	ROE	return on equity
EGT	Ergebnis der gewöhnlichen Geschäftstätigkeit – income from ordinary activities	RTGS	Real-Time Gross Settlement system
EMS	European Monetary System	SCSS	Securities Clearing and Settlement Systems
EMU	Economic and Monetary Union	SSS	security settlement system
ESA	European System of Accounts	TARGET	Trans-European Automated Real-time Gross settlement Express Transfer
ESCB	European System of Central Banks	UMTS	Universal Mobile Telecommunications System
EU	European Union	VaR	value at risk
EURIBOR	Euro Interbank Offered Rate	ViDX	Vienna Dynamic Index
EWMA	exponentially weighted moving average	WIIW	Wiener Institut für internationale Wirtschaftsvergleiche – The Vienna Institute for International Economic Studies
FDI	foreign direct investment		
Fed	Federal Reserve System (the central bank of the United States)		
FSAP	Financial Services Action Plan		
GDP	gross domestic product		
GFCI	gross fixed capital investment		