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Financial Stability Report

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Published and produced by:

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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 Surveyllance Division

Walter Waschiczek, Economic Analysis Division

In collaboration with:

Michael Andreasch, Markus Arpa, Stephan Barisitz, E. Philip Davis (Brunel University, West London), Werner Dirschmid, Karin Dlaska, Ralf Dobringer, Gerhard Fiam, Friedrich Fritzer, Ernst Glatzer, Helmut Gruber, Rudolf Habacht, Wolfgang Harrer, Wolfgang Hengelmüller, Georg Hubmer, Ferdinand Klaban, Bettina Kunz, Birgit Leichtfried, Fritz Novak, Martin Oppitz, Franz Partsch, Thomas Reininger, Margarita Schandl-Greyer, Franz Schardax, Martin Scheicher, Martin Schneider, Michael Strommer, Gabriele Süß, Martin Taborsky, Johannes Turner, Andreas Vielhaber, Karin Wagner, Walter Waschiczek, Michael Würz

Editorial work:

Alexander Dallinger, Economic Analysis Division

Translated by:

Dagmar Dichtl, Ingrid Haussteiner, Irene Mühldorf, Ingeborg Schuch, Susanne Steinacher, Foreign Research Division

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
Documentation Management and Communications 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 2398

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Introduction

In the 1990s financial stability evolved into one of the key central bank policy objectives. The most recent political developments and their implications for the economy underline what an important role central banks play in prudential oversight and in the design of the framework conditions for financial markets, above all in times of crisis.

The resolute response of the world's major central banks after the terrorist attacks of September 11, 2001, in the U.S.A. was material in largely containing the negative repercussions on international financial markets. By quickly providing liquidity and by slashing key interest rates, the Federal Reserve System and the Eurosystem demonstrated that they would take the appropriate monetary policy measures in response to the risks both to financial markets and to the real economy. These measures served above all to prevent short-term liquidity shortages of banks operating in the international arena.

Central banks' aim to secure stable financial markets and a stable banking system is a fundamental prerequisite for effective monetary policy-making. It is crucial to note that price stability and financial stability are interdependent aims: Reaching one goal supports the attainment of the other; therefore, both tasks are equally important for central bank policy-making to succeed.

Against this background, the Oesterreichische Nationalbank (OeNB) is presenting its second Financial Stability Report. The broad range of topics in this report effectively mirrors the entire gamut of financial stability issues. The questions analyzed span a detailed treatment of topical developments on financial markets, the new Basel II capital adequacy framework, the OeNB's role in payment systems oversight, the new Austrian Finanzmarktaufsichtsgesetz (financial market supervision act), security standards for electronic signatures and the information value of financial market indicators.

"Financial stability" remains a concept which is difficult to pin down; hence, it is rarely clearly defined. This definitional limbo prompted E. Philip Davis to draw up a typology of various types of financial instability. In essence, he distinguishes between two main categories of crisis, banking failures and market crises (market price volatility and market liquidity collapses). Based on this typology, E. Philip Davis develops different implications for the euro area, in particular that European financial systems should be less vulnerable to the economic repercussions of banking crises as securities markets develop.

In general, however, the probability of undesirable trends on financial markets has grown, and the dimension of banks' risk management has increased. This, in turn, puts greater demands on the legal frameworks to ensure stability. Basel II was designed to take into account these new developments on financial markets and aims at giving banks the incentive to observe the principle of prudency in their operations.

Banks play a crucial role in the economy as financial intermediaries and as economic agents on the financial markets. Therefore, this publication focuses on examining developments in the Austrian banking system. In more detail, direct lending is clearly on the decline. In parallel to the current economic slowdown, banks have become cautious with new lending. The picture is

much the same for Austrian banks' foreign exchange trading activities. Total foreign exchange and derivatives trading has contracted perceptibly in recent years, with the data also reflecting the mergers between the five largest Austrian banks.

Overall, developments in Austria's banking system remained stable in the first half of 2001, though the business downturn naturally weighed on profitability. Nevertheless, the large banks pressed on with consolidation, reengineering and internal restructuring measures and continued to do business with Central and Eastern Europe at an unbroken pace. Capital ratios, too, remained satisfactory. An analysis based on individual banking data shows that big banks have above-average capital ratios.

The banking sector in Eastern Europe, in turn, provides empirical evidence of the effectiveness of the wide range of economic policy responses to banking crises. For instance, the thorough reforms Bulgaria implemented in 1996 and 1997 proved to be more appropriate in the medium term than Romania's more hesitant measures.

A major change in the framework governing Austria's financial markets is the Finanzmarktaufsichtsgesetz (financial market supervision act) adopted in the summer of 2001. A financial market authority (FMA) will take up operation in April 2002; it will be in charge of banking, insurance and securities supervision. From the OeNB's vantage point it is particularly important that the role of the OeNB in banking supervision is spelled out in full detail. The tried and true system of reporting data to the OeNB and the processing of these data by the OeNB will be continued, and the exchange of information between the OeNB and the FMA will be ensured by explicitly standardizing the duty of cooperation and information sharing. Moreover, the role of the OeNB in the assessment of banks' market risk and credit risk are defined more precisely in the law. In addition, the OeNB will have a wide variety of macroprudential duties related to financial stability to fulfill within the Eurosystem.

Since the terrorist attacks of September 11, credit risk has risen markedly in the U.S.A., but also in the euro area. The period is still too short to be able to assess reliably how large the potential danger in fact is. Still, the OeNB is carefully optimistic in its judgment of the outlook for global economic developments. The repercussions of the terrorist strikes on the world economy are likely to be temporary. Hence, forecasters generally expect the U.S. economy to bottom out and recover in the course of 2002. Once the upswing gains a foothold in the U.S.A., it should help the euro area and Austria to overcome slow growth contingent both on the worsening of international economic conditions and anemic domestic demand.

The OeNB has decided to regularly publish a Financial Stability Report to make all players on financial markets and the general public aware of the problems that could arise if developments on financial markets go awry.

The regular analysis of financial market developments and the identification of risks to financial stability may contribute to the early detection of potential threats and may help head off these threats by taking appropriate action quickly.

With this purpose in mind, the Financial Stability Report is an instrument designed to safeguard financial stability, which in turn is crucial to securing price stability and to promoting economic growth.

REPORTS

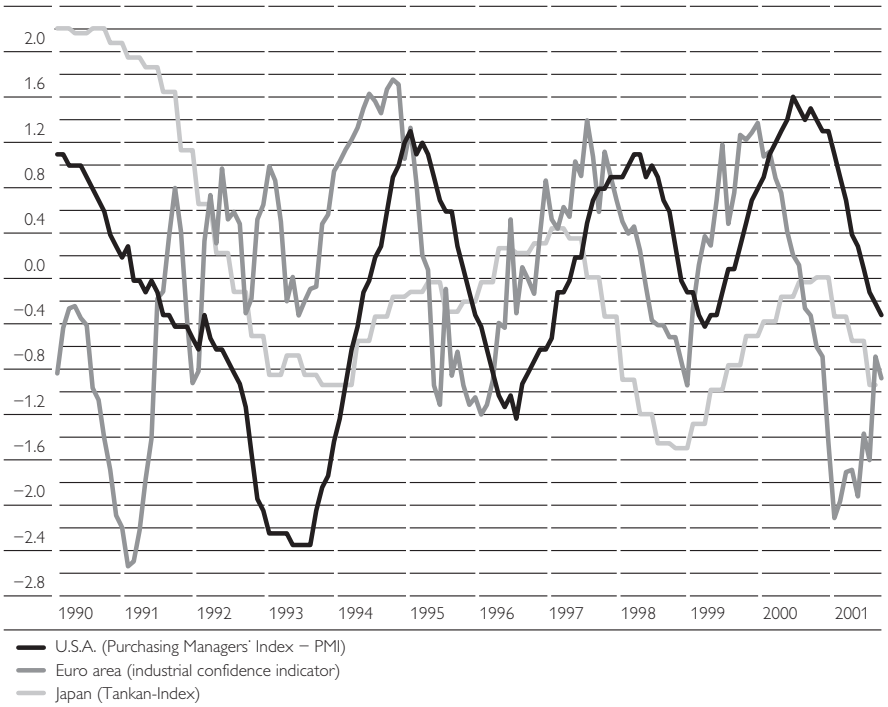
International Economic Developments

The terrorist attacks of September 11, 2001, markedly increased uncertainties about the course of the world economy. Even before this blow, international economic conditions had already suffered from weakness spreading to nearly all regions across the globe. The retrenchment had been triggered above all by excess investment in the high-tech sector toward the end of the 1990s and in 2000, followed by the cutback of investment and the deflation of the high-tech asset bubble on stock markets from spring 2000. Moreover, inflation rates, though still low by historical standards but on the rise up to the spring of 2001, burdened households' real incomes and corporate profits.

Geographically speaking, the global downturn was sparked in the U.S.A. and at first fanned out to the United States' neighbors, Canada and Mexico, along with the countries exporting high-tech goods, such as the Asian tiger economies. Thereafter, harldy a region escaped the slowdown in world trade growth triggered above all by tepid demand for capital goods, bearish equity markets and declining consumer and business confidence. This situation was compounded by unfavorable developments in some regions. In the euro area, the inflation rate temporarily crested at over 3%, chiefly because of the two supply-side shocks emanating from higher oil prices and the animal disease crises (BSE and foot-and-mouth disease), which dampened above all real incomes and consumer spending. In Japan, the banking crisis heated up, as the banking system increasingly failed to fulfill its intermediation function.

Business Climate Indicators in the G-3

Deviation from the mean value of the indicator relative to the standard deviation (since 1990)



Source: Datastream, own calculations.

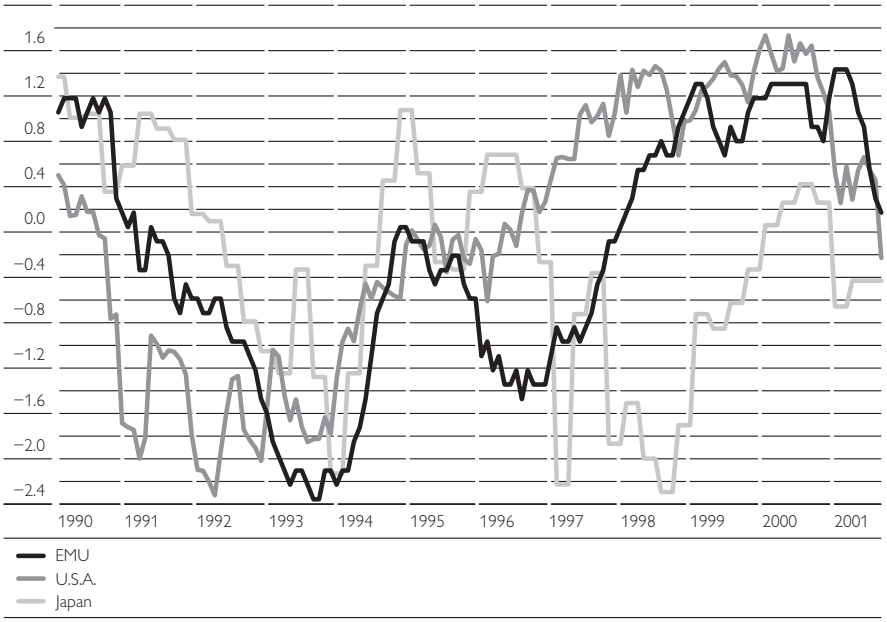
In the emerging markets, some long-standing problems flared up, e.g. the Argentine debt crisis. The economic development in the Central and Eastern European Countries (CEECs) proved to be relatively robust.

The U.S. economy showed a fairly steady development from the fall of 2000 to the summer of 2001. Industry was in recession, but the continued moderate advances of consumer spending kept the downturn from putting a stranglehold on the entire economy. U.S. economic policymakers took two crucial steps to end the slide in the industrial sector and to boost household spending. The U.S. Treasury slashed marginal tax rates from July 2001 and paid tax rebates of roughly USD 40 billion (0.4% of GDP). The Federal Open Market Committee trimmed the target federal funds rate in seven steps from 6.5% to 3.5% between January and August 2001.

Coming on top of rising unemployment and a gloomier international outlook, the terrorist attacks of September 11 put an additional strain on consumer and business confidence and the financial markets. The global economic downturn has been dampening inflation, which gave U.S. monetary policymakers the room for maneuver to ease key interest rates again. After two cuts of 50 basis points each, the federal funds rate stood at 2.5% at the beginning of October.[1]) At the beginning of October, the U.S. Congress was ready to spend some USD 130 billion (about 1.3% of GDP) for fiscal stimulus packages, measures which are likely to melt the budget surplus in 2002 down to nearly zero.

Consumer Confidence Indicators in the G-3

Deviation from the mean value of the indicator relative to the standard deviation (since 1985)



Source: Datastream, own calculations.

1 Addendum: On November 6, 2001, the target federal funds rate was cut by another 50 basis points to 2%.

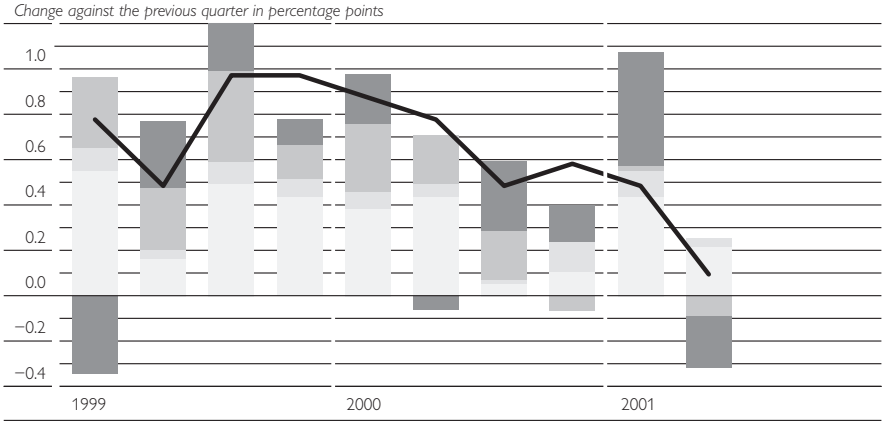
The euro area was not able to decouple from the business downturn; the bursting of the speculative bubble also hit the European technology and telecommunications sectors. Shrinking U.S. exports, weaker European FDI results, bearish stock markets and crumbling business confidence acted as a drag on gross fixed capital formation in the euro area. Consumer spending, which had been reined in by supply-side shocks especially in the second half of 2000 – by higher oil prices and the animal disease epidemics – and which was only barely augmenting, began to recover once these shocks let up and, after tax reforms of various kinds had been passed, reemerged as a pillar of euro area economic growth.

Real GDP in the euro area expanded by just 0.1% in the second quarter of 2001, down from 0.5% in the first quarter. Year-on-year growth in the second quarter amounted to 1.7%.

Growth of Real GDP Components in the Euro Area

Contribution to Seasonally Adjusted GDP Growth

Change against the previous quarter in percentage points



Net exports (goods and services)
Gross fixed capital formation
Final consumption expenditure by government
Final consumption expenditure of households and nonprofit organizations
GDP at market prices

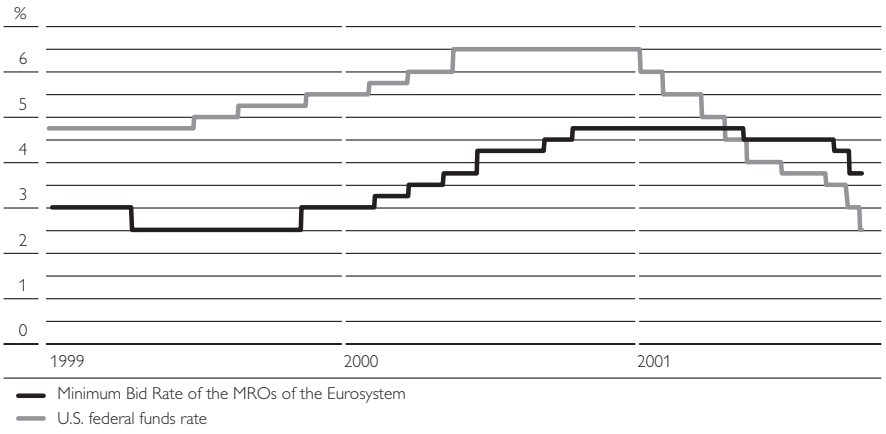
Source: Eurostat.

Inflation, which had begun to accelerate at the beginning of 1999, stopped rising after hitting a high of 3.4% in May 2001. The first factor to fuel inflation in 1999 was the hike in oil prices; this was compounded by the higher food prices in the wake of the BSE and foot-and-mouth disease crises from mid-2000. From the summer of 2001, perceptibly lower oil prices and the ending of the effects of the animal diseases along with the fact that these influences had hardly any second-round effects translated into a decline in inflation. Moreover, the worldwide economic downswing is putting a brake on the rate of price increase, which means that inflation is expected to sink further. The main risk to this scenario is the further development of oil prices.

Against this economic background, the ECB left its minimum bid rate on the main refinancing operations (MROs) unchanged at 4.75% until the beginning of May 2001. On May 10, the Governing Council of the ECB

decided to lower this rate to 4.5%. The growth of the monetary aggregate M3 had been moving steadily closer to its reference value, and the indicators under the second pillar of the Eurosystem's monetary policy strategy also signaled that inflationary pressures were letting up. At the end of August, the Governing Council again lowered the rate on the main refinancing operations by 25 basis points to 4.25%, a move justified mainly by the slowdown of economic activity and the associated easing of price pressures. In the wake of the terrorist attacks, on September 17, 2001, the Governing Council voted to slash the minimum bid rate on the main refinancing operations by 50 basis points to 3.75%. This interest rate decision was taken at an extraordinary teleconference in concert with the U.S. Federal Open Market Committee. The Governing Council of the ECB explained this step with the likelihood that the events in the U.S.A. would have adverse effects on confidence in the euro area and that they would worsen the short-term outlook for euro area growth. These developments, in turn, would reduce inflationary risks in the euro area further.[1])

Key Interest Rates: Euro Area and U.S.A.



Source: Datastream, Federal Reserve System.

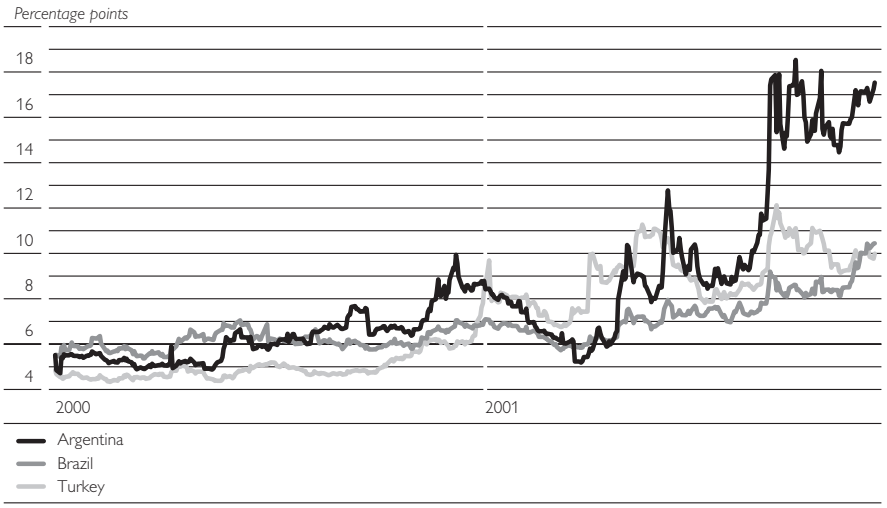
Japan's economy seems poised to slip into its fourth recession in a decade in 2001. After real GDP inched up by just 0.1% in the first quarter of 2001 against the previous period, the adverse labor market situation depressed consumer spending more and more. In addition, weak global economic activity weighed on Japanese exports. In the second quarter Japan's economy contracted by 0.8% on the previous quarter; especially domestic demand sank markedly. In view of burgeoning unemployment, persistent deflation, the quandary of Japan's banks and the enormous backlog of structural reforms, the short-term economic outlook for Japan is none too pleasant. The Bank of Japan's Tankan Report of September 2001 and other reports confirm this assessment.

1 *Addendum: On November 8, 2001, the Governing Council of the ECB cut the minimum bid rate for the main refinancing operations by an additional 50 basis points to 3.25%.*

The economic downturn affects the emerging market economies to varying degrees. The Asian tiger states (e.g. South Korea, Singapore and Malaysia), whose exports contain a comparatively large share of intermediate and finished high-tech goods, benefited from worldwide high investment in this sector until the beginning of 2000, but were hit all the harder by the high-tech downturn afterwards. Conversely, the relatively closed Asian economies, e.g. China or India, were barely affected by the recession spreading across the globe. Especially on account of its trade and finance links to the U.S.A., Latin America was not able to escape the influence of the downslide of the U.S. economy. Moreover, Argentina, caught in the throes of a recession which extended to 2001 and unable to attract investors leery of risks, failed to shake off its debt burden completely despite having concluded a stand-by arrangement of almost USD 22 billion with the International Monetary Fund (IMF). In Central and Eastern Europe, whose development is influenced most by the economies of the euro area, growth dipped in 2001, though the setback should translate into a fairly flat curve. Only in Poland is the expansion of real GDP likely to slow down substantially in 2001. Turkey labored under the aftermath of its banking crisis and the ensuing devaluation of the Turkish lira in 2001. Propped up by IMF aid of roughly USD 19 billion, Turkey gradually stabilized in the course of 2001. Nonetheless, Turkey will post clearly negative GDP growth in 2001 as well as high double-digit inflation. The economic predicament of some emerging countries, coupled with investors' increasing risk aversion from 2000, was reflected for instance by the wider interest rate spreads of these countries' debt securities.

Emerging Countries: Interest Rate Spread to U.S. Treasury Bonds

Lehman Emerging Market Indices Minus 10-Year U.S. Treasury Bonds



Source: Datastream.

Overall, world economic growth slowed considerably in 2001. Most recently, the IMF forecast real GDP growth to decline from 4.7% in 2000 to about 2.5% in 2001. The world economy is expected to gain strength continuously and throughout all regions in 2002.

International Financial Markets

Current Risk Factors

The events of September 11, 2001, have undoubtedly made it necessary to review potential risk factors to financial stability in the euro area. The terrorist attacks' effects on credit and market risk have been significant, but whether these effects are permanent is still impossible to ascertain with certainty several weeks after the events. Consequently, information derived from financial asset prices is currently surrounded by heightened uncertainty and does not clearly reflect market participants' medium- and long-term expectations.

The risk factors identified in the OeNB's financial stability report of June 2001 are still in place. What is more, the events of September 2001 have significantly increased their potential to destabilize financial markets. More and more signs of a U.S. slowdown have been emerging over the past few months, and it seems as if the slowdown is now on the verge of becoming a slump. Whether it will be a sustained one largely depends on how long it takes the stock markets to restore consumer confidence and thus prop up demand. For these reasons, an evaluation of the American stock markets is currently of special importance in assessing financial stability. Airlines and insurance companies that were severely hit by the terrorist attacks, the tense financial situation and hesitant debt reduction in the technology, media and telecommunications (TMT) sector can be considered as additional risk factors. Furthermore, sliding stock prices have further aggravated the unrelenting crisis in the Japanese banking sector. Another destabilizing factor could be the financial crisis in Argentina, which the IMF stand-by arrangement has so far failed to alleviate.

International Stock Markets on a Downward Path

Deteriorating business conditions in the U.S.A. and in Japan and the cooling of the European economy as well as the terrorist attacks in the U.S.A. have set stock prices spiraling downward at the international stock markets since

Stock Markets (Part 1)

Source: Datastream.

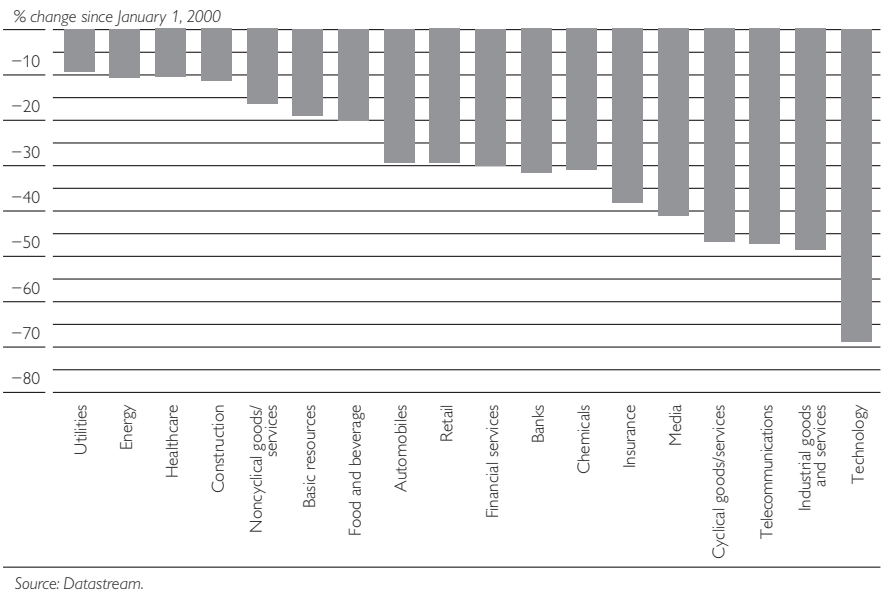
Stock Markets (Part 2)

Source: Datastream.

the beginning of 2001. Waning demand for information and communications technologies and subsequent revisions of earnings expectations also seem to have contributed to the marked decline in stock prices, especially in technology-based indices.

The interest rate cuts by the Federal Reserve have failed to inspire the market, except for temporary capital gains in the second quarter of 2001. Since then, the Standard & Poor's (S&P) 500 index, the Dow Jones Euro STOXX and the Nikkei 225 have continuously trended downwards. A 20%

Relative Price Changes in the Dow Jones Euro STOXX

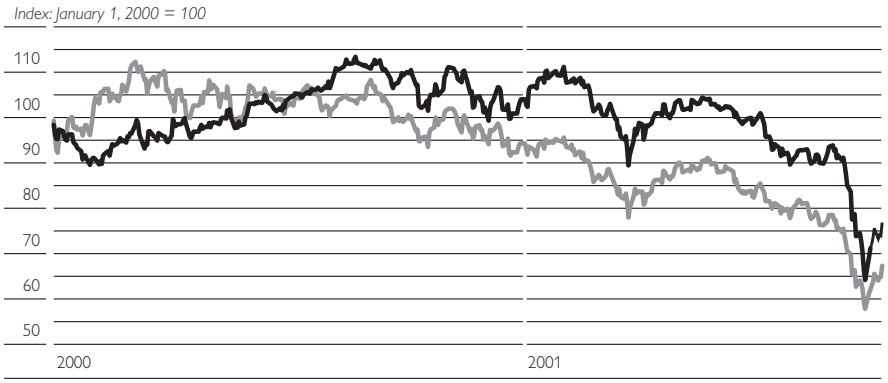


Source: Datastream.

to 30% decline has been recorded since the beginning of 2001. The technology indices moved down even more rapidly: Between early April 2000 and the cut-off date for data, the Neuer Markt (Nemax) All Share index dropped by some 87% and the Nasdaq Composite Index by approximately 65%. The losses suffered after the terrorist attacks of September 11, 2001, have however been partly offset meanwhile.

In the first three quarters of 2001, more defensive stocks, i.e. those less affected by cyclical swings, did not record gains either. Prices of TMT stocks tumbled by even 35% to 60% between January and September. More defensive stocks, such as utilities and healthcare, food and energy stocks, declined more moderately over the same period, by 6% to 16%.

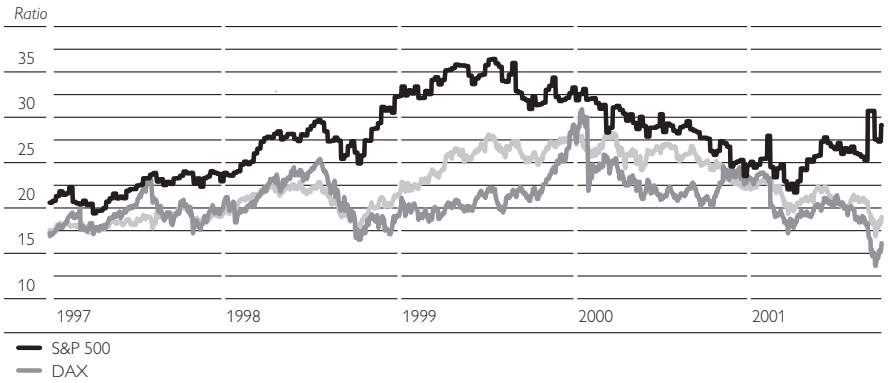
Relative Price Changes in the Banking Sector



Source: Datastream.

The banking sector, which – against the general trend – had done rather well in 2000, was unable to maintain its good performance in 2001. Since May 2001, the banking sector of the Dow Jones Euro STOXX has deteriorated dramatically: The banking subindex fell by 27% and the Dow Jones Euro STOXX by 30% between January and end-September 2001.

Price/Earnings Ratio



Source: Datastream.

The price/earnings ratio (P/E ratio) helps gauge to what extent a stock or an index may be overvalued (or undervalued). The chart "Price/Earnings Ratio" shows that the P/E ratios of stock price indices of major international stock markets significantly decreased this year. Compared to P/E ratios recorded in the past and to the DAX P/E ratio of 15, the S&P 500 P/E ratio of approximately 27 is still above average. In other words, the P/E ratio implies that there are downward risks to the S&P 500. However, since international markets tend to be highly correlated in their price movements, it cannot be ruled out that the DAX, which is rather moderately valued, will see further declines.

Japan's Economy in a Delicate State

The Japanese economy continues to be in dire straits. The bleak situation has further deteriorated since early 2001. A rapid and sustained consolidation of the Japanese banking sector is vital to ensure the stability of the financial market. For years, Japanese financial institutions have been troubled by enormous amounts of bad loans. The sharp nosedive of the Nikkei 225 led to a further weakening of the banking sector, given the large equity portfolios of the latter. Since the beginning of the year, the Nikkei 225 has lost some 30%. The rating of Japanese banks – already very low by international standards – could be downgraded further when stock prices continue to fall. The consolidation of the banking system is, consequently, one of the key objectives of the government's reform package to stimulate the economy passed in September 2001. The restructuring of the banking system is to restore the financial markets' confidence. Among other things, prudential supervision carried out by the Japanese financial market supervisory authority is to be made more effective. This is to prompt financial institutions to exert more caution in rating large loan transactions.

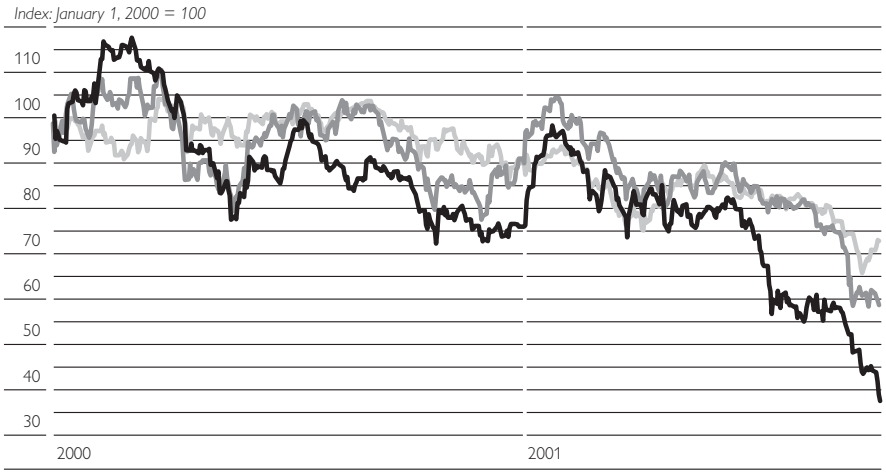
Repeated monetary easing in 2001 did not substantially improve the economic situation either. While the marked decrease in money market and capital market interest rates did make loans cheaper for Japanese businesses, the Bank of Japan's most recent "Short-Term Economic Survey of Enterprises in Japan" (issued in June) showed that the borrowing conditions for small-sized enterprises had in fact deteriorated. This may be attributable primarily to enterprises' poor earning prospects and financial institutions' greater prudence in extending loans.

Developments in the Emerging Economies

Earlier this year, the financial crisis in Turkey was the main focus of attention. Meanwhile, however, it is rather the economic situation in Latin America, especially in Argentina, that gives reason for concern. The IMF stand-by arrangement agreed upon in August 2001 helped ease but not overcome the tense situation. Contrary to other stock markets in Europe and in the U.S.A., stock prices in Argentina have not recovered but deteriorated dramatically since September 11, 2001.

The Argentine stock index Merval has dropped to its lowest level in more than ten years. The main reasons for this downslide are the global cooling of the economy and, above all, the tight fiscal situation. It was more

Stock Markets (Part 3)

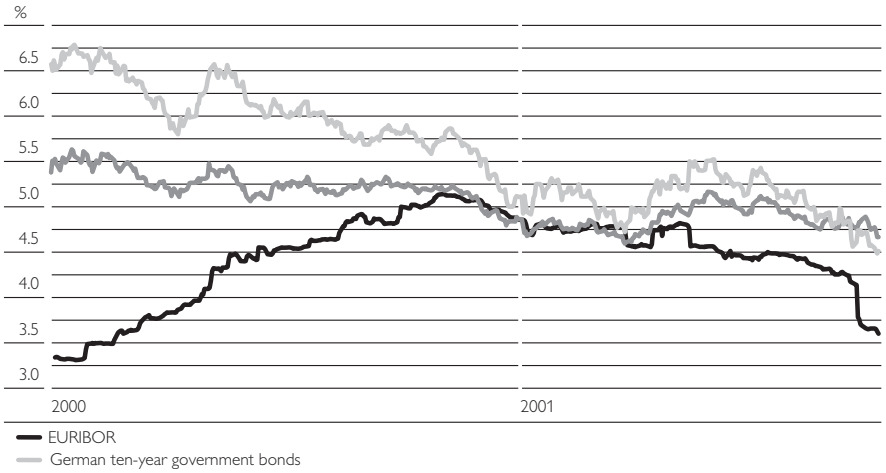


Source: Datastream.

difficult for Argentina to issue bonds in 2001 than one year earlier. Investors' confidence had been shaken already before the terrorist attacks in the U.S.A. In June 2001, Argentina swapped bonds with short maturities for bonds with longer maturities; but it was mostly Argentine banks and pension funds and only a few foreign investors that took part in the swap. Owing to the recent terrorist attacks and their implications for the American and international financial markets, the outlook for the Latin American emerging economies remains uncertain. In early October 2001, the rating agency Standard & Poor's saw reason to downgrade the rating of long-term Argentine government bonds (from B- to CCC+).

U.S. Downturn to Filter through to Europe?

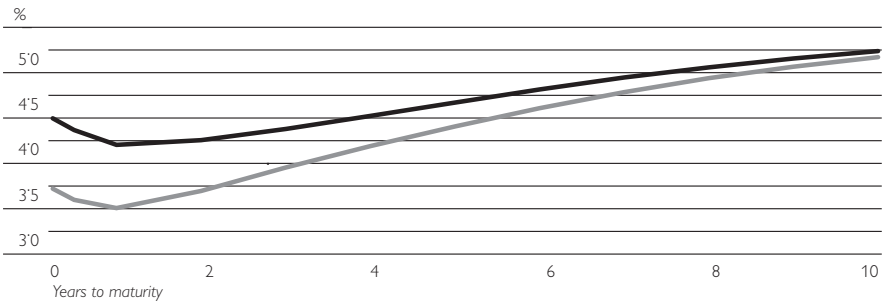
Interest Rates in the Euro Area and in the U.S.A.



Source: Datastream.

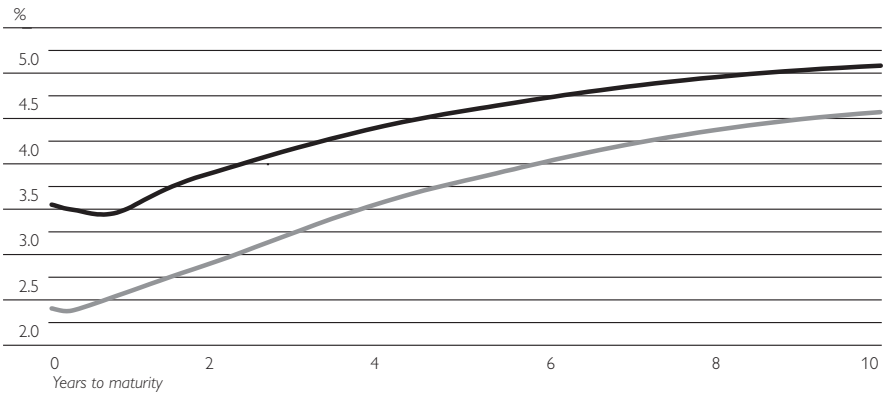
The Federal Reserve cut the target federal funds rate by a total of 400 basis points in 2001 (by the cut-off date for data). This massive interest rate cut was prompted by the economic slowdown and the terrorist attacks in the U.S.A. Even though interest rates are already at a very low level, the financial markets expect further rate cuts in the U.S.A. and in the euro area,[1]) as the shape of the zero-coupon yield curve shows.

Yield Curve Euro Swaps



Source: Datastream.

Yield Curve U.S.A.



Source: Bloomberg.

The yield curves in the U.S.A. and in Europe have shifted considerably in the course of the past half year, with the interest rate cuts of the Federal Reserve and the negative outlook for the U.S. economy having played a key role in this context both in the U.S.A. and in the euro area. The current euro swap yield curve is inverted up to a maturity of one year (the current U.S. dollar curve is also slightly inverted at the short end). This implies that the economy is expected to slow down for a period of up to one year and that interest rate cuts on the euro and the U.S. dollar interbank markets are

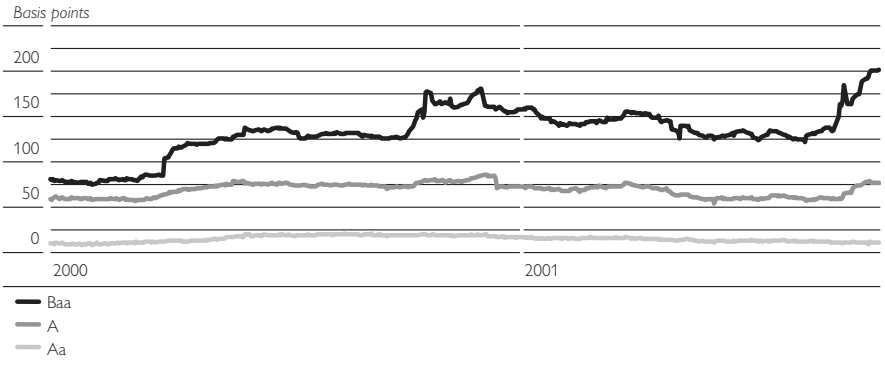
1 On November 6, 2001, the target federal funds rate was cut by another 50 basis points to 2%.

deemed likely. Thereafter financial market participants expect interest rates to rise again.

Higher Corporate Credit Risk in the Euro Area

Credit risk is the risk of a counterparty's deteriorating creditworthiness and/or – finally – its inability to meet its obligations. The spreads between risk-free government bonds and interest rate instruments with default risk are common indicators of credit risk.

Interest Rate Spread against German Government Bonds in the Euro Area



Source: Datastream.

Uncertain economic conditions affect lower quality borrowers most severely, as clearly demonstrated by the interest rate spreads of the Lehman Brothers Euro Corporate Bond Indices for the ratings Baa, Aa and A against German government bonds with a maturity of ten years. In April and October 2000, when stock prices were falling, the spread of Baa-rated bonds increased more sharply than that of A-rated bonds, whereas comparatively highly rated (Aa) corporate bonds were hardly harmed by the depressed mood on the stock markets.

The situation was similar after September 11, 2001: The credit risk of Aa-rated companies did not change significantly, while the spreads of Baa- and A-rated bonds widened by 30 and 10 basis points, respectively. Given widespread uncertainty about future developments on international financial markets, investors apparently tend to invest in lower-risk assets.

Immediately after the terrorist attacks in the U.S.A., Moody's Investors Service did not see the credit rating of the European corporate bond market seriously harmed, provided that the economic slowdown would not continue in the long run and, subsequently, force corporates to reduce their profit outlooks. According to Moody's, more than three quarters of European corporate bonds outstanding have not been affected by the terrorist attacks in the U.S.A. For now, the credit risk of lower-rated companies is likely to rise, since there are currently no signs of the economy picking up noticeably in the next few months.[1]) Airlines and insurance companies have been hit hardest by the events of September 11, 2001.

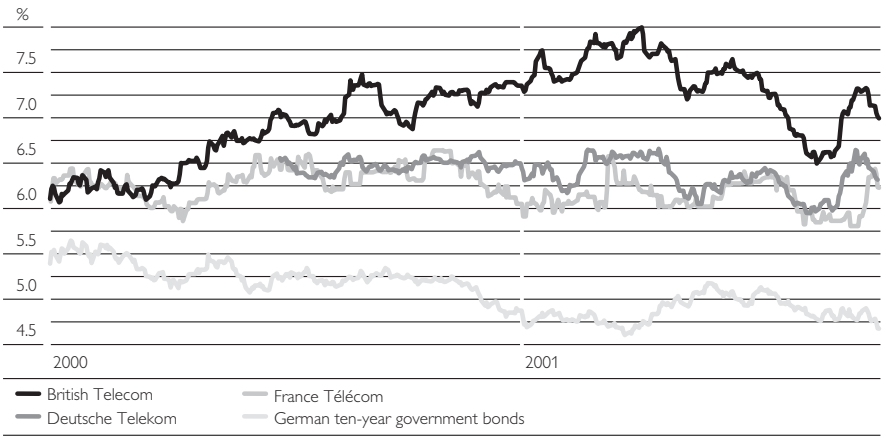
1 *Corporate credit quality is directly linked with the economic cycle: More bankruptcies are recorded during cyclical downturns than during upturns.*

Airlines' and Insurance Companies' Credit Ratings Downgraded

After September 11, 2001, a number of airlines announced the grounding of planes as well as sizeable capacity and job cuts. Standard & Poor's put all U.S. airliners' long-term bonds on CreditWatch[1]) immediately after the terrorist attacks. Of the European airlines, initially only British Airways was added to the list, given its large number of transatlantic flights. Its long-term bonds were placed on Standard and Poor's CreditWatch on September 13, 2001. In the following days, the credit rating of Swissair and – to a lesser extent – of Lufthansa and SAS also deteriorated. Though Moody's confirmed Lufthansa's and SAS's ratings, it changed their outlook from "stable" to "negative." Swissair will cease to exist in its current form. The terrorist attacks notwithstanding, Moody's assumes that insurance companies continue to maintain their solvency. Given the prevailing uncertainty about the implications of September 11, 2001, for the financial strength of the insurance industry, several insurers' ratings are currently being reviewed. If stock prices continue to fall, the credit rating of a few insurance companies will deteriorate, rating agencies predict.

Credit Risk of Telecommunications Companies Still High

Bond Yields in the Telecommunications Sector



Source: Datastream.

The yields of Deutsche Telekom, British Telecom and – to a smaller extent – France Télécom have mounted by 42 to 53 basis points since early September. The spread against German government bonds is currently 64 to 238 basis points. This, however, is not considered to be the terrorist attacks' direct impact on the companies' financial situation. In economically uncertain times, investors generally tend to invest in lower-risk assets

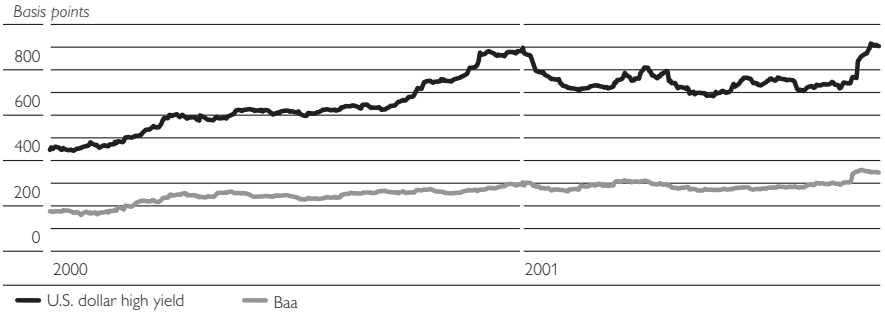
1 *CreditWatch highlights the potential direction of a short- or long-term rating. It focuses on identifiable events and short-term trends that cause ratings to be placed under special surveillance by Standard & Poors's analytical staff. These may include mergers, recapitalizations, voter referendums, regulatory action, or anticipated operating developments. Ratings appear on CreditWatch when such an event or deviation from an expected trend occurs and additional information is necessary to evaluate the current rating.*

rather than high-yield bonds. The rating agencies continue to rate credit risk in the TMT sector as very high. As debt cutting measures at France Télécom had been delayed, Standard & Poor's downgraded the issuer rating of the French telecommunications provider from A– to BBB+.

Credit Risk in the U.S.A. Rising Sharply since July 2001

In the U.S.A., next to interest rate spreads of high- or medium-rated corporate bonds (investment grade bonds), interest spreads of high-yield bonds (speculative grade bonds and/or issues with a Ba rating or worse) against U.S. Treasuries with a maturity of ten years may also be used as credit risk indicators. The U.S. swap spread,[1]) by contrast, is currently distorted by special factors and therefore not useful.[2]) The yield spreads of U.S. corporate bonds rated Baa by Moody's and of U.S. high-yield bonds[3]) against U.S. Treasuries with a maturity of ten years are currently much more influenced by fundamentals.

Interest Rate Spread against U.S. Treasuries



Source: Datastream.

The two interest rate cuts by the Fed by a total of 100 basis points in January 2001 reduced the cost of access to the U.S. bond market for lower-quality borrowers, but the decline in interest rate spreads of high-yield bonds was only temporary. From July 2001, the release of bad macroeconomic data and profit warnings left no doubt that the U.S. economy was cooling down.

The behavior of interest rate spreads of Baa-rated assets has differed considerably from that of high-yield bonds since the fall of 2000. After the attacks of September 11, 2001, for instance, the spread of speculative grade bonds soared by approximately 100 basis points (by the cut-off date for data). Over the same period, the spread of investment grade bonds rose by a mere 50 basis points. Against the backdrop of a globally high uncertainty about future developments on the financial markets and a still rather bleak

1 *Spread between U.S. Treasuries with a maturity of ten years and the fixed rate of interest swaps with a maturity of ten years.*

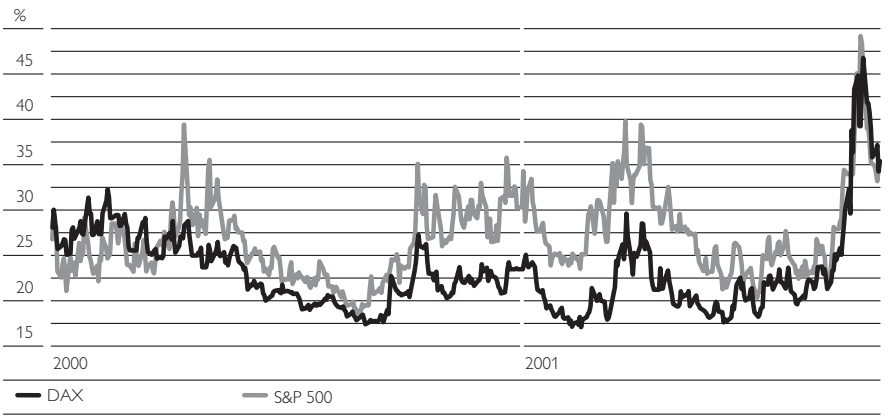
2 *After the Fed had cut interest rates and provided additional liquidity following the attacks of September 11, 2001, inflationary expectations on the financial markets apparently increased. There were sales of long-term U.S. bonds subsequently, followed by an increase in the rate of return. Hence, the decline in swap spreads observed after September 11, 2001, is not primarily attributable to reduced credit risk, but rather to rising U.S. treasury yields.*

3 *Merill Lynch High-Yield Index.*

economic outlook, investors at present prefer lower-risk assets. In the light of the cooling down of the economy and the heightened likelihood of insolvencies, default risk has increased in all rating categories.

Heightened Uncertainty on Financial Markets after September 11, 2001

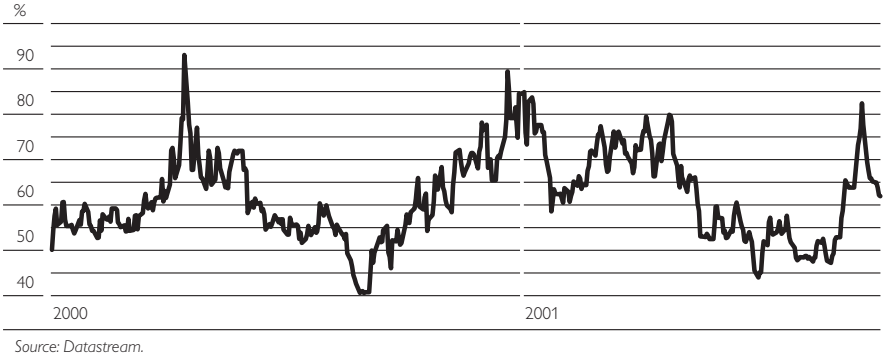
Stock Market Implied Volatility



Source: Datastream.

Market participants' uncertainty about future developments on the international stock markets has dramatically increased since the terrorist attacks in the U.S.A., as shown by the implied volatility of the DAX and the S&P 500, which soared from approximately 30% to almost 50% after September 11, 2001. These are very high figures, even if taking a somewhat longer-term view. Only during the Russian crisis in August 1998 was the degree of uncertainty higher, when financial market participants expected volatility (around the mean) to come to approximately 50% (New York Stock Exchange) or even 55% (Frankfurt Stock Exchange). That the volatility of the S&P's 500 tended to be higher than that of the DAX in 2001 can be traced to the fact that leading indicators pointed to a cooling economy in the absence of clear evidence of the pace of the slowdown. The Fed's and the Eurosystem's interest rate cuts prior to the reopening of the U.S. stock markets on September 17, 2001, did not suffice to fully overcome

Nasdaq Implied Volatility

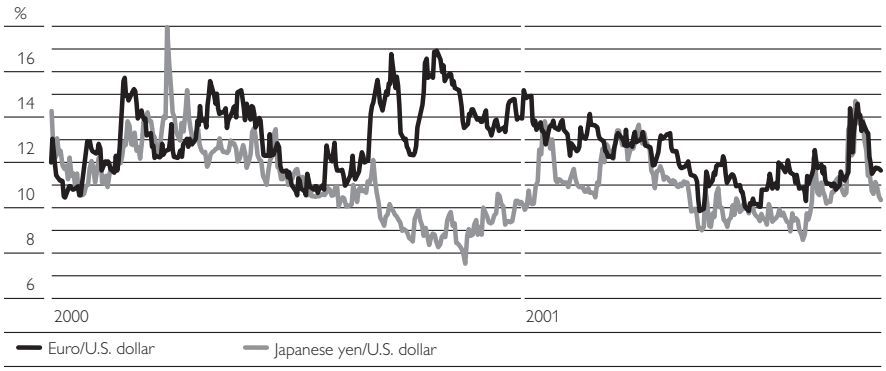


Source: Datastream.

uncertainty about future stock price developments. Toward the end of September the volatility of the DAX and the S&P 500 went down only hesitantly, to be precise to some 35%.

The implied volatility of the Nasdaq has been significantly higher than that of the DAX or the S&P 500 for some time, the former amounting to more than double the implied volatility of the DAX or the S&P 500 at times. Technology stock prices also became considerably more volatile after September 11, 2001. The slight recovery of stock prices some one and a half weeks after the terrorist attacks reduced uncertainty and lessened volatility on the Nasdaq stock market. At present, market sentiment on possible revisions of the valuation of technology stocks may be overshadowed by the tense political situation, but owing to delayed debt reduction in the TMT sector, further corrections have to be expected also in these industries.

Foreign Exchange Market Implied Volatility



Source: Bloomberg.

In the first few months of 2001, the euro significantly appreciated against the U.S. dollar following signs of a weakening U.S. economy. By contrast, the Japanese yen has been traded at rates fluctuating merely between approximately JPN 100/EUR and JPN 114/EUR since early 2001. On the foreign exchange markets uncertainty diminished in sync with the euro's gain in the fall of 2000. Between April and early September 2001, the implied volatility of the euro/U.S. dollar exchange rate fluctuated between 10% and 12%. After the terrorist attacks in the U.S.A., uncertainty rose also on the foreign exchange markets, which were concerned about possible negative effects of military retaliation. Historically, at 14% the volatility highs of the euro/U.S. dollar and of the Japanese yen/U.S. dollar exchange rates recorded in September 2001 were still well below the high recorded in October 2000.

The Terrorist Attacks and the Central Banks' Response

The terrorist attacks of September 11, 2001, had far-reaching implications for the international financial system. Essential telecommunications facilities as well as offices and computer systems of a number of important financial market participants were destroyed or rendered unusable. Due to system breakdowns, several enterprises and organizations were temporarily unable to meet their credit obligations, causing recipient institutions to face temporary payment defaults. Eventually, all the pressure accumulated had to be borne by the commercial banks − both within and outside the U.S.A. Several banks in the euro area found themselves unable to meet their payment obligations in U.S. dollars, as they were faced with payment defaults of clients in the U.S.A. while being hard put to find a private financial market participant willing to lend U.S. dollars.

In this critical situation for the international financial system, the central banks took action.

Already on the day of the terrorist attacks, the Federal Reserve System (Fed) and the Eurosystem issued short, but crucial statements of similar content:

"The Federal Reserve System is open and operating. The discount window is available to meet liquidity needs."

"After the unprecedented and tragic events in the United States today, the Eurosystem stands ready to support the normal functioning of the markets. In particular, the Eurosystem will provide liquidity to the markets, if need be."

The Fed's and the Eurosystem's offer to "provide liquidity to the markets, if need be" immediately met huge demand.

Already on September 11, 2001, demand for liquidity through the Fed's discount window surged. On September 12, 2001, discount window lending at the Federal Reserve banks amounted to USD 45.6 billion, which marked an increase by USD 45.4 billion on the previous week. Furthermore, the Federal Reserve Bank of New York provided the money market with an additional USD 38.3 billion (instead of the usual USD 2 to 6 billion) under repurchase agreements to meet the banks' refinancing needs.

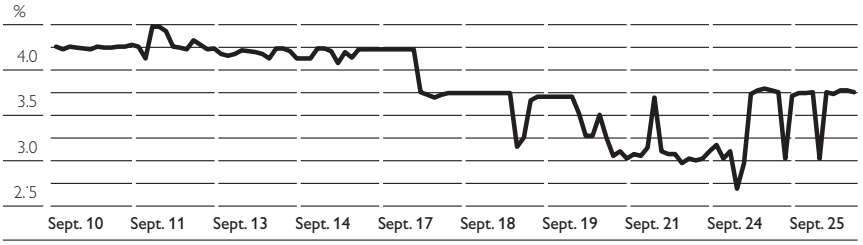
In the euro area the Euro OverNight Index Average (EONIA) held steady at about 4.25% immediately after the terrorist attacks on September 11, as the largest part of money market transactions had already been completed for the day. On the morning of the next day, despite the ECB's announcement of September 11, 2001, that it was able to supply additional liquidity, overnight interest rates temporarily climbed to over 5%. Hence, the ECB decided to conduct a fine-tuning operation as a quick tender at the fixed rate of 4.25% and a maturity of one day, thus providing the money market with EUR 69.3 billion. Announcing this operation sufficed to push overnight interest rates back to normal levels.

Also, the ECB entered into talks with the Fed about a swap agreement, which was publicly announced by the ECB and the Fed on September 13, 2001. The agreement with a maturity of 30 days encompassed USD 50 billion. The swap agreement enabled the ECB to conduct swaps in U.S. dollar together with a number of national central banks, which used their own reserves.

The swaps in U.S. dollar made it possible for the banks in the euro area to alleviate their most severe problem − servicing open U.S. dollar obligations. Supplying the euro money market with liquidity, by contrast, primarily helped fight the symptoms, whose cause lay with the U.S. dollar market rather than with the euro money market.

EONIA

from September 10 to September 25, 2001, hourly averages



Source: Bloomberg.

Since the EONIA was about to rise again in the morning of September 13, 2001, the ECB decided to conduct another quick tender under the same conditions as on the previous day; the operation supplied the market with EUR 40.5 billion, thus – like on September 12 – making a crucial contribution to stabilizing the money market. The Governing Council of the ECB, convening on the same day, decided to leave the key interest rates unchanged. In a press release, the Governing Council stated that the Eurosystem was coordinating its activities with the Fed and other major central banks.

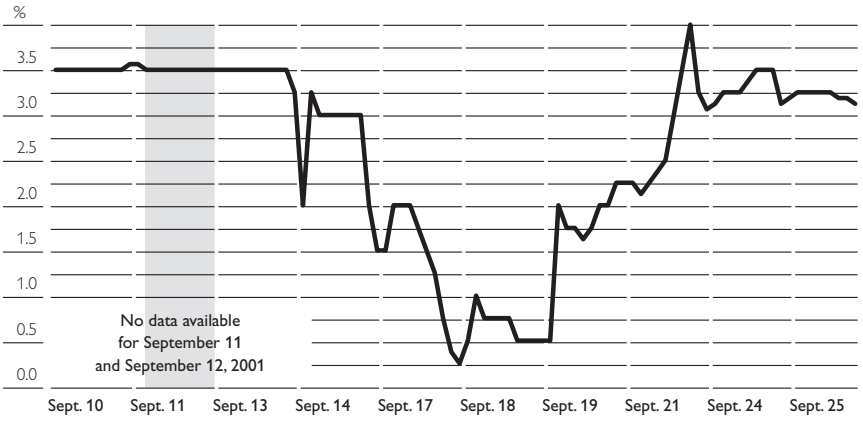
On Friday, September 14, 2001, the situation on the euro money market had calmed down notably, so that the ECB did not see the necessity of conducting another quick tender.

The U.S. capital markets remained officially closed from September 11, 2001. Government bond trading resumed – if to a very limited extent and with prolonged settlement periods – on September 13. At the New York Stock Exchange and Nasdaq, trading reopened as late as Monday, September 17, 2001. The European financial markets had been operating throughout the entire period.

On Monday, shortly before U.S. stock markets reopened, the Fed's Federal Open Market Committee (FOMC) decided at an extraordinary teleconference to cut the target federal funds rate by 50 basis points to 3%. At the same time the Fed announced that due to the extraordinary situation, it would continue to provide the markets with sufficient liquidity, even if the federal funds rate dropped below the target rate of 3%. And in fact, the federal funds rate temporarily fell to slightly more than 0% in the days to follow.

Federal Funds Rate

from September 10 to September 25, 2001, hourly averages



Source: Bloomberg.

After the decision by the FOMC, the Governing Council of the ECB held an extraordinary teleconference. In concert with the interest rate cuts in the U.S.A., the Governing Council of the ECB slashed the minimum bid rate on the main refinancing operations from 4.25% to 3.75%, arguing that the terrorist attacks in the U.S.A. were likely to have darkened the short-term economic outlook for the euro area and reduced further inflation risks in the euro area. After the Fed's and the Eurosystem's interest rate cuts, all major central banks of the industrialized world followed suit.

In the week between September 17 and September 21, 2001, things finally calmed down notably on the euro and U.S. dollar money markets. The ECB did not deem necessary further fine-tuning operations, an assessment also mirrored by the EONIA, which at times dropped − significantly − below the ECB's key interest rate of 3.75%. In the weeks to follow, the situation on the euro money market also returned back to normal. In the U.S.A. lending through the discount window was cut back to close to zero within two weeks.

In October the volume of repurchase agreements outstanding at the Federal Reserve Bank of New York, equaling USD 61 billion on September 12, 2001, came close to the level prior to the terrorist attacks (some USD 30 billion). The federal funds rate also reflected the normalization of the U.S. dollar money market, leveling off slightly below the target federal funds rate in the first half of October, which the FOMC had cut by another 50 basis points to 2.5% on October 2, 2001.[1])

[1]) *Addendum: On November 6, 2001, the target federal funds rate was cut by another 50 basis points to 2%. On November 8, 2001, the Governing Council of the ECB cut the minimum bid rate for the main refinancing operations by an additional 50 basis points to 3.25%.*

Central and Eastern Europe

Macroeconomic and External Sector Developments in Central Europe

External Imbalance in Slovakia

An assessment of the stability of the Austrian financial sector would not be complete unless it included a macroeconomic analysis of the developments in the Czech Republic, Hungary, Poland and Slovakia, since all large Austrian banks do business in these countries and since these activities have, in recent years, contributed substantially to their operating income. This section therefore analyzes external macroeconomic risks that exist in the above-mentioned countries and may adversely affect Austrian banks' operating results through the impact of exchange rates.

Like in 1999 and 2000, real GDP grew faster in Hungary in the first half of 2001 than in the other countries under review.[1])

Real GDP

period average	1995	1996	1997	1998	1999	2000	1st half of 2001
	Annual changes in %						
Poland	+7.0	+6.0	+6.8	+4.8	+4.1	+4.0	+1.6
Slovakia	+6.7	+6.2	+6.2	+4.1	+1.9	+2.2	+2.9
Czech Republic	+5.9	+4.8	−1.0	−2.2	−0.4	+2.9	+4.0
Hungary	+1.5	+1.3	+4.6	+4.9	+4.2	+5.2	+4.2

Source: National statistical offices, The Vienna Institute for International Economic Studies (WIIW), OeNB.

Compared to the year 2000 as a whole, growth weakened particularly in Poland, but also in Hungary, where the economic deceleration can be traced to slower rises in real exports (especially in the second quarter) and in real investment demand (including changes in inventory). In Poland the real decline in gross fixed capital formation nearly stopped GDP growth in its tracks, even though the contribution of net exports to growth continued to augment as real import growth, on the back of weak investment demand, contracted more than real export growth.

In the Czech Republic and Slovakia, by contrast, robust domestic demand (both in terms of consumer spending and business investment) boosted GDP growth. While more powerful domestic demand did not fuel real import growth in the Czech Republic, and growth of foreign demand eased only moderately, developments in Slovakia were more pronounced: domestic demand speeded up considerably, imports quickened markedly and foreign demand diminished faster than in the Czech Republic. In both countries, GDP growth accelerated compared with the relatively low growth rates of 2000, but the level of GDP growth, especially in Slovakia, still remained below that of Hungary in the first half of 2001.

It should be pointed out that in all four countries under review real exports continued to be the demand factor which accounted for by far the largest contribution to GDP growth in the first half of 2001, in spite of a considerable decline in year-on-year export growth in the second quarter. This development also signals that the risk of a marked slowdown in GDP growth in the euro area spreading to the CEECs is quite large.

1 *All percentage changes are over the same period of the preceding year unless otherwise indicated.*

Consumer price inflation continued to fall in the four countries under review, coming to a low of 4.3% in Poland in September – this was the lowest rate in the observed group; the Czech Republic came in with the second lowest result (4.7%), reflecting an easing of inflation in the wake of a surprisingly fast growth in prices in the period from January to July 2001. After going down sharply in the third quarter, inflation in Slovakia and Hungary ran to between 7.4% and 8.0% in September 2001. Disinflation was bolstered by diminishing oil prices. However, country-specific developments also played a role, e.g. weak domestic demand and the zloty's strength in Poland, a favorable base effect for food prices and the enlargement of the currency fluctuation band in Hungary.

Consumer Price Index

	1995	1996	1997	1998	1999	2000	1st half of 2001
	Annual changes in %						
Poland	+27.8	+19.9	+14.9	+11.8	+ 7.3	+10.1	+ 6.7
Slovakia	+ 9.9	+ 5.8	+ 6.1	+ 6.7	+10.6	+12.0	+ 7.5
Czech Republic	+ 9.1	+ 8.8	+ 8.5	+10.7	+ 2.1	+ 3.9	+ 4.6
Hungary	+28.2	+23.6	+18.3	+14.3	+10.0	+ 9.8	+10.4

Source: National statistical offices, WIIW, OeNB.

The divergent cyclical developments also passed through to the current account. In the first half of 2001, Poland and Hungary posted lower current account deficits than in the comparable period of 2000, whereas current account balance shortfalls expanded in the Czech Republic and – to a particularly large extent – in Slovakia. The deterioration of the current account in the Czech Republic in 2000 and in the first half of 2001 (compared to the first half of 2000) was not only attributable to cyclical developments, but also to the import-boosting effect of high direct investment and to the nominal (and real) appreciation of the exchange rate, whose contribution was, however, reduced by the development of unit labor costs. In Poland, by contrast, the current account deficit diminished despite nominal/real appreciation. Especially in the year 2000, the strength of the exchange rate was set off to a considerable extent by the development of unit labor costs.

In the first half of 2001, the substantial widening of the Slovak current account deficit was still largely financed by high net foreign direct investment, which was at the same time also key to the country's marked growth in imports. Unlike in the Czech Republic and in Hungary, however, net foreign direct investment in Slovakia did not suffice to offset the current

Current Account

	1995	1996	1997	1998	1999	2000	1st half of 2001
	% of GDP						
Poland	4.3	– 0.9	–3.0	–4.3	–7.5	–6.3	–5.2
Slovakia	2.1	–10.6	–9.5	–9.7	–5.8	–3.7	–8.1
Czech Republic	–2.6	– 7.4	–6.1	–2.3	–2.9	–4.7	–4.3
Hungary	–5.6	– 3.7	–2.1	–4.8	–4.4	–3.3	–3.1

Source: National statistical offices, national central banks, WIIW, OeNB.

account deficit. Moreover, Slovakia's high inflow of foreign direct investment both in 2000 and in the first half of 2001 is to a large extent attributable to privatization proceeds.

Net Foreign Direct Investment

	1995	1996	1997	1998	1999	2000	1st half of 2001
	% of GDP						
Poland	0.9	1.9	2.1	3.1	4.1	5.2	3.2
Slovakia	1.1	1.4	0.4	2.0	3.7	10.7	6.8
Czech Republic	4.9	2.2	2.4	6.3	11.4	8.8	8.6
Hungary	10.0	4.4	3.8	3.3	3.6	2.5	3.7

Source: National statistical offices, national central banks, WIIW, OeNB.

Slovakia's International Investment Position Remains Weak

Despite a very high current account deficit, Slovakia's external liabilities grew only moderately in the first half of 2001 (by 1 percentage point of GDP), mainly on account of high net FDI. Hungary recorded a remarkable rise in gross external liabilities which cannot be explained by valuation effects in the wake of changes in the exchange rate of the euro to the U.S. dollar. Two thirds of this rise can be traced to an increase in the volume of outstanding government bonds held by foreign investors. Half of this increase, in turn, stems from forint-denominated bonds issued in Hungary. For years, Slovakia and Hungary have posted the highest levels of gross external debt (in % of GDP) among the observed countries.

Gross External Debt

End of period	1995	1996	1997	1998	1999	2000	1st half of 2001[1])
	% of GDP						
Poland	40.0	31.1	31.4	33.3	36.7	38.3	38.4
Slovakia	31.7	39.5	52.4	55.9	53.4	54.7	55.7
Czech Republic	33.0	36.6	39.1	39.0	37.2	36.8	36.2
Hungary	68.4	58.3	49.2	52.6	55.0	60.5	62.9

Source: IMF, national statistical offices, national central banks, WIIW, OeNB.
[1]) Data of end-June 2001 in % of GDP for 2000.

The development of gross official reserves in Slovakia in the first half of 2001 can partly be traced to that part of the current account deficit that is not financed by direct investment and new net borrowing. In Hungary, analogous developments reflect part of the increase in gross external debt.

At 37% to 38% of GDP in the first half of 2001, Hungary and Slovakia also topped the net external liabilities ranking (external liabilities less gross official reserves). Hungary and Slovakia, in fact, were the only two countries that recorded a rise in net external debt during the first half of 2001. The case of Hungary, however, demonstrates the drawbacks of this indicator, as in parallel to rising external liabilities, external assets augmented substantially, both in the form of loans and financial derivatives.

When relating gross official reserves to average monthly imports, Poland's reserves-to-imports ratio, which has been high for years, sharply contrasts the continued low values recorded in Slovakia. Among the four

Gross Official Reserves (Excluding Gold)

End of period	1995	1996	1997	1998	1999	2000	1st half of 2001[1])
	% of GDP						
Poland	11.6	12.4	14.2	16.7	15.8	16.8	16.6
Slovakia	18.3	17.3	15.8	13.5	17.1	20.9	19.0
Czech Republic	26.6	21.3	18.5	22.0	23.5	25.6	25.0
Hungary	26.8	21.5	18.4	19.8	22.8	24.5	25.2

Source: IMF, national statistical offices, national central banks, WIIW, OeNB.
[1]) Data of end-June 2001 in % of GDP for 2000.

countries under review, Poland posts the lowest reserve position in relation to GDP, but the highest in relation to the external sector (as measured by imports); this is linked with the size of the Polish economy and its correspondingly low import ratio (imports as a percentage of GDP). In Slovakia, the reserves-to-imports ratio has recently fallen markedly, reaching its lowest level since end-1998 and reflecting a strong uptrend in imports and a reduction in the absolute level of reserves.

Gross Official Reserves (Excluding Gold)

End of period	1995	1996	1997	1998	1999	2000	1st half of 2001
	as a multiple of average monthly imports per period						
Poland	7.2	6.6	6.4	7.2	7.2	7.7	7.5
Slovakia	4.6	3.7	3.8	2.7	3.6	3.8	3.0
Czech Republic	6.6	5.4	4.3	5.2	5.5	4.8	4.2
Hungary	9.4	6.9	4.7	4.8	5.5	4.9	4.8

Source: IMF, national statistical offices, national central banks, WIIW, OeNB.

Based on the relation of gross official reserves to external debt with an original maturity of under one year, liquidity appears to be relatively well secured in particular in Poland, but also in the Czech Republic and Hungary (with the caveat, however, that this indicator does not comprise redemptions due within one year of medium- and long-term external liabilities, interest payment obligations and foreign investors' positions in shares and local currency-denominated longer-term debt securities). No current data are available for Slovakia; in 1999, this indicator had improved considerably.[1])

Gross Official Reserves (Excluding Gold)

End of period	1995	1996	1997	1998	1999	2000	1st half of 2001
	in % of gross external debt with an original maturity of under one year						
Poland	399.3	359.1	350.4	331.4	240.5	283.1	277.8
Slovakia	175.3	103.4	73.9	63.4	125.7	..	..
Czech Republic	199.3	142.8	118.9	139.4	156.9	158.0	155.7
Hungary	377.5	268.5	216.6	246.7	255.0	206.0	206.8

Source: IMF, national statistical offices, national central banks, WIIW, OeNB.

1 *The 1999 improvement of this indicator in the Slovak Republic by 62 percentage points on end-1998 figures was mainly attributable to a massive reduction in short-term liabilities (by 51 percentage points), with the rise in official reserves contributing considerably little (11 percentage points).*

The ratio of gross official reserves to M2 (i.e. broad money; includes foreign currency deposits held by residents with domestic banks) indicates to what extent reserves cover a broad measure of liquid domestic assets that can relatively easily be transferred abroad (coverage ratio). Hungary records the by far highest coverage ratio.[1])

It must be pointed out, however, that this ratio also depends decisively on the degree of monetization (money stock as a percentage of GDP) prevailing in an economy. Any deviations of the ratio of official reserves to broad money from the reserves-to-GDP ratio exclusively result from the different degrees of monetization in the respective economy. The coverage ratio in the Czech Republic, for example, is much lower than in Hungary, although the reserves-to-GDP ratio is almost identical in both countries, since the Czech level of monetization (78%) is far above that of Hungary (46%). By contrast, the gap between the coverage ratios of Poland and Hungary is even wider (in percentage points) than between their reserves-to-GDP ratios, because they have roughly the same level of monetization. Slovakia's roughly mid-way monetization level of 65% is responsible for the fact that the country's coverage ratio is lower than in any of the other countries under review (although Poland posts the lowest reserves-to-GDP ratio), while at the same time it helps Slovakia narrow the gap to the Czech coverage ratio.

Gross Official Reserves (Excluding Gold)

End of period	1995	1996	1997	1998	1999	2000	1st half of 2001
	as a percentage of broad money (including domestic foreign currency deposits)						
Poland	35.0	38.1	40.7	42.0	38.6	37.4	34.5
Slovakia	27.9	26.2	24.8	22.7	27.1	31.3	29.1
Czech Republic	35.4	30.1	27.7	29.2	33.3	33.3	32.0
Hungary	62.9	49.1	44.0	45.4	52.8	54.1	54.6

Source: IMF, national statistical offices, national central banks, WIIW, OeNB.

Exchange Rate Risks Rising in Tune to Cyclical Risks in the Euro Area

The Polish and Czech currencies appreciated by 12.2% (zloty) and 4.3% (koruna) on average vis-à-vis the euro, in nominal terms, in the first half of 2001 compared to the like period of 2000. At an average of 5.5%, Poland had already posted the highest annual nominal appreciation in 2000, followed by the Czech Republic and Slovakia.

The repercussions of the crisis in Argentina and the cloudier outlook for exports dampened the nominal appreciation of the Polish currency to just under 6% on average year on year in the third quarter, whereas the widening of the currency band in Hungary at mid-year triggered a nominal appreciation of the forint by 3.7% year on year.

All in all, the exchange rate risks resulting from the balance of payments and the international investment position appear to be higher in Slovakia than in the other three countries under review. As domestic demand revived in

1 *Countries that in recent years had been affected by massive financial crises, such as Mexico, Thailand or Russia, typically posted values of 20% or less for this indicator.*

Local Currency/EUR

Period average	1995	1996	1997	1998	1999	2000	1st half of 2001
	changes[1]) on previous year in %						
Poland	−17.0	− 5.5	−5.3	− 4.9	− 8.0	+5.4	+12.2
Slovakia	− 4.8	+ 1.8	+5.0	− 3.3	−11.0	+3.6	− 2.9
Czech Republic	− 4.2	+ 2.5	−1.2	− 0.3	− 2.8	+3.6	+ 4.3
Hungary	−26.0	−13.4	−5.8	−11.8	− 5.5	−2.8	− 1.6

Source: National central banks, WIIW, OeNB.
[1]) Minus = depreciation.

Slovakia after when the country emerged from (domestically driven) recession, the contribution of net exports to growth turned from +4.4 percentage points in 2000 to –4.0 percentage points in the first half of 2001, so that output growth accelerated rather slowly to a modest level. Accordingly, the external imbalance increased markedly. Even though gross external debt is comparably high and gross official reserves are relatively low, the risk of economic insolvency is cushioned decisively because the exchange rate may float freely.

A pronounced decline in euro area growth would drive the exchange rate risk further up in Slovakia, but it might also partly reverse the appreciation that has taken place in Poland and the Czech Republic over the last one or two years.

The Banking Sector in Central Europe

Mixed Development of Individual Balance Sheet Positions

In the year 2000, the banking sectors in central Europe benefited from the positive economic conditions prevailing in most of the CEECs and from the ongoing restructuring of the Slovak and Czech banking sectors.

With the exception of Slovakia, total banking sector assets in the CEEC-4 (Czech Republic, Hungary, Poland, Slovakia) went up in 2000, both in nominal and in real terms. Poland recorded the strongest growth, posting a nominal rise by 18.4% (+7.5% in real terms) from end-1999 to end-2000. In Slovakia, by contrast, the nominal rise in total banking sector assets (+11%) remained below the average inflation rate of 12%.

While total banking sector assets in the CEEC-4, at growth rates of between +7.5% and –1.1%, developed along relatively similar lines, developments were highly divergent across the individual balance sheet positions: In Hungary, loans to households climbed by 32% in real terms (from a low level) and loans to the business sector went up by 15% in real terms, while government bonds and central bank holdings had a lower share in total assets at the end of 2000 than in the previous year.

Despite the overall strong rise in total assets, lending to nonbanks cooled off markedly in Poland in the year 2000: While loans[1]) to households continued to climb by 20% in real terms, lending to the business sector only augmented by 2.1%. On the assets side of Polish banks, interbank lending posted the strongest growth in real terms (38%).

1 Including only commercial banks (exclusive of credit unions).

In the Czech Republic, by contrast, the volume of loans extended to the private sector even declined (as in 1999),[1]) with loans to enterprises suffering more than loans to households. The growth of aggregate banking sector assets in the Czech Republic is primarily traceable to a strong rise in the holdings of Treasury bills (+30% in real terms) and other securities, in particular medium- and long-term government bonds. This increment reflects both banking recapitalization measures carried out by the state and banks' contribution to funding that part of the budget deficit that is not accounted for by recapitalization measures. The restrictive lending practices of Czech banks mirror the fact that the Czech economy has only recently pulled out of recession and has successfully begun to tackle the problem loans the banking sector has accumulated over the past years.

The story is quite similar for Slovakia: While banks' securities holdings (above all government bonds) went up by almost 52% in real terms, the volume of loans (to the private sector and the public sector) even decreased in absolute figures.[2]) The massive increase in securities holdings in Slovakia is mainly attributable to recapitalization measures, in the course of which problem loans were replaced by government bonds in commercial banks' portfolios.

Profitability Improved in 2000

Bank profitability, as measured by return on equity (ROE) and return on assets (ROA) ratios, augmented markedly in the central European banking sector, with Slovakia improving most compared to the previous year and registering the highest absolute values of both ROE (25.2%) and ROA (1.5%) in 2000. Most likely, the above-mentioned recapitalization measures contributed essentially to this result – however, owing to a lack of detailed data, it is hardly possible to draw any more precise conclusions. The fact that net interest and noninterest income went up by 18.6% in nominal terms in 2000 year on year shows, however, that this massive improvement in total net income is not only attributable to changes in loan loss provisioning, which suggests a certain degree of sustainability. In this case, in particular, recapitalization measures might have had a "second-round effect," as banks are now earning income on government bonds swapped for de facto non-interest-bearing bad loans. In contrast to Slovakia, gross operating income in the Czech Republic fell by 11% in nominal terms and the country increase in

Return on Equity (ROE)

	1997	1998	1999	2000
	%			
Poland	22.7	8.1	11.7	13.9
Slovakia	..	−13.4	−36.5	25.2
Czech Republic	− 2.9	− 5.2	− 4.3	12.0
Hungary	11.9	7.5	3.6	10.9

Source: National central banks, own calculations.

1 *This observation does not take into account transfers of nonperforming loans to the state-owned consolidation bank.*

2 *This observation does not take into account transfers to state-owned consolidation institutes.*

ROE is exclusively attributable to the release of provisions. In Poland and Hungary, by contrast, total operating income augmented markedly, both in terms of interest and noninterest income.

As in previous years, the Polish banking sector remained one of the best-performing banking sectors in central Europe, recording a ROE of 13.9% and a ROA of 1.1%, followed by the Czech Republic and Hungary with a ROE of 12.0% and 10.9%, respectively. In terms of ROA, Hungary outperformed the Czech Republic, at 1% compared to 0.6%. In contrast to 1999, real (inflation-adjusted) ROE in 2000 was positive not only in Poland, but in all four countries under review.

Lending Rate Minus Deposit Rate[1])

	1997	1998	1999	2000
	Percentage points			
Poland	7.3	7.2	6.9	6.7
Slovakia	..	×	6.7	6.4
Czech Republic	2.8	2.3	3.1	2.9
Hungary	3.3	4.2	4.5	3.9

Source: National central banks, own calculations.
[1]) Excluding household deposits without agreed maturity.

In the year 2000, all CEEC-4 were able to reduce the gap between their lending and deposit rates; with the exception of Poland, they also recorded falling net interest rate spreads (net interest income as a percentage of average total assets). On the one hand, this development suggests a further increase of competitive pressure, while on the other, particular attention should be paid to the considerable change in the asset structure from loans to the private sector to less risky investment in government securities above all in the Czech Republic and in Slovakia.

Net Interest Rate Spread

	1997	1998	1999	2000
	%			
Poland	4.8	4.6	4.0	4.2
Slovakia	..	..	..	..
Czech Republic	1.8	2.9	2.3	2.0
Hungary	3.8	4.3	4.0	3.9

Source: National central banks, own calculations.

Unlike in the Czech Republic, noninterest income increased more strongly than interest income in Poland and Hungary.

Net Interest Income as a Percentage of Gross Operating Income

	1997	1998	1999	2000
	%			
Poland	72.9	70.3	63.7	61.7
Slovakia	..	..	..	..
Czech Republic	45.4	67.7	62.7	66.5
Hungary	67.8	71.9	88.8	60.6

Source: National central banks.

Although general administrative expenses grew by 22.8% in nominal terms in Poland, they did not expand as much as gross operating income. With general administrative expenses climbing by 9.5% in nominal terms, the ratio of general administrative expenses to operating income improved in Hungary while, owing to subdued operating income, it deteriorated in the Czech Republic even though general administrative expenses went up only by 3%; the same value was also recorded in Slovakia.

General Administrative Expenses

as a Percentage of Gross Operating Income

	1997	1998	1999	2000
	%			
Poland	55.6	63.0	65.2	62.9
Slovakia	..	..	..	..
Czech Republic	48.6	49.2	56.6	65.7
Hungary	54.5	59.6	87.0	57.9

Source: National central banks, own calculations.

Risk Provisions Decrease, Capital Adequacy on the Rise

The recapitalization measures carried out in the Czech Republic and in Slovakia in the year 2000 led to a pronounced decrease in the share of bad loans in assets and to large-scale releases of provisions. In 2000, the burden of

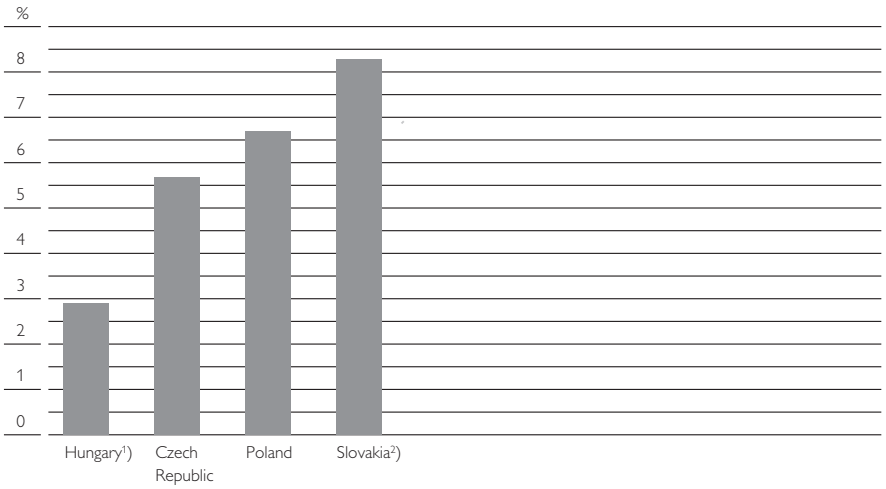
Risk Provisions as a Percentage of Gross Operating Income

	1997	1998	1999	2000
	%			
Poland	4.4	9.9	14.3	15.8
Slovakia	..	..	..	..
Czech Republic	34.0	14.6	0.1	–46.7
Hungary	1.4	8.1	1.1	0.2

Source: National central banks, own calculations.

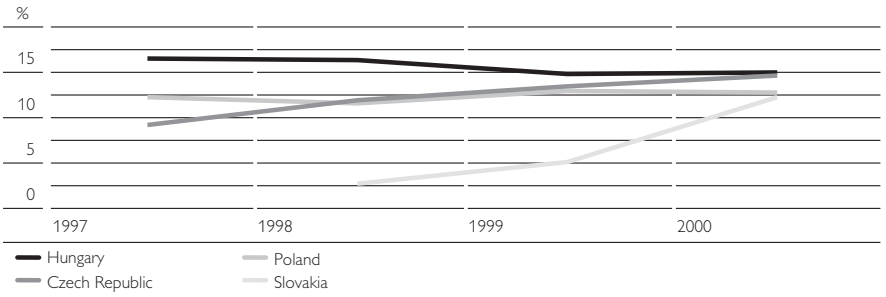
Share of Nonperforming Loans in Total Assets

As on December 31, 2000



Source: National central banks.
[1]) Share of risky assets (including off-balance-sheet items).
[2]) First half of 2000.

Ratio of Regulatory Capital to Risk-Weighted Assets[1])



Source: National central banks.
[1]) An international comparison is particularly difficult to make in this area.

risk provisions on net income in Hungary was even lower than in 1999, when this component of the profit and loss account had already reached a very low level. The economic slowdown in Poland, however, caused risk provisions to rise and the loan portfolio to deteriorate.

Moreover, Poland was the only country in the observed group to register a slightly deteriorating capital adequacy ratio. With recapitalization measures beginning to take effect in the Czech Republic and in Slovakia, the capital adequacy ratios of the banking systems in all the CEEC-4 are now quite satisfactory.

Judging from previous years' trends in net results, however, Poland appears to be the only country whose profits suffice to largely secure the capital adequacy ratio. In 2000, the downward trend (from a high level) of capital adequacy ratios in Hungary was interrupted; noninterest income clearly increased while loan loss provisions remained low. In view of the positive economic situation in Hungary at the cut-off date for data the question arises as to what extent a deteriorating economic environment might drive up risk provisions, which are currently very low. Despite recent recapitalization measures, the situation of the Czech banking sector, which is characterized by a reduction in gross operating income, must be viewed more critically. The very moderate rise in general administrative expenses does suggest that Czech banks adhere to a certain cost discipline, but this notwithstanding, the Czech banking sector (with the exception of individual credit institutions) has not succeeded, over the past few years, in opening up a sufficient number of additional sources of income. Owing to a lack of data, it is not possible to give detailed information on the corresponding situation in the Slovak banking sector; however, Slovak banks at least succeeded in improving their operating results (prior to changes in risk provisions) in the year 2000.

Special Issue: The Bulgarian and Romanian Banking Sectors[1])

Problems Abound Early in Transition

Bulgaria and Romania share many similar fundamental experiences in terms of banking sector development. In both countries, particularly difficult initial conditions and long-term political instability were typical of the environment for banking and structural reforms. The first steps toward the transition to a market economy (liberalization) were followed by growing problems in the banking sector (nonperforming loans, etc.). Authorities repeatedly reacted to the situation by introducing ad hoc measures and following stop-and-go macroeconomic policies. Stringent structural reform was avoided or postponed, which meant that fundamental problems remained unsolved. This accumulation of problems led to veritable banking crises in both countries, although the immediate causes as well as the impacts on the respective economies differed in both cases.

Banking Crises and Economic Policy Measures

Bulgaria (1996 to 1997)

In the period from 1996 to 1997, Bulgaria went through a particularly serious banking crisis. With decapitalization almost completed, the banking sector was hit by a currency crisis that caused several large banks to become insolvent, triggering a hefty economic contraction (GDP in 1996: –10.1%). Not even a radical reform program, supported by the IMF, was able to calm down the overall situation, although it contributed – at least to some extent – to the reorganization of the banking sector. In the first few months of 1997, the country experienced hyperinflation. The situation stabilized only after elections in spring 1997 and after the introduction of a currency board regime (as suggested by the IMF) pegging the Bulgarian lev to the Deutsche mark (and later to the euro).

Banking Sector Indicators for Bulgaria

End of period	Number of banks (of which foreign-owned)	Asset share of state-owned banks	Deposit rate	Lending rate	Domestic credit	Domestic credit to enterprises	Bad loans	Capital adequacy (capital/risk-weighted assets)
	Number	*%*			*% change*	*% of GDP*	*% of total loans*	*%*
1991	75 (0)	..	57.7	83.9	148.0	7.2	..	..
1992	79 (0)	..	45.3	64.6	57.2	5.8	..	..
1993	41 (0)	..	53.6	83.7	56.0	3.7	6.6	..
1994	40 (0)	..	72.3	117.8	37.1	3.8	6.8	8.6
1995	41 (3)	..	25.3	51.4	16.8	21.1	12.6	4.6
1996	42 (3)	82.0	211.8	480.8	216.8	35.6	14.6	10.8
1997	28 (7)	66.0	3.0	13.9	155.5	12.6	12.9	23.4
1998	..	..	3.3	13.3	– 17.7	12.7	..	36.7
1999	27 (14)	48.9	3.3	14.1	0..2	14.6	12.0	41.6[3])
2000[1])	34 (25)	20.0[2])	3.1	12.1	5.0	..	..	..

Source: IMF, EBRD, WIIW, Bulgarian National Bank.
[1]) Preliminary data or estimates.
[2]) September 2000.
[3]) September 1999.

1 *For a detailed analysis of the banking sectors in these two countries, see Barisitz, Stephan (2001). The Development of the Romanian and Bulgarian Banking Sectors since 1990. In Focus on Transition 1. OeNB, Vienna, 79–119.*

Interestingly, devaluation and hyperinflation eased the economic situation of numerous commercial banks, as the value of their liabilities was minimized on the one hand while, on the other, the hard-currency bonds acquired at the beginning of the 1990s facilitated "recapitalization" to a certain degree. In the wake of the introduction of the new currency regime, banking supervision was enhanced and implemented more strictly. In 1997, a number of large state-owned Bulgarian banks were privatized. The decisive changes in their business environment caused most Bulgarian banks to become more prudent and hesitant when lending to the real sector. Moreover, their capital adequacy, liquidity and solvency improved substantially.

Romania (1997 to 1999)

Romania went through its banking crisis in the time from 1997 to 1999. Compared to Bulgaria, the Romanian crisis was longer, but less severe and comprehensive. After the formation of a new government at end-1996, a structural reform program was launched, which was backed by the IMF. As the situation of various large banks and state-owned industries continued to worsen, the country somewhat loosened its monetary and fiscal policies. New banking acts entered into force in 1998, but their implementation left a lot to be desired.

Finally, 1999 was the first year to see decisive progress in restructuring the banking sector. In the first half of the year, two larger banks were sold to foreign strategic investors. In spring 1999, rumors contributed to a run on Bancorex (the former Romanian Bank for Foreign Trade), which caused the bank to collapse. After long hesitance, Bancorex was closed. The (state-owned) Banca Comerciala Romana, however, took over part of Bancorex in summer 1999. With Bancorex gone, a large-scale destabilizing factor had disappeared from Romania's financial sector. Banca Agricola (the former Bank for Agriculture and Food Industry) remained in dire straits throughout 1999, as clients withdrew large part of their deposits; after several futile attempts at restructuring Banca Agricola in the past, the Romanian authorities launched a new restructuring initiative in 1999.

Banking Sector Indicators for Romania

End of period	Number of banks (of which foreign-owned)	Asset share of state-owned banks	Deposit rate	Lending rate	Domestic credit	Domestic credit to enterprises	Bad loans	Capital adequacy (capital/risk-weighted assets)
	Number	*%*			*% change*	*% of GDP*	*% of total loans*	*%*
1991	12 (0)	..	. .	. .	. .	. .	. .	. .
1992	12 (0)	. .	. .	. .	86.1	. .	. .	. .
1993	14 (0)	. .	42.5	86.4	110.4	. .	. .	. .
1994	20 (3)	80.4	49.5	61.8	109.2	. .	18.5	. .
1995	24 (6)	84.3	32.4	47.5	123.6	. .	37.9	. .
1996	31 (8)	80.9	38.9	53.6	82.1	11.5	48.0	14.0
1997	33 (13)	80.0	34.1	55.6	82.1	13.7	56.5	13.6
1998	36 (16)	75.3	42.3	58.9	95.2	15.2	67.5	10.3
1999	34 (19)	50.3	41.3	62.0	26.8	10.5	36.6	17.5
2000[2])	35 (23)	. .	27.0	47.3	18.4	. .	. .	41.6[3])

Source: IMF, EBRD, WIIW, Romanian National Bank.

[1]) Refers to Romanian incorporated commercial banks, excluding branches of foreign banks.

[2]) Preliminary data or estimates.

[3]) Mid-2000.

Latest Developments and Economic Policy Measures

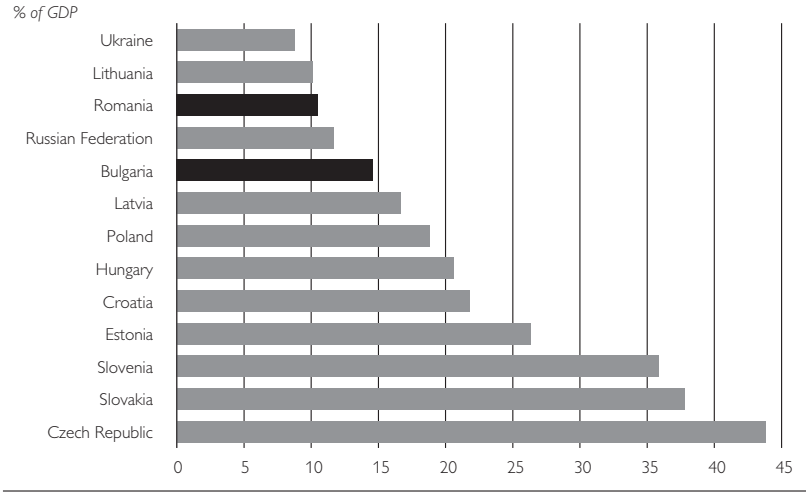
Bulgaria (1998 to 2001)

Even though many small investors were among the victims of the Bulgarian banking crisis, the macroeconomic situation in Bulgaria, and in particular the situation of the banking sector, has improved considerably since the introduction of the currency board regime. Despite adverse external influences in 1998 (Russian crisis and the financial crisis in the emerging markets) and in 1999 (Kosovo war), the country returned to the growth path, with economic expansion speeding up in 2000. Inflation, which was traditionally high, has been stopped. The official gross foreign exchange reserves (used to cover domestic currency circulation) went up considerably, while Bulgaria's foreign debt remained high. The most difficult problem seems to be the country's chronically high unemployment.

1999 saw the greatest wave of privatization since the onset of transition. By March 1998, all credit institutions that had been closed during or after the crisis were declared bankrupt, but liquidation procedures were slowed down by long and complicated court trials. Postbank, Expressbank and Hebrosbank, three medium to large credit institutions, were sold to strategic foreign investors in 1998 (Postbank) and 1999 (Expressbank and Hebrosbank). In July 2000, Bulbank, Bulgaria's largest and most prudent commercial bank, was privatized along the same lines. As a consequence of these transactions, the share of state-owned banks in total banking sector assets went down to below 20% in fall 2000, while the share of foreign-owned banks went up to more than 70%.

Since 1997, Bulgarian banks have mainly invested in relatively secure and liquid assets such as government securities. The share of bad loans in the overall credit volume shrank to 12% by 1999, while the capital adequacy of Bulgarian banks rose from 23% at the end of 1997 to 42% in September 1999. Despite the changes in ownership, banks' lending to the business sector remained hesitant. In 1999, the volume of domestic credits to

Domestic Credit to Enterprises in 1999



Source: EBRD Transition report 2000.

enterprises came to 15% of GDP in Bulgaria, which was below the figure recorded in some other transition countries such as Hungary (21%) or Croatia (22%).

Certainly, the currency board regime prompts commercial banks to hold higher liquidity reserves. But granting credits to Bulgarian firms continues to bear considerable risks and uncertainties. The Bulgarian authorities have lately taken measures to overcome these difficulties, such as establishing a central credit register in March 2000, which banks may consult before granting loans to firms. In the last months before the cut-off date for the report, banks' exposure to the business sector seems to have grown slightly, with the Bulgarian banking sector's total claims on the nongovernment sector, for example, augmenting by 15% to 20% in real terms (from a low level) year on year in August 2001.

Romania (1999 to 2001)

After a three-year downturn, Romania's economy recovered somewhat in the year 2000 and also in the first half of 2001. By end-2001, inflation is expected to exceed 30%. Progress with the privatization of Romanian enterprises has been rather slow up to now; many state-owned companies continue to operate at a loss. This circumstance, as well as the authorities' attempts at tightening banking supervision and their reduced willingness to provide financial backing for credit institutions, have caused commercial banks to become more cautious when granting credits to the real sector. Not unlike its Bulgarian counterpart, the Romanian banking system is not (yet) in a position to effectively act as an intermediator.

The volume of domestic credits in Romania only came to 11% of GDP in 1999. Serious problems in the nonbank financial sector have been further aggravating the situation. The country's most important mutual fund and its largest credit cooperative, for example, collapsed in 2000. At the end of 1999, the central bank elaborated an indicator-supported early warning system to uncover banking problems. In December 1999, a credit information center was established in Romania – which happened a few months before the creation of the respective Bulgarian institution.

Following a considerable cut in costs and the number of staff as well as substantial capital injections, Banca Agricola was sold to a group of international investors in April 2001; the main investor was Raiffeisen Zentralbank Österreich AG. At the end of 2000, before the privatization of Banca Agricola, foreign-owned banks already accounted for more than half (53%) of Romanian banking assets, while state-owned credit institutions accounted for 45%. The privatization of Banca Comerciala Romana, Romania's largest commercial bank, was repeatedly delayed and is now scheduled for 2002 or 2003. The capital adequacy of the banking sector rose from 14% at end-1997 to 21% in mid-2000.

Current Challenges

A long-term problem that has so far remained unsolved in both countries is credit institutions' limited capacity to insist on the performance of contracts and to call in outstanding debts, i.e. the unsatisfactory implementation of

creditors' rights. Progress in insolvency and liquidation procedures is sluggish in particular in Romania, where important reforms in the business sector are still outstanding. For these reasons, commercial banks in both countries are currently not able to adequately provide financial intermediation.

Given the high level of unemployment in particular in Bulgaria, the bottleneck in restructuring can only be overcome step by step. Nevertheless, the greater success of Sofia's strategy is most likely attributable to Bulgaria's stricter and more effective reform measures. In general, the Bulgarian banking sector today is without doubt more solid than the Romanian banking sector. More comprehensive and stringent measures would be called for in Romania.

Austrian Credit Institutions

Further Consolidation Efforts and Improvements in Prudential Supervision

The Austrian banking system continues to be stable and efficient. No new problem cases emerged in the first half of 2001. After the multitude of large-scale mergers and takeovers seen over the past two years, Austria's major banks are currently implementing consolidation and internal restructuring measures. By streamlining their organization, the banks are at the same time intensifying their efforts to achieve further cost reductions. The Austrian banks continue to pursue their activities in the Central and Eastern European countries. In the first six months of 2001, the economic slowdown put downward pressure on earnings.

The Austrian banking system is built on a sound legal basis and protected by a comprehensive safety net. In order to improve the regulatory effectiveness of bank supervision even further, the Financial Market Supervision Act (FMAG) was passed in the summer of 2001. Under this Act, a financial market authority will be set up as of April 2002, with responsibility for overseeing banks, investment firms, pension funds, and insurance companies. The aim of the new statutory regulation is a qualitative improvement in supervision and the realization of synergies through the close integration of the OeNB, Austria's central bank, into the process.[1])

Activities designed to strengthen the stability of the banking sector have also been initiated at the sector level. Effective January 2002, the savings banks sector will set up its own liability-sharing program, which in the event of problems arising in one of the member institutions, will guarantee deposits even beyond the amount of EUR 20,000 prescribed by the law. This liability-sharing program will be a significant move in preparing the sector for consolidation of its members' financial statements. It should also help to provide access to better refinancing facilities and thus strengthen the competitive position of the savings banks sector.

A particular challenge to Austrian banks will be the task of ensuring a smooth and safe transition to euro notes and coins around the year-end 2001. For stability considerations it is important to ensure that businesses and the population at large are promptly and adequately supplied with cash to avoid potential negative effects (e.g. cash shortages) or over-reactions (e.g. hoarding of cash).[2])

The purpose of distributing euro notes and coins prior to E-day (frontloading and subfrontloading) is to have the mechanism in place for the main rollout of euro cash to businesses and consumers from January 1, 2002. The supplies of euro currency ordered under the frontloading scheme are destined for the further distribution (subfrontloading) to companies and consumers in Austria as well as to credit institutions outside the euro area and should meet the cash needs of the first few business days in January 2002.

1 *See the study entitled "Reform of Financial Market Supervision in Austria – The New Financial Market Supervision Act" in this issue.*

2 *Regarding the effects on the overall economy see Dirschmid, Fluch, Gnan (2001): Economic Aspects of the Euro Cash Changeover in Austria. In: Focus on Austria 2, 246–269.*

Increasing Significance of e-Banking

During the past few years, the Austrian banks have been making increasing use of new information technologies, including in particular the Internet. All major banks have been investing in the development and improvement of their systems and the implementation of new developments in electronic business and commerce systems. The rising use of the Internet and the resulting potential for cost savings are already starting to change the banks' customer relations both in retail and wholesale banking.

By now, all major Austrian banks offer to execute security transactions through their own platforms or via Internet brokers. In the first half of 2001, three new e-banks were founded. On the other hand, the continuing weakness of the stock markets and declining trading volumes have had a negative impact on online brokers' earnings. This may lead to mergers of Internet brokers in the near future as efforts are made to expand transaction volumes.

Regarding account management via the Internet, only some empirical data were available at editorial close. Currently, about 10% to 20% of the major Austrian banks' clients seem to have access to their accounts through the Internet or mobile phones.[1]) For the electronic transaction of payments, new systems have been developed, among them bezahlen.at, an electronic bill presentment and payment method whereby clients can pay their bills through the Internet, and the Paybox System (since 2001) for payments via the mobile phone (with payments being made by direct debiting).

The development of the electronic purse market (e-money on a smart card) has advanced with the introduction of the Quick card, which is used for paying small amounts. By July 2001, more than 5.8 million cards with the Quick functionality had been issued in Austria. These cards can be loaded at 2,600 automated teller machines. To date, a total of 424,000 payments have already been transacted with an aggregate value of slightly above EUR 2 million. The average sum paid is around EUR 4.4. A novelty in the segment of network-based e-cash is the BAWAG-P.S.K. group's Paysafecard, which can be used to pay for purchases on the Internet. However, it is currently accepted only by a limited number of businesses.

The debate about the legal and security implications of e-banking has recently also intensified in Austria. Based on the equal treatment of all distribution channels (both online and offline), additional measures will have to be taken to improve in particular the security infrastructure as a precondition for successful e-banking. Acceptance of new modes of payment depends to a large extent on system security, which means that more attention will have to be directed at technology-related risks.

The Secure Information Technology Center – Austria (A-SIT), which has been monitoring technology and conducting technology assessments since its foundation in May 1999, provides support to payment systems supervisors. Currently, its main focus is on the security of electronic payment systems. Another feature that is gaining importance is the electronic signature. A number of companies have already been set up which will offer certification services for digital signatures on the Internet in accordance with the 2000 Electronic Signatures Act to guarantee secure order procedures in the banking business as well.[2]) Banks are keenly interested in making Internet transactions more secure.

[1]) *With specialized banks, this rate is 100%.*

[2]) *On this topic, see the study entitled "Secure Electronic Signatures – an Infrastructural Contribution to Financial Stability" in this issue.*

It is expected that 1.5 billion coins will be issued representing a value of EUR 645 million, along with 360 million banknotes worth EUR 18.1 billion. The issuance of euro coins and banknotes is an enormous challenge not only in terms of logistics but also with regard to security.

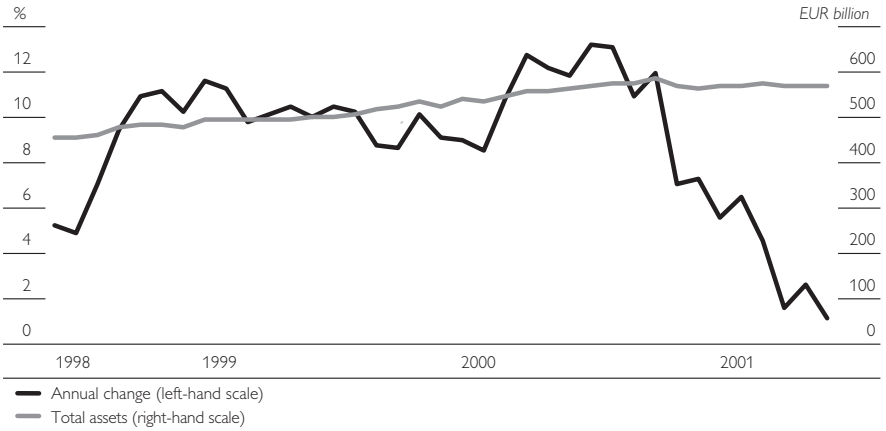
Another major task in addition to planning the frontloading of the euro, is the withdrawal from circulation of the legacy schilling currency. In order to avoid the accumulation of extreme quantities in late December 2001/early January 2002, the OeNB and credit institutions initiated joint campaigns for an early collection of hoarded coins (piggy bank campaigns).

The large Austrian banks are increasingly relying on multiple distribution channels. In addition to branch offices and mobile distribution (field service), marketing of financial products via the Internet is gaining importance as an additional distribution channel. However, the use of advanced technologies has hardly speeded up the reduction of branch offices in Austria to date. The ongoing expansion of electronic banking services might raise the pressure to thin out the closely knit branch networks.

Total Assets Growth Has Slowed Noticeably

The first six months of 2001 were characterized by noticeably weaker growth in the Austrian credit institutions' total assets. Total assets increased by only EUR 5.46 billion or 1.0% (to EUR 568.16 billion) compared with EUR 37.43 billion or 7.1% in the first two quarters of the year 2000. Even though this development was attributable in part to the more sluggish economic environment, the primary reason was the restructuring of Bank Austria AG following its merger with Bayerische Hypo- und Vereinsbank AG.[1]) Excluding Bank Austria AG, the Austrian credit institutions' total assets would still have grown by about 6.2%, i.e. at an only slightly lower rate than in the year 2000.

Domestic Banks' Total Assets



Source: OeNB.

1 *Closure of three branches (Milan, London, and Munich).*

Along with the slowing economy, the increase in lending lost momentum in the first half of 2001. Most of the increase in total assets was attributable to domestic interbank transactions, which expanded by EUR 6.30 billion or 6.2%. On average, interbank transactions accounted for around 34% of the credit institutions' assets and liabilities.

The level of funds raised climbed from the level at the beginning of the year 2001 by EUR 2.84 billion (+1.6%) and thus at almost the same pace as in the corresponding period of the year 2000 (+EUR 2.74 billion or +1.6%). However, while in the previous year more than one third of the growth in deposits was ascribable to deposits denominated in foreign currencies, the increase in the year 2001 came entirely from euro deposits.

An analysis by sector shows the savings banks' strong position in terms of market share (due in large part to Bank Austria AG) ahead of the joint stock banks and Raiffeisen credit cooperatives. As had been expected, the level of interbank transactions is above the average in multi-tier sectors because of intra-sector cooperation.

Balance Sheet Items by Sector

June 2001

	Market Share	Loans	Deposits	Interbank transactions	
				assets	liabilities
	%				
Savings banks	34.8	34.0	26.3	36.4	40.0
Joint stock banks	22.0	46.8	37.9	23.6	31.2
Raiffeisen credit cooperatives	21.6	39.5	35.9	38.2	43.0
Special purpose banks	7.7	16.3	2.2	59.4	23.8
State mortgage banks	5.9	60.2	20.2	16.2	12.4
Volksbank credit cooperatives	4.7	51.2	41.6	26.5	33.9
Building and loan associations	3.3	73.5	87.2	13.8	7.7
All sectors	100.0	40.3	31.4	33.3	34.5

Source: OeNB.

An analysis by bank size shows that the number of small banks is still very large. As of June 30, 2001, four credit institutions reported total assets in excess of EUR 30 billion each, while 16 were in the range between EUR 5 and 30 billion. The remaining 906 banks each had total assets of less than EUR 5 billion.

Over the past few years, the consolidation process in the Austrian banking sector has steadily intensified. In 1990, the five largest (individual) credit institutions held a market share of only 35% in terms of total assets. After the recent bank mergers, particularly those of the large banks, it rose to 45.9% in December 2000. In the first half of 2001, the market share of the five largest (individual) banks fell to 44.1% due to the restructuring of Bank Austria AG. On a consolidated basis, the five largest banking groups held 54.2% of the market and thus slightly more than in the year 2000 (53.2%).

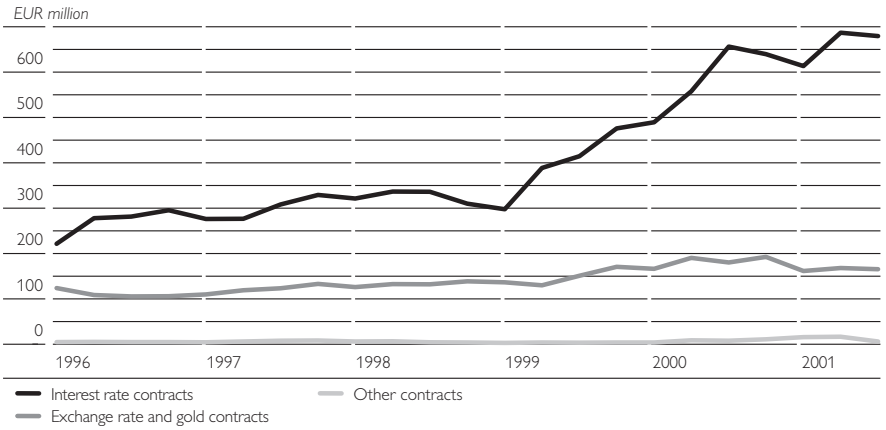
Slower Growth in Derivatives Trading

The volume of domestic banks' derivatives business, i.e. trading in futures, options, swaps and forwards, increased by some 7.7% in the first half of 2001 and thus at a slower rate than in the prior year, when it still expanded by 28%. At mid-year 2001, off-balance sheet transactions amounted to about 150% of total assets. According to data reported in banks' monthly returns, trading in interest rate derivatives is rising. The expansion of these trading activities coincided with the onset of Monetary Union.[1])

From the market participants' point of view, the key benefit of interest rate swaps is that they guarantee a uniform interest rate structure across the entire euro area. Unlike the interbank market, the euro area member countries' government bond markets are not fully integrated for the time being. Integration of the unsecured money markets was promoted by the Eurosystem's single monetary policy. On the implementation of Monetary Union, all national money market rates therefore converged to a uniform level, which differs only according to maturities. The interest rate structure calculated from interbank rates is thus no longer influenced by national market characteristics such as different tax rules, liquidity premiums or the issuer's credit rating. Interest rate swaps are used to adjust the structure of cash flows in assets/liabilities management, to hedge against the risk of interest rate changes, or for trading purposes. For these reasons, the importance of interest rate swaps has increased.

Beside interest rate contracts, exchange rate derivatives are another key object of trading activities. Since the beginning of Monetary Union, the data reported in the monthly returns have not indicated any decline in trading activities in this segment but even reflected an – albeit slight – increase. This

Derivatives



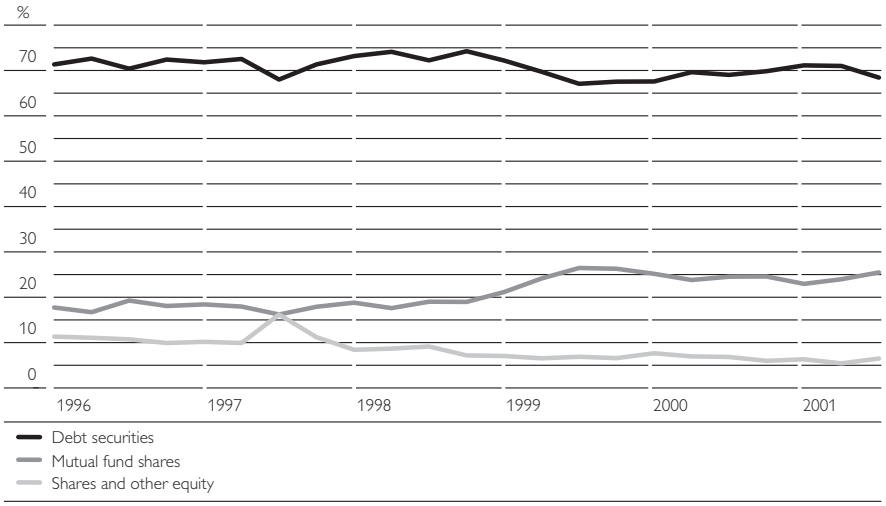
Source: OeNB.

1 *Interest rate swaps are an important subset of interest rate contracts, being the most frequently over-the-counter-traded interest rate derivatives. Interest rate swaps are contracts under which fixed-rate interest flows are exchanged against variable-rate interest flows for a specified principal and a fixed maturity. In the euro area, the interest rate used for this purpose is the EONIA rate for short-term contracts and the EURIBOR rate for longer maturities.*

may be attributable to transactions executed for the purpose of hedging foreign currency-denominated loans and partly offsets the discontinuance of trading in the legacy currencies of the euro area.

Overall, the Austrian banks' securities portfolios are comprised mainly of debt securities and other bonds and notes. In recent years, the share of bonds and similar instruments has been around 70%. Holdings of mutual fund shares have surged while the share of stocks has tended to decline. The recent stock market slides have not had any significant impact.

Securities Portfolio



Source: OeNB.

The 2001 BIS Survey issued by the Bank for International Settlements (BIS), which shows foreign exchange and derivatives trading volumes in the month of April 2001, provides a good overview of Austrian banks' foreign exchange trading activities. While the previous BIS Survey conducted in 1998 still reported all European currencies separately, this is the first Survey that employs the euro as the reporting currency. Since the 1998 BIS Survey, both global foreign exchange and derivatives markets and financial markets in Austria have undergone some change. Trading volumes have gone down significantly. The data reflect the impact of mergers among the five largest Austrian banks.

Since 1998, activity in foreign exchange and derivatives trading has shrunk by 18%, with trading volumes falling in the traditional foreign exchange business but still edging up slightly in the more complex derivatives transactions. In April 2001, the total transaction volume in the Austrian foreign exchange market stood at EUR 172.4 billion. This corresponds to an average daily volume of EUR 8.7 billion on each of the 20 trading days in April 2001. Compared with the total trading volume in the month of April 1998, this is a contraction by 27%, due primarily to a decline in FX swaps (–36%), spot transactions (–20%), and forward exchange deals (–16%). In April 2001, the volume of derivatives transactions, i.e. currency swaps, over-the-counter foreign exchange options and forward rate agreements (FRAs), interest rate swaps and interest rate options, reached EUR 104.7

billion, which corresponds to a daily volume of EUR 5.3 billion. Compared with 1998, daily transaction volume – in U.S. dollars – has thus risen by about 1%. The total volume of foreign exchange and derivatives trades has declined by 18% (again in U.S. dollars) since 1998. As noted above, activity in traditional foreign exchange trading decreased while trading in the more complex derivatives contracts inched up slightly.

Spot transactions still accounted for the largest share of foreign exchange trades (56%), followed by FX swaps (39%). Only 6% of trades fell into the category of forward exchange deals. In the derivatives business, trading was most lively in interest rate swaps (47%), followed by FRAs (42%). Activity in foreign exchange options (9%) was significantly lower than in the year 1998. The least activity was again recorded in currency swaps (0.8%) and interest rate options (1.4%).

Notable International Activities of Austrian Banks, Particularly in Central and Eastern European Countries

In the past few years, the credit institutions' foreign business has gained importance, particularly as a result of an increase in international cross-ownership. In the first half of 2001, however, the overall result of external operations was affected considerably by the restructuring activities of Bank Austria AG mentioned above and the simultaneous closure of several foreign branch offices: both foreign assets and foreign liabilities declined in the first six months (by EUR 4.25 billion or 2.7% and EUR 3.27 billion or 1.9%, respectively) and the foreign branches' total assets were halved to the current level of EUR 21.15 billion.

At the same time, the share of the domestic banks' external business relative to their total assets contracted from 28.0% to 27.0%, while the share of liabilities fell from 31.0% to 30.2%.

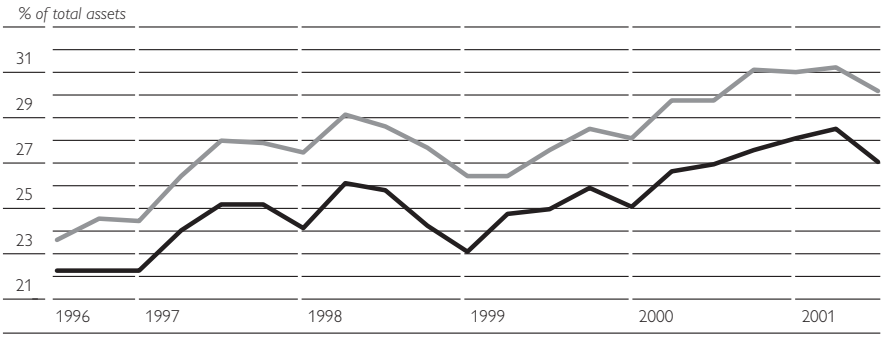
The major Austrian commercial banks continued to be highly active in the Central and Eastern European Countries (CEECs), reporting total assets of some EUR 45 billion (the equivalent of about 8% of their domestic assets) as of June 2001.[1]) Their operations have been expanding continuously and currently comprise 38 banks, up 6 banks compared with June 2000. The number of banking offices has risen substantially (from 784 in June 2000 to 2,066 in 2001), i.e. to 38% of domestic bank offices (5,462 as of June 2001). The workforce grew from 19,252 to 42,951 in June 2001 year on year. The significant expansion from the previous year's level is due primarily to the acquisition of Česká Spořitelna and Slovenská Sporiteľňa.

In the Central and Eastern European transition economies, bank consolidation continues to progress dynamically. At year-end 2000, the market share held by international banks (in terms of total assets) reached 53% (excluding Russia) and thus exceeded 50% for the first time.[2]) As of year-end 2000, the market share of foreign banks, ranked by countries, was

1 *OeNB (2001). Results of the June 2001 quarterly survey of Austrian banks regarding their subsidiaries in Central and Eastern Europe.*

2 *Bank Austria/Creditanstalt (2001). Bankenvergleich Mittel- und Osteuropa 2000, Studie, 7 September. See also Stepic, H. (2001). Banking business in Eastern Europe. In: Finanznachrichten 18, 33–40.*

Domestic Banks' Foreign Assets and Liabilities



Source: OeNB.

76% in Slovakia, 67% each in Bulgaria and in the Czech Republic, and 62% in Hungary. While the banking sector's aggregate total assets rose from EUR 244 billion to EUR 290 billion (+20%), the foreign banks' total assets augmented much more vigorously from EUR 104 to EUR 155 billion (+48%).

As a matter of fact, the CEEC-based subsidiaries of Austrian banks have been among the pioneers in these external markets since the year 1987. Their good positions in all key markets of the region were achieved first and foremost through the early development of a branch network and the establishment of bank subsidiaries after the opening of the borders.[1]) Subsidiaries of Austrian banks are currently represented in twelve countries of eastern Europe.[2])

Austrian banks are most active in Slovakia, where they hold about 40% and thus the highest market share, followed by the Czech Republic with a market share of 21%, Hungary (16%), Croatia (14%), and Poland (7%).

The CEEC subsidiaries continue to contribute significantly to the major Austrian banks' earnings. In the year 2000, the CEEC subsidiaries of Bank Austria accounted for about 5% of the group's total assets, while their share in the group's operating result was 24%. The subsidiaries of Österreichische Volksbanken-AG contributed 18% to their group's total earnings. The highest profit contribution (59%) was generated by the Eastern European subsidiaries of Raiffeisen Zentralbank Österreich AG (RZB), which represented 19% of the group's total assets. Return on equity (ROE) ranges

1 *It is basically two groups that are currently competing for market shares in Central and Eastern Europe: the market pioneers, which created large banking networks mainly through greenfield investments; and the latecomers, which over the past three years established a presence in a number of markets through acquisitions (Bank Austria/Creditanstalt, 2001).*

2 *At the end of 2000, the Bank Austria/Creditanstalt group, with a market share of 9.9%, was the second-largest international banking group in the CEECs after the Belgian KBC. With Erste Bank der oesterreichischen Sparkassen AG (market share: 7.4%) in sixth place and Raiffeisen Zentralbank Österreich AG (market share: 4%), three Austrian banks thus rank among the ten largest foreign banks in the CEECs.*

between 7% and 43%, i.e. substantially above the rates attained by banks in Austria.

From a stability perspective, it is interesting to note that these high profit contributions were earned without any major increase in risk provisions. Risk provisions as a percentage of total assets compare quite favorably with the domestic business (0.3%) or are even lower: e.g. 0.2% in the Czech Republic (1999: 0.6%), 0.1% in Slovakia (1999: 0.7%), and 0.2% in Hungary (no change on 1999). While in Slovakia and the Czech Republic risk provisions fell in the first half of 2001 compared with the same period of the preceding year, a slight increase was observed in Poland.

The problematic credit risks of Česká Spořitelna (5% of total loan volume) were transferred to the government-owned Konsolidacni banka. Of the EUR 326 million in loss provisions set up by Erste Bank der oesterreichischen Sparkassen AG for its international exposure, only EUR 4 million were related to operations in Croatia, Poland, Slovakia, Slovenia, the Czech Republic and Hungary. In 2000, EUR 43 million out of the total of EUR 162 million in loan loss provisions set up by the Erste group

Eastern European Commercial Banks

Majority-Owned by Austrian Banks[1])

	Total assets	Operating result	Loss provisions	Market Share	ROE	Staff	Offices
	EUR million			*%*		*Number*	
Croatia							
as of December 1999	1,198	60	– 25	9	21	867	45
as of December 2000	1,715	57	– 25	13	20	1,108	58
as of June 2001	2,461	44	– 9	14	22	1,422	65
Poland							
as of December 1999	5,558	116	– 2	5	18	9,490	364
as of December 2000	7,664	155	– 71	7	15	9,839	414
as of June 2001	9,017	939	– 68	7	10	9,834	410
Slovakia							
as of December 1999	2,286	71	– 17	11	40	1,997	77
as of December 2000	2,789	79	– 13	16	28	2,365	98
as of June 2001[2])	7,790	70	– 9	40	24	8,994	555
Slovenia							
as of December 1999	594	7	0	3	9	344	11
as of December 2000	706	14	0	5	17	380	12
as of June 2001	780	7	– 2	5	11	407	15
Czech Republic							
as of December 1999	3,134	41	– 19	5	9	1,482	46
as of December 2000[3])	15,256	170	–100	21	3	17,303	749
as of June 2001	17,595	95	– 41	21	8	16,333	754
Hungary							
as of December 1999	3,010	60	– 5	14	24	2,550	127
as of December 2000	3,484	59	– 11	18	26	2,813	134
as of June 2001	4,264	44	– 8	16	19	2,920	137
Values as of June 2001	41,907	1,199	–137	×	×	39,910	1,936
Values as of December 2000	31,614	534	–220	×	×	33,808	1,465

Source: OeNB.

[1]) Rounded values (totals) by country.

[2]) Inclusive of Slovenská Sporiteľňa.

[3]) Inclusive of Česká Spořitelna.

were Central Europe-related. Only 1% of the aggregate loan loss provisions of Bank Austria AG were related to its Eastern European business.[1])

At the end of September 2001, the rating agency Moody's upgraded the credit rating of Erste Bank der oesterreichischen Sparkassen AG from A2 to A1. Given the strong equity interests of Erste Bank der oesterreichischen Sparkassen AG in the CEECs, this is an indication that the international rating agencies are gradually adopting a more positive view in their assessments of bank subsidiaries in Eastern Europe.

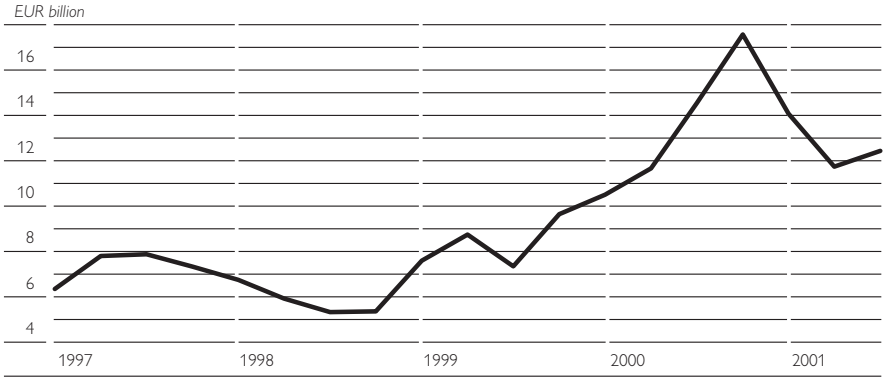
In many CEECs, the market has been largely carved up by now, which will lead to sharper competition in the coming years and increase pressure on bank profits. A number of major international banks have already withdrawn from some market segments. In several countries the market is largely saturated by now but some further privatization is expected in south-eastern Europe and Yugoslavia.

The large Austrian banks see further growth potential in Central and Eastern Europe, due in part to the still low degree of intermediation in the banking sector. In the year 2000, total bank assets amounted to about 70% of GDP in Central and Eastern Europe but to 273% in Austria.

Credit Growth Slower than in the Previous Year

The most important part of the Austrian credit institutions' operations is still the lending business. In June 2001, claims on customers accounted for slightly less than 50% of total assets. In 1995, the comparative figure had been 51%, which means that the significance of lending within banks' operations has not changed substantially during the past six years. In the first six months of 2001, loans to nonbanks declined from 2.7% (January to June 2000) to 1.8%, mainly as a consequence of the deterioration of the real economic environment (also see the section on "The Real Economy and Financial Stability").

Credit Growth (Part 1)

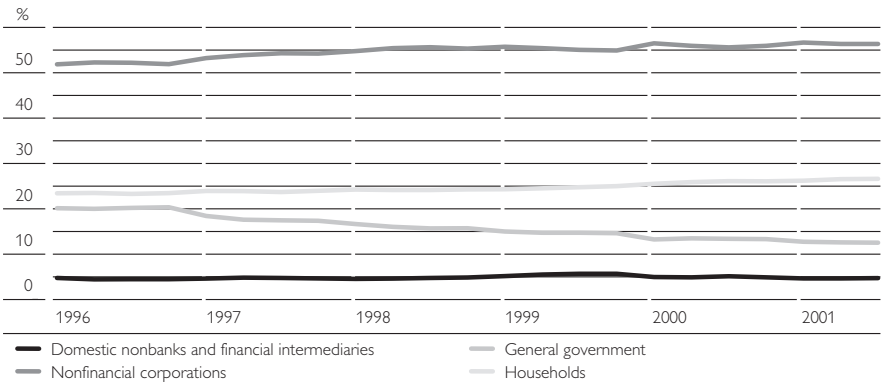


Source: OeNB.

1 *See also the annual reports of Bank Austria AG and Erste Bank der oesterreichischen Sparkassen AG for the year 2000.*

An analysis of lending by economic sectors shows that 56% of loans were granted to enterprises. More than one quarter of the banks' claims are on households. The share of loans made to the government has been declining for quite some time and now stands at 12%. Less than 10% of claims are on domestic nonbank financial intermediaries, mostly insurance companies.

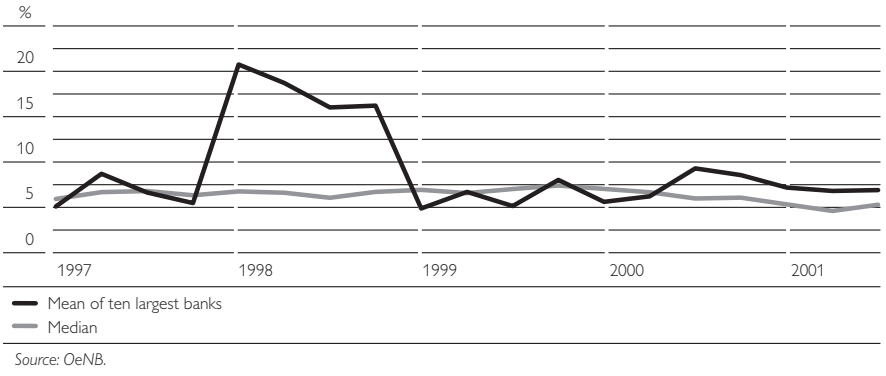
Claims by Economic Sectors



Source: OeNB.

Additional insights into the trends in the lending business are provided by an analysis of credit growth based on data relating to individual banks. This shows how large banks perform relative to the "average," i.e. the bank representing the median. The average of the growth rates of the ten largest banks as measured by total assets[1]) is compared with the rate of the "median" bank[2]). This differentiation is of interest as the performance of large banks is of particular importance for the stability of the financial system. Since the year 1996, the large system-relevant banks, with just one exception, performed more or less in unison with the "average bank." Only in the year 1998 did lending by the large banks temporarily grow at a faster pace due to one-off effects caused by mergers and restructuring measures.

Credit Growth (Part 2)

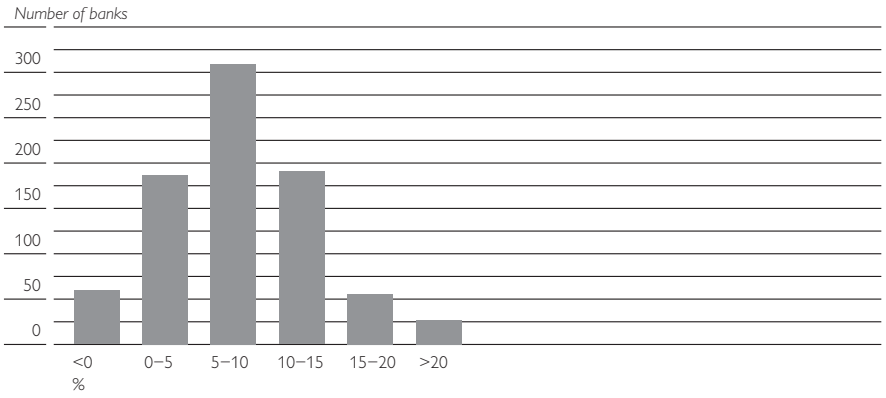


Source: OeNB.

1 *These were Creditanstalt AG, Bank Austria AG, BAWAG, Erste Bank der oesterreichischen Sparkassen AG, Raiffeisenlandesbank Niederösterreich-Wien, Raiffeisenlandesbank Oberösterreich, RZB, Österreichische Postsparkasse AG, Oberbank AG, and Österreichische Volksbanken-AG.*

2 *The credit institution whose rate marks the 50% percentile.*

Credit Growth (Part 3)



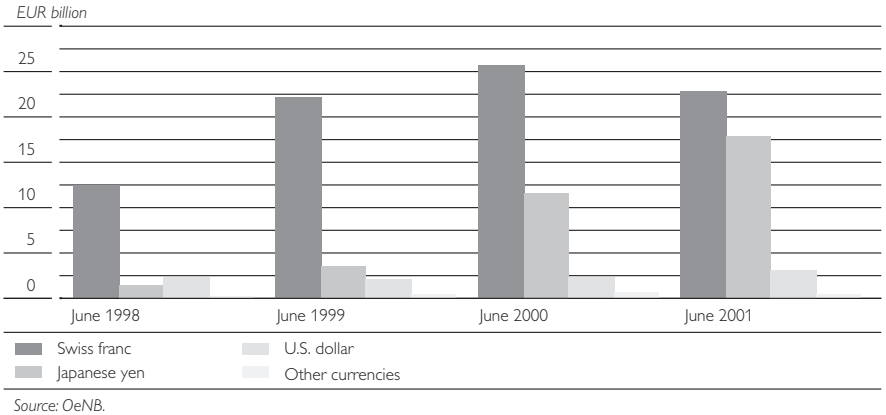
Source: OeNB.

As the histogram entitled "Credit Growth (Part 3)" (covering joint stock banks, savings banks, state mortgage banks, Raiffeisen credit cooperatives, Volksbanken credit cooperatives, and building and loan associations) shows, the dispersion of lending growth is relatively limited. Most of the rates reported by 684 banks are between 0% and 10%. This concentration indicates homogeneous conditions in wholesale and retail lending.

Demand for Foreign Currency Loans Slightly Slowing

The steady increase in demand for foreign currency-denominated loans since 1995 seems to have peaked, for the time being, last year. Compared with the first half of 2000, a relatively significant shift from foreign currency loans to euro loans was observed in the first six months of this year. Last year, the volume of euro-denominated loans expanded by only EUR 0.26 billion (+0.1%) while foreign currency loans grew by EUR 5.52 billion (+16.7%). In the first half of 2001, euro credits climbed by EUR 2.18 billion (+1.2%) but foreign currency-denominated loans only by EUR 1.95 billion (+4.9%). Thus, in the first half of 2001, the share of foreign currency-denominated loans in total loans granted fell from 21.3% at the beginning of the year 2001

Breakdown of Foreign Currency Loans



Source: OeNB.

to 18.1%. More than half of all foreign currency loans are still denominated in Swiss francs. However, in view of the strong decline in interest rate spreads, the demand for Swiss franc loans has receded noticeably.

By contrast, loans denominated in Japanese yen still enjoy great popularity. Since the beginning of the year, their share in aggregate foreign currency lending climbed from 33.7% to 40.5%. As the exchange rate of the Japanese yen relative to the euro edged up by only some 1.5% in the first two quarters of 2001, this rise apparently reflected real new business. With a share of some 7%, U.S. dollar loans continued to play a rather insignificant role.

At 22.5%, the share of foreign currency loans in total lending was higher for households than for other sectors of the economy. An analysis by regions shows that, at 14.9%, the share of foreign currency-denominated loans in total lending was significantly lower in eastern Austria than in the west (31.5%).

As a result of the uncertainty in the wake of the terrorist attacks of September 11, the Swiss franc – as a safe haven currency – appreciated against the euro. The rise in the Swiss franc's exchange rate relative to the euro made loans in this currency more expensive for borrowers in the euro area and thus increased their loan liabilities and debt service expenditure. The lower interest rates charged on loans taken out in Swiss francs are thus being offset increasingly by higher repayment obligations. The banks closely monitor movements in the exchange rate as well as the borrowers' credit standing and, where appropriate, call for the provision of additional collateral.

A comparison with the euro area shows that in Austria, foreign currency loans have become a significant factor. While in the euro area as a whole, the domestic share of foreign currency credits in aggregate euro area lending to enterprises and households was 3.1%, Austrians raised 29.9% of all Swiss franc loans granted in the euro area; with loans denominated in Japanese yen, the corresponding figure was even 31.2%.[1])

Risk Factors Remain Limited

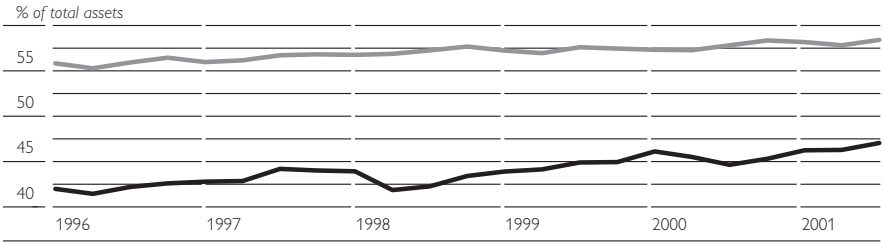
A significant source of operating risks is the development of credit exposure, i.e. the risk that a borrower or a contracting party may default on its obligations.

The calculation of credit exposure, which provides the basis for the statements made in this study, is currently based on the 1988 Basel Accord, as the new standards (Basel II) have yet to be finalized and implemented. These profound changes in capital adequacy regulations will lead to credit exposure being calculated on an entirely new basis. The aim is to reduce the difference between economic and regulatory capital and to recognize risks more effectively. The current debate focuses on issues of implementation including, in particular, the potential impact of the procyclical movements in regulatory capital requirements.

1 Data from the end of March 2001.

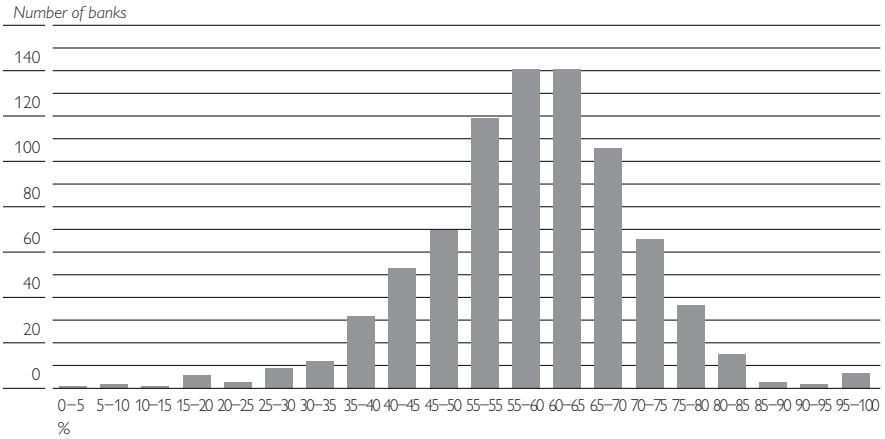
A comparison of the developments in system-relevant banks and the average shows that the "median" bank's ratio is higher at around 58%. Among the ten largest banks, the share of risk-weighted assets in total assets is lower, namely 47%. An analysis by sectors shows that the Volksbank credit cooperatives hold the largest share at 60%, while the savings banks sector (42%) and the building and loan associations (40%) account for the lowest shares. The differences suggest that larger banks and the two sectors mentioned have fewer loans in the categories with higher risk weights. The histogram of risk-weighted assets shows that the share of most banks ranges between 50% and 60%.

Risk-Weighted Assets (Part 1)



Source: OeNB.

Risk-Weighted Assets (Part 2)



Source: OeNB.

A key indicator in measuring credit quality is the level of loan loss provisions.[1]) The level of loan loss provisions relative to claims on customers has been low for many years and, in June 2001, edged up slightly to 3.2%. It is thus 0.1 percentage point higher than in June 2000. At that date, the Volksbanken sector (4.4%), the Raiffeisen sector (4.0%), and the savings banks sector (3.7%) were above the average, while the building and loan

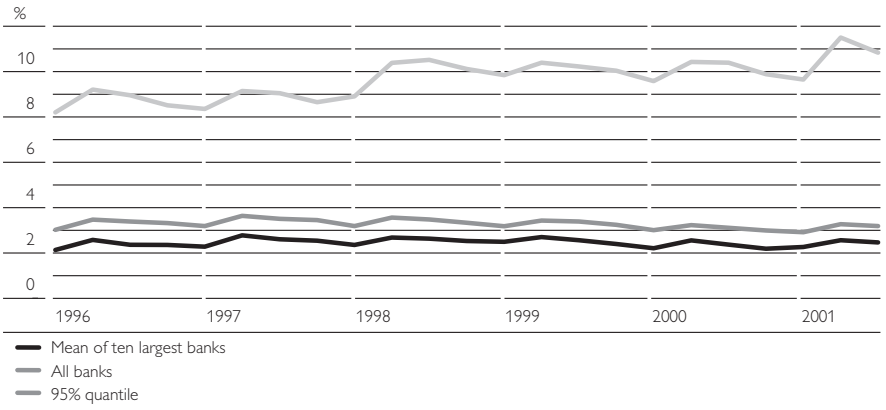
1 *Loan loss provisions are reported by the banks in their monthly returns. Loss provisions are set up in respect of loans where the bank doubts the borrower's ability to meet his financial obligations.*

associations sector reported below-average loss provisions (0.4%). A look at the frequency distribution of value adjustments across all banks (except special purpose banks) shows a concentration between 2% and 6%.

The number of banks reporting more than 10% loss provisions in their monthly returns is 47, i.e. 5.7% of banks. Overall, 95% of domestic institutions report a loss provision rate of less than 11%. The comparison of the loss provisions set up by the large banks and the average of all credit institutions shows that over the entire period under review, i.e. since the year 1995, the large institutions reported a lower loss provision ratio for potential defaults of their borrowers. The average percentage of the ten largest institutions is 0.7% below the total mean value.

Overall, the data on loan loss provisions show that the quality of the domestic credit institutions' loan portfolios is good. At the time the study was compiled, the data in hand did not point to any major rise in bad loan charge-offs due to a higher level of defaults.

Loss Provisions Relative to Claims on Nonbanks



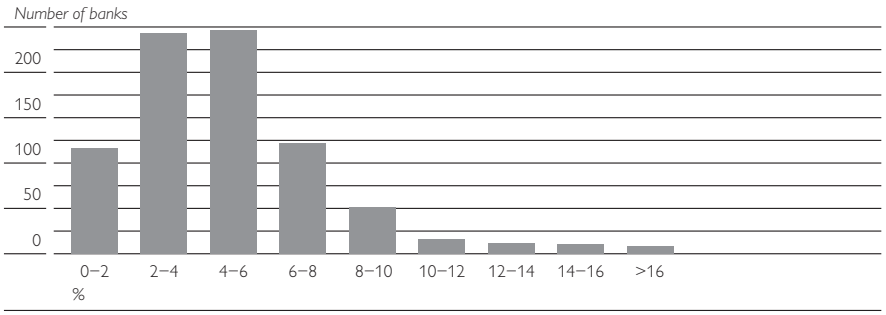
Source: OeNB.

A more detailed analysis of the quality of the Austrian banks' loan portfolios can be carried out on the basis of the prudential report, which includes observations on the overall situation of credit institutions by the bank auditors required under the Austrian Banking Act (BWG).[1])

On the whole, the domestic banks' nonaccrual and nonearning assets (measured as a percentage of loans) remained at a low level during the past years. At year-end 2000, the global mean value of nonaccrual and nonearning assets was 1.15%. A breakdown of loans by risk categories shows that the volume of problem loans (nonperforming and irrecoverable) as a proportion of total credit volume has declined over recent years. In the year 2000, some 2.2% of loans were classified as nonperforming. With 95% of

1 *Annual reports are available for the period from 1996 to 2000, with loan quality being classified into the following categories: without default risk; watch list loans (loans that might be at risk in the future); nonperforming (defaults are expected to occur), irrecoverable (default has already occurred); nonaccrual and nonearning assets (this risk category comprises claims against which payments are expected to be made neither at present nor in the near future).*

Loss Provisions



Source: OeNB.

banks, the share of nonaccrual and nonearning assets in total outstanding loans was less than 3%, the share of nonperforming loans less than 9% and that of irrecoverable loans less than 4%. Like the loan loss provisions, the major domestic banks' indicators derived from the prudential report were again below the global mean value.

For the purpose of this analysis it must be taken into account that loans in the nonperforming category are not necessarily irrecoverable, i.e. nonperforming does not always imply a total loss. As collateral is not considered in this context, forecasts about the repayment rate cannot be made. The data contained in the prudential report thus represent conservative assessments of credit quality.

Credit Quality

	1996	1997	1998	1999	2000
	Share in %				
Nonaccrual and Nonearning Claims on Nonbanks					
50% quantile	0.15	0.10	0.19	0.16	0.12
Mean of ten largest banks	1.18	1.14	1.15	1.05	0.95
95% quantile	4.05	3.89	3.82	3.93	3.38
Nonperforming					
50% quantile	2.10	2.28	2.43	2.30	2.44
Mean of ten largest banks	2.56	2.92	2.07	1.98	1.73
95% quantile	8.20	8.67	8.64	8.87	9.07
Irrecoverable					
50% quantile	0.38	0.53	0.55	0.57	0.55
Mean of ten largest banks	0.48	0.44	0.48	0.51	0.48
95% quantile	3.86	4.17	4.15	4.11	4.01

Source: OeNB.

Performance Deteriorates in the First Half of 2001

After the good results of the fiscal year 2000, the Austrian banks' performance declined noticeably in the first half of 2001 as increases in operating expenses were not offset by similar growth in revenues.[1]) Declines were recorded in particular in income from securities and participations and in fee income.

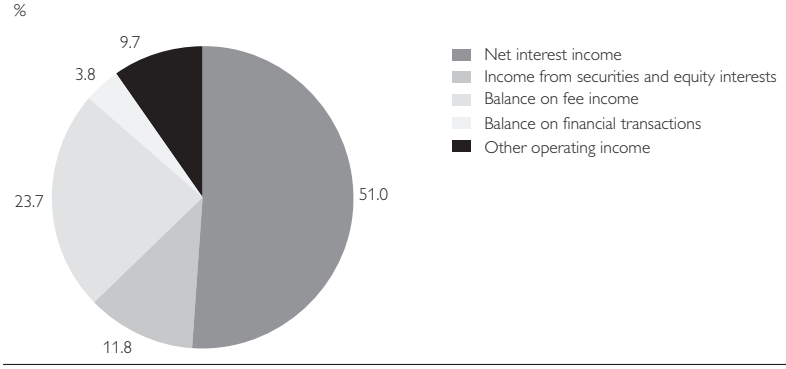
1 *This analysis is based on quarterly report data as of June 2001, which show the unconsolidated earnings of credit institutions operating in Austria.*

Overall, the operating result of the first half of 2001 was 10% lower than in the same period of the year 2000. Relative to total assets, it even deteriorated by 0.06 percentage point to 0.36%.

Operating income grew only very moderately (+0.5%) in the first half of 2001 and continued to include a large portion of interest income. Compared with the first six months 2000, net interest income rose by 2.2% and thus at a slightly slower pace than business volume. In proportion to average total assets, it declined by 0.01 percentage point. The geographic distribution of interest income shifted significantly: while net interest income from domestic business fell 12% below the level of the first half-year 2000, income from external business surged by 86%. The share of interest income in total operating income was 51% in the first half of 2001, which was 0.8 percentage point more than in the corresponding period of the preceding year.

Fee income declined slightly in the first half of 2001 after having expanded in previous years. Fee income from payment transactions, lending, and trading in foreign exchange, foreign notes and coins, and precious metals rose while fee income from securities transactions plunged as a result of uncertainty in the stock markets and reluctance on the part of investors to buy securities and mutual fund shares. Due to difficult stock market conditions, the results from the banks' own trading activities likewise remained below the figures of recent years.

Breakdown of Operating Income in the First Half of 2001



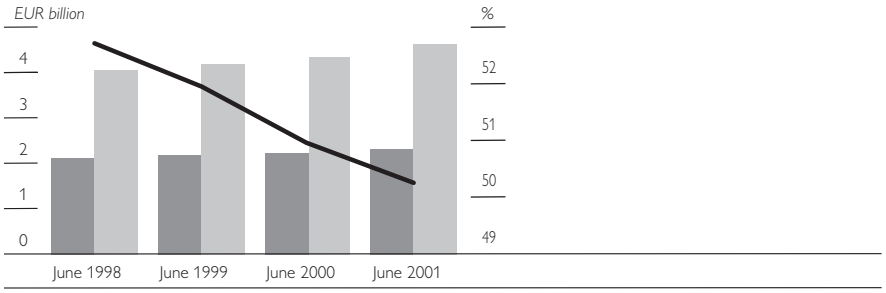
Source: OeNB.

In contrast to the moderate growth in income, operating expenses grew much more strongly in the first half of 2001 (+6.2%), owing to higher payroll expenditure as well as an increase in other administrative expenses (cost of materials and services). The share of payroll expenditure in total operating expenses continued to decline, as in previous years, to a level of 50.3%, while the percentage of the cost of materials and services increased further.

Due to the divergent trends in costs and revenues, the credit institutions' cost/income ratio[1]) deteriorated to an average of 69.1% in the reporting

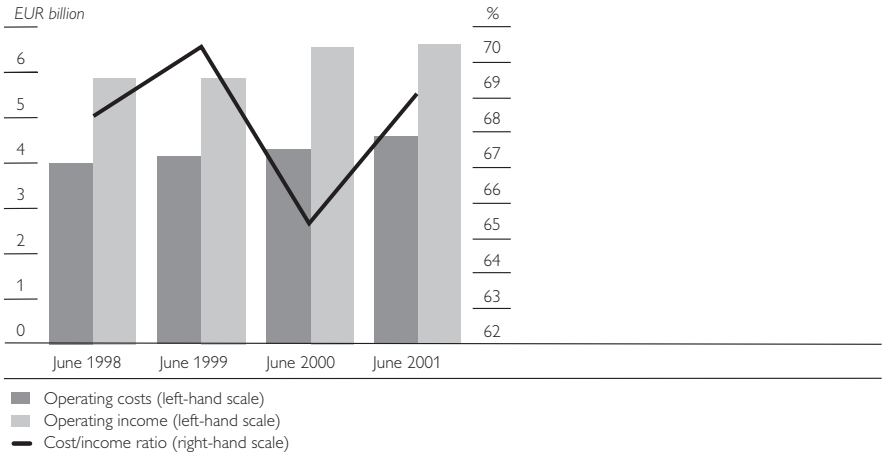
1 This ratio (operating expenses to operating income) shows the portion of income that is needed to pay for costs.

Payroll Costs Relative to Operating Costs



Source: OeNB.

Cost/Income Ratio



Source: OeNB.

period. At 64.6%, the 30 largest banks recorded a more favorable ratio, which, however, was still clearly below the level of the corresponding period of the year 2000.

Due to stability considerations, a more detailed analysis of system-relevant large banks is of particular interest. The large banks' operating results and forecast annual results are largely in line with the general development, which was not always the rule in the past. A striking feature in some of the major banks' results is the decline in net interest income, which is attributable primarily to higher interest expenses for the refinancing of acquisitions of equity interests and/or the customers' increased preference for higher-yield investments (e.g. a high-yield type of savings passbook). Among the reasons cited for higher operating expenses are the remodeling of branch offices in connection with the euro launch and the conversion of computer systems (already with a view to Basel II). Cost savings, particularly at branch offices, are materializing only slowly.

Better Performance on a Consolidated Basis

Because of the major differences that evolved in recent years between the Austrian major banks' consolidated results and their individual results, it is becoming increasingly difficult to interpret performance on the basis of individual financial statements. This is attributable to the development of a network of banks abroad – mainly in Central and Eastern Europe – as well as mergers of large banks. For example, the increase in total assets due to intra-group interbank transactions – particularly in the Bank Austria group – is reduced only through the consolidation of the group's accounts. As a result, all income ratios relative to total assets appear less favorable on a non-consolidated basis.

As some of the major banks (Bank Austria AG, Erste Bank der oesterreichischen Sparkassen AG, and RZB) prepare their financial statements according to International Accounting Standards (IAS) while other data are compiled on the basis of the Commercial Code (HGB), full aggregation is not possible or only to a certain extent. The problem of comparing IAS and HGB financial statements therefore has a negative impact on the interpretation of their substance.

Due to the – if only slightly – better performance data shown in group reports, the consolidated financial statements paint a brighter picture than the unconsolidated approach used in quarterly reporting: the consolidated statements still show a declining operating result (relative to total assets) despite rising net interest income, but the decline is significantly less dramatic than from an unconsolidated perspective. Gauged in absolute figures, the operating result increased even on a consolidated basis. The results of the large banking groups also tend to provide a brighter picture when taking into account the income generated by their foreign subsidiaries.

Performance Outlook Remains Dim until Year-End 2001

In their projections for the full financial year 2001, the Austrian credit institutions (according to their quarterly reports and based on business trends in the first half-year 2001) expect an operating result of EUR 3.84 billion, which is slightly below the previous year's EUR 4.20 billion.

The anticipated risk provisions (estimates for the year 2001 based on results as of June 2001) are, overall, almost EUR 300 million below the level of the previous year (EUR 1.05 billion). Across the group of the 30 largest banks, projections differ widely, however. On the one hand, the banks are expecting a need for higher loan loss provisions (+19.9% above the estimated level of the previous year), including, in particular, higher-than-expected provisions for claims on customers. The slowdown of economic activity in Austria and abroad as well as a number of high-profile bankruptcies are expected to have a negative effect on the valuation of loans. On the other hand, a substantial balance resulting from the reversal of loss provisions for securities and equity holdings is expected to add to income. Owing to expected lower risk provisions, the banks therefore project the total annual result to match about the level of the previous year.

These estimates, however, do not yet take into account the economic consequences of the September 11 terrorist attacks on the U.S.A. Even though assessments of their impact on the economy are still varying widely, there are widespread expectations of a further deterioration of profitability until year-end 2001. Specifically, continuing weakness in the stock markets combined with the investors' reduced readiness to take on risks might continue to depress income from the banks' own trading activities as well as fee income. The streamlining and layoff plans announced by many major European banks in the wake of the terrorist attacks might also increase the pressure on Austrian banks to speed up their cost-cutting programs.

Equity Ratios Remain Solid

As credit institutions play a key role in any economy, the regulatory body has taken special precautions to ward off banking crises. One of the mechanisms to limit the repercussions of problems arising at one single bank is the capital adequacy requirement. The bank's capital is the reserve that buffers the impact of potential losses. Such losses may be incurred as a result of borrowers' defaults or, in securities trading, due to adverse market movements. The most important gauge of the Austrian banks' risk-bearing capacity is the equity ratio, i.e. the ratio of own funds to the assessment base calculated on the basis of a bank's assets.[1])

As of June 30, 2001, credit institutions operating in Austria held about EUR 39 billion in eligible own funds, which is EUR 3.2 billion more than at the beginning of the year. As in previous periods, around two thirds of own funds consisted of core capital (EUR 26.93 billion). The credit institutions' core capital ratio increased slightly versus December 2000, by 0.4 percentage point to 10.7%. It is highest among the special purpose banks at 23% and lowest among the state mortgage banks at slightly below 8%. The sectoral analysis shows that with the exception of Volksbank credit cooperatives, state mortgage banks and building and loan associations, all sectors have a core capital ratio in excess of 10%. Tier 3 capital, which is used only as a cushion against market risk, declined by EUR 0.32 billion to EUR 1.25 billion.

The original method of calculating own funds, which was based essentially on the first Basel Accord of 1988, was expanded in later years by taking market risk into account. Since 1998, the equity ratio has been around 15% and, in June 2001, stood at 15.4%. The minimum level required by the Austrian Banking Act is 8%. None of the credit institutions currently reports own funds below that level.

Across the various sectors, the development of the equity ratio did not follow a uniform trend: the joint stock banks report about 14%, the savings banks 17%, the Volksbank credit cooperatives 13%, and state mortgage banks 12%, special purpose banks – as outliers – 26%, and the Raiffeisen

1 *According to Articles 22 and 23 of the Austrian Banking Act (BWG), there are three types of own funds in relation to the assessment base: tier 1 capital (higher quality funds – core capital); tier 2 capital (funds of lower quality – supplementary capital); and tier 3 capital (special subordinated capital as a capital charge for market risk).*

Capital Adequacy (Part 1)

	1995	1996	1997	1998	1999	2000	June 2001
	%						
Joint stock banks	13.4	13.7	13.4	14.0	12.8	13.8	14.3
Savings banks	12.9	13.8	16.9	16.2	16.7	16.9	17.4
State mortgage banks	11.3	12.2	12.7	13.0	12.6	11.9	12.2
Raiffeisen credit cooperatives	13.4	13.6	13.3	13.4	13.1	13.5	14.4
Volksbank credit cooperatives	11.6	13.0	13.1	12.8	11.9	12.7	12.9
Building and loan associations	7.7	8.0	8.5	10.2	10.3	9.4	9.7
Special purpose banks	23.0	22.4	22.9	36.5	34.9	29.2	26.4
All banks	13.2	13.8	14.6	15.0	14.6	14.9	15.4

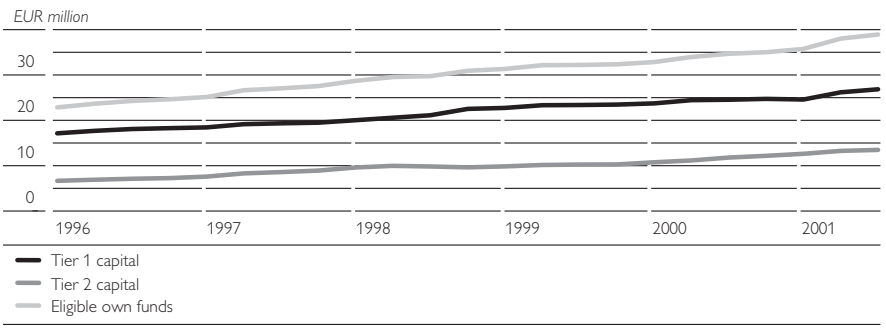
Source: OeNB.

sector 14%. Thus all sectors, with the exception of the building and loan associations (10%), have an equity ratio in excess of 11%.

The comparison of the major banks' own funds relative to the "median" bank shows that the system-relevant banks have almost always boasted a higher equity ratio than the "median" bank. As the histogram entitled "Capital Adequacy (Part 3)" indicates, the dispersion of equity ratios is not substantial. Overall, almost 90% of the institutions report an equity ratio of above 10%. An analysis of movements in own funds also revealed that, at editorial close, a negative effect of the stock market slide since March 2000 was not identifiable. The bursting of the technology-media-telecommunications (TMT) bubble had thus failed to cause any major losses to the banks by the editorial closing date.

Overall, the Austrian banks' equity ratios can be regarded as sound. The fact that the Austrian banks were able to cope with the losses sustained, for example, in Russia in the year 1998 by taking out funds from regular returns and by tapping reserves highlights the adequacy of the Austrian banks' risk-bearing capacity. Also, the *system-relevant* banks (on an unconsolidated basis) have a larger buffer of own funds than the "median" bank.[1])

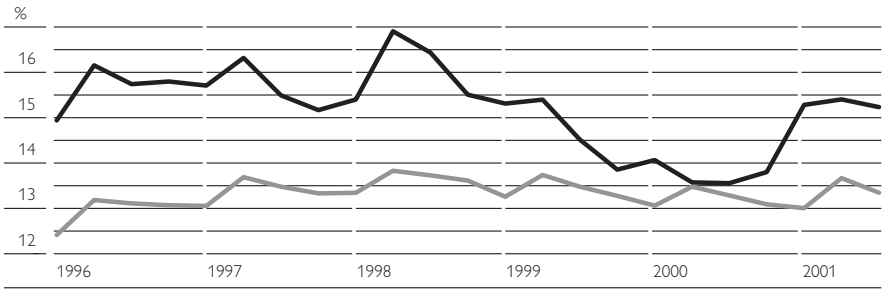
Own Funds



Source: OeNB.

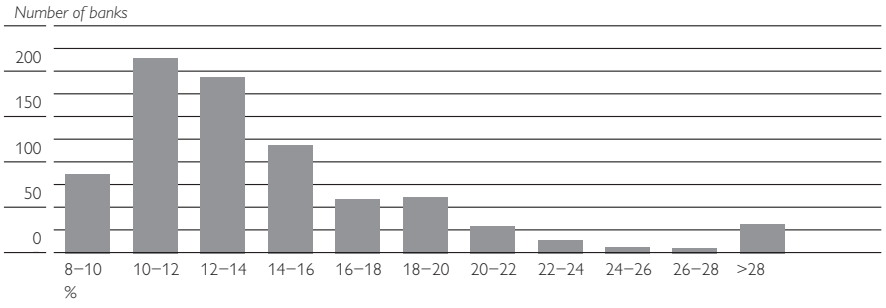
1 On a consolidated basis, the equity ratio is slightly lower.

Capital Adequacy (Part 2)



Source: OeNB.

Capital Adequacy (Part 3)



Source: OeNB.

Concluding Remarks

The Austrian banking system continued its stable development in the first half of the year 2001. After the mergers of the years 1999 and 2000, Austria's major banks continued their consolidation measures and internal restructuring. Organizational streamlining also contributed to the efforts undertaken to achieve further cost savings. The Austrian banks are keeping up their activities in the CEECs on a full scale; the economic slowdown depressed earnings in the first half of 2001.

The terrorist attacks on New York of September 11 underscored the significance of operational risks from a financial market perspective. A complete breakdown of computer systems might easily lead to systemic risks in payment or settlement systems. While test runs can of course be used to examine the functionality of a system to a certain degree, it is only in real operations that systems demonstrate their true robustness. The tragic events in one of the world's key markets showed, however, that backup facilities and emergency systems were started up quickly and largely without any major problems. The need for safe data storage and a further development of security systems was heavily underlined.

The central banks contributed significantly to warding off major problems or even a global financial crisis. In rapid and concerted action, the central banks provided additional liquidity and cut key interest rates. This

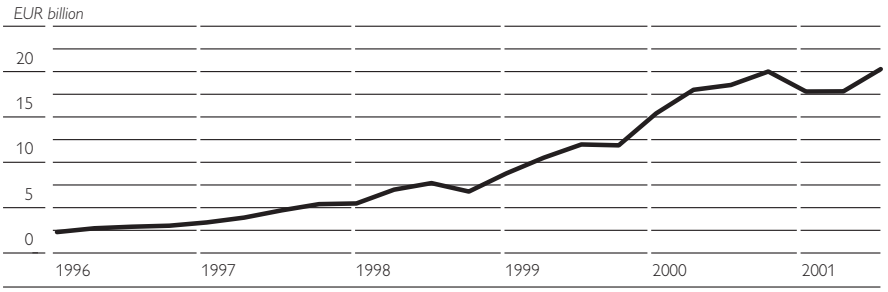
prevented the emergence of short-term liquidity bottlenecks in banks operating in an international environment. The medium-term impact on the Austrian banks is still difficult to assess but it is expected that higher volatility in the stock markets will continue to depress banks' earnings.

Institutional Investors

Investments of institutional investors (mutual funds, insurance companies, pension funds) in Austria were largely determined by the development of international stock markets in 2000 and 2001. In the past few years, mutual funds in particular have significantly increased their exposure to foreign equities. Since mutual funds are the main investment vehicle of pension funds, the latter may also be affected by this tendency, even though a detailed breakdown of the amounts invested is not available. Insurance companies' holdings of foreign equities have increased considerably, but are still smaller by comparison. In general, Austrian institutional investors' exposure to international stock markets is still fairly modest. Adjusted by pension funds' and insurance companies' holdings of domestic mutual funds shares, the portion of foreign stocks has tripled since 1997, but still comes to a mere 3%.

Having shrunk in the previous two quarters, the share of foreign equities in Austrian institutional investors' portfolios grew in the second quarter of 2001, thus reaching some EUR 20 billion, the level recorded in the third quarter of 2000. U.S. issuers accounted for almost 40% of these foreign stocks, companies based in the euro area (excluding Austria) for roughly 35%. Exposure to the United Kingdom was also fairly high (10% of assets), whereas the share of Japanese stocks was 5%. Central and Eastern European stocks accounted for only 1% of Austrian institutional investors' foreign assets.

Austrian Institutional Investors' Foreign Equity Exposure[1])



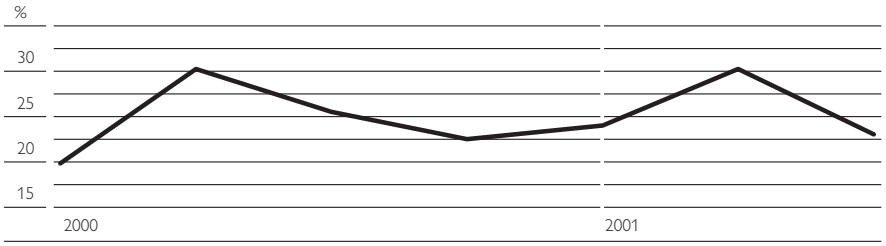
Source: OeNB.
[1]) Mutual funds, insurance companies, pension funds.

All in all, exposure to international stock markets may seem comparatively small, but it should be noted that investments focused largely on those segments that have recently experienced significant price declines. The falling prices of TMT (technology-media-telecommunications) stocks notwithstanding, Austrian institutional investors had augmented their holdings in this sector until the first quarter of 2001. A trend reversal, which is most likely attributable to both the reallocation of portfolios

and tumbling stock prices in the industry, did not evolve until the second quarter of 2001. By mid-2001, technology stocks made up almost a quarter of institutional investors' foreign portfolios; by end-1999, this share had amounted to some 20%. Their exposure to higher market risks in general and to the higher credit risks in the industry thus remains fairly large.

By comparison, stocks of airlines and insurance companies were represented only to a small degree in institutional investors' portfolios.

Share of TMT Stocks[1])
in Austrian Institutional Investors' Portfolios



Source: OeNB.
[1]) Technology, media, telecommunications.

Mutual Funds

Price Calculations for Mutual Funds Suspended for Two Days

After the terrorist attacks of September 11, 2001, the directorate of the Austrian association of investment companies (VÖIG) by agreement with the supervisory authority and the Federal Ministry of Finance recommended on September 12 that due to "exceptional circumstances" (Article 10/2 Austrian Mutual Fund Act),[1]) the price calculations for all Austrian mutual funds be suspended until normal trading would resume on the major stock exchanges.[2]) All Austrian investment companies followed this recommendation. Supervisory bodies or national mutual funds associations in most European countries recommended the suspension of price calculations.

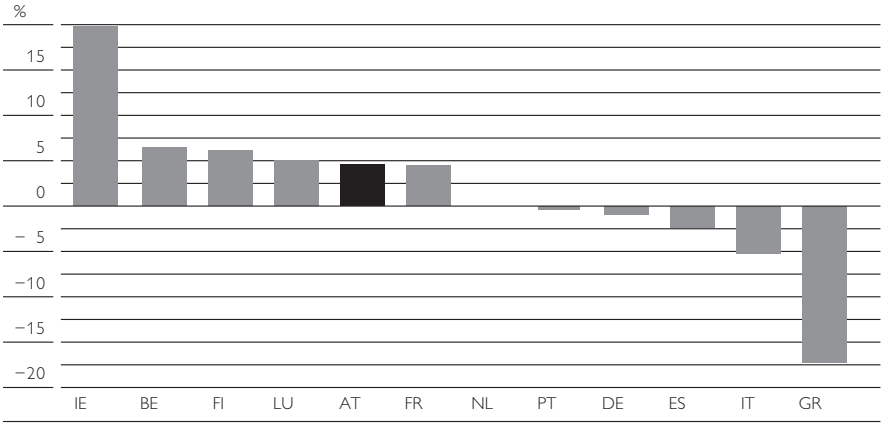
Significant Reduction of Asset Portfolios in the Euro Area and in Austria

Owing to falling stock prices and investors' subsequently heightened caution, which dampened demand for equity funds particularly in the first few months of 2001, funds' assets in the euro area rose much more hesitantly than in the previous years, augmenting by some 1.8% to EUR 3,200 billion in the first half of 2001. Some countries faced partly considerable asset outflows, which in turn resulted in a reduction of assets managed; in some

1 *Article 10 (2) of the Austrian Mutual Fund Act states that the shareholder's share in the investment fund is to be paid to the shareholder on their request in exchange for the stock certificate, the coupon and the renewal certificate. The prerequisites for payment are to be laid down in the funds regulations.Payment of the selling price can be temporarily deferred – provided that the Federal Minister of Finance is notified – and made contingent on the realization of assets from the portfolio and on the receipt of the realization proceeds under exceptional circumstances implying that such proceedings would be in the justified interest of the shareholders. The Federal Minister of Finance need not be notified in the case of institutional funds.*

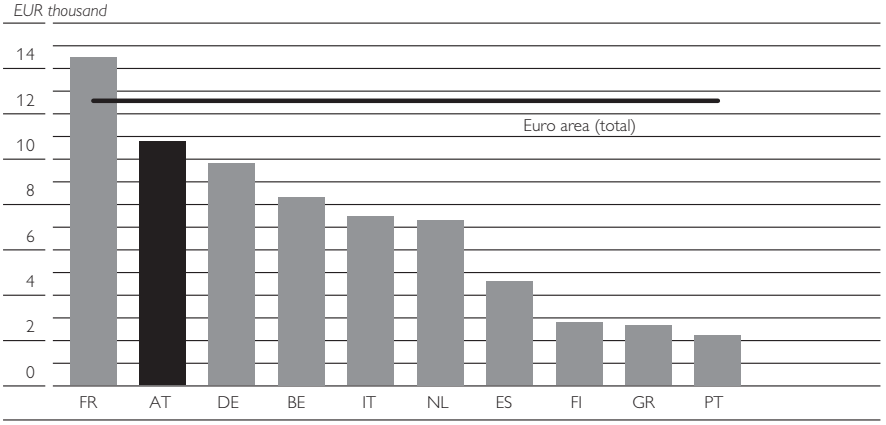
2 *The suspension of price calculations implies that funds units are neither being purchased nor sold.*

Change in Assets Managed by Mutual Funds in the First Half of 2001



Source: FEFSI.

Per Capita Assets Managed by Mutual Funds[1]) in the First Half of 2001



Source: FEFSI, ECB.
[1]) Excluding Luxembourg and Ireland.

cases, however, this was also attributable to changes in the legal framework. Moreover, in many countries capital has been reallocated from equity funds and balanced funds to fixed-income funds and, especially, money market funds.

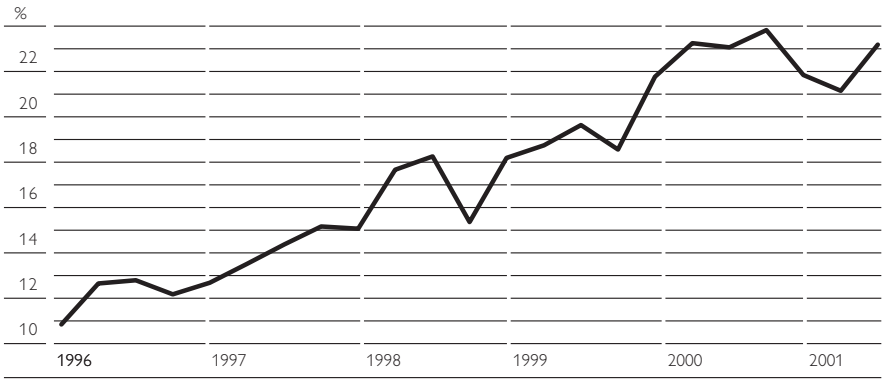
Compared to other European countries, investment in mutual funds is relatively popular in Austria. By mid-2001, per capita assets held in mutual funds amounted to some EUR 10,700, which is slightly less than the euro area average, but it should be noted that Luxembourg's share – approximately a quarter of all assets managed in the euro area – is inflated by inflows from other countries of origin that are allocated to Luxembourg for lack of detailed data about the countries of sale. Likewise, Ireland successfully established itself as a center of international mutual funds in the past decade. Apart from these two specialized financial centers, market penetration of mutual funds in Austria is higher than in other euro area countries, except for France.

The volume of assets invested in mutual funds in Austria widened by 4.5%[1]) to EUR 87.3 billion, which puts the Austrian mutual funds market in the middle range in a euro area ranking. The high growth rates recorded in the previous years (more than 30% per year) have been out of reach also in Austria since the fourth quarter 2000. In absolute terms, i.e. not adjusted for domestic mutual funds shares included in funds-of-funds, the 24 Austrian investment companies managed assets of EUR 96.8 billion in the 1,618 mutual funds they operated by mid-2001.[2])

Investment Structure Changed

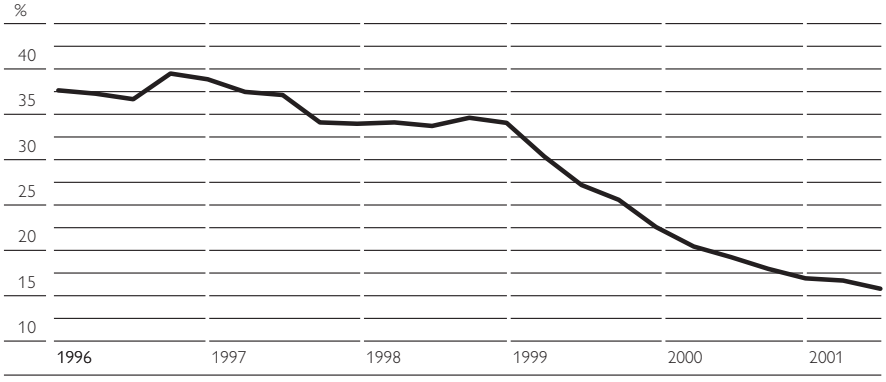
With stock prices dwindling over the past few months, the equity share in mutual funds' portfolios shrank in the fourth quarter of 2000 and in the first quarter of 2001, but increased in the second quarter, as demand for equity funds was gathering new momentum. At 23.2% by mid-2001, the equity

Equity Share in Austrian Mutual Funds' Portfolios



Source: OeNB.

Share of Government Bonds in Austrian Mutual Funds' Portfolios



Source: OeNB.

1 *Adjusted for domestic mutual fund shares included above all in funds-of-funds, which would be counted twice when examining the volume of assets invested.*

2 *This figure is given as total assets of domestic mutual funds in table 2.1 / EUR in the OeNB's statistical monthly bulletin (see www.oenb.at).*

share was double the amount recorded at the end of 1995. The share of domestic equity in investment companies' total assets remained more or less unchanged at 2% over the past few years.

In contrast to the growing equity share, the share of Austrian government bonds in the portfolios of mutual funds has been decreasing markedly, shrinking to 16% from more than a third recorded in the mid-1990s. Obviously, domestic government bonds have to some degree been replaced by foreign ones.

Funds-of-funds, which were launched in Austria after the amendment of the Mutual Fund Act in 1998, were strongly sought-after. Since the first fund-of-funds was issued in April 1998, assets in this fund category have mounted to EUR 14.8 billion, or some 17%[1]) of total assets invested in Austrian mutual funds.[2]) About a third of all Austrian mutual funds (535) are funds-of-funds.

Stock Market Developments Harm Performance

Data on profit distributions and changes in market prices of Austrian mutual funds have been reported to the OeNB since December 2000, facilitating an approximate assessment of their overall performance.

According to these data, Austrian mutual funds posted market price valuation gains of EUR 988 million in the first half of 2001; measured by asset holdings as of end-2000, including profit distribution, this amounts to an annualized performance of 4.0%. Total performance in 2000 is calculated to have amounted to 7.5%. Given the global slump in stock prices, Austrian mutual funds recorded a negative performance of –0.6% p.a. in the first quarter of 2001.

Equity funds seem to have suffered significantly larger valuation losses than all funds taken together. Data from the VÖIG on price changes of mutual funds registered in Austria support this conclusion: At the end of August 2001, Austria's largest investment companies' funds investing in European equity posted losses of more than 20% compared to year-end 2000. According to VÖIG, only two of the equity funds registered in Austria showed a positive one-year performance at end-September 2001.

Insurance Companies

Profit Sharing Rates Curtailed

Insurance companies' investments – excluding reinsurance assets – increased by 3.3% in the first half of 2001 and at the same time continued to shift toward stocks and foreign equity. Stocks of domestic debt securities and outstanding loans were on the decline as in previous years, while stocks of equity securities and foreign assets continued to rise. Three quarters of the portfolios of insurance companies stem from life insurance plans and serve to cover life insurance entitlements.

1 *By mid-2001, some 20% of retail fund assets were placed with funds-of-funds; non-retail mutual funds and institutional funds accounted for 14% in funds-of-funds.*

2 *A similar development can be observed in Germany, where more than half of the funds issued in the first half of 2001 were funds-of-funds.*

The volatility of stock prices can strongly affect insurance companies' financial performance. At the same time, insurance companies' profit sharing rates[1]) are likely to be cut by 0.25 to 0.5 basis point owing to the sharp decline in stock prices. The maximum guaranteed interest rate in life insurance schemes was cut from 4% to 3.25% this year (see Financial Market Stability Report 1, page 53).

Impact of Terrorist Attacks in the U.S.A. on Austrian Insurance Companies Expected to be Small

Since Austrian insurance companies' international activities focus on Eastern Europe and are very limited in the U.S.A., the direct impact of the terrorist attacks in the U.S.A. on domestic insurers is expected to be fairly small.

However, the events could trigger premium hikes in property insurance schemes, for instance in liability insurance plans for industrial enterprises, since original insurers will take into account increased reinsurance costs when renegotiating contracts. Also, if stock prices on the international capital markets continue to fall, profit sharing rates in life insurance plans may be reduced even further.

Pension Funds

Just like the performance of mutual funds and life insurers' profit sharing rates, the yields of Austrian pension funds also came under increased pressure as stock prices were sliding. Still, the majority of investment and risk associations is apparently posting profits.

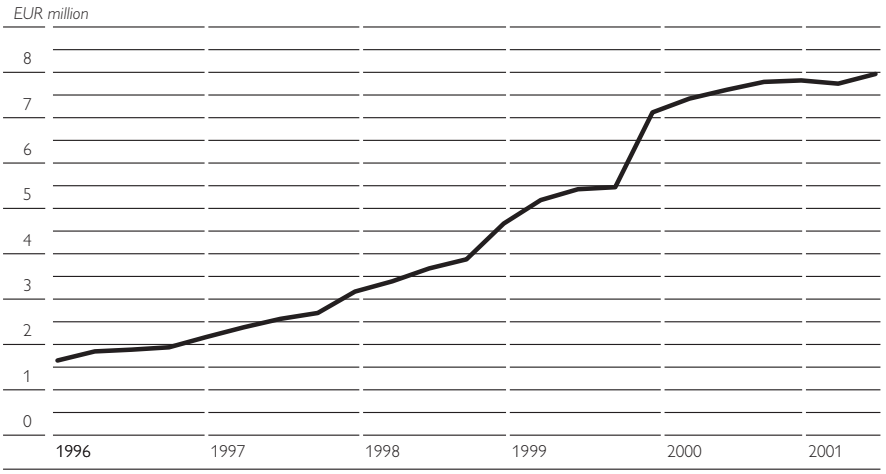
At the same time, at enterprises which introduced pension plans only recently, the investment performance plus accumulated reserves might not suffice to fund the benefit accounts as required under the retirement plans. In this case, the funding ratio would be too low compared to the original projection. However, considering the long horizon retirement plans typically have, an adequate funding level should be reached over time. To protect pensioners from the effect of market fluctuations on investment, Austrian law permits the creation of a negative fluctuation reserve. Should the fluctuation reserve dip below –5%, it would become necessary to draw on the assets of the plan, as a result of which pension payments might have to be cut. This applies primarily to defined-contribution plans[2]) (as opposed to defined-benefit plans[3])). At the end of 2000, 31,300 persons received pension fund benefits; this share corresponds to 3% of all pensioners in Austria. The number of active pension fund members and pensioners drawing pension fund benefits totaled 284,000 (against 231,000 by the end of 1999).

1 *Agreement on the policyholder's participation in the direct insurer's surplus,provided that the insurer has in fact posted a surplus in the relevant insurance category. In capital-accumulating (life) insurance schemes in particular, surplus largely depends on the possible yields of return on the financial markets.*

2 *In a defined-contribution plan, contributions are predetermined and pension benefits equal an annuity paid on the assets accumulated in the pension fund.*

3 *In a defined-benefit plan, the pension is predetermined and the contributions required to fund the pension fund's total obligations are based on actuarial calculations.*

Pension Funds' Total Assets



Source: OeNB.

Capital market developments have also impacted on Austrian pension funds' holdings; asset growth has shrunk considerably since the fourth quarter of 2000. In the first quarter of 2001, there was even a decline compared to the end of 2000. By mid-2001, pension fund holdings came to some EUR 8.0 billion, which puts the annual growth rate at 4.6%. Approximately 95% of the assets are managed by investment companies.

Implications for Financial Stability

Just as institutional investors have been playing an increasingly important role in the allocation of funds in Austria, private sector investment has become more and more market-oriented. Investment income is playing an ever more important role in Austrians' overall income and, in particular, in old age provision – implicitly under general investment plans or expressly through retirement benefits accrued under pension plans. The strong increase in pension plan members over the past few years implies that the number of persons drawing pensions from pension funds will rise continually in the future. Of course, investment income forms a highly volatile part of people's incomes, as shown by much lower returns in the first half of 2001.

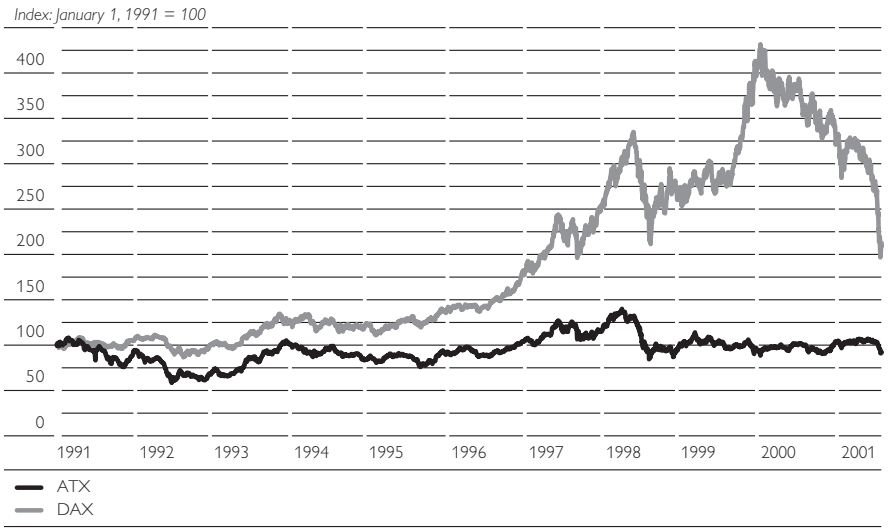
This aspect may impact on financial stability in Austria in so far as life insurance schemes (especially equity-linked life insurance plans) or mutual funds are often used as repayment vehicles to pay off foreign currency loans. Monthly installments (the repayment rate) are paid into this fund, its yield is used to pay off the capital at the end of the loan. If the performance of these repayment vehicles cannot keep up with the actuarial assumptions used in the provider's model calculations, the borrower, who is already exposed to high exchange rate and interest rate risks, becomes even more exposed to risk.

The Stock Market

So far, the performance of shares on the Vienna stock exchange, Wiener Börse AG, has not exhibited any clear trend in 2001. Contrary to the international downtrend, the ATX has remained more or less steady since the beginning of the year, thus largely detaching itself from the German Stock Index DAX in terms of stock performance. However, the Wiener Börse has also come to feel the consequences of the terrorist attacks of September 11, 2001. Stock prices fell by around 8%, reaching their lowest level on September 21, 2001 – a decline comparable to that registered on other stock exchanges, except for the DAX, which went down about twice as much.

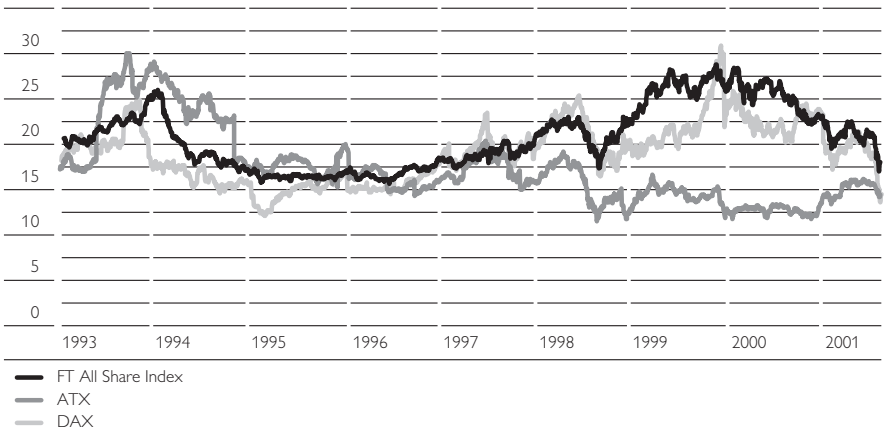
The price-to-earnings (P/E) ratio of the companies quoted on the Vienna stock exchange has remained within a tight band (between around 10 and 15) since fall 1998 – a level which is low both by historical and international

ATX and DAX



Source: Datastream.

Price/Earnings Ratio ATX, DAX and FT All Share Index



Source: Datastream.

standards. The P/E ratio of DAX companies, for example, stood at around 30 at the beginning of 2000. In the aftermath of the events of September 11, 2001, the DAX's P/E ratio fell to around 14, thus roughly matching the level of the ATX. Neither the current performance of stock market prices nor the longer-term stagnation of the P/E rate indicate an "overvaluation" of the Wiener Börse.

The low market liquidity of the Vienna bourse appears to have dampened demand for Austrian stocks and is thus likely to be one of the main reasons for their weak market performance. At the same time, however, this also helps explain why the Wiener Börse is less exposed to international price fluctuations than other bourses. The clearly lower correlation of the ATX with the main stock indices abroad reflects this reduced vulnerability. The ATX's correlation with foreign stock indices even continued to decline in the second half of the 1990s. While the correlation between other stock exchanges was more than 0.9, the correlation of the Wiener Börse with foreign stock exchanges only amounted to 0.6.

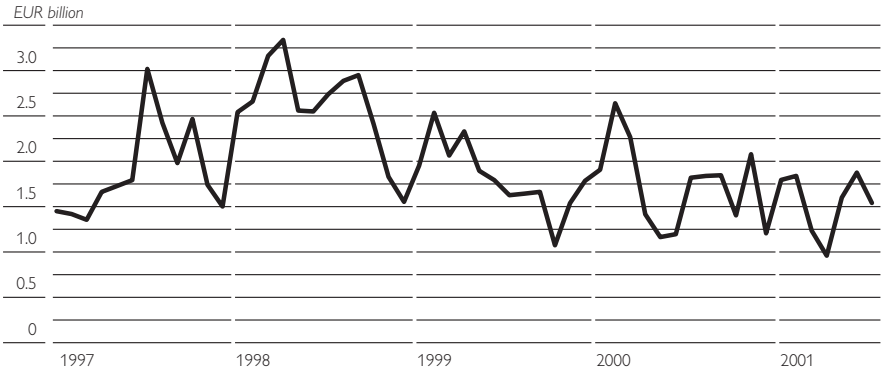
Correlation between Stock Indices

	from February 20, 1991, to September 30, 2001					from January 1, 1995, to September 30, 2001				
	AT	DE	US	FR	UK	AT	DE	US	FR	UK
AT	1.00	×	×	×	×	1.00	×	×	×	×
DE	0.56	1.00	×	×	×	0.39	1.00	×	×	×
US	0.57	0.96	1.00	×	×	0.41	0.94	1.00	×	×
FR	0.43	0.97	0.92	1.00	×	0.23	0.97	0.93	1.00	×
UK	0.60	0.96	0.99	0.92	1.00	0.45	0.96	0.98	0.98	1.00

Source: Datastream.

Market liquidity on the Vienna stock exchange remains low. During the first seven months of 2001, turnover even declined, coming to just around 90% of the value recorded in the corresponding period of the previous year. Despite the lower liquidity in Vienna, the ATX did not exhibit more volatility than liquid markets. In fact, the number of days since the beginning of 2001 on 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 and the FT All Share Index.

Equity Turnover at Wiener Börse



Source: Wiener Börse AG.

Number of Days with Absolute Price Changes

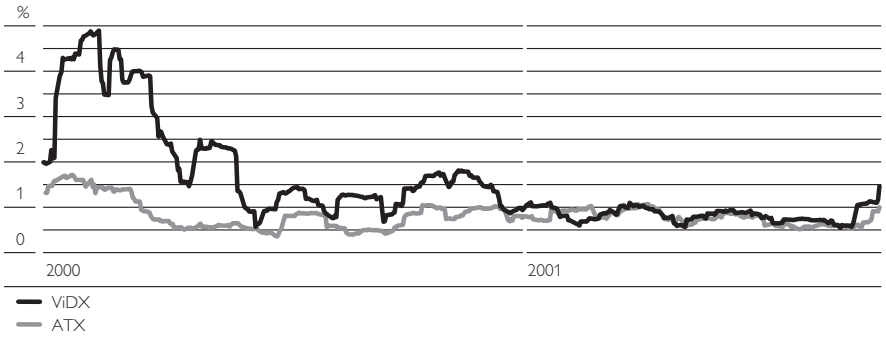
from January 1, 2001, to September 30, 2001

	absolute price changes of		
	0–2%	2–4%	4% and over
	Number		
ATX	188	5	0
DAX	151	37	5
FT All Share Index	173	19	1
Dow Jones	174	14	5

Source: Datastream.

The volatility of technology stocks on the Wiener Börse, which was very pronounced in 2000, dropped off in 2001. Since the beginning of the year, the historical volatility (measured as the standard deviation of the daily change) of both the ATX and the Vienna Dynamic Index (ViDX), which comprises technology-oriented companies listed on the Vienna stock exchange, has been mostly below 1%. Volatility only began to slightly rise again after September 11, 2001.

Historical Volatility of Stock Indices[1])



Source: Datastream.

[1]) Volatility calculated as the standard deviation of daily changes over the preceding 30 days.

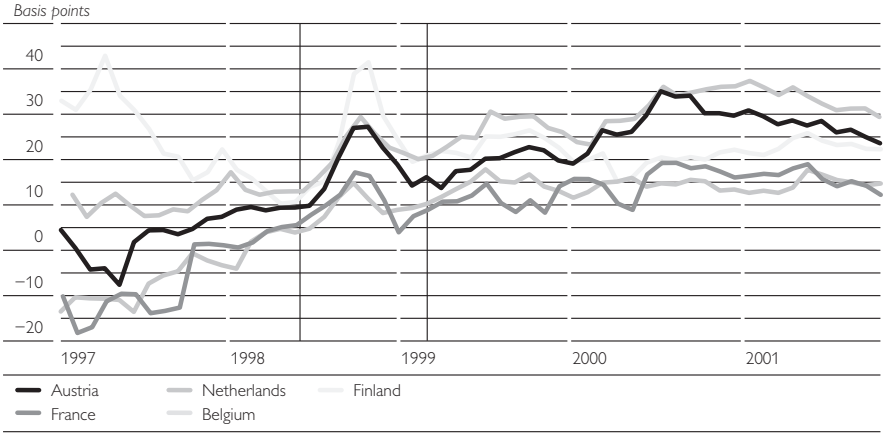
Bond Market

Interest Rate Differential to German Benchmark Yields Remains Unchanged

The creation of a highly integrated euro area-wide bond market has visibly stepped up the competitive pressure on smaller issuers. As a measure to promote the liquidity of the Austrian market, the federal government proceeded to amalgamate individual new issues into larger euro issues. In addition, several issues of federal government bonds were reopened at unchanged terms. This approach has the advantage of both securing a steady foothold on the market and providing for high volumes of bonds outstanding. From a financial stability perspective, it is worth noting that the yields of Austrian ten-year government bonds – like those of government bonds issued by the other euro area members – continue to post a positive interest rate margin to German ten-year government bonds.

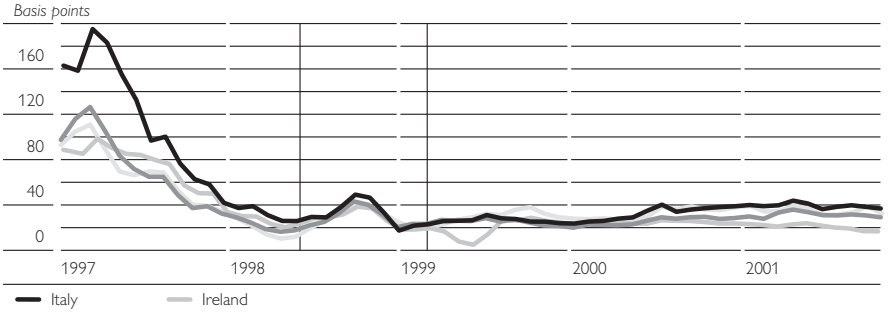
Coming to between 29 and 23 basis points, the interest rate differential of Austrian benchmark yields to German government bonds has remained nearly unchanged since the beginning of 2001. While market liquidity is

Interest Rate Margin Compared to German Ten-Year Government Bonds from 1997 to 2001 (Part 1)



Source: BIS.

Interest Rate Margin Compared to German Ten-Year Government Bonds from 1997 to 2001 (Part 2)



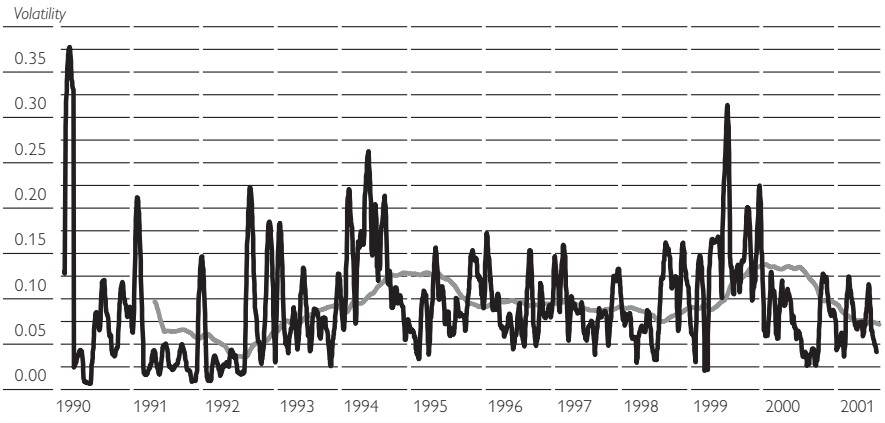
Source: BIS.

without doubt one of the key reasons why the yields of individual government bonds differ across the euro area, lower credit ratings are likely to have lost their importance as a determinant of yield differences.

Volatility of Bond Market Yields Remains Low

Apart from the difference between Austrian bond market yields and EMU benchmark yields, volatility is a yardstick for financial market stability. Investors consider the volatility of yields over time a risk and try to achieve an optimal balance between the expected yield and the underlying risk.

Historic Volatility for Austria



Source: OeNB.

Deviating by less than 12 basis points from the mean of the average yield, the volatility of the Austrian secondary market yield has hardly changed throughout 2001. A similar pattern in volatility developments was observed for German secondary market yields on government bonds, both over time and in terms of averages.

Editorial close:
November 30, 2001

Economic Outlook for Austria

Current forecasts for 2001 and 2002 are characterized by significant downward revisions against earlier forecasts. The OeNB now expects real GDP growth to reach 1.2% in 2001 and 0.9% in 2002. This compares with real output growth of 1.3% predicted by WIFO for 2001 (down from 1.7% in the June outlook) and 1.9% for 2002. The IHS forecast is 1.4% for 2001 and 1.7% for 2002.

Key Economic Indicators for Austria

	OeNB November 2001		WIFO September 2001		IHS September 2001		OECD November 2001		EU Commissionn November 2001	
	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
	Annual change in %									
Main results										
Real GDP	+1.2	+0.9	+1.3	+1.9	+1.4	+1.7	+1.2	+1.5	+1.1	+1.2
Real private consumption	+1.4	+1.4	+1.5	+1.9	+1.5	+1.7	+1.5	+1.8	+1.4	+1.6
Real gross fixed capital formation	+0.4	+0.8	−0.9	+0.5	+0.3[1])	+2.1[1])	−0.5	+0.3	−0.2	+0.8
Real exports	+4.1	+2.9	+4.6	+4.6	+4.8	+4.4	+5.3	+3.8	+5.3	+4.0
Real imports	+3.1	+3.0	+4.2	+4.1	+3.7	+4.0	+4.6	+3.3	+4.4	+3.3
GDP deflator	+1.5	+1.0	+1.4	+1.6	+1.9	+1.6	+2.0	+1.8	+1.4	+1.5
CPI	×	×	+2.6	+1.9	+2.6	+1.6	×	×	×	×
HICP	+2.3	+1.3	×	×	×	×	×	×	+2.4	+1.7
Unit labor costs	+1.9	+1.4	+1.9	+1.0	×	×	×	×	+1.3	+0.9
	%									
Unemployment rate[2])	3.8	3.9	3.8	3.8	3.8	4.0	4.8	5.3	3.9	4.3
	% of GDP									
Current account balance	−2.8	−2.9	−2.6	−2.5	−2.4	−2.1	−2.5	−1.9	−2.7	−2.4
Fiscal balance	−0.2	−0.3	−0.7	−0.3	−0.7	−0.2	0.0	−0.4	−0.2	−0.4
	USD									
External assumptions										
Oil price/barrel[3])	24.4	18.7	28	28	25	25	24.6	21.5	×	×
USD/EUR[3])	0.9	0.89	0.9	0.95	0.91	0.96	×	×	×	×
	Annual change in %									
Real GDP, U.S.A.	+1.1	+0.1	+1.0	+2.0	+1.0	+2.3	+1.1	+0.7	+0.9	+0.5
Real GDP, world	+2.0	+1.5	×	×	×	×	×	×	+2.1	+2.2
World trade	+0.9	+0.4	+5.0	+5.6	+2.5	+7.0	+0.3	+2.0	+0.9	+1.8

Source: OeNB, WIFO, IHS, EU Commission, IMF, OECD.
[1]) Gross capital formation.
[2]) EU definition; OECD: as defined by the OECD.
[3]) OeNB: external assumptions of the ECB.

Both WIFO and IHS present a guardedly optimistic outlook on international economic developments (particularly in the U.S.A.); the OeNB's outlook, by contrast, is more restrained. The consequences of the terrorist attacks of September 11, 2001, are generally regarded as temporary phenomena. In anticipation of a marked rebounding of the U.S. economy as of spring 2002, the consensus view is that U.S. economic growth will come to 1% in 2001. For 2002, WIFO predicts 2.0% and IHS 2.25%, whereas the OeNB assumes only 0.1% output growth for the U.S. economy. The EU economy is expected to expand at a substantially higher pace than the U.S. economy, namely at 1.5% (WIFO) or 1.75% (IHS) in 2001 and at 2.0% (WIFO) in 2002.

Turning to Austria, the slowdown of domestic growth is based both on the bleaker international economic conditions and on a decline in domestic

demand growth, with the latter being primarily responsible for the revisions against the June forecasts. The substantial problems of the construction sector (which is oversized by European standards) and the slackened growth of private consumption, in particular, lead to domestic demand growth expectations of somewhat below 1% for 2001 and of scarcely 1.5% for 2002.

Inflation forecasts have hardly changed against the June 2001 outlooks. A rise of the national Index of Consumer Prices (CPI) of 2.6% is predicted for this year. At 1.6%, the IHS inflation forecast for 2002 is – largely on the basis of an expected decline in oil prices – somewhat below the WIFO figure (1.9%). The OeNB forecasts HICP growth to decelerate from 2.3% in 2001 to 1.3% in 2002.

The labor market situation is going to tighten markedly. The year 2001 will, however, still see some employment growth, though largely in part-time jobs. The unemployment rate is generally expected to inch up to 3.8% in 2001.

The negative impact of the economic slump will hit the general government already this year, but more severely in 2002. Thus, a general government deficit of 0.7% is forecast for 2001 by both WIFO and IHS. The OeNB, having taking the latest tax revenue statistics into account, expects a deficit of 0.2% for 2001. In 2002, the target of a zero budget deficit will be missed by a narrow margin according to the OeNB's projections.

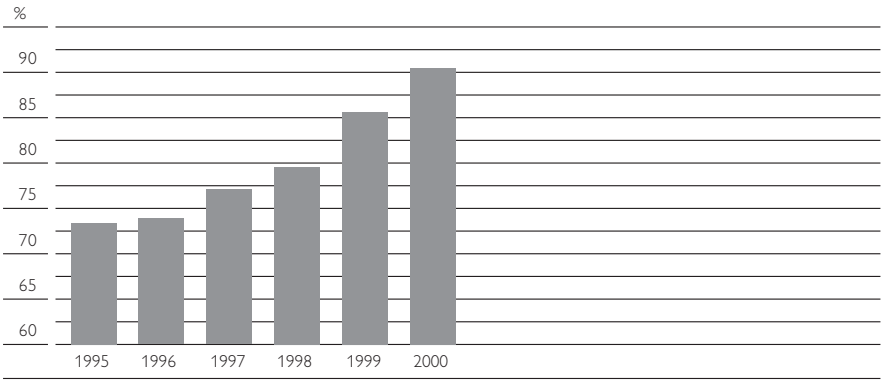
The risks involved in the forecasts are considerably higher than usual. Especially the confidence of U.S. consumers and investors might decline more strongly than anticipated and thus substantially delay a recovery. Economic developments in the euro area might not meet expectations either if fiscal policy measures fail to have the anticipated effect. The predicted low saving rate is another risk factor in both forecasts. Should the savings of Austrian households be higher than expected – which might well be the case in times of greater uncertainty – the stabilizing effect of private consumption would lessen and growth may drop markedly against the forecasts.

Nonfinancial Corporations[1])

Further Rise of Corporate Debt

In 2000, Austrian businesses augmented their debt by EUR 16.8 billion, an increase that almost equaled that of the year 1999. Since 1995 corporate debt capital has been advancing at a much faster pace than domestic output. While the debt-to-GDP ratio came to 73% in 1995, it was as high as 90% by 2000.

Ratio of Corporate Debt to GDP in Austria



Source: OeNB.

Less Bond Market Financing in 2000

Credit markets continue to play a prominent role in the financing of Austrian businesses. In 2000, the share of credit financing in total debt financing increased while the share of bond financing shrunk.[2])

While debt securities, at EUR 2.7 billion, were employed more than average as a source of corporate funding in 1999,[3]) redemption and net issuance were balanced in 2000. The ratio of bonds outstanding to bank debt declined from 10.0% in 1999 to 8.7% in 2000.

The main reason for this was that utilities, which had largely tapped the capital market in the past few years, substantially reduced their funding requirements in 2000. Furthermore, quasi-public entities,[4]) which are also strongly represented on the bond market, made increasing use of intermediary funding programs ("Rechtsträgerfinanzierung"), with the central government issuing bonds to relend the proceeds under unchanged conditions to public-owned entities. In 2000, this form of funding amounted to EUR 2.4 billion; cumulative liabilities outstanding meanwhile come to

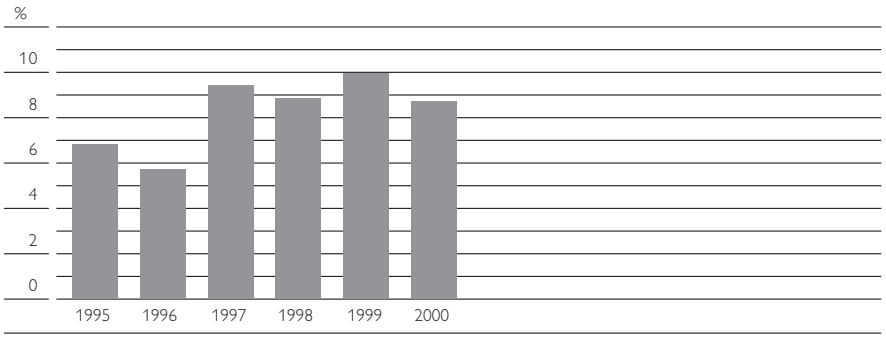
1 *National accounts data and financial accounts data for businesses refer to the sector "nonfinancial corporations" as defined in ESA 1995 (European System of Accounts). The Financial Accounts are drawn up annually; figures for 2001 will not be available before 2002.*

2 *The Financial Accounts also reflect – purely statistical – shifts in the financing instrument "loans" between the sector "nonfinancial corporations" and the sector "general government."*

3 *According to the Balance of Payments Statistics, about EUR 700 million thereof were attributable to changes not related to transactions, which were accrued in securities trading abroad. Changes not related to transactions are largely valuation changes caused by price and exchange rate fluctuations.*

4 *Austrian Railways; OeIAG, the Austrian state holding company; ASFINAG, the public-sector road construction company; SCHIG, the Austrian rail infrastructure financing company.*

Bond-to-Loan Ratio of Austrian Nonfinancial Corporations



Source: OeNB.

EUR 8 billion. By comparison, corporate bonds issued since 1995 only amount to EUR 6.7 billion.

By raising funds through the issuance of debt securities and relending them to quasi-public entities, the central government has substantially increased its creditor position against the corporate sector. The ratio of government loans to total bank loans has gone up from under 4% in 1996 to 11% in 2000. By increasingly acting as a financial intermediary, the public sector has also extended its risk position with respect to possible defaults.

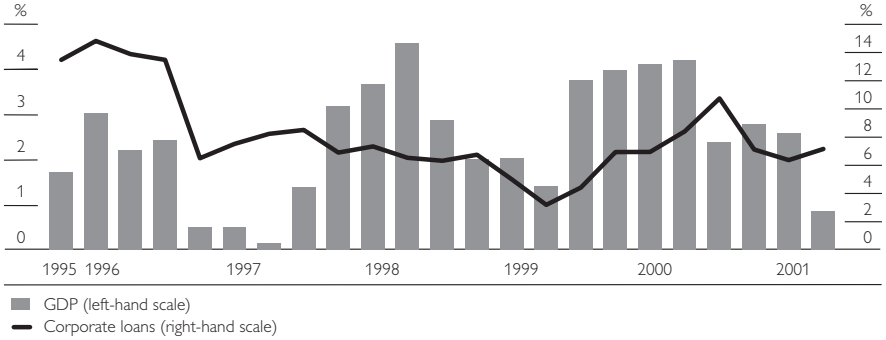
Economic Slowdown Dampens Loan Demand

Corporate loan demand is on a sharp decline. The annual growth rate of bank debt slowed down from 10.7% in the third quarter 2000 to 7.2% in the second quarter 2001. This mirrors the overall economic development in Austria, which has noticeably lost momentum in the second half of 2001.

Maintaining debt service might become more difficult as the economy cools down, but the potential rise in creditor risks is counteracted by the distinct slowdown of bank debt growth and the drop of interest rates, which is tantamount to a debt service relief, given the high share of variable interest rates in Austria.

Corporate Loan and GDP Growth

Change on same quarter of previous year



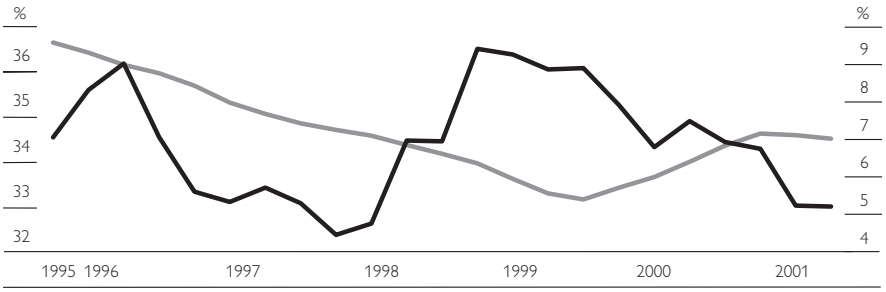
Source: OeNB, WIFO.

According to Kreditschutzverband von 1870, the total number of Austrian insolvencies went down slightly from 4,062 to 3,881 year on year in the first three quarters of 2001, but liabilities augmented from EUR 2.01 billion to EUR 2.70 billion. A further intensification of the economic cooling might translate into a rise of insolvencies and further add to creditors' default risk this year.

Less Demand for Short-term Bank Loans

The share of short-term loans in corporate loans has already been on the decrease since the beginning of EMU. From almost 37% at the end of 1998 it receded to 33% in the second half of 2001. In addition to the effects of economic activity, this may have been due to changes in the interest rate level and to changes in the interest rate structure.

Short-term Corporate Loans and Interest Rates

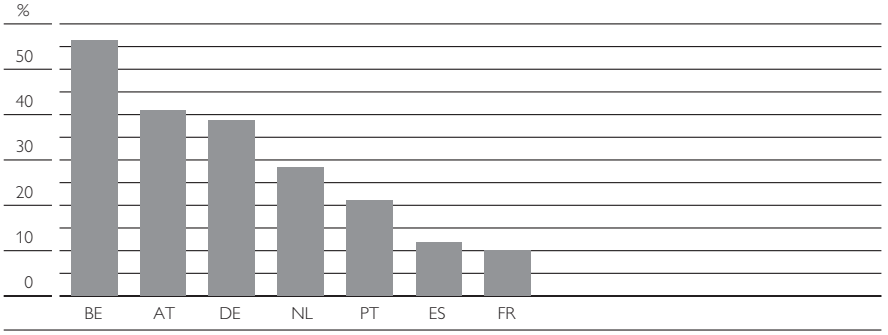


Source: OeNB, WIFO.

Liquidity Reserves Sufficient

A high share of short-term loans in total financing may augment liquidity risk. Corporations that are temporarily strapped for cash on account of the economic slowdown, will be especially affected if they have a high short-term debt. In 1999, 41% of short-term liabilities were covered by currency and

Ratio of Short-Term Financial Assets to Short-Term Liabilities of Nonfinancial Corporations[1])



Source: OeNB, Eurostat.
[1]) Short-term assets: currency and deposits; short-term liabilities: money market paper, short-term loans, other liabilities.

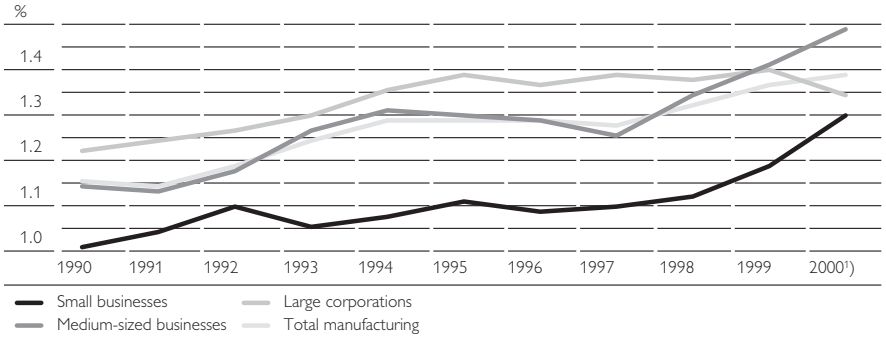
deposits. In comparison with other euro area countries, Austria thus ranges second behind Belgium with 56% (see chart "Ratio of Short-Term Financial Assets to Short-Term Liabilities of Nonfinancial Corporations").

While small and medium-sized businesses raised their liquidity – measured by the cover ratio of short-term liabilities – in the past few years, large corporations have not been able to increase their high liquidity reserves since the second half of the nineties; in 2000, their liquidity position even weakened slightly.

On the whole, however, Austrian corporations are comparatively well prepared for short-term financial difficulties.

Liquidity Ratio Developments in Austria

(Current Assets to Short-Term Liabilities)

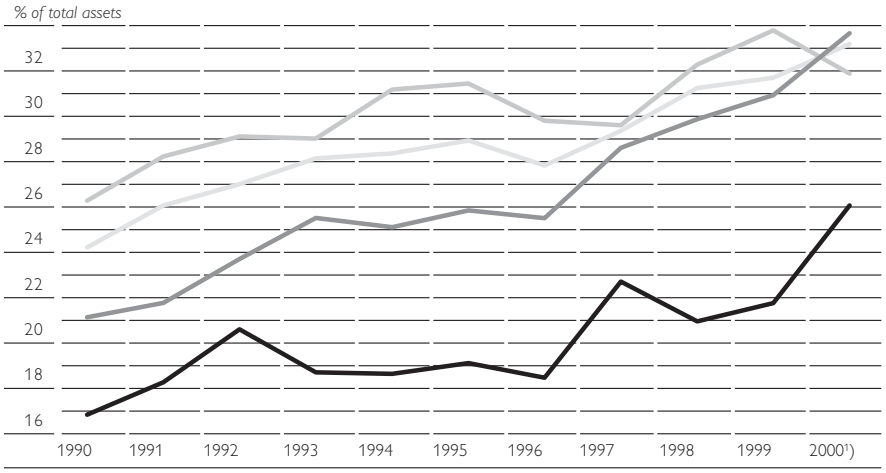


Source: OeNB.
¹) Provisional Figures.

Equity Ratio Improved

Sufficient equity capital serves as an essential buffer against default. A lower equity ratio tends to increase the probability of bankruptcy, which, in turn,

Equity Ratio Developments in Austria



Source: OeNB.
¹) Provisional Figures.

lowers the market value of a business or may result in higher interest rates for outside capital.

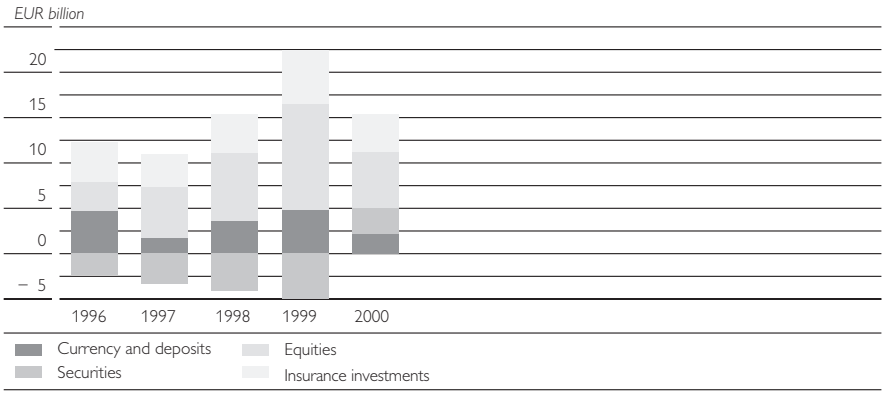
In Austria, equity ratio developments differed according to company size. Whereas small and medium-sized businesses could markedly improve their equity positions at the end of the nineties, the position of large businesses became slightly worse. The figures for 2000 – although provisional – indicate a somewhat larger creditor risk for transactions with large businesses.

Households[1])

Stock Market Trends Prompt Decline in Financial Asset Accumulation

At EUR 15.7 billion, the accumulation of financial wealth by households in 2000 fell behind the year-on-year figure of EUR 17.6 billion.

Accumulation of Financial Assets by Households



Source: OeNB.

The decline in financial asset accumulation is attributable to a severe stock market downturn worldwide amid which investor behavior changed as well. In times of greater uncertainty households apparently adjust to shorter-term investment horizons, i.e. they tend to expand their liquidity positions at the expense of longer-term investments. Against the trend of the past few years, short-term bank deposits thus registered an above-average expansion at a volume of EUR 2.4 billion. This expansion amounted to 15% of financial asset accumulation in 2000. By contrast, the absolute volume of savings deposits shrank for the first time, by EUR –2.4 billion.

In 2000, bond market investments went up by EUR 2.7 billion, with bank bonds being highest in demand. Stock market investors focused on foreign, most of all euro area issues.[2])

1 *The Financial Accounts data used for this section were only available for the year 2000 at cut-off date for the report.*

2 *In 2000, household holdings of foreign shares, however, depicted an upward bias on account of the sale of Bank Austria AG to Bayerische Hypo- und Vereinsbank AG. This sale was effected by means of a share exchange, which expanded Austrian investors' holdings of foreign shares. This transaction contributes to raise the impact of international market developments on the financial assets of Austrian investors.*

The demand for mutual funds shares, by contrast, declined sharply. Whereas 42% of financial assets accumulated in 1999 were invested in mutual funds shares, this figure plummeted to 14% in 2000. This development is also attributable to the price losses at international bond markets, which considerably damaged the performance of mutual funds (see also chapter "Institutional Investors").

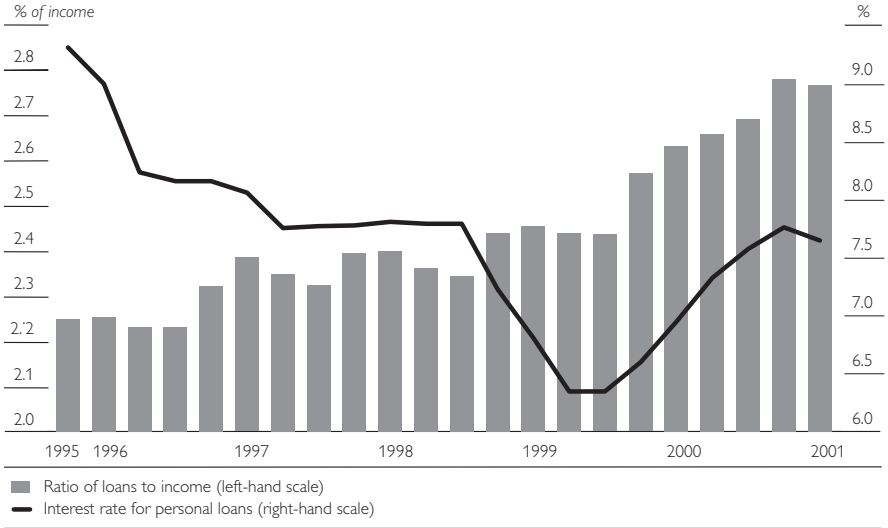
Similarly, money invested in pension fund plans in 2000 (EUR 560 million) came to just about a fourth of the amount allocated in 1999 (EUR 2.3 billion). Life insurance plan growth in 2000 also lagged behind the 1999 figure. Generally price adjustments on international capital markets generated less money for investment in private pensions in 2000.

Stepped-up investment in market-based assets during the past few years fed through to a greater exposure of household financial assets to market volatilities. In 2000 – and, according to available indicators, also in the year 2001 until now – these market volatilities had considerable repercussions on the stock of financial assets (compare chapter "Institutional Investors"). At the same time, investors reacted to the developments on international financial markets by opting for greater liquidity or by investing in the less volatile bond markets, at least when came to reallocating free-up investments.

Borrowing Remains High

Households extended their total financial liabilities by EUR 7.3 billion in 2000.[1]) After bank loans, public sector home loans are the second most important source of financing of households.

Ratio of Loans to Household Income and Interest Rate Development



Source: OeNB, ECB.

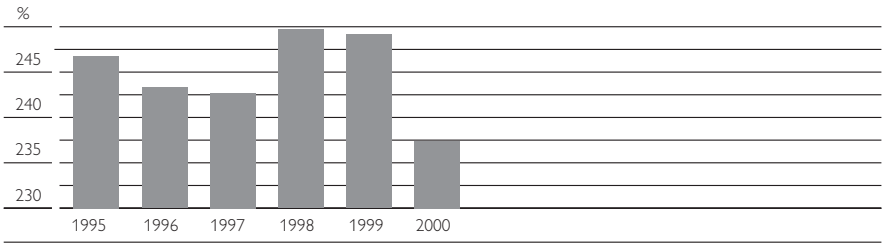
1 *A statistical adaptation of home loans extended by provincial governments accounts for about EUR 2 billion of this amount.*

The ratio of debt to income (with income measured as total payroll) is an indicator for household indebtedness.[1])

The degree of indebtedness of households has been going up perceptibly since the end of 1999, when declining interest rates and favorable income prospects still supported the readiness to borrow.

Both income earned and financial assets accumulated by households lagged behind household debt incurred in 2000. Net financial assets accumulated[2]) in 2000 came to the lowest level registered since 1995. This notwithstanding, household net financial wealth was still more than twice as high as total household debt and thus continues to offset the liabilities incurred – at least in a macroeconomic perspective.

Net Financial Wealth of Households
in Relation to Their Indebtedness



Source: OeNB.

Long-term Indebtedness on the Rise

The major part of household debt to banks is over a long-term horizon, a preference that has even increased in the past year. In the middle of 2001, more than 87% of loans were long-term loans. Consumer loans were largely responsible for this trend.

In part, interest rate development also had an impact on the strong household demand for long-term loans. In the second part of 1999, short-term interest rates stepped up continuously, whereas long-term interest rates were slower to go up. The yield curve flattened. Households benefited from these interest rate trends and only marginally augmented short-term bank debt. The tendency toward long-term debt was probably intensified by the recently vigorous loan demand, which considerably pushed up the debt-to-income ratio. Higher indebtedness obviously favors the distribution of redemption and interest rate payments over a longer period, thus reducing the monthly financial burden.

1 *There are certain restrictions to the explanatory power of this ratio regarding the financial situation of households. For instance, it does not provide any information on the distribution of income and household indebtedness. Naturally, it does make a difference whether the rise in debt is attributable to a small number of households or to a greater loan demand of a large share of households. Furthermore, the debt-to-income ratio does not differentiate between households with low income and little assets and those with sufficient assets to cover their debts.*

2 *Net financial assets is the balance of financial assets accumulated and financial liabilities incurred in a certain year.*

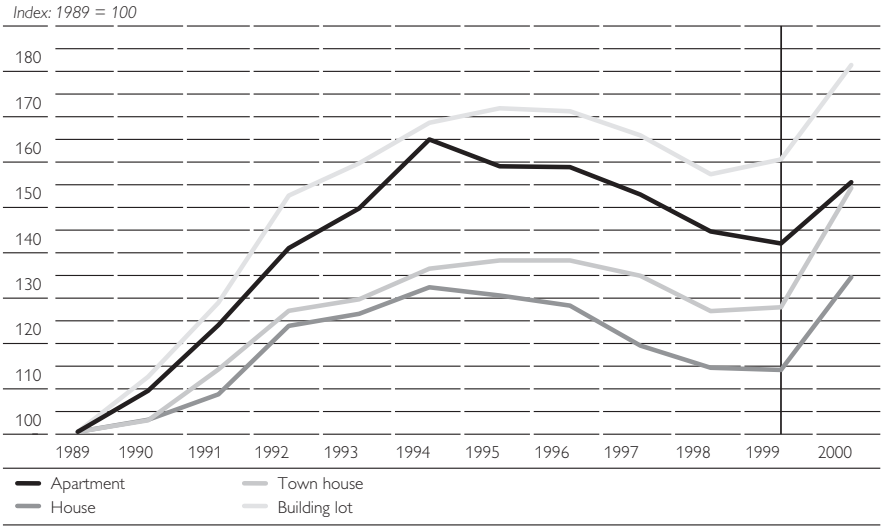
Default risk should have declined on account of the household preference for long-term loans. This development is contrasted by the rising share of foreign currency loans in total loans. The creditor risk thus incurred mainly results from exchange rate fluctuations, which may dramatically increase the financial burden of borrowers.

Real Estate Market

Prices Continue to Rise

The Immobilien-Preisspiegel of the Federal Association of Real Estate and Property Trustees of the Austrian Federal Economic Chamber, published annually since 1990, has recently been restructured considerably.[1]) This will substantially improve the future evaluation of price developments on the Austrian real estate market, but at present it means that, due to the new structure, comparisons between 2000 and previous years are possible only to a limited extent.

Purchase Prices in Austria



Source: CA-Immobilienpreisindex.

Upon reorganization of the data basis, the prices recorded have generally been higher, an effect that is, at least in part, likely due to the changes in the basis for data collection. But despite the limited comparability of data series it is evident that the decline of real estate prices observable since the middle of the nineties has bottomed out and that all real estate categories are now trending upward again.

Not only real estate prices, also building costs are going up. Information on building costs may only be collected with a certain time lag when building completion data have come in. The most recent data on building costs thus refer to housing completions in 1999. In 1999, building

1 *The former subdivision into 8 object categories, 3 site criteria and 9 provincial capitals has now been replaced by 12 object categories, 3 quality grades and 118 districts.*

costs for multi-floor residential buildings rose 2% year on year, after a drop in previous years.[1])

Housing demand does not indicate any future price pressure. According to housing statistics, housing completions in 2000 dropped 9.6% year on year. The decline in residential building permits observable in recent years has thus finally fed through to completions. Residential building permits plummeted 8.8% against 1999.[2])

Hardly Any Rise in Real Estate Bank Financing

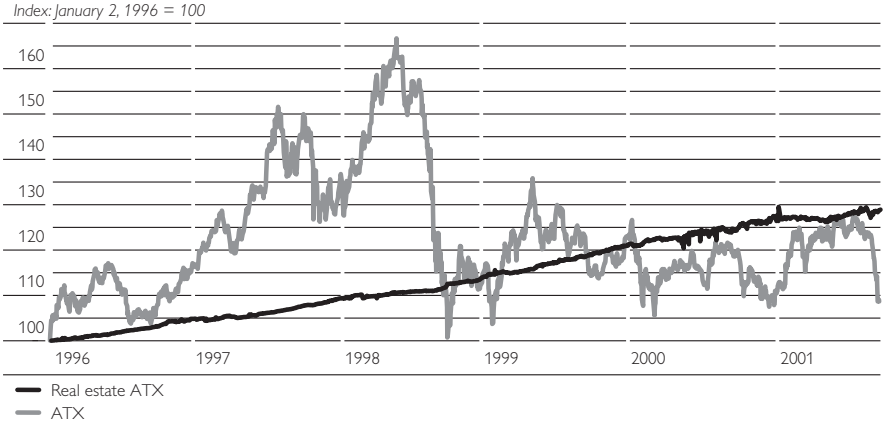
Banks' engagement in real estate financing has almost remained stable over the past few years, whereas foreign currency real estate financing has surged considerably, increasing four and a half times since 1996, while total loans have tripled. Growth in foreign currency real estate financing has been edging down since the third quarter of 2000.

Home loans have posted continuous growth since 1997. The share of foreign currency home loans has been going up since 1995, reaching about 7%. Simultaneously, the share of subsidized home loans has gone down.

Real Estate Financing Through the Capital Market

Real estate investments generally require a very large amount of capital. This form of cash investment is thus only available to a limited range of customers, which is why the option of indirect real estate investment is increasingly made use of through the purchase of real estate securities or securities collateralized by real property. Market capitalization of Austrian real estate stock corporations has by now reached EUR 1.24 billion. Listed real estate

Real Estate ATX and ATX



Source: Immobilienkammer, Wiener Börse AG.

1 *Building costs for one- and two-family residences were financed half by the owner's funds and half by debt capital. The focus on bank loans has continuously become more pronounced, reaching 43% in 1999. With multi-floor residential buildings, debt capital accounted for two thirds and owners' funds or bridging loans from property developers for one third of funds. 40% of debt capital were government funds, 60% stemmed from the capital market, including building and loan associations.*

2 *Residential building permits went down 3% – excluding Vienna, which registered a drop by 35% in 2000 after a surge of almost 30% in 1999.*

securities thus amount to about 4% of the market capitalization of all stocks listed on the Vienna stock exchange. The Austrian real estate ATX (Immobilienaktienindex, IATX)[1]) of the Vienna Stock Exchange excels in great stability and low volatility.

Housing bonds have been on the market since 1994 and are issued with fixed or variable interest rates. They are higher-yielding than other bonds with equal interest rate, as the annual coupon is exempt from capital income tax up to 4%. Furthermore, investments into housing bonds are tax deductible as special expenses within the scope of the pertinent legal provisions. By the end of 2000, housing bonds issued amounted to EUR 2,707 million, a sum that will go into the long-term financing of subsidized housing and equals 1.7% of the total volume outstanding of bonds issued in Austria.

Real Estate Funds as a New Form of Investment on the Austrian Market

The Immobilien-Investmentfondsgesetz, the Real Estate Investment Fund Law, will become effective as of the beginning of April 2002 and will permit real estate funds also in Austria. The value of a share derives from the value of the real estate purchased by the fund and is determined by two evaluation experts. The fund management company is obliged to repurchase shares at this price. As banking transactions, the issuance and management of real estate funds are under the authority of the Financial Market Authority, which, however, cannot be held liable.[2]) As trustee securities, real estate funds are likely to enter the premium reserve stock of insurances and pension funds.

This eliminates a potential competitive disadvantage vis-à-vis similar funds in other countries, notably Germany. In addition, investments into real estate will become more comprehensible and transparent, and – given the supervision by the Financial Market Authority – investor interests will be better respected. The Immobilien-Investmentfondsgesetz would also make the market more receptive for planned real estate privatizations, ranging from the sale of forests to federally-owned apartments.

1 *The IATX contains 68% of the capitalization of real estate securities.*

2 *With regard to tax purposes, real estate funds will likely be treated more or less like bond-based funds. 80% of valuation gains are to serve as tax base; there will be a 25% capital earnings tax on profits.*

Financial Stability and the Real Economy

Financial markets enable the intertemporal allocation of funds. The prices quoted on these markets, such as stock prices, interest rates, etc., convey essential information on the relative value of the traded assets, thus indicating the relative earnings prospects of alternative investments. Therefore, the stability of financial markets and of financial market institutions is a key prerequisite for a stable and growing economy.

There are two preconditions for the efficient functioning of financial market institutions: first, sufficient confidence in the ability of market participants to fulfill their commitments, and second, that the prices of the assets traded on financial markets reflect their "fundamental" economic value and thus give "correct" economic signals.

Financial stability is certainly most important in times of economic distress, such as in case of sudden reversals of capital movements as during the Asian crisis or of abrupt fluctuations of stock prices or exchange rates as at the beginning of the 1990s within the European Monetary System (EMS). Past events show that financial market crises may at times entail substantial costs for the real economy.

Financial stability, however, is not the mere absence of a crisis; and what is more, it is often difficult to differentiate between a crisis scenario and basically justified capital flows or price movements. In addition, maintaining and enhancing stability is also fundamental for the proper working of the markets.

A number of studies show that, in general, growth perspectives are better in countries with functioning financial systems, although the matter of causality has not yet been completely clarified in this respect. The question of whether a financial system is more strongly based on banks or on markets seems to be of less importance here – this is mainly determined by the historic development and institutional framework of a country. It is much more essential to what extent and under which conditions financing is made available to potential investors, and in how far investors are able to share their risk with other suppliers of capital or may distribute it over a sufficient number of projects. These are the key factors determining the accumulation of the capital stock of an economy and, as a consequence, its output potential.

It is part of the role of functioning financial markets and financial intermediaries to counteract information asymmetries, which also allows more efficient corporate governance. The type and efficiency of instruments employed in corporate governance are closely related to the way decisions on investments and financing are made and thus also influence the macroeconomic efficiency of capital allocation.

This efficiency may also be distorted if asset prices, such as stock prices, considerably deviate from their economic value over a longer period of time and no longer signal their fundamental value. Due to the growing stock investments of households, both directly and indirectly through mutual funds, the share of investment income in total income is going up and its influence on consumer demand is growing. On the one hand, sudden fluctuations may thus directly feed through to household income and, as a consequence, to overall economic demand, and on the other hand, they may further reduce demand due to greater uncertainty. But falling stock prices also increase the cost of financing on the stock market and reduce the equity of enterprises, which, in turn dampens banks' willingness to lend.

Bank lending may, however, also be hampered in case of uncertainties and instabilities that reduce the significance of financial market indicators. (Decisions on economic policy measures may be slowed down as well.) These uncertainties and

instabilities hamper banks' ability to differentiate between good and bad risks, thus making the distribution of information between the (potential) counterparties even more uneven. Consequently, banks' ability or willingness to lend declines and intermediation costs, i.e. the expenses for transforming deposits into loans to "credit-worthy" customers, go up. A more difficult access to financing may force businesses and households to cut their expenses; less investment, in turn, dampens capital accumulation and in the longer run both the output capacities and growth tendencies of an economy.

Financial markets are in many ways interrelated with saving and investment decisions and thus have a great impact on other macroeconomic factors, which is why their stability affects the real economy in numerous ways. The stability and functioning of financial markets is therefore of vital interest to central banks. Thus, the OeNB will focus on these topics in the coming issues of the Financial Stability Report and analyze key issues concerning the interrelation of financial stability and the real economy.

Special Topics

A Typology of Financial Instability

E. Philip Davis[1]),
Brunel University,
West London

Introduction

This article seeks to provide an overview of the various types of financial instability that have been experienced in recent years. We focus particularly, but not exclusively, on events in advanced industrial countries where securities markets as well as banks are, or are becoming, important to the financial system and financial intermediation.

The article is structured as follows: first we provide a theoretical framework that helps us to understand financial instability. Then we outline three main types of financial turbulence, before going on to consider some of the subcategories of financial disorder that can be distinguished. We provide detailed examples of each of the three main types of instability,[2]) and then we use this material to evaluate the theories and develop a set of generic features which history suggests are common to periods of financial instability despite their differing nature.

We contend that the typology, as it takes into account risks in securities markets as well as banking, is strongly relevant to the euro area (see also Davis, 2001a). This is because unification of previously segmented monetary areas is leading to rapid growth in money, bond and equity markets to complement the banking sectors, which in most countries were previously dominant.

Before commencing, it is important to define financial instability. We prefer to define systemic risk, financial instability or disorder as entailing heightened risk of a financial crisis – "a major collapse of the financial system, entailing inability to provide payments services or to allocate credit to productive investment opportunities." Such a crisis in turn would have a major effect on general economic activity. Note that the definition excludes asset price volatility and misalignment as independent aspects of instability.[3]) Systemic risk tends to be ultimately related to concerns about solvency of financial institutions, although failure of market liquidity and breakdown of market infrastructure may also be important. In most OECD countries, which are our principal focus in this article, systemic risk has generally been countered by the authorities, thus preventing a crisis per se. In emerging market economies, on the other hand, a large number of full-blown financial crises have taken place in recent decades (Mishkin, 2001).

1 *The author is Professor of Economics and Finance at Brunel University and a Visiting Fellow at the National Institute of Economic and Social Research. He is also an Associate Member of the Financial Markets Group at LSE, Associate Fellow of the Royal Institute of International Affairs and Research Fellow of the Pensions Institute at Birkbeck College, London. (e-mail: e_philip_davis@msn.com, website: www.geocities.com/e_philip_davis). The material is derived in part from Davis (2001d), which will appear in an IMF volume on Assessment of financial systems.*

2 *The descriptions draw on Davis (1995a), the publishing rights of which are held by Oxford University Press.*

3 *The correct definitions of financial stability and instability are a topic of controversy, which is by no means resolved. See the discussion in www.yahoogroups.com/group/financial_stability during June 2001.*

1 Understanding Financial Crises

A theoretical framework for analysing and seeking to predict periods of financial instability is set out in detail in Davis (1999a) and summarised here. We suggest that many of the strands of the theory of financial instability have a contribution to make to our understanding of financial crises, but that the explanations are in most cases partial. A selective synthesis drawing on the evidence of actual crises is the correct approach to adopt. We shall review this matter after presenting some case studies of the three main types of instability in section 4.

The basic theories include those of:

– *"debt and financial fragility,"* which suggests that financial crises follow a credit cycle with an initial positive shock (displacement) provoking rising debt, mispricing of risk by lenders and an asset bubble, which is punctured by a negative shock, leading to a banking crisis. These patterns are seen as a normal feature of the business cycle (Fisher, 1933, Kindleberger, 1978, Minsky, 1977);
– *"monetarist"* that bank failures impact on the economy via a reduction in the supply of money. Crises tend to be frequently the consequence of policy errors by monetary authorities generating "regime shifts" that, unlike the business cycle, are impossible to allow for in advance in risk pricing (Friedman and Schwartz, 1963);
– *"uncertainty"* as opposed to risk (in the sense of Knight, 1921) as a key feature of financial instability, in that, unlike the cycle, one cannot apply probability analysis to rare and uncertain events such as financial crises and policy regime shifts and hence price risk of them correctly. Financial innovations are subject to similar problems when their behaviour in a downturn is not yet experienced. Uncertainty is linked closely to confidence and helps to explain the frequently disproportionate responses of financial markets in times of stress (Shafer, 1986);
– *"disaster myopia"* that competitive, incentive-based and psychological mechanisms in the presence of uncertainty lead financial institutions and regulators to underestimate the risk of financial instability so that they accept concentrated risks at low capital ratios. The pattern leads to sharp increases in credit rationing when a shock occurs (Guttentag and Herring, 1984, Herring and Wachter, 1999, Herring, 1999) and
– *"asymmetric information and agency costs"* that these aspects of the debt contract, which generate market failures of moral hazard and adverse selection, help to explain the nature of financial instability, e.g. credit tightening as interest rates rise and asset prices fall (Mishkin, 1991, 1997), or the tendency of lenders to make high-risk loans owing to the shifting of risk linked to agency problems (Allen and Gale, 1999, 2000).

Complementing these, we must highlight:

– *"bank runs"* that the basic ingredient of crises is panic runs on leveraged institutions such as banks, which undertake maturity transformation, which generates liquidity crises (Diamond and Dybvig, 1983); such theory can also be applied to failures of securities market liquidity, as all market participants seek to sell simultaneously (Davis, 1994, 1999b);

– *"herding"* among institutional investors is a potential cause for price volatility in asset markets, driven e.g. by peer-group performance comparisons, that may affect banks and other leveraged institutions (Scharfstein and Stein, 1990, Davis and Steil, 2001);
– *"industrial"* that effects of changes in entry conditions in financial markets can both encompass and provide a supplementary set of underlying factors and transmission mechanism to those noted above (Davis, 1995a), as for example entry of new intermediaries leads to deterioration of information for existing players and heightened uncertainty about market dynamics.

Inadequacies in regulation may heighten tendencies to take excessive risks. Mispriced "safety net" assistance generates moral hazard,[1]) which if not offset by enhanced prudential regulation may lead to heightened risk taking (McKinnon and Pill, 1996). This pattern may be particularly threatening as developments such as deregulation and increased competition reduce franchise values of financial institutions (Keeley, 1990). Moreover, lenders in the interbank market may not have the correct incentives to discriminate between banks (by price or quantity rationing) and discourage risk-takers (Bernard and Bisignano, 2000).

There is also a need for consideration of the *role of international capital flows.* Traditionally, the focus of the literature on exchange rate crises (Krugman, 1991) has been on the possible gains from speculation against a depreciation of a fixed parity, given the size of the nation's foreign exchange reserves. The process is akin to a bank run. The contribution of international capital flows to recent crises and their international transmission introduce a number of additional elements:

– *exchange rate pressure,* resisted by the authorities via interest rate increases, which may trigger or aggravate financial instability;
– complications introduced by the *financing of the public or private sector in foreign currency,* which makes balance sheet positions sensitive to exchange rates and leads to a potential link from depreciation in the context of a currency crisis to more general financial instability;
– *the increasing role of institutional investors* as a conduit for capital flows, "herding" into rising markets and to seek rapid withdrawal from falling markets, which destabilises domestic financial markets and exchange rates (Davis and Steil, 2001);
– a possible link of contagion where there are cross-country *similarities in trade patterns* (Glick and Rose, 1998).

2 Three Principal Types of Financial Instability

A list of recent episodes of systemic risk is given in table 1. At first glance these events, and indeed episodes of financial instability that have been seen throughout history (Kindleberger, 1978), seem to be highly diverse in genesis and manifestation. Certainly, financial crises never recur in an identical manner, both because institutional structures vary across countries and over time and because individuals learn to some limited extent from such

1 *Risks can arise from agency problems independently of the safety net (Allen and Gale, 1999).*

Table 1

Selected Periods of Financial Instability since 1970

Date	Event	Main feature
1970	U.S. Penn Central Bankruptcy	Collapse of market liquidity and issuance
1973	UK secondary banking	Bank failures following loan losses
1974	Herstatt (Germany)	Bank failure following trading losses
1979–89	U.S. thrifts	Bank failures following loan losses
1982	LDC debt crisis	Bank failures following loan losses
1984	Continental Illinois (U.S.)	Bank failures following loan losses
1985	Canadian Regional Banks	Bank failures following loan losses
1986	FRN market	Collapse of market liquidity and issuance
1985–89	Texas banking crisis	Bank failures following loan losses
1987	Stock market crash	Price volatility after shift in expectations
1989	Collapse of U.S. junk bonds	Collapse of market liquidity and issuance
1989	Australian banking problems	Bank failures following loan losses
1990	Swedish commercial paper	Collapse of market liquidity and issuance
1990–91	Norwegian banking crisis	Bank failures following loan losses
1991–92	Finnish banking crisis	Bank failures following loan losses
1991–92	Swedish banking crisis	Bank failures following loan losses
1992–96	Japanese banking crisis	Bank failures following loan losses
1992	ECU bond market collapse	Collapse of market liquidity and issuance
1992–93	ERM crisis	Price volatility after shift in expectations
1994	Bond market reversal	Price volatility after shift in expectations
1995	Mexican crisis	Price volatility after shift in expectations
1997	Asian crisis	Price volatility following shift in expectations and bank failures following loan losses
1998	Russian default and LTCM	Collapse of market liquidity and issuance

Source: Davis (1999a).

problems. But we would maintain, in the light of the theoretical aspects shown above, that there are three generic types of instability that have most commonly been observed.

One generic type of instability is centred on bank failures typically following loan or trading losses (Davis, 1995a, 2001a). Examples include the Texas banking crisis and the U.S. thrifts crisis as well as the LDC debt crisis, the banking crises in Japan, the Nordic countries and Australia and the Asian crisis. Many developing countries have suffered such crises in recent decades (Caprio and Klingebiel, 1996). Bank failures are likely in turn to lead to contraction of credit to the nonfinancial sector, entailing wider economic disruption. This may be the case even where debt securities markets are developed if banks and borrowers share private information on their creditworthiness, which is not available to bond investors, which implies that substitution is difficult (Bernanke, 1983, Davis, 2001b). Within these banking crises, one may distinguish those that were confined to the domestic financial system (such as those in Japan) as opposed to those that are also linked to cross-border bank lending and indebtedness in foreign currencies (LDC debt, Asia). The distinction is not solely one between crises in OECD and emerging market economies, since the Swedish banking problems were also aggravated by foreign currency exposures (Englund, 1999).

A second type of financial disorder involves extreme market price volatility after a shift in expectations (see Davis, 1995b). Such crises are distinctive in that they tend to involve institutional investors as principals and

are focused mainly on the consequences for other financial institutions of sharp price changes which result from institutional "herding," as groups of such institutions imitate one another's strategies. Whereas violent price movements may in themselves not have systemic implications,[1]) these may emerge when such movements threaten institutions that have taken leveraged positions on the current levels of asset prices. Examples are the stock market crash of 1987, the ERM crisis, the 1994 bond market reversal and the Mexican crisis. There were also elements of this pattern in the Asian crisis.

A third type of turbulence, which is linked to the second, involves protracted[2]) collapse of market liquidity and issuance (see Davis, 1994). Again this type of disruption often involves institutional herding, yet the distinction with the second type is often largely one of whether markets are sufficiently resilient and whether market maker structures are suitably robust. Also, such crises tend to characterise debt and derivatives markets rather than equity or foreign exchange. The risks are acute not only for those holding positions in the market but also for those relying on the market for debt finance or liquidity – which increasingly include banks. Examples in the past have tended typically to be rather specific and idiosyncratic markets, which by nature relied on a narrow investor base, market maker structure and/or issuer base (U.S. junk bonds, international floating rate notes, Swedish commercial paper, ECU bonds). However, the events following the Russian default and the rescue of the hedge fund LTCM (Long-Term Capital Management) were much more serious (see section 4), as liquidity failure was threatened in markets such as the U.S. securities repurchase (repo), swaps, commercial paper, corporate and Treasury bond markets (see IMF, 1998, Davis, 1999b). The main historical precedent was the Penn Central Bankruptcy and its effect on the U.S. commercial paper market. In these cases liquidity was threatened in core markets, which made the U.S. authorities to take decisive action.

3 Subcategories of Financial Turbulence

Beyond the three main types, a cross-cutting set of distinctions may be made in terms of the broad causes of financial vulnerability. Here, one may highlight that a number of crisis situations began with financial deregulation (such as the Scandinavian and Japanese banking crises). The behaviour of inexperienced financial institutions (overseen by equally inexperienced regulators) in the wake of this "displacement" led to a build-up of corporate and personal debt to unsustainable levels, and then to financial fragility (Englund, 1999). Or, as in the case of the U.S. thrifts shown above, deregulation was seen as a means of recapitalisation, while regulators forbore to intervene despite low or zero capital ratios. More generally, deregulated financial systems may be more subject to instability in the longer term (see Demirguc-Kunt and Detragiache, 1998b).

1 *They may, however, lead to resource misallocation and an increased cost of capital, with deflationary macroeconomic implications.*

2 *It is not denied that all sharp asset price changes will tend to affect market liquidity to a greater or lesser degree.*

Second, there are crises characterised by disintermediation and reintermediation of financial flows from banks to nonbanks or markets, which has proven a cause of difficulty for the institutions facing adverse flows of funds. Examples include the UK secondary banking crisis (1973), the initial U.S. thrifts crisis as shown above, and failure of "Jusen" and nonbank-banks during the Japanese banking crisis. Often the nonbank institutions were poorly regulated and hence aggravated the tendency to overlending.

A third subcategory is financial instability caused by the failure of a single large institution whose position at the core of the financial system has potential consequences out of proportion to its size (such as Continental Illinois or LTCM). Whereas most types of financial instability link to shocks which affect the balance sheets of a range of institutions simultaneously owing to actual or perceived similarities in vulnerability, failure of a "core institution" brings to the fore direct counterparty linkages between the firm in question and others.

Commodities (LDC debt) and property-related lending and speculation (secondary banking, Scandinavia, Japan as well as U.S. thrifts) have been a significant source of instability in the past owing to their heavy demands for capital and uncertain returns due to cyclical instability of prices.

One can also distinguish those crises linked to international debt, where the additional complication of foreign-currency liabilities affecting balance sheets when exchange rates change and volatility of capital flows enters the picture (Asia, LDC debt, Mexico). Much of the recent academic work has focused on such events in emerging market economies (see Dornbusch, 2001, Mishkin, 2000). Often such crises are linked directly to balance of payments crises that may precede or help to trigger more general financial instability (Kaminsky and Reinhart, 1999), not least when the exchange rates are seen to be misaligned (Mexico). The international interbank market has also tended to play a crucial role in destabilising capital flows, not least given lenders in the interbank market may not have the correct incentives to discriminate between banks (by price or quantity rationing) and discourage risk-takers, especially when there is perceived to be an explicit or implicit guarantee of bank liabilities (Bernard and Bisignano, 2000). Balance sheet weakness that helps precipitate the crisis may be in the public sector (LDC debt) or the private sector (Asian crisis). It may result from either prior solvency problems at banks such as nonperforming loans (Thailand, Malaysia) or maturity and currency mismatch by banks and nonbanks (Indonesia, Korea).

Finally, there are crises with an equity-market linkage, whose systemic aspect may reflect the presence of leveraged institutions recycling money back into the market, "illusions of liquidity" due to innovative trading techniques, or equity held as an asset on banks' books. Examples are the stock market crash of 1987 (section 4), and the recent banking difficulties in Japan.

4 Examples

In this section, we seek to provide further insight into the three types of financial instability by providing details of three archetypal events, which illustrate the key features of bank failure, price volatility and liquidity failure aspects of financial instability. These are, respectively the U.S. thrifts crises, the stock market crash of 1987 and Russia/LTCM in 1998. It will be seen that besides their contrasting features, there are also generic elements in common when viewed in the light of theory. We address this point in more detail in section 5.

4.1 Bank Failures after Loan Losses – the U.S. Savings and Loans Crises (1979–1989)

U.S. savings and loans institutions (or thrifts) are a long-established form of mutual bank, which in the 1980s were subject to two linked crises, a "maturity mismatch" crisis at the beginning of the decade and a "loan quality" crisis in the mid- to late 1980s. However, it is suggested that the genesis of these events lies several decades further back. In the tightening of regulation and compartmentalisation of the U.S. financial system that ensued after the crises of 1929–33, thrifts were assigned responsibility for provision of residential mortgages (usually long-term, at fixed rate) while interest rate ceilings were imposed on bank deposits to prevent disintermediation of thrifts. Such a system sought to provide stability and protection for the institutions.

But problems arose as the regulatory structure came into conflict with economic conditions. Already in the 1950s and 1960s, interest rates were occasionally high enough to result in disintermediation of deposits to market instruments such as Treasury bills, but in practice rates soon fell and the high denomination of bills limited depositor interest. Imposition of ceilings on thrifts' own rates – at their own request – in 1966 prevented their liability rates exceeding asset yields. In the 1970s the problems became more serious as, first, under pressure from inflation, interest rates rose for long periods above the deposit ceilings (typically around 5%, depending on maturity) and, second, the development of money-market mutual funds enabled small depositors to shift to money-market instruments. Thrifts thus suffered increasingly from liquidity problems.

To prevent such disintermediation, interest-rate ceilings were progressively raised, while the institutions switched heavily into wholesale funding (after being permitted in 1978 to issue unregulated money market certificates, with a denomination of USD 10,000). This, however, exposed a serious problem of interest-rate risk owing to the mismatch between the existing stock of fixed-rate long-term mortgage assets (often at low interest rates) and high-interest short-term floating-rate liabilities. This effect was particularly severe after U.S. monetary policy was tightened in 1979 (while the recession also increased bad debts). Net worth, earnings, and capitalisation declined and failures increased.

Rather than seeking orderly closure of the whole industry while net worth remained positive, the authorities sought to enable them to continue in business, in the hope that eventually profitability could be re-estab-

lished, as new mortgages at higher interest rates replaced old unprofitable ones. The problem was deferrable because confidence was retained and insolvent institutions were allowed to continue operating. In acts of deregulation dated 1980 and 1982, thrifts were allowed to diversify assets away from long-term home mortgages in the hope of speeding the return to profitability, and capital standards were relaxed. The level of deposit-insurance coverage was increased in 1980. Finally, as regards interest-rate controls, they were further eased as permission was granted for issue of high-interest/low-denomination money-market deposit accounts in 1982, and interest-rate ceilings were finally abolished in 1986.

Heightened risk-taking was the response, as many thrifts tried to grow out of their problems by rapid expansion, diversifying into high-yield and high-risk assets such as land, development, construction, and commercial real estate as well as "junk bonds," although there was also considerable expansion in traditional fields of mortgage lending (and some fraud). Risk was often concentrated in narrow types of business as well as geographically. Real estate was particularly favoured due to generous depreciation provisions in the tax code at the time. Growth tendencies were particularly marked in the South-West, which experienced an oil-related boom over 1983–85.

Depositors were content to finance such ventures, given the generosity of U.S. deposit insurance, which covered 100% up to USD 100,000 per bank – hence individuals and even pension funds could hold USD 100,000 deposits with many banks in total safety, despite increased credit and interest-rate risk (Kane, 1985). With low capital standards and limited liability, equity holders had little to lose and much to gain from "gambling for resurrection," particularly for thrifts that were technically insolvent (438 in 1984). Managers, who had often entered the industry de novo or taken over faltering institutions, had little reputational or monetary capital at risk. And reductions in supervisory budgets, as well as disruptive reorganisations, over this period meant monitoring of these trends was highly imperfect.

After declines in commodity prices in 1985–86, as well as over-building and tightening of tax laws, the office real estate market collapsed, and many of the other speculative loans proved nonperforming. In combination with low capital ratios, resulting insolvency was widespread – thrifts were unable to sell remaining mortgages on secondary markets to pay off depositors. There was also evidence of insider abuse, fraud, mismanagement, and unsound banking practices, such as inadequate credit appraisal, at many of the insolvent institutions, although pursuit of higher yields via acceptance of high risk was probably the overriding factor. Such problems were compounded by the fact that the deposit insurer (FSLIC) lacked the resources to wind down all the insolvent thrifts, which were thus left to operate while taking ever-increasing risks.

Pauley (1989) recorded that at the end of 1988, 360 thrifts were insolvent according to "generally accepted accounting principles" (GAAP) and another 150 had negative GAAP capital after deducting

goodwill. A further 292 had GAAP net worth of under 3% of assets. In combination with those already closed or merged, assets of these institutions amounted to USD 540 billion. The second thrifts crisis occurred without runs, except in Ohio and Maryland in 1985 when a panic took place among depositors with privately insured thrifts (see Davis 1995a).

The policy response was to guarantee deposit-insurance liabilities (the danger of not doing this could have been loss of faith in insurance of banks, and hence widespread runs and failures) and set up a corporation (Resolution Trust) to acquire ailing thrifts in order to close them or sell them to other institutions. Meanwhile, under the FIRREA (Financial Institutions Regulatory Reform and Enforcement Act) of 1989 remaining thrifts were subjected to tighter capital standards and limits on types of investment. Reserves were required against risk of future defaults on higher risk assets, which in turn reduced ability to meet the new capital standards. As a consequence, the industry shrank and by the mid-1990s, less than half of the institutions present in 1980s still existed, while assets fell around 20% from 1989 to 1995 (Eisenbeis et al., 1996).

4.2 Price Volatility after a Shift in Expectations – the U.S. Stock Market Crash

Whereas popular accounts tend to focus on the events of October 19–20, 1987, focus on the crash itself abstracts from the need for an explanation why the market rose so much prior to the crash. Davis (1995a), summarising available accounts, suggests that there was a deviation between fundamentals and prices – a form of speculative bubble – which was reflected in historically unprecedented yield ratios between bonds and equities. Such a situation leads to a suspicion that forms of herding or trend-chasing, led by institutions fearing to perform worse than their peers, was involved. But clearly many other factors may have played a role in generating buoyant investor expectations, such as the merger wave in many countries, falling interest rates over 1987, buoyant economic prospects, rapid credit growth (notably growth in corporate debt) and lower transactions costs, which fostered an impression of high liquidity and led funds into the illusion that they could exit before prices fell sharply. The bubble occurred despite a degree of monetary tightening – over the year prior to the crash the Fed funds rate rose from 6.3% to 6.9%, while real monetary growth decelerated from 14.3% to –1.5%.

As regards the immediate causes of the collapse, since a bubble relies on continuously rising prices, it can be burst by any form of adverse news; in practice, factors underlying the crisis itself may have included current account imbalances between the U.S., Germany and Japan, which led to fears of a falling dollar and caused rises in long-term U.S. interest rates in the week prior to the crash. Also, tensions in the policy co-ordination process between the G-3 countries (following the Plaza and Louvre accords on exchange rates) may have played a role in triggering the crisis. Evidence supportive of the bubble hypothesis is that none of these items could in themselves justify a price adjustment of the magnitude observed (Fortune, 1993).

Some commentators in the United States also blamed the interaction between pension fund managers' portfolio insurance and index arbitrage[1]) strategies for causing volatility at the time of crash itself. Basically, it was considered that computer-driven sell orders for futures, which are a normal feature of portfolio insurance (or "dynamic hedging") strategies when prices fall, helped drive the market down much faster than would otherwise have been the case. The initial wave of selling of futures is thought to have driven futures to a discount to the market itself (known as backwardation) as well as reducing stock prices themselves and triggering further portfolio insurance-related sales of futures. The backwardation, seen as a market failure in the futures markets, encouraged index arbitrageurs to sell stocks and buy futures, thus, according to Brady (1989), leading to a so-called cascade effect or accelerating declines in prices.

Note also that *if* U.S. pension funds were relying on portfolio insurance strategies to protect them against market falls, such strategies could be held partly responsible for provoking the bubble. Only in the U.S. was portfolio insurance used to a significant extent,[2]) whereas markets collapsed world-wide. The view of the crash itself as dominated by portfolio insurance is also disputed (for a survey see Fortune, 1993).[3]) What is less disputed is that institutions were heavily involved in the selling wave that accompanied the crash, with a particular tendency to dispose of cross-border holdings. Such sales helped to generate the contagion across markets, which was such a feature of October 1987.

The crash posed major issues for monetary policymakers in both the short and medium term. In the short term, the major concern was to avoid potential systemic risk arising from failure of investment banks, which was combated by an easing of liquidity and moral suasion on banks to lend. Such an easing was continued, however, owing to fears that there would be a major recession in the wake of the crash. In fact, the latter fears seem not to have been justified, and the easing of monetary conditions sowed the seeds of inflation in a number of countries.

4.3 Collapse of Market Liquidity and Issuance – Russia/LTCM

In considering the events of 1998, it is important to note that the crisis followed a long bull period, where equity prices had risen sharply and credit quality spreads on bonds had contracted. Issuance even of low grade bonds was very high. The Asian crisis had had little effect on this pattern, although

1 *Index arbitrage involved buying and selling simultaneously a stock index futures contract and the underlying stocks, so as to profit from any discrepancy (known as spread or basis) between them.*

2 *Indeed, in the UK the crash was largely irrelevant to pension funds, since at the time their funding status relied on estimates of future dividend growth, which were unaffected by the crash, rather than market values.*

3 *On the one hand, any form of strategy which aimed to lock in current values, such as stop-loss selling of equities (i.e. selling when the price had fallen to a pre-specified level), would equally have induced a rush of sales when the market fell; and this was probably the more prevalent strategy. Also, Fortune (1993) suggests that the discounts between stock index and futures prices were in fact illusory and that they resulted from such phenomena as delays in reporting of individual share prices, late openings or trading halts for individual stocks, but their appearance led traders to panic; in other words, the problem was in the cash market and not the futures markets. Moreover, Grossman (1988), examining U.S. daily transactions data for 1987 as a whole, found no link from stock market volatility to programme trading.*

bid-offer widening was apparent in the mortgage backed securities market – where LTCM was active – in April 1998.

The trigger for serious turbulence was the moratorium on sovereign debt and effective devaluation of the rouble by Russia in August. It led to a sharp fall in equity prices, a rise in core government bond prices (in the context of a "flight to quality") and a rise in spreads, most markedly on low grade corporate bonds (although the rise in yields was cushioned by an overall fall in bond yields). Issuance collapsed for the U.S. high yield market (to USD 2 billion in October compared with USD 15 billion per month in the second quarter), and was sharply reduced for all private debt instruments. Crucially, it was apparent at the time that not all of the widening in spreads was linked to credit risk perceptions, but to an extreme liquidity preference and a general unwillingness to deal in corporate bonds. In the words of McDonough (1998), there was an "abrupt and simultaneous widening of credit spreads globally, for both corporate and emerging market sovereign debt, (which) was an extraordinary event beyond the expectations of investors and financial intermediaries."

Underlying these patterns, a wide variety of institutions had taken long positions in Russia and other emerging markets. The spillover to the U.S. and other mature markets was linked to the financing of these positions in a leveraged manner in those markets. Attempts at rapid liquidation by a large number of investors in the context of high leveraging led to sharp price changes. The overall widening of spreads in turn inflicted heavy losses on the significant number of large investors which had purchased other higher-risk and/or lower-liquidity assets (e.g. junk bonds or mortgage backed securities – and off-the run[1]) Treasuries) while going short in high-quality debt on the assumption that the existing widening of spreads that had occurred after the initial Asian crisis would be unwound (i.e. spreads would "mean revert"). Such losses led to further margin calls, liquidation and hedging, putting further demands on liquidity.

LTCM was one such investor, a hedge fund with large and (50:1) leveraged positions across what were thought to be a diversified range of financial markets. U.S. and European banks had major credit exposures to it. Simultaneous price shifts in previously uncorrelated markets in the wake of Russia wiped out its capital and threatened insolvency. A rescue was undertaken by private-sector banks to preserve orderly market conditions (McDonough, 1998). Notably, there was concern if LTCM had suddenly been put into default, its 75 counterparties would have rushed to "close out" hundreds of billions of dollars of positions, which would have caused massive illiquidity and price shifts and harmed both the counterparties and other market participants. Such a move might generate further uncertainty in a vicious circle, which would ultimately impact sharply on the cost of capital.[2])

1 *On-the-run Treasury securities are the most recently issued stocks and heavily traded; off-the-run securities are earlier issues of the same maturity which lack liquidity, being largely in the hands of long-term investors. As both are obligations of the U.S. Treasury, there is no distinction in credit risk, and the spread is one of the "cleanest" indicators of liquidity risk.*

2 *The U.S. investor Warren Buffett reportedly sought to resolve the situation, but his help was refused.*

Despite the rescue, LTCM heightened uncertainty by leading to fear of the unknown regarding unwinding of its positions and similar hedge fund[1]) or bank failures, which would entail the unloading of assets into illiquid markets at distressed prices. There was a sharp increase in price volatility and departures from normal pricing relationships (spreads between long-term on-the-run and off-the-run Treasuries widened from a norm of under 10 basis points to 35 basis points, despite similar duration and the same credit risk) implying a major premium was placed on liquidity. Further widenings were seen in the yield spreads on eurodollar bonds and on private-sector instruments over U.S. Treasury bills, as well as on swaps of fixed for floating rates, showing also heightened concern about counterparty risk. Even in currency markets such as the dollar-yen, there was a sharp rise in bid-offer spreads – and, separately, a one-day move of JPY 15 as the so-called yen carry trade was rapidly unwound. There was concern about a possible credit crunch – as issuance of corporate debt and commercial paper fell, but a rise in bank lending tended to substitute – apparently, U.S. nonfinancial firms were able to switch between markets and backup lines of credit with banks, on tighter terms.

Much larger institutions than LTCM had similar if not greater positions with comparable leverage, i.e. the markets lacked "macro portfolio diversification." LTCM had USD 80 billion in U.S. Treasury arbitrage positions while commercial banks had USD 3,000 billion. Direct creditors and counterparties of LTCM were hence not the only ones likely to be hit by losses from an enforced unwinding of LTCM's positions. In such circumstances, market makers were naturally reluctant to take the opposite side of the market.[2]) According to the Wall Street Journal, they "cut back on the size of trades, quoted wider bid-offer spreads or did not quote at all." Consequently, liquidity plunged and market prices moved to levels that were at times wholly unjustified by fundamentals. Markets that were traditionally uncorrelated became highly correlated, and VaR (value-at-risk) models were interpreted as prompting further sales. There was paralysis among long-term investors who could have corrected pricing anomalies due to risk aversion and/or lack of credit. Trading techniques such as dynamic hedging and portfolio insurance apparently worsened such tendencies and exacerbated market price movements once they began. The result was intensified focus on paper that could be liquidated quickly, regardless of its quality in other respects.

Beyond the rescue of LTCM per se, resolution of the crisis required several cuts in U.S. interest rates, in order to restore confidence in market operations.

1 *One of the key issues raised by the crisis was the lack of transparency of hedge funds, despite which banks appeared willing to offer financing. See Basel Committee on Banking Supervision (1999).*

2 *The institutions making markets had themselves been financially weakened in the crisis.*

5 Generic Features of Crises

It is instructive to view the three events set out in section 4 in the light of the theory outlined in section 1. These on the one hand give insights into which aspects of theory that are most important, and on the other enable us to develop a set of generic features of crisis that can be of considerable assistance in prediction of instability, whatever its nature. Full detail on these aspects is given in Davis (1995a, 1999b); here we offer a flavour. For brevity, we use the abbreviations SL for the savings and loans crisis, EC for the stock market crash and RL for Russia/LTCM.

Concerning "debt and financial fragility" theory, a prior displacement can be seen for SL in the deregulation of the early 1980s. All the events entailed a growth in debt (to property for SL, underwriters and corporate debt for EC and lower quality borrowers and hedge funds for RL), with higher leverage incurred by the borrowers. There were also rises in asset prices, be they of real estate (SL), equities (EC) and lower quality bonds (RL). Ex post it appears that risk was underpriced in each case, although it is arguable whether the underpriced risks were solely "normal business cycle risks" as the theory suggests. This point is strengthened since the crises did not occur at business cycle peaks. Indeed, following the "monetarist" approach it can be argued that the events to some extent followed "regime shifts" and are hence hard to price for. The initial SL crisis linked to an unanticipated monetary regime shift in 1979 towards a tight counter-inflation policy; EC followed a monetary tightening. Moreover, the EC and RL were unprecedented events in terms of the speed of occurrence, size of adjustment and spread of markets affected. Monetary contraction in terms of declines in the money supply after the crisis were generally absent, however, either due to a monetary policy response (EC, RL) or deposit insurance (SL).

There was also "uncertainty" owing to the above-mentioned regime shifts. Financial innovations featured in both EC (portfolio insurance and programme trading, giving rise to "illusions of liquidity") and RL (hedge funds, use of VaRs for risk management purposes), which had not been fully tested over the cycle. The onset of the crises was accompanied by loss of confidence in the markets and institutions concerned, e.g. as Russia's default during RL led to a re-evaluation of credit risk generally. The initial SL crisis was accompanied by the innovation of money market funds. Equally, "disaster myopia," was clearly generated in SL by the existence of deposit insurance (also among regulators) and in EC again by portfolio insurance. During RL it appears that investors underestimated credit risk as well as market and liquidity risk during the run-up to the crisis, driven by short-termism and the "bonus culture" as well as by the long noninflationary upturn. The lack of response of spreads to Asia is another indicator of disaster myopia. Such disaster myopia may even have been exacerbated by overconfidence in VaRs intended to prevent the assumption of excessive risks but which disregard market liquidity risk and assume the future will resemble the past. Risk was concentrated before SL in property, and during RL at the level of "macro portfolios." Credit rationing affected the institutions directly concerned in EC and RL, as well as bond market issuers, especially in the latter case.

Concerning "asymmetric information and agency costs," SL is a classic case of agency costs whereby deposit insurance and regulatory forbearance was exploited by equity holders and depositors with thrifts, with low or zero capital ratios resulting, but no liquidity crises. In EC and RL an increase in credit rationing followed falling asset prices, which themselves generated moral hazard and adverse selection. Regarding "bank runs," as noted, there were few runs in the SL crisis owing to deposit insurance; the withdrawal of funds from U.S. investment banks in EC as well as from markets for lower-quality credits and from LTCM and other hedge funds in RL all had elements of bank runs. "Herding" by thrifts into property helped generate the SL crisis; collective shifts by institutional investors preceded EC, and there were elements of herding by investment banks, hedge funds and institutional investors into lower quality credit markets prior to RL.

For "industrial" aspects, the entry behaviour of financial institutions was instructive prior to all the crises. In the case of the SL, it was initially the entry of money market funds to deposit markets that generated liquidity risk for thrifts; later the entry of the thrifts to new and unfamiliar markets brought heightened credit risk. For EC, attempts by underwriters to increase their business by using "bought deals" on UK issues to gain reputation and future business led to market risk (and credit risk for banks lending to them). In RL, banks were keen to lend to hedge funds as a new market segment as well as to expand position-taking activities themselves, which led to exposure to market risk, credit risk and market liquidity risk. Own-account position taking may in turn be linked to increased competition in banks' core deposit and loan markets, which led them to seek alternative sources of profit.

Inadequacies in regulation were most evident in the case of thrifts, where the second crisis was closely linked to excessively generous deposit insurance and forbearance over low capital ratios. A role of international capital flows was not strongly apparent in these events, which showed that OECD country crises tend to be "home grown" whereas crises of emerging market economies (LDC debt, Mexico, Asia) are often directly related to them.

Following on from this discussion of theory seen in the light of experience, we can identify certain common features to all three types of crisis, which are helpful in anticipating crisis events. Indeed, examination of the features of diverse financial crises, set out in table 2, suggests that there are common *generic patterns* in advance of crises. Key aspects are:

- *regime shifts,* first to laxity (e.g. deregulation), later to rigour (e.g. monetary tightening);
- easing of *entry conditions* to financial markets, leading to heightened competition and risk taking;
- *debt accumulation* and asset price booms generating vulnerable balance sheets in the financial and nonfinancial sectors;
- *innovation* in financial markets, which increases uncertainty during the crisis; and
- *risk concentration* and lower capital adequacy for banks, which reduces robustness to shocks.

Table 2

Features of Selected Episodes of Financial Instability (1989–1998)

	U.S.A. thrift crisis (mid-1980s)	Stock market crash (1987)	Norwegian banking crisis (1990)	Finnish banking crisis (1991)	Swedish banking crisis (1991)	Japanese banking crisis (1992)	ECU bond market collapse (1992)	ERM crisis (1992)	Bond market reversal (1994)	Mexican crisis (1994)	Asian crisis (1997)	Russia and LTCM (1998)
Debt accumulation	•	•	•	•	•	•	•		•	•	•	•
Asset price boom	•	•	•	•	•	•			•		•	•
Concentration of risk	•	•	•	•	•	•			•		•	•
Regime shift	•	•	•	•	•	•	•	•	•	•	•	•
New entry of intermediaries	•	•	•	•	•	•	•				•	•
Innovation	•	•					•	•	•			•
Monetary tightening		•	•	•	•	•		•	•	•	•	•
Declining capital adequacy of financial institutions	•		•	•	•	•					•	•
Credit rationing/ liquidity failure/bank runs		•	•	•	•	•	•				•	•
Contagion between markets		•							•		•	•
International transmission		•					•	•	•	•	•	•
Action by the authorities	•	•	•	•	•	•				•	•	•
Severe macroeconomic impact			•	•	•	•		•	•	•	•	
Dysfunction of financial system/ economic collapse						?					?	

Source: Davis (1999a).

These elements can be readily traced in the descriptions of archetypal crises given in section 4 above and their analysis in the light of theory.

More generally, we consider these features to provide the most basic dataset of indicators common to crises.[1]) Of course, many of these features have occurred separately without entailing a crisis and indeed are part of the normal functioning of a market economy. It is their combination and acuteness that is crucial to the occurrence of financial instability. As shown in Davis (1999a), a wider range of crises reflects similar features.

A useful distinction to employ when interpreting such generic developments is between shocks and propagation mechanisms.[2]) Following "financial fragility" theory, in our view crises follow a pattern whereby there is an initial positive shock (what Kindleberger (1978) calls a "displacement") which leads to propagation of vulnerability via credit expansion, asset price rises, etc. Finally, there is a secondary negative shock or trigger, which leads to the crisis. Shocks resulting in failure of certain institutions or markets lead to more general instability in two complementary ways. They may lead on directly to failure of another institution or market with strong counterparty links, which generates contagion via further balance sheet links to the rest of the financial system. Or they may generate uncertainty about solvency for institutions or markets, whose balance sheet/instruments outstanding are both opaque and share some characteristics with the failed firm. Note that shocks are of very variable nature (deregulation, war, natural resource discovery, adjustment of monetary or fiscal policy regime, etc.), but propagation mechanisms are more common, and much of the useful work of surveillance lies in outlining the current state of "vulnerability" in terms of them.

1 *See also Demirguc-Kunt and Detragiache (1998a and b) and Kaminsky (1999).*

2 *I am indebted to Darren Pain of the Bank of England for this insight.*

Clearly, the generic nature of the features means that careful judgement is needed in interpreting actual data. Moreover, some diverse data gathering is needed to help predict crises of the three main types. At a most basic level, banking data need to be supplemented by data on securities market developments (including "market intelligence") so as to capture the risks of a securities-market-led crisis. There needs to be careful coordination in monitoring these two aspects since banks may be affected by crises originating in securities markets and vice versa. (For a broader discussion of macroprudential surveillance see IMF, 2000, BIS, 2001 and Davis, 2001d).

Conclusion

We have maintained that despite the apparent diversity of financial instability seen in the world, a useful summary categorisation is between bank, market-price and market-liquidity-based crises. There are important subcategories of each type, such as domestic versus international, single-institution-based, equity-related, property, commodities, deregulation and disintermediation-linked crises. Financial crises are usefully examined in the light of the theories of financial instability, not least to illuminate common generic patterns that can be helpful in macroprudential surveillance.

The typology and generic features have some relevant implications for euro area countries (for more detail see Davis, 2001a). An immediate point to make is that most historic periods of financial instability in Europe have linked to the first type of crisis (i.e. banking crises), with market crises occurring in, or largely originating in the U.S. or international capital markets. The likely securitisation of euro area markets may pose challenges in adaptation, whereby securities market problems are likely to generalise across the monetary area, while banking crises can remain local. On the other hand, the presence of both banks and securities markets as a source of financing in a monetary area is beneficial in offering a form of diversification for the financial system (Davis, 2001b). European financial systems should thus become less vulnerable to economic repercussions of banking crises as securities markets develop.

In Davis (2001a) we also suggest that in a large and diverse monetary area with segmented local banking markets, regional crises can pose a major challenge to policymakers, while the existence of a large monetary area in a global sense means that there will inevitably be international transmission of shocks generated within it. There is also a need for special care in the case of new monetary arrangements that have not yet experienced major financial instability. Meanwhile money and securities market liquidity become of great systemic importance in a securitised financial system; equity prices too may become of major importance for financial stability; disintermediation becomes a major factor with which banks must contend and adjust as best they can; nonbanks such as investment banks and even hedge funds may become of systemic importance; and even institutional investors' strategies can cause major asset price shifts which threaten systemic stability. Meanwhile, as noted in Davis (2001c), at a longer time horizon, population ageing may also generate major threats to financial stability in the EU.

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Reform of Financial Market Supervision in Austria The New Financial Market Supervision Act (Finanzmarktaufsichtsgesetz – FMAG)

Michael Würz

General Remarks

The goal of the reform of Austrian financial market supervision consisted in setting up a sophisticated, effective and cost-efficient supervisory system with a view to creating a sound foundation for the central pillar of financial stability that financial market supervision represents. The other pillars are of course a clearly defined legal framework and a stability-oriented monetary policy.

Only a combination of these three pillars will ensure effective competition among financial institutions as well as financial stability, which constitutes a vital factor of economic life. It is against this background that the importance and necessity of an intensive and operationally far-reaching involvement of central banks in the oversight of financial markets become particularly evident.

Need for Reform of the Austrian Financial Market Supervisory System

The need to restructure the financial market supervisory regime arose, in part, from the altered regulatory conditions. These changes concern in particular the "Basel Core Principles for Effective Banking Supervision" as well as the vital new capital provisions (Basel II), which are still in their infancy.

Moreover, the globalization of banking and finance calls for sweeping systemic responses: The Austrian banking sector's growing volume of cross-border business requires a massive expansion of audit activities and an intensification of the relevant international cooperation. The ever increasing complexity of financial services and banks' internal risk management system necessitates sophisticated know-how on the part of the supervisory experts.

Thus, as early as 1997 the Federal Ministry of Finance looked into the features of an ideal banking supervisory system, obtaining national and international experts' opinions on how to best organize the supervisory regime. 1999 marked the first attempt at a legislative reform: The Finance Ministry drew up a bill designed to transfer banking supervision – as opposed to other supervisory fields – to the Oesterreichische Nationalbank.

This bill (Banking Supervisory Authorities Act) passed the review process but did not get the approval of the Council of Ministers. Consequently, in summer 2000 the Federal Minister of Finance commissioned Professor Josef Zechner (Department of Business Studies, University of Vienna) to draw up an expert opinion on international supervisory models and the optimum organization of an administratively autonomous financial market supervisory authority.

Taking account of internationally recognized or required criteria (operational independence of the supervisory authority, effectiveness of supervision, sufficiency of resources, cost-efficiency through synergies), Professor Zechner concluded that a so-called "Allfinanz" supervisory system (i.e. supervision by a single regulator), integrating the resources of the OENB, would constitute the ideal solution. As a result of this opinion, the implementing conclusions which were based on assumptions that are not entirely compelling in the OeNB's view, the Federal Ministry of Finance decided to charge a new body rather than the OeNB with the tasks of

supervising banks plus insurance companies, pension funds and the securities sector. To work out a detailed solution, the Federal Ministry of Finance launched the project Reorganization of Financial Market Supervision at the end of 2000, establishing several project groups, in which the OeNB was also represented.

Contents of the Financial Market Supervision Act (Finanzmarktaufsichtsgesetz – FMAG)

Establishment of a Largely Autonomous Financial Market Supervisory Authority (Finanzmarktaufsichtsbehörde) with the Mandate of Banking, Insurance, Pension Fund and Securities Supervision

The Financial Market Supervisory Authority as "Allfinanz" Supervisory Authority

To carry out banking, insurance, securities and pension fund supervision, Article 1 Financial Market Supervisory Authority Act (Finanzmarktaufsichtsbehördengesetz – hereinafter referred to as FMABG) provides for the establishment of a public law institution with its own legal personality, designated as Financial Market Supervisory Authority (Finanzmarktaufsichtsbehörde – FMA). Together with amendments made to other legal regulations (e.g. Banking Act [Bankwesengesetz – BWG], Insurance Supervision Act [Versicherungsaufsichtsgesetz – VAG], Securities Supervision Act [Wertpapieraufsichtsgesetz – WAG]) and pertaining to questions of jurisdiction, this constitutes the transfer of banking, insurance and pension fund supervision (previously Federal Ministry of Finance) and of securities supervision (previously Austrian Securities Authority – Bundes-Wertpapier-Aufsicht – BWA) to the FMA. The BWA is dissolved, with all rights and duties being assigned to the FMA. The FMA has its registered office in Vienna, its jurisdiction extends to the entire federal territory.

To *enhance* the *enforceability of supervisory measures,* the FMA will be vested with *administrative penal power* and the *power to enforce the supervisory rulings issued* by it.

Moreover, the FMA has the *power to issue ordinances,* which must be promulgated in the Federal Law Gazette. No appeal of any kind is possible against rulings issued by the FMA, except for administrative penal rulings. The FMA for its part may contest decisions of the independent administrative tribunal by lodging complaint with the Administrative Court.

Since the constitutional majority required to create a fully autonomous banking supervisory authority not bound by any instructions could not be reached, the Act seeks to emulate the model of an authority not bound by instructions as closely as possible, notwithstanding the lack of constitutional protection for this status.

In the final analysis, the outcome is intended to maintain the operational independence in supervisory matters – even though compliance with instructions can be enforced in principle – and thus to comply with international standards as best as possible.

This is guaranteed primarily by the strict adherence to the rule of law ("legality principle") in accordance with Article 18 (1) of the Federal

Constitutional Act (Bundes-Verfassungsgesetz – B-VG), which has a binding effect on both the FMA and the Federal Minister of Finance when it comes to taking or issuing instructions, respectively. Moreover, procedural and transparency regulations under constitutional law are applicable should the need to instruct the FMA arise.

Decision-Making Bodies of the FMA

The FMA is made up of a *Board of Management* and a *Supervisory Board*. The *Board of Management* consists of *two members,* who are appointed by the Federal President on the basis of a proposal by the federal government, with reappointment permissible. Their term of office is three years when first appointed, five years in the case of a reappointment. The bill contains detailed rules on the conditions on which the function of a Board member is terminated.

Prior to the appointment of Board members, the Federal Minister of Finance has to arrange for a job tender. Based on the outcome of this process, the *Federal Minister of Finance* and the *OeNB* have each to designate, from the group of applicants, *one person* for the Board. The Board is in charge of day-to-day operations and conducts the FMA's business.

The *Supervisory Board of the FMA* is composed of the Chairman, the Deputy Chairman and four other members. The members of the Supervisory Board are appointed by the Federal Minister of Finance. The *Deputy Chairman* and *two additional members of the Supervisory Board* are designated by the *OeNB.*

Supervisory Board members serve for a period of five years, with reappointment permissible. The Supervisory Board oversees the management and the conduct of business of the FMA. Tasks related to management and business conduct cannot be transferred to the Supervisory Board, although certain duties enumerated in Article 10 (2) FMABG require the approval of the Supervisory Board (e.g. drawing up of the finance plan, purchase of property, annual accounts, rules of procedure).

Personnel of the FMA

The *FMA* should be adequately *staffed,* with recruitment possible in different ways. The FMA takes over, ex lege, the personnel of the Austrian Securities Authority (BWA) and contractual employees of the Federal Ministry of Finance previously working in banking, insurance and pension fund supervision. Moreover, Federal Ministry of Finance officials from the aforementioned supervision areas are officially assigned to the FMA. The FMA also has the right to recruit personnel as it sees fit and to issue employment contracts to this effect.

Under the Act, the OeNB is not obliged to assign personnel in any way to the FMA. Such a move is only possible on the basis of a contractual agreement between FMA, OeNB and the employees concerned.

Mutual Administrative Assistance and Cooperation Between FMA and OeNB

The *FMA* is *entitled to mutual administrative assistance:* All decision-making bodies of the Federal Government, the Laender and local authorities are obligated to provide assistance to the FMA within the scope of their

jurisdiction. According to Article 21 (2) FMABG, a special obligation for mutual administrative assistance exists between courts, the Federal Minister of Finance, the OeNB (within the framework of its duties under federal law and vis-à-vis the ESCB), the Takeover Commission and the relevant regulatory stock exchange body in so far as they must cooperate with the FMA in reciprocal terms. The FMA also has the right to make use of the services of law enforcement officials in investigations.

Start of FMA Operations and Transition Provisions

The *FMA* is deemed established as soon as *the first member of the Board of Management and the first Supervisory Board member have been appointed.* By contrast, the *official jurisdiction* of the *FMA* does not take effect until *April 1, 2002.*

The transition provisions relating to the FMABG stipulate that the Federal Minister of Finance shall take, as soon as possible, all the measures needed for the appointment of the first member of the FMA's Board of Management and that the newly appointed Board of Management shall draw up rules of procedure and submit them to the Supervisory Board for approval by February 28, 2002.

Costs of Supervision

Costs to Be Borne by the Supervised Institutions

As was already the case in *insurance and securities supervision, the costs of supervising the banking and pension fund sectors* will be borne *primarily* by the *supervised institutions* themselves.

Costs are dealt with in Article 19 FMABG and – with respect to the cost apportionment, within an accounting cycle, between the individual persons liable for costs in the second stage – in the substantive legislation (§ 69a Banking Act – BWG; § 117 Insurance Supervision Act – VAG; § 7 Securities Supervision Act – WAG; § 35 Pension Fund Act – PKG).

Basically, the FMA's total supervisory costs (personnel and operating expenses, writedowns and other expenditure) must be equitably – i.e. in terms of imputable costs – assigned to the individual supervisory areas, which constitute specific accounting cycles.

The supervised institutions are obliged to make advance cost contributions. Based on an institution's annual accounts, the FMA promptly calculates the costs arising for this institution for the previous fiscal year, with the calculated amount offset by the advance payments received.

Contribution of the Federal Government

The *Federal Government* pays *an amount of EUR 3.5 million per fiscal year* to the FMA, which accordingly reduces the costs to be borne by the supervised institutions. Pursuant to Article 19 (9) FMABG, the Federal Government may, as a type of "contingency facility," make an additional cost contribution from funds earmarked in the annual Federal Finance Act, should the need arise to cover necessary supervisory costs, in spite of sound, efficient and expedient financial management of the FMA.

Finance Plan

The *FMA's Board of Management* has to draw up a *finance plan* (including *investment* and *personnel plan)* for *each financial year,* which is submitted to the FMA Supervisory Board for approval and represents a binding legal basis for budget and personnel management. The finance plan must contain a detailed breakdown of all of the FMA's revenues and expenditures expected for the following financial year. The personnel plan section of the annual finance plan lays down the permissible size of the FMA staff, with the type and number of posts limited to the extent needed for the performance of the duties of the FMA.

Financial Market Committee

To foster cooperation and the exchange of views and to provide advice on supervisory matters, a *Financial Market Committee* is set up at the Federal Ministry of Finance, serving as a *platform* for the institutions *jointly responsible for financial stability.* This Committee is made up of one representative each of the FMA, the OeNB and the Federal Ministry of Finance, with a deputy appointed for each representative by the above-mentioned institutions.

Recommendations on financial market issues can be made by the *Financial Market Committee* by a majority of votes. The Financial Market Committee convenes at least four times during a calendar year. It has the right to enlist *external experts* as advisers for its meetings. Subgroups may be established for special technical questions and current supervisory issues and may also include external experts.

As illustrated by its composition, the Financial Market Committee is an autonomous body independent of the FMA. From the viewpoint of the *central bank,* the Committee plays a *crucial role* in everyday supervisory practice, because it provides a forum for discussing financial stability-related issues and finding solutions by mutual agreement.

The OeNB has greatly contributed to the establishment of this body, which is instrumental in maintaining and developing financial stability, and will continue to attach special attention to the Financial Market Committee in the future.

OeNB and Payment Systems Oversight

The *amendment of the Federal Act on the Oesterreichische Nationalbank* (Nationalbank-Gesetz – NBG; addition of a new Article 44a) provided for the OeNB to be entrusted with *tasks related to payment systems* oversight (Zahlungssystemaufsicht – ZSA), which the OeNB had claimed for years. The ZSA oversees payment systems and involves examining systemic safety (see also the relevant article on "The Future Role of the OeNB as the Body Responsible for Payment Systems Oversight in Austria" in this issue).

Far-Reaching Operational Involvement of the OeNB in Banking Supervision

In spite of the transfer of banking supervision from the Federal Ministry of Finance to the FMA and despite the establishment of the FMA as a supervisory authority with respect to financial markets, the existing *banking*

supervisory tasks and rights of the OeNB set out in the Banking Act *remain not only essentially unchanged, but are even extended in important areas.*

Right of the OeNB to be Consulted

The *OeNB's rights to be consulted* (e.g. prior to the granting of a license or issuance of an ordinance), which are laid down in the Banking Act, *remain untouched.* These rights refer to measures of both the FMA and the Federal Ministry of Finance. As regards the right of the OeNB to be consulted in the conclusion of memoranda of understanding related to international cooperation of banking supervisory authorities, the *report of the Financial Committee* explicitly stated that the Federal Minister of Finance, *in line with previous practice,* will arrange for the *participation of the OeNB* in talks preparing agreements between competent authorities on cooperation with the FMA, in accordance with Article 77a of the Banking Act.

Reporting System and Obligation to Provide Information

The *OeNB will continue to collect and process money and banking statistics* (e.g. monthly returns, quarterly reports, major loans register), with the information flow between the OeNB and the FMA underpinned by the explicit inclusion of an obligation to provide mutual administrative assistance.

The OeNB is obligated to provide the Federal Minister of Finance and the FMA with observations and findings of a basic nature or of special significance in banking. Moreover, on request, the OeNB has to furnish the necessary factual explanations, make documents available and provide expert opinions.

Conversely, the FMA has to notify both the Federal Minister of Finance and the OeNB of observations of a basic nature or of special significance in banking and provide the OeNB with rulings that are necessary for the OeNB to fulfill its legal mandate. Moreover, the bank auditors remain obligated to inform both the supervisory authority and the OeNB of evidence suggesting that the proper functioning of a credit institution or the performance of its obligations seem no longer ensured.

Expert Opinions of the OeNB

The *obligation of the OeNB to provide expert opinions,* as laid down in *various provisions of the Banking Act,* remains unaffected. The OeNB continues to act as expert and must be called in for this purpose by the FMA.

The OeNB has to furnish, e.g., expert opinions for the FMA based on banks' monthly returns and quarterly reports. *Article 26 (3) and (4) of the Banking Act (internal models) is the only provision* where the obligation of the supervisory authority to turn to the OeNB for an expert opionion was *replaced by an optional provision* to make use of the OeNB's services.

OeNB Entrusted with On-Site Inspections

Article 70 (1) Nos. 3 and 4 of the Banking Act, which is of some practical significance as it regulates the Federal Minister's of Finance right to entrust the OeNB with the examination of credit institutions (i.e. on-site inspections), is essentially not only continued but even expressly specified through

a *reference by the Financial Committee,* which assumes that, *as a rule, the OeNB will be charged with* on-site inspections pursuant to Article 70 (1) Nos. 3 and 4, Articles 70a and 77 (6) of the Banking Act with a *view to utilizing the OeNB's existing capacities and personnel resources.* In the Committee's view, the participation of the OeNB will entail cost savings for the financial market supervisory system and thus also for the supervised institutions.

Formally, Article 70 (1) Nos. 3 and 4 as well as Articles 70a and 77 (6) of the Banking Act provide that the *OeNB may* be entrusted with the *examination of the proper limitation of credit and market risks.*

Introduction of Various Measures to Enhance Supervision and Supervisory Instruments in Banking Supervision

To enhance the efficiency of banking supervision, the new legislation contains further improvements in substantive terms:

Public Notification of the Scope of the License and of the Imposition of Supervisory Measures; License Database

Under Article 4 (7) of the Banking Act, the FMA is authorized to notify the public, by public announcement in the Amtsblatt zur Wiener Zeitung or in any other means of public notification circulating throughout Austria, of the fact that a given institution, designated by name, is not authorized to conduct certain types of banking business.

Furthermore, in response to individual inquiries, the FMA has to provide information on the scope of credit institutions' license within an appropriate period and must establish a free Internet-accessible license database by January 1, 2004.

Shift of Burden of Proof with Regard to License Applications

In *license granting* and revocation procedures, a *shift of the burden of proof* has occurred in so far as, should reasonable doubt arise about the personal reliability of the manager or holders of qualified participating interests, the license can be granted only if the applicant has proven that the doubts are unfounded. This procedure is tantamount to a stronger obligation on the part of the applicant to participate in the administrative procedure.

Strengthened Position of the Internal Supervisory Body of a Credit Institution

In future, the *outcome* of the investigations undertaken by the *internal auditors* must also be reported, on a quarterly basis, to the chairman of the internal supervisory body (Article 42 (3) of the Banking Act). Moreover, the new Article 63a of the Banking Act is intended to give the internal supervisory body independent means of inspection, enabling the inspectors to perform their supervisory tasks more thoroughly, if necessary. To this end, the supervisory body has the right to commission CPAs to examine the lawfulness and propriety of the whole institution or to ask the competent statutory auditing bodies for the appointment of an auditor. The appointed CPA has to report the results of his examination to the chairman of the supervisory body. Moreover, the management has to notify the supervisory body's chairman of all rulings issued by the FMA (Article 70 (8) of the Banking Act).

Tightening of the Provisions Concerning Bank Auditors

Articles 61 to 63 of the Banking Act provide for an extension of the *exclusion criteria* for the *appointment of bank auditors* set out in the Commercial Code (Handelsgesetzbuch – HGB) and in the Banking Act, *tightening* their *professional* and *personal qualifications.*

In future, appointment of a bank auditor is impossible if, inter alia,

- he examined the credit institution as bank auditor in the previous six financial years *(rotation principle),*
- the bank auditor does not exercise his duties with the due professional care,
- the bank auditor does not furnish proof that he engages in continuous professional training to keep abreast of legal developments in banking with a view to ensuring a high quality of his skills and expertise.

The new legislation, as opposed to the provisions of the HGB, provides for an increase in *bank auditors' liability for damages.* Negligence involves a maximum amount of liability – depending on the total assets of the audited credit institution – of EUR 2.0 to 6.0 million; in the case of intent, liability is unlimited (Article 62a of the Banking Act).

The new Act also contains provisions granting the FMA the right to *prohibit* the *appointment of an unqualified bank auditor* or, *in case of imminent danger,* to appoint *another bank auditor* itself (Article 63 of the Banking Act).

Extension of the Bank Auditor's and FMA's Rights to Demand Information and Inspect Documents

The bank auditor's and the FMA's (i.e. its auditing agents') rights to demand information and inspect documents extend to all documents and data carriers of the audited institution, which in future also applies to those managed or held in safe custody by a third party or managed or held in safe custody abroad.

If the documents to be audited are managed or held in safe custody abroad, the credit institution has to ensure that they can be made available in Austria any time for a period covering at least three preceding financial years (Article 60 (3), 70 (1) No. 1, and 71 (2) of the Banking Act).

Modified Initiation of On-Site Inspections

Apart from extending the scope for measures by the OeNB to properly limit market and credit risks, the Act contains another modification instrumental in enhancing the *efficiency of supervisory measures:* Under the previously applicable provisions, the institution concerned had to be notified of on-site inspections one week prior to the actual inspection or, if there was a danger that the purpose of the inspection would be defeated, with the start of the inspection proper.

Since pre-announced inspections seem less suited to detect any fraudulent activities, the notification system was modified. Now, the institution concerned is notified of *on-site inspections* as a rule *with the start of the inspection proper.* Only if pre-announcement is unlikely to thwart the purpose of the inspection and previous notification seems useful with a view to facilitating and accelerating the inspection due to the institutions' organiza-

tional preparations, inspections may be announced up to two weeks in advance (Article 71 (1) of the Banking Act).

Enhanced Exchange of Information Between the FMA and Other Bodies

To improve the *efficiency* and *pace* of *supervisory action,* a *direct exchange of information* is established between the *FMA* and other *institutions,* which have already performed tasks within the framework of supervision, the early warning system or crisis prevention. Consequently, the mutual exchange of information between the FMA and deposit insurance facilities as well as government commissioners is ensured (Article 70 (1) No. 2 of the Banking Act).

Extension of the Period for Inspecting Data of the Insolvency Register

The Insolvency Act stipulates that official announcements in insolvency proceedings be effected by means of the inclusion of the relevant data in the insolvency register. Under the new Article 91 (2) of the Banking Act, the restriction on the possibility of inspecting data, which basically applies in bankruptcy proceedings, is extended to three years after the lifting of receivership.

Other Legislative Modifications

The new legislation transfers the insurance and pension fund supervision duties currently performed by the Federal Ministry of Finance and the securities supervision tasks carried out by the BWA (Austrian Securities Authority) to the FMA in its function as the new one-stop ("Allfinanz") supervisory authority. Moreover, in view of the FMA's new jurisdiction in administrative penal proceedings, the penal provisions are revised, while cost reimbursement arrangements are adapted or newly adopted.

The amendments of the Commercial Code (HGB), the Corporation Act (AktienG) and the Limited Liability Company Act (GmbhG) introduce stricter liability for auditors of annual accounts (Commercial Code) and tightened penal provisions for the violation of the Board of Management's obligation to provide information to the Supervisory Board (Corporation Act, Limited Liability Company Act). In future, any person *providing incorrect information* to the *Supervisory Board* will be subject to prosecution, just like the provision of incorrect information *to the public* and the *General Meeting.*

Entry into force

The *omnibus law,* which has already been *passed and properly promulgated,* will enter into force on *April 1, 2002.* Only provisions governing the establishment of the FMA in fall 2001 went into force with effect from the day following the date of promulgation of the Act in the Federal Law Gazette, i.e. on August 8, 2001.

Conclusion

The OeNB stands *ready to assume the additional responsibility with which it has been entrusted in the areas of banking, financial market and payment systems oversight,* thus strictly *fulfilling its legal mandate in close cooperation with the FMA.*

The passage of the Financial Market Supervision Act has, moreover, ensured the *OeNB's continued ability to perform its wide range of macroprudential tasks in the Eurosystem and hence to make an effective contribution to the maintenance of financial stability.*

The Future Role of the OeNB as the Body Responsible for Payment Systems Oversight in Austria

Rudolf Habacht

Introduction

In line with the payment systems standards and policies of the European System of Central Banks (ESCB), the amendment to the Federal Act on the Oesterreichische Nationalbank (Nationalbank Act 1984) confers payment systems oversight in Austria on the Oesterreichische Nationalbank (OeNB) from April 1, 2002. This amendment reflects the fact that electronic payment systems have become increasingly important to the smooth functioning of financial systems.

Pursuant to Article 105 of the Treaty on European Union and to Articles 3 and 22 of the Statute of the ESCB, the European Central Bank (ECB) "may make regulations, to ensure efficient and sound clearing and payment systems within the Community and with other countries." Hence the ECB is vested with the power to issue regulations in those areas of payment systems which do not have a substantial impact on other legislation.

However, Eurosystem practice until now has shown a clear preference to agree on a common payment systems oversight policy stance in Governing Council meetings and to entrust the national central banks (NCBs) with its implementation. This approach is designed to optimally take into account the respective national requirements in exercising payment systems oversight. In short, payment systems oversight is an essential function of NCBs, which in Austria is performed by the OeNB.

Payment Systems Oversight in the Eurosystem

The Eurosystem's objective in exercising payment systems oversight must be the stability and efficiency of payment systems and the enforceability of monetary policy. These objectives were laid out in a policy statement in June 2000 along with the repartition of oversight tasks within the Eurosystem.[1])

The decentralization and subsidiarity principles apply to the organization of payment systems oversight in the Eurosystem. Accordingly, the NCBs enforce the oversight policy stance over national payment systems whereas in the case of cross-border payment systems the ECB carries out those oversight tasks which cannot be exercised by the NCBs alone.[2])

The main documents in which the framework for oversight is set forth are the "Core Principles for Systemically Important Payment Systems" (BIS, 2001)[3]) and the minimum requirements for electronic money systems laid down in the "Report on Electronic Money" (ECB, 1998).[4])

The Eurosystem enforces payment systems oversight in close cooperation with the European Commission, above all by providing consultation on Directives and Recommendations[5]) and by according the European Commis-

1 *See ECB (2000).*

2 *The Governing Council decides who plays the role of overseer on a case-to-case basis; the ECB is the overseer of Euro 1 and CLS. For the TARGET system, it was agreed that the NCBs would act as the overseers of the national components (Austria: ARTIS), whereas the ECB would be the overseer of the central components.*

3 *The "Core Principles for Systemically Important Payment Systems" were developed by the G-10 (Committee on Payment and Settlement Systems of the BIS) in cooperation with the Eurosystem; for details, see annex A.*

4 *See annex B for details.*

5 *See annex D.*

sion permanent observer status in the ECB working groups dealing with payment systems oversight.

Implementation of Payment Systems Oversight in Austria

Legal Basis and Scope of Application

The OeNB will perform payment systems oversight on the basis of Articles 44a[1]) and 82a Nationalbank Act. In addition to providing the mandate to inspect systemic stability, Article 44a specifies the authority of the OeNB to issue regulations, carry out inspections and to impose sanctions; moreover, it specifies disclosure obligations as well as a strict organizational separation of responsibilities to prevent a conflict of interest within the OeNB. Article 82a specifies penalties for infringements.

On principle, all payment systems which fall under Article 44 para 4 are subject to oversight.[2]) The OeNB takes account of the legislator's intention to heed the "scale and nature" (as stated in Article 44a para 3 Nationalbank Act) of payment systems by applying the full scope of regulatory power only to those payment systems which are of fundamental importance for noncash payments in Austria and whose failure would have negative repercussions on the economy as a whole and would severely impair public confidence. The criteria with which to assess whether a payment system is subject to the full scope of regulatory power are (i) the size of the individual transactions handled by the payment system, (ii) the total volume of payments handled, and (iii) the scope of the (actual or planned) geographical coverage.[3]) More than ten Austrian payment systems currently fulfill these criteria.

Oversight Principles

Oversight Principles for Electronic Payment Systems in Austria will spell out the principles on which the regulations, the disclosure of qualitative information and inspection are based. By analogy to the oversight areas defined in the Core Principles, the OeNB will specify in detail minimum requirements to be fulfilled and documented for the oversight areas legal certainty, financial risk, settlement, access to systems, and technical security and reliability.[4])

Based on the Eurosystem's aims, the catalogue of standards in Austria will cover the following criteria, whose application to specific categories of payment systems is specified in the five modules[5]) of oversight principles:

1 *See annex C for the complete article.*

2 *"Participants of payment systems" covers all commercial entities that participate in payment systems by agreeing to follow the rules established by the operator of the payment system and by maintaining an account with the operator, or having the operator maintain an account for them, to which the payments they receive from their business transactions are credited.*

3 *Thus the full scope of regulatory power does not have to apply to test installations or pilot projects, but all or part of the regulations can be declared to be operative in individual cases.*

4 *This documentation also fulfills the IMF Code of Good Practices on Transparency in Monetary and Financial Policies (IMF, 2000).*

5 *Module 1: Large-value payment systems*
Module 2: Multilateral electronic retail payment systems
Module 3: Multilateral card-based payment systems
Module 4: Electronic money systems
Module 5: Electronic access payment systems

– *Legal robustness*
  Every payment system must have a clearly defined legal basis, of which every participant[1]) must be informed. The terms and conditions of the system must cover all rights and obligations of using the payment system and must be legally enforceable with respect to all participants.
– *Understanding of the financial risk*
  All participants must have a clear understanding of the credit and liquidity risks arising from the operation of or participation in the system. Proof must be furnished that commercial participants and private users are informed about any financial risks.
– *Defined procedures for the management of financial risk, specification of responsibilities*
  The operator must ensure that all participants are capable of taking on and managing specified financial risks. Above all, it is necessary to set credit risk limits for each participant. The terms and conditions of the payment system must provide for well-defined responsibilities for all participants to hedge and contain financial risk.
– *Settlement*
  The system must provide prompt final settlement on the day of value, at minimum at the end of the day. The assets used for settlement should preferably be a claim on the OeNB. Where other assets are used, the operator must make sure that they carry little or no credit or liquidity risk. Multilateral netting systems must also guarantee daily settlement of balances even in the event of an inability to settle by the participant with the largest single settlement obligation.
– *Security and reliability*
  In order to guarantee confidentiality and the integrity of the payments handled by the system, the operator must make use of state-of-the-art IT security. The system must ensure a high degree of security and operational reliability. Apart from the necessary IT security measures, appropriate organizational and personnel measures must also be taken. Above all, suitable contingency arrangements for timely completion of daily settlement in the event of failure and disruptions must be made and well documented. The operator must provide for transparent and effective governance control.
– *Fair and open access to the system*
  The operator must specify in detail all criteria for participation in the system and disclose these criteria to interested parties. Any restrictions on access must be based on objective criteria. Clear rules and procedures must be established for the orderly termination of participation on the participant's request and for the exclusion of a participant.

The operators must demonstrate compliance with these requirements by submitting appropriate documentation. Appropriate documentation consists above all in documents specifying the legal standards on which the operation of the system is based and their enforceability with respect to all participants (legal opinions), the terms and conditions of the payment system and other

1 *Operators, commercial participants and private users of the payment system.*

legal documents. Technical security and reliability are to be evidenced by the submission of a comprehensive description of the basic structure of the system, the environment in which it is used, its security and internal system control (system policy) and of opinions of certified auditing agencies confirming the asserted fulfillment of security requirements.

Such documentation must be delivered before new payment systems go into operation and six months after the respective regulation enters into force in the case of existing payment systems. Subsequently, operators must provide evidence of their continuous compliance with the requirements at least every two years.[1])

External Experts

The OeNB will have the right to use the services of external experts and national or international auditing agencies (Article 44 para 8 Nationalbank Act). The OeNB will avail itself of this option above all in the field of technical security and system reliability.

Payment Systems Statistics

The OeNB will use a reporting system for payment system statistics to judge the systemic relevance of payment systems, which represents the criterion for assessing the appropriateness of oversight measures (Article 44a para 10 Nationalbank Act). Article 44a para 7 Nationalbank Act specifies the reporting obligations for these statistics. Payment Systems Statistics are planned to be organized in three reporting modules[2]) and are designed to provide reliable data about the number and value of transactions processed by payment systems at quarterly intervals.

Outlook

With the establishment of payment systems oversight as covered by Article 44a Nationalbank Act, the OeNB will be fully compliant with the Eurosystem requirements from April 1, 2002. The OeNB will recognize both Austrian and European requirements in taking the steps required to implement the provisions of the Nationalbank Act in Austria and in exercising the oversight functions incumbent on it.

1 *In the case of significant changes in the system or a founded suspicion of security shortcomings, the OeNB will reserve the right to demand evidence in the interim.*

2 *Module 1: card-based payment systems (credit card systems, POS systems, cash dispensing systems and electronic purse systems); Module 2: software-based electronic money payment systems; Module 3: giro system (complete noncash payments infrastructure exclusive of ARTIS/TARGET and card-based and software-based retail payment systems).*
Only operators will be subject to reporting requirements under modules 1 and 2. Participants are required to report only if they participate in a foreign payment system. Module 3 of the payment systems statistics is designed to meet the statistical requirements for the ECB's Blue Book, which is why these reporting requirements will also apply to participants (as a rule banks) in bilateral payment systems.

Annex A:

Core Principles for Systemically Important Payment Systems[1])

1. The system should have a well-founded legal basis under all relevant jurisdictions.
2. The system's rules and procedures should enable participants to have a clear understanding of the system's impact on each of the financial risks they incur through participation in it.
3. The system should have clearly defined procedures for the management of credit risks and liquidity risks, which specify the respective responsibilities of the system operator and the participants and which provide appropriate incentives to manage and contain those risks.
4. The system should provide prompt final settlement on the day of value, preferably during the day and at minimum at the end of the day.
5. A system in which multilateral netting takes place should, at a minimum, be capable of ensuring the timely completion of daily settlements in the event of an inability to settle by the participant with the largest single settlement obligation.
6. Assets used for settlement should preferably be a claim to the national bank; where other assets are used, they should carry little or no credit risk and little or no liquidity risk.
7. The system should ensure a high degree of security and operational reliability and should have contingency arrangements for timely completion of daily processing.
8. The system should provide a means of making payments which is practical for its users and efficient for the economy.
9. The system should have objective and publicly disclosed criteria for participation, which permit fair and open access.
10. The system's governance arrangements should be effective, accountable and transparent.

Responsibilities of the central bank in applying the Core Principles

A. The central bank should define clearly its payment system objectives and disclose publicly its role and major policies with respect to systemically important payment systems.
B. The central bank should ensure that the systems it operates comply with the Core Principles.
C. The central bank should oversee compliance with the Core Principles by systems it does not operate and it should have the ability to carry out this oversight.
D. The central bank, in promoting payment system safety and efficiency through the Core Principles, should cooperate with other central banks and with any other relevant domestic or foreign authorities."

1 See BIS (2001).

Annex B:

Report on Electronic Money[1])

Requirement 1: Prudential supervision: Issuers of electronic money must be subject to prudential supervision.

Requirement 2: Solid and transparent legal arrangements: The rights and obligations on the part of the respective participants (customers, merchants, issuers and operators) in an electronic money scheme must be clearly defined and disclosed. Such rights and obligations must be enforceable under all relevant jurisdictions.

Requirement 3: Technical security: Electronic money schemes must maintain adequate technical, organisational and procedural safeguards to prevent, contain and detect threats to the security of the scheme, particularly the threat of counterfeits.

Requirement 4: Protection against criminal abuse: Protection against criminal abuse, such as money laundering, must be taken into account when designing and implementing electronic money schemes.

Requirement 5: Monetary statistics reporting: Electronic money schemes must supply the central bank in each relevant country with whatever information may be required for the purposes of monetary policy.

Requirement 6: Redeemability: Issuers of electronic money must be legally obliged to redeem electronic money against central bank money at par at the request of the holder of the electronic money.

Requirement 7: Reserve requirements: The possibility must exist for central banks to impose reserve requirements on all issuers of electronic money.

Desirable objective 1: Interoperability of electronic money schemes

Desirable objective 2: Adoption of adequate guarantee, insurance or loss-sharing schemes for electronic money products.

Annex C:

Finanzmarktaufsichtsgesetz (Financial Market Supervision Act), Federal Law Gazette Part I no. 97/2001, Amendment of the Nationalbank Act 1984

§ 44a. (1) Die Oesterreichische Nationalbank ist zur Ausübung der Aufsicht über die Zahlungssysteme verpflichtet. Die Aufsicht umfasst die Prüfung der Systemsicherheit von Zahlungssystemen. Sie erstreckt sich auf

1. Betreiber von dem österreichischen Recht unterliegenden Zahlungssystemen;
2. in Österreich niedergelassene Teilnehmer an Zahlungssystemen, die österreichischem Recht unterliegen;

1 See ECB (1998).

3. in Österreich niedergelassene Teilnehmer an Zahlungssystemen, die nicht österreichischem Recht unterliegen.

(2) Systemsicherheit im Sinne dieses Bundesgesetzes ist die Summe der von den Betreibern und Teilnehmern eines Zahlungssystems zu ergreifenden Maßnahmen, die dem sicheren Umgang mit den rechtlichen, finanziellen, organisatorischen und technischen Risiken dienen, die mit dem Betrieb von einem Zahlungssystem oder mit der Teilnahme an einem Zahlungssystem verbunden sind.

(3) Die Oesterreichische Nationalbank ist berechtigt, unter Beachtung der Aufgaben und Größe der betroffenen Zahlungssysteme durch Verordnung den Inhalt von Empfehlungen der Europäischen Zentralbank und des Basler Komitees für Zahlungs- und Settlementsysteme, die internationale Prinzipien für die Systemsicherheit von Zahlungssystemen darstellen, im Aufsichtsbereich gemäß Abs. 1 als verbindlich festzulegen.

(4) Zahlungssystem im Sinne dieses Bundesgesetzes ist jedes System gemäß § 2 des Finalitätsgesetzes, BGBl. I Nr. 123/1999, sowie jede gewerbliche Einrichtung mit mindestens drei Teilnehmern, die dem elektronischen Transfer von Geldwerten dient.

(5) Betreiber eines Zahlungssystems im Sinne dieses Bundesgesetzes ist, wer gewerblich tätig ist und mit dem Zweck der direkten oder indirekten Erzielung von Einnahmen die zentrale Verantwortung für das Systemkonzept, die Aufbau- und Ablauforganisation, die Ordnungsmäßigkeit des laufenden Betriebes und die technische Sicherheit eines Zahlungssystems trägt.

(6) Teilnehmer an einem Zahlungssystem im Sinne dieses Bundesgesetzes ist, wer gewerblich tätig ist und mit dem Zweck der direkten oder indirekten Erzielung von Einnahmen am Transfer von Geldwerten innerhalb eines Zahlungssystems oder aus einem oder in ein Zahlungssystem mitwirkt.

(7) Die Betreiber eines Zahlungssystems haben der Oesterreichischen Nationalbank auf deren Verlangen Auskünfte über

1. die von ihnen getroffenen Maßnahmen zur Gewährleistung der Systemsicherheit des Zahlungssystems sowie
2. die Art und das Volumen der über das Zahlungssystem abgewickelten Zahlungen

zu erstatten und die diesbezüglich geforderten Unterlagen vorzulegen. Werden die geforderten Auskünfte von einem Betreiber nicht oder nicht vollständig binnen angemessener Frist erteilt, so hat die Oesterreichische Nationalbank unter nochmaliger Fristsetzung zur Erteilung der Auskünfte unter Androhung von Sanktionen gemäß Abs. 11 die Erteilung der Auskünfte aufzutragen.

(8) Die Teilnehmer an einem Zahlungssystem haben der Oesterreichischen Nationalbank auf deren Verlangen Auskünfte über

1. die von ihnen für die sichere Teilnahme am Zahlungssystem getroffenen Vorkehrungen sowie
2. im Falle der Teilnahme an einem Zahlungssystem, das nicht österreichischem Recht unterliegt, die Art und das Volumen der von ihnen über dieses Zahlungssystem abgewickelten Zahlungen

zu erstatten und die diesbezüglich geforderten Unterlagen vorzulegen.

(9) Falls die gemäß Abs. 7 oder 8 eingeholten Auskünfte keine ausreichenden Aufschlüsse zulassen oder falls begründete Zweifel an der Richtigkeit oder Vollständigkeit der Auskünfte und der Unterlagen bestehen, ist die Oesterreichische Nationalbank berechtigt, entsprechende Erläuterungen zu verlangen und Überprüfungen vor Ort durch eigene Prüfer, und zwar auch unter Beiziehung von Sachverständigen gemäß § 52 AVG, durchführen zu lassen. Solche Sachverständige dürfen unbeschadet der in § 53 Abs. 1 AVG genannten Ausschließungsgründe für keinen Betreiber von oder Teilnehmer an Zahlungssystemen tätig sein. Im Einvernehmen mit der FMA können Überprüfungen vor Ort auch durch Prüfungsorgane der FMA im Namen und auf Rechnung der Oesterreichischen Nationalbank durchgeführt werden.

(10) Erfüllt ein Betreiber oder ein Teilnehmer die von der Oesterreichische Nationalbank gemäß Abs. 3 erlassenen Verordnungen nicht, so hat die Oesterreichische Nationalbank diesen unter Androhung von Sanktionen gemäß Abs. 11 oder 12 aufzufordern, binnen angemessener Frist die festgestellten Mängel zu beheben.

(11) Kommt der Betreiber eines Zahlungssystems seinen Auskunftspflichten nach Abs. 7 nicht oder nicht vollständig nach, oder wird einer Mängelbehebungsaufforderung gemäß Abs. 10 trotz Sanktionsandrohung nicht oder nicht vollständig entsprochen, so kann die Oesterreichische Nationalbank mit Zustimmung der FMA, wenn dies nach Art und Schwere des Verstoßes angemessen ist und eine Herstellung des rechtmäßigen Zustandes auf andere Weise nicht erreicht werden kann, den Betrieb des Zahlungssystems untersagen oder die Anerkennung des Systems gemäß § 2 Abs. 1 Z 3 Finalitätsgesetz zurücknehmen.

(12) Kommt ein Teilnehmer an einem Zahlungssystem trotz Sanktionsandrohung einer Mängelbehebungsaufforderung gemäß Abs. 10 nicht oder nicht vollständig nach, so kann die Oesterreichische Nationalbank, wenn dies nach Art und Schwere des Verstoßes angemessen ist und eine Herstellung des rechtmäßigen Zustandes auf andere Weise nicht erreicht werden kann, die Teilnahme an einem Zahlungssystem untersagen.

(13) Soweit die Teilnehmer an einem Zahlungssystem keinen Sitz in Österreich haben, sind sie zur Erfüllung der Auskunftspflichten nur insoweit verpflichtet, als das Recht ihres Sitzstaates dem nicht entgegensteht.

(14) Die Oesterreichische Nationalbank ist berechtigt, den Inhalt einer gemäß Abs. 11 oder 12 verhängten Aufsichtsmaßnahme im ‚Amtsblatt zur Wiener Zeitung' oder in einem sonstigen bundesweit verbreiteten Bekanntmachungsblatt zu veröffentlichen, sofern dies im Interesse der Systemsicherheit oder der Kunden von Zahlungssystemen erforderlich und nach Art und Schwere des rechtswidrigen Verhaltens gerechtfertigt ist.

(15) Die Oesterreichische Nationalbank hat nachvollziehbar jene organisatorischen Vorkehrungen zu treffen, die zur Vermeidung von Interessenskollisionen auf Grund eigener wirtschaftlicher Tätigkeiten erforderlich sind. Insbesondere sind aus der Aufsichtstätigkeit herrührende Informationen auf die damit befassten Bediensteten einzuschränken.

§ 82a. (1) Wer den in § 44a normierten Auskunfts- und Vorlagepflichten nicht oder nicht vollständig nachkommt, begeht, sofern die Tat nicht den

Tatbestand einer in die Zuständigkeit der Gerichte fallenden strafbaren Handlung bildet, eine Verwaltungsübertretung und ist mit Geldstrafe bis zu 2000 € zu bestrafen.

(2) Wer trotz Untersagung gemäß § 44a Abs. 11 ein Zahlungssystem betreibt oder trotz Untersagung gemäß § 44a Abs. 12 an einem Zahlungssystem teilnimmt, begeht, sofern die Tat nicht den Tatbestand einer in die Zuständigkeit der Gerichte fallenden strafbaren Handlung bildet, eine Verwaltungsübertretung und ist mit Geldstrafe bis zu 7000 € zu bestrafen.

Annex D:

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Potential Impact of the New Basel Capital Accord on Financial Stability

Birgit Leichtfried,
Franz Partsch

Regulatory and supervisory authorities, in interaction with the industry, have been hammering out reform proposals for the capital adequacy standards for banks and investment firms (Basel II) for almost three years now. It has been a given, not least since the publication of the second consultative paper drawn up by the Basel Committee on Banking Supervision and the European Commission's subsequent consultation document in early 2001, that this reform is bound to impact banks and thus financial markets thoroughly due to the risk-sensitive weighting factors it introduces and the highly refined minimum requirements it proposes.

In June 2001, the international regulators had to postpone by one year their original plan of finalizing the new capital adequacy provisions by end-2001 and introducing them in 2004. The proposals submitted during the second consultation phase were incomplete still, and the provisions on the sections yet to be covered, such as retail, project finance and equity exposures under the internal ratings-based (IRB) methods proved utterly complex. Besides, concern was widespread that the envisaged provisions might not be apt to increase the stability of the global financial system. In fact, some critics fear that they will be even counterproductive in that the financial markets will suffer from increased volatility. This study centers on a select number of potential effects on financial stability. The arguments presented here are certainly not exhaustive and possibly controversial. The simple objective is to make a contribution to and thus fuel the ongoing debate.

The section "Reactions to the Current Proposals for a New Capital Accord" thus summarizes the echo the second consultative package produced and also presents the outcome of the *Quantitative Impact Study (QIS 2),* an international survey of banks which the Basel Committee conducted in the first half of 2001 and which may shed some light on the measurable consequences of Basel II. Subsequently, "The New Capital Adequacy Framework" section describes the *structure of the capital adequacy provisions.* Here, the focus is on the *interplay of the three pillars* of the new framework and the necessary *interaction* among regulatory and supervisory bodies, financial institutions as well as other market partners. The following section on "Prudential Regulation and Supervision" investigates possible *future regulatory and supervisory processes* in detail. This section revolves around the role of sound practices in formulating and honing standards. Suggestions for how to address the potential impact on financial stability round off this paper.

Reactions to the Current Proposals for a New Capital Accord

The objectives of the new Accord – increased financial stability through risk-sensitive capital levels, promotion of advanced risk measurement and management techniques, use of internal methods for calculating the regulatory capital and bringing minimum capital requirements more closely in line with economic capital[1]) – and its framework have generally met with high approval. There is a general consensus that the overhaul of the Basel

1 *Basel Committee on Banking Supervision (1998).*

Accord is a step in the right direction as the proposed provisions reflect both state-of-the-art research and the financial industry's best practices. The standard-setting bodies, in addition, attempt to design the new provisions in such a way that they may be adapted quickly to market change. Last, but not least, the genesis of the new Capital Accord as such is regarded as a contribution to maintaining the soundness of the financial system, with risk management practice having taken center stage for three years now and having benefited from continual revision and refinement.

This notwithstanding, several elements of Basel II have aroused stiff criticism. The major bone of contention are the conservative assumptions for calibrating risk charges, which result in overly high capital weights. Furthermore, part of the provisions are considered to be too complicated and detailed. This paper only deals with feedback from the consultation rounds that points out potential adverse repercussions for banks' stability, the structure of the financial markets and general economic developments. The central arguments may be summed up as follows:[1])

- The risk-sensitive advanced methodologies bear the risk that minimum capital requirements will fluctuate more strongly than under the standardized approaches. The need thus arises for an additional capital buffer to prevent undershooting of the minimum capital thresholds. This extra capital cost coupled with the increased cost of operating an advanced risk management system translate into disincentives to implementing internal approaches, especially for financial institutions with high-risk exposures.
- Capital charges that are geared more strongly toward risk may during times of economic depression prompt institutions to delay or even forgo necessary adjustments to the risk assessment of borrowers; even more so if an institution is just barely meeting the regulatory capital requirements.
- Allowing both for virtually risk-indifferent standardized approaches and for risk-sensitive internal ratings-based approaches may prompt banks that have opted for the standardized approach to seek higher-risk business – for which they must hold less capital than banks employing the IRB approach – or to step up those operations which do not pay for the latter due to risk considerations.
- The greater informative value of capital ratios and the expected effects on refinancing costs may cause institutions to resort increasingly to window dressing to make the most of these ratios. Again, the incentive is the higher, the worse the turn of economic developments.
- Improving the transparency of the regulatory capital requirements and the informative value of the capital ratios might lead to effects described by signaling models of corporate debt, namely that high capital levels give a negative signal to the markets. Consequently, banks strive to post average capital levels rather than high capital buffers.
- Increased transparency of banks' internal ratings and borrowers' stepped-up demand for external ratings stand to diminish the importance of

1 *See Jokivuolle (2001).*

credit assessment and information as a competitive edge for banks. At the same time, small and medium-sized banks will – at least following the introduction of the New Basel Capital Accord – be faced with the necessity to use external credit ratings and risk data. As a consequence, the quality of banks' internal credit assessment may start to slip.

– While ampler liquidity on credit markets facilitates optimal risk management, institutions are simultaneously presented with new options to significantly alter their risk profiles in a swift and easy fashion. This might actually reinforce a pattern of excessive risk taking in dire economic times.
– From a macroeconomic point of view, the primary concern is a potential procyclical effect triggered by increased risk sensitivity, which is amplified by the transparency of both banks' risk profiles and borrowers' ratings.
– The attempt to apply capital charges to risks other than the traditional bank risks has met with skepticism, since under the Basic Indicator Approach operational risk capital charges are tied to a single income ratio.
– Unlike the detailed minimum capital requirements, the principles underpinning the proposed supervisory review process offer few pointers as to how to translate a qualitatively assessed risk profile into an individual minimum capital charge. In the light of this, there has been much concern about how to maintain a level playing field. This issue featured prominently in the comments received during the second consultative period.[1]) The countries which already have similar methods in place fear that implementation of the new provisions will be too lax in other parts of the world. Countries whose supervisory process rests on the principle of legality criticize that a review process relying on qualitative criteria inherently lacks in the objectivity necessary to assign individual capital charges.
– Furthermore, supervisory review might face the daunting task of being singled out for covering all the complicated areas. For instance, a number of publications criticize the procyclical effect of the new Capital Accord. Moreover, using the supervisory review as proposed is more than problematic – if a consensus were attainable in the first place on how to in "good times" allocate capital for bad times, the obvious way to go would be via minimum capital requirements. The dynamic between supervisory review and increased disclosure also brings this problem to light. On the mere grounds of the capital disclosed as actually available, it is impossible to differentiate between a conservative institution taking precautions by earmarking substantial capital for potential crises and a troubled institution. On top of that, it is unclear whether an institution is inclined to engage in risky business in the future or whether an institution principally takes a particularly conservative approach. Quantitative measures may naturally be complemented by analyses, yet

1 *See Basel Committee on Banking Supervision at http://www.bis.org/bcbs/cacomments.htm.*

the fear is justified that given today's data and information overload, key elements might fall by the wayside, thus going unnoticed and unused.[1])

The potential negative implications for financial stability hinge very much on the final framework of risk weightings applicable to the advanced internal ratings-based approaches as well as on whether Basel II succeeds in providing adequate incentives for banks to actually employ these IRB approaches. As mentioned above, the weighting factors drew criticism during the second consultative period. The results of the QIS 2 conducted in the first half of 2001 in parallel to the consultations lent substance to this criticism. The global outcome will, however, not be released before end-2001. For Germany's internationally active banks, for instance, the foundation IRB approach results in 37% higher minimum capital levels compared to current values, while the advanced IRB approach yields a 9% increase.[2]) The small and medium-sized banks stand to benefit from a lower threshold (–2%) under the foundation IRB approach given their larger share of retail exposures, which compared to other exposures (borrowers) are assigned lower weighting ratios. Adjusting the risk weights in the internal approaches is therefore a high profile concern of the Basel Committee to be able to gauge the consequences of the envisaged reform in a third consultative period and another Quantitative Impact Study. At any rate, the risk weighting functions are very likely to be overhauled substantially. This is why it is still too early to evaluate what effects the minimum regulatory capital requirements and the incentives scheme will have on financial stability. The potential adverse repercussions listed above also include several aspects which concern a number of regulatory/supervisory issues and organizational issues of banks and financial markets; some of these aspects will be investigated in greater detail below.

The New Capital Adequacy Framework

Three Pillars

In the debate about the capital adequacy overhaul the weaknesses of the current Basel Accord, i.e. inadequate coverage of operational risks, loopholes for regulatory arbitrage through inconsistent provisions and insufficient flexibility to account for technological and market developments, very early on led to the design of a three-pillar framework. The following overview of the main characteristics of each of these three pillars focuses in particular on their interplay.

The first pillar allows for a *more risk-sensitive approach to minimum regulatory capital requirements*. For credit risk, the range of risk-sensitive options comprises ratings by *external credit assessment institutions under the standardized approach and two evolutionary internal ratings-based (IRB) approaches.*[3]) The new Accord is to raise the profile of credit risk-mitigating (CRM) techniques and to promote risk sensitivity. Furthermore, an analysis of risks has shown that, apart from market and credit risks, significant risk in fact emanates from

1 *See Basel Committee on Banking Supervision at http://www.bis.org/publ/bcbsca.htm.*

2 *See Börsenzeitung (2001).*

3 *See Basel Committee on Banking Supervision (2001a).*

so-called other risks. Risk has risen considerably over the past decade given not only the trend toward electronic banking or the spinoff of individual business areas, but also mergers and the emergence of ever more complex financial products. The new capital adequacy provisions thus also encompass other risks, namely e.g. operational, reputational, liquidity and legal risks. The minimum capital requirements only refer to the operational risk subset in the light of the difficulty of quantifying other risks. By analogy to credit and market risks, three methods are offered for calculating the capital charge applied to "the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events." Banks using the Basic Indicator Approach have to hold capital for *operational* risk equal to a fixed percentage of a single indicator (gross income), while in the Standardized Approach, banks' activities are broken down into different business lines. The new Advanced Measurement Approach allows banks to use the output of their internal operational risk measurement systems. The recognition of mitigants (insurance) was still under discussion at editorial close.

The multitude of methodologies envisaged is a key innovation for the treatment of both credit and operational risks. Institutions may choose from a menu of options for calculating the minimum capital requirements depending on their type of business and risk profile. In contrast to market risk treatment, risk models are not an option yet. However, the respective provisions are already designed in such a fashion that the advanced IRB methods may be regarded as paving the way for the use of risk models.

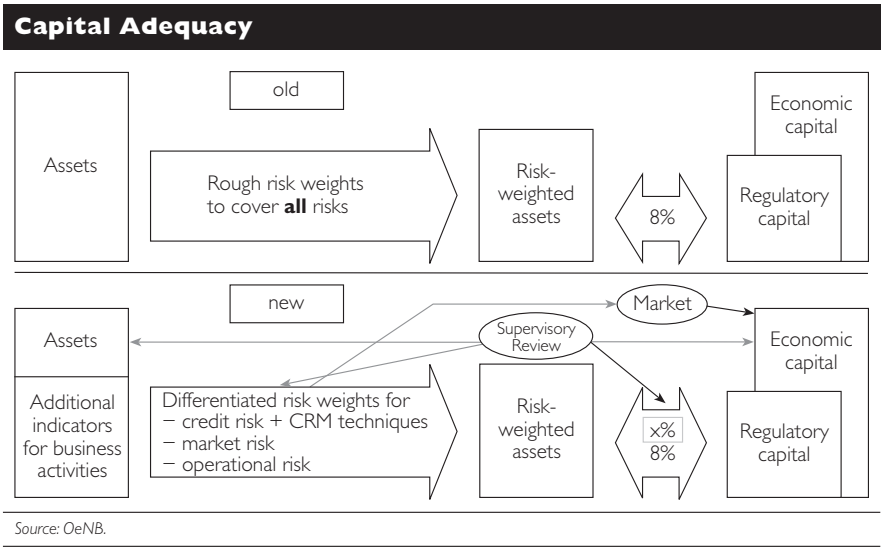
Complementing the considerably refined minimum capital requirements, the second pillar of the new framework envisages a *supervisory review process.* This pillar rests on the principle of an open dialogue between the supervisory authorities and the institutions subject to supervision. Both parties discuss the bank's current risk profile and the supervisors clarify with the bank's representatives how their internal risk management addresses these risks. Following this review, the supervisory bodies should dispose of a variety of instruments to take appropriate action. The new Accord proposes to invest supervisors with the power to demand that banks improve their risk control measures in place, unwind particularly risky positions, and restrict or even terminate the payment of dividends. Supervisors' envisaged discretion in setting individual regulatory capital ratios above the universal 8% mark has been the most contentious issue. The focus in the supervision of financial institutions is thus shifting increasingly from rules toward processes. Here, the spotlight is on the supervisors' and banks' joint review of a bank's risk profile and control environment.

Finally, the third pillar of *market discipline*[1]*)* is meant to enhance transparency vis-à-vis the general public. Institutions are to disclose for each individual risk category their risk management targets and principles. This is to shed light on strategies and processes as well as on the structure and organization of the relevant risk management functions. Besides, information should be made publicly available on the scope and nature of risk reporting

1 *See Basel Committee on Banking Supervision (2001e).*

and measurement systems, policies for hedging and/or mitigating risk, and strategies and processes for monitoring the continuing effectiveness of hedges/mitigants. Mandatory disclosure of individual capital ratios has so far not been envisaged. In other words, the third pillar also enlists the market partners of financial institutions, such as customers, investors, employees, in the supervisory process. The disclosure principle will also apply to the supervisory authorities so as to give market participants access to information on the methods and processes used by supervisors. Through this competitive supervisory environment the Basel Committee on Banking Supervision hopes to set the stage for uniform supervisory practice.

Relationship between the Three Pillars



Source: OeNB.

Even though the basic framework underpinning the new capital adequacy provisions closely resembles the 1988 Capital Accord (see Capital Adequacy chart) – i.e. a minimum capital charge of 8% is applied to risk-weighted assets deduced from business activities – a whole new supervisory environment, both in qualitative and quantitative terms, ensues amid the interplay of the three pillars. The new framework renders the simple and one-size-fits-all calculation of regulatory capital based on risk-weighted assets obsolete. For each risk category, the new Accord offers a complexity-driven continuum of approaches. The interplay of the three pillars is to ensure that banks opt for methodologies commensurate with the complexity of their business activities. As with market risk models, using advanced methods for calculating capital charges is subject to supervisory approval. Again, the three pillars are mutually reinforcing: The first pillar covers technical minimum requirements and eligible methodologies, data quality, length of time series as well as sound practice requirements for risk management. Market discipline impacts on the approval process, which is geared toward verifying the adequacy and frequency of the information provided. Apart from monitoring compliance with the requirements set under the first pillar, the

second pillar is also meant to detect additional risks and to ensure that the approach chosen by a bank matches its actual risk profile. Given the greater risk sensitivity, capital requirements will become more volatile and will, thus, have to tie in closely with an institution's risk management regime and capital strategy. Risk management must adequately cover and marry capital strategies deriving from given risk profiles and regulatory capital charges. Compliance with capital adequacy standards will in the future no longer be limited to maintaining a specific level of capital calculated according to predefined rules. Instead, supervisory authorities, market partners and bank managers will have to monitor continually if the overall risk management regime complies with changing requirements.

Significance of Economic Capital

The analysis of the strengths and weaknesses of the 1988 Basel Accord revealed that the regulatory framework was perceived as somewhat detached from banking practice and as being based on, if you will, a reality of its own. The new approach is designed to reinforce the major risk management functions ranging from the identification of risks to the definition of the economic capital appropriate to cover these risks and to harness these functions for supervisory purposes.

An analysis of risk components, such as default, loss, use of credit lines, maturity and diversification, helps to *identify credit risks.* It serves as the basis for measuring risk in terms of internal rating grades by assigning risk parameters like probability of default (PD), loss given default (LGD) and exposure at default (EAD). Credit risk assessment builds on estimates derived from past internal losses and external data.

In another step, *risk is monitored* continually through credit ratings, assessment of collateral and use of credit lines. The results are disseminated internally in risk reports.

Banks' in-house risk management systems must adequately cover risk identification, risk assessment and risk monitoring to qualify for internal ratings-based approaches to calculating capital charges. While the potential effects on *risk management* are not an explicit part of the new framework, they may certainly be quite beneficial. The independent rating method is to be integrated both into the credit approval procedure and the limit and authority systems. Besides, credit portfolios might be optimized through securitization of credit exposures and credit derivatives. This is why the new Capital Accord also includes globally harmonized requirements for securitization.

The governing principles underlying the provisions on credit risk thus, by analogy to those on market risk, are economic capital and risk-adjusted income.

As to the management of other risks, only a small share of globally active institutions employ an active risk control approach geared toward economic capital. The provisions on operational risk are therefore meant to provide additional inputs to the development of the basic framework. First, it will be necessary to pinpoint the risks, and here it will be essential to differentiate between market and credit risks as well as other risks, in particular since

operational failures result largely in market or credit risks. The differentiation called for is to be attained through self and risk assessment exercises, i.e. by capturing potential triggers of failures and their consequences. Compared with the traditional risk categories, measuring and quantifying other risks is an even greater challenge. Once a risk plan has been drawn up and processes have been analyzed, it is possible to choose from a top-down, bottom-up or hybrid approach. According to the top-down approach, part of the available capital is allocated to covering any possible loss from other risks. The bottom-up approach has stirred a most lively discussion. Following the very restrictive provisions on the Internal Measurement Approach laid down in the second consultative package, which essentially drew on the methods for measuring credit risk, the new proposal introduces the Advanced Measurement Approach, which leaves it up to the industry to design the method.

It is utterly more complicated to calculate economic capital for risks other than the traditional bank risks. One feasible approach suggests breaking down events into low-frequency, high-impact events (e.g. fraud on a scale with Barings) and high-frequency, low-impact ones (e.g. settlement errors).

Irrespective of the quantification issue, monitoring of other risks is a key element of a bank's sound overall management regime. An effective internal audit and management system is to pinpoint errors and analyze atypical frequencies of errors. Risk control, which hinges considerably on management, deals with such central functions as eliminating the causes of errors, but also devising contingency plans.

Prudential Regulation and Supervision

Evolutionary Approach

The evolutionary approach to risk management and supervision thereof harks back to the drafting of the provisions on market risk. The general framework of the 1988 Basel Capital Accord, which consists in calculating risk-weighted assets, basically underpinned the Basel Committee's proposals on the treatment of market risks as well as the EU's Capital Adequacy Directive. The industry, however, was quick to stress that both the proposed maturity band method and even the advanced duration method failed to adequately reflect risk management practice. The subsequent recognition of banks' internal value-at-risk (VaR) models for calculating the regulatory capital might almost be regarded as a paradigm shift. On the condition of compliance with specific minimum requirements as to data quality, length of time series, backtesting, stress testing and risk management standards, credit institutions may choose from three VaR models. Consequently, it was no longer necessary for banks to operate two systems in parallel to measure risk and calculate capital buffers, since the supervisory authorities started to recognize banks' internal risk management regimes for supervisory purposes. The proposals at hand now attempt to extend this principle to other risks. They offer institutions a menu of different methods for various risk profiles and are designed to incorporate new methods in the future (see above).

Orientation on Sound Practices

The evolutionary approach and process-oriented supervision require that the regulatory and supervisory authorities continually monitor the developments in risk management practices and, by extension, incorporate change into regulations and supervisory practice on an ongoing basis. As a matter of fact, the second consultative package became so extensive not least because due consideration had to be given to the sound practices in the various risk areas. The constant change of assessment methods essentially reflects the interplay of the three pillars or the different parties to the supervision process.

History of the New Basel Capital Standards – Consultation and Comitology

The genesis of the new capital adequacy standards merits an in-depth analysis. Over the past 10 to 15 years the development of standards and guidelines has improved perceptibly. In the 1980s, it was standard procedure for regulators to draft new standards and present the parties subject to these standards with finalized blueprints. At such an advanced stage, it was possible to make only minor changes, if at all. It followed that supervisory authorities bore the burden of ensuring the functioning and feasibility of legally binding provisions. Even though the regulators consulted with the industry already much more extensively in devising the provisions on market risk in 1995 and the Capital Adequacy Directive in 1996, consultation has been stepped up even further for the new Capital Accord.

Since 1999 the public has been solicited twice to comment on the new capital adequacy standards in intensive consultative rounds. The regulatory and supervisory authorities had arrived at the conclusion that it was more effective to draft standards in interaction with the industry, which for some market participants was difficult to grasp though. Furthermore, it was necessary to break down the multitude of topics into smaller chunks and also have different forums address specific issues. When the QIS 2 was being conducted, it was in fact already known that substantial elements would undergo change. While such consultation overlaps continue to be a challenge, they are also inevitable in order to stay on track and meet the ambitious deadline – despite the postponement to 2005. The third consultative paper was originally expected to be issued by the Basel Committee in early 2002. It remains to be seen whether the European Commission will likewise release a third consultative paper or present a draft directive instead.

To have internationally harmonized standards take effect simultaneously calls for considerable coordination. While, for instance, in the United States of America the provisions could be applied immediately upon completion, in Europe, it is necessary to devise an EU Directive first. The majority of EU Member States will then have to transpose such a Directive into national law, drawing on their respective parliaments. To ensure compliance with the 2005 deadline, European and national standard-setting bodies have been involved with this complex matter from an unusually early stage.

In the future, a comitology approach is meant to allow for ongoing adjustments of the provisions to keep abreast with developments as well as for enhancing suboptimal passages.

Concluding Remarks

An analysis of the structure of the provisions and of the regulatory and supervisory processes at first glance corroborates the potential negative effects of the new Capital Accord on financial stability laid out in the section "The New Capital Adequacy Framework."

The interplay of the three pillars, the evolutionary approach and the central role of sound practices are likely to increase uncertainty among banks about minimum capital requirements and might encourage them to maintain greater capital buffers. In addition, new forms of regulatory arbitrage may emerge, e.g. if regulatory and supervisory practice differs across regions.

Strict orientation on economic capital may necessitate an overhaul of management practices at many banks. In the process, they are likely to face adjustment and transition problems, which might spill over into the financial realm. Besides, uniform management practices applied by a host of banks may lead to herding behavior and thus set off or reinforce crises in particular market subsegments – phenomena well-known from international financial markets. There is widespread fear that bank loans would become considerably more expensive or even inaccessible for specific industries or small and medium-sized enterprises.

How to prevent these potential adverse consequences to instead reap the clear benefits of the enhancements Basel II offers over to the current standards? The success of such a comprehensive endeavor like the reform of the capital adequacy standards for banks and investment firms hinges on the confluence of many factors, some of which are discussed below:

- *Correct calibration of risk weight functions* will be key to ensuring the quality of the new minimum capital requirements. In this respect, the regulatory bodies rely considerably on the participation of numerous banks in the Quantitative Impact Study scheduled for the first half of 2002. The need for the same broad-based cooperation naturally applies to the Basel Committee's third consultative paper and any blueprints for an EU Directive or for national laws, which will subsequently be put up for consultation. It is therefore imperative to prolong and intensify the constructive dialogue of the past consultative periods.
- *Transparency* is a central prerequisite for the functioning of the new standards and promises to have a beneficial impact on financial markets. This concerns all areas:
  - By disclosing their supervisory methods, *supervisory authorities* reduce uncertainties at financial institutions about prescribed capital charges and quality requirements applicable to risk management systems.
  - By complying with disclosure standards, *financial institutions* help market partners take informed decisions.
  - By providing relevant inputs, *borrowers* help financial institutions conduct sound analyses of creditworthiness and risk.
- Besides, *international cooperation*[1]*)* in implementing the new standards and in the ongoing supervisory practice is a critical factor, especially also with a view to preventing regulatory arbitrage. Harmonization could be

1 *See Zürn (2001).*

extended beyond banking legislation, as it would also be desirable to address accounting and income taxation issues connected with risk assessment and risk provisioning.

– The impact of the new Basel Accord will eventually also depend on how the *individual market participants brace themselves* for possible changes.
  – For *banks* it will be increasingly important to spell out a clear-cut risk strategy and *embed* it into their methodologies and organization, drawing on best *practices*.
  – Investors will have to learn to *cope with* the new *wealth of information* about banks' risk profiles and to continually monitor their risk strategies as well as business policies.
  – Banks' borrowers will have to be capable of *making* their own *risk profiles transparent* and to gain insights into banks' loan approval process to identify the financing partner that best meets their needs.
  – The *supervisory authorities* will have to dispose of adequate instruments and the expertise necessary to back up the objectives of the capital adequacy standards through their decisions.

By way of conclusion, it is worth pointing out that despite drawing heavily on the 1988 Basel Accord principles, the new Capital Accord revolutionizes financial market supervision. The impact Basel II will actually have on many areas will manifest itself only after a transition phase; then it will also be possible to evaluate the consequences in a more definitive manner.

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Secure Electronic Signatures – an Infrastructural Contribution to Financial Stability

Martin Oppitz

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Introduction[1])

Objective

This article aims at providing an overview of the issue of secure electronic signatures as stipulated in the Austrian Signature Act[2]) and of procedures based on electronic signature methods as well as of their infrastructural contribution to financial stability.[3])

Problem Outline

Web transactions are to a great extent not based on familiar processes. The persons involved in the transaction are not personally present when business is conducted, and in many applications they are neither visible via video link nor audible via sound transmission.[4]) Data (e.g. the type and content of a transaction or the ordering party's identity) are increasingly captured via machine interfaces and processed automatically.

As a consequence, what is required are technologies offering security standards adapted to Web transaction as well as legislation creating legal certainty and, for instance, following the principle of legality, enabling authorities to act in cyberspace.

Not only can transactions be automated, possible security flaws may also be utilized automatically[5]) (and with a criminal intent). Risks no longer pertain to individuals and individual transactions only, but to groups of persons and business lines or transaction technologies: Individual risks turn into systemic risks.

The following security services would be required to ensure that Web transactions are handled in a secure manner:

– Data integrity: This service guarantees that any unauthorized data manipulation is identified.
– Certification, identification, authentication: This service ensures that communication partners or the origin of data can be identified.
– Bindingness, undeniability, nonrepudiation: This service prevents the non-recognition of acts done or obligations assumed earlier.
– Confidentiality, secrecy, privacy: This service ensures that information is accessible to authorized persons only.

The Special Interest of Central Banks

Pursuant to Article 105 (2) of the Treaty establishing the European Community and Article 3 of the Statute of the European System of Central Banks (ESCB) and the European Central Bank (ECB), one of the ESCB's basic

1 See ECB (2000a); ECB (2000b); Lipp, P., et al. (2000); Directive on a Community framework for electronic signatures.

2 The Austrian Signature Act i.a. defines the concept "secure electronic signature." See "The Austrian Legal Framework," under "Implementation."

3 The author would like to extend his special thanks to Herbert Leitold of the Institute for Applied Information Processing and Communications (IAIK) at the Graz University of Technology and his colleagues at the OeNB's Financial Markets Analysis and Surveillance Division for valuable suggestions and pointers.

4 Moreover, the extent to which image and sound information can be simulated (in real time, too) is improving constantly.

5 This article is not designed to provide information about such attack scenarios.

tasks is "to promote the smooth functioning of payment systems." Beyond that, the central banks take an interest in the overall stability of the financial system. For this reason, they welcome legal, institutional and technical developments which foster the smooth functioning of payment systems and the stability of the financial system on the whole.

As already mentioned, Web transactions are exposed to systemic risks. Even though – theoretically, if viewed isolated – financial settlement systems (payment as well as securities settlement systems) can be regarded as sufficiently secure, compromised information may enter these systems (e.g. payment orders or securities orders) or exit them (e.g. confirmation of successful transactions, or current stock price quotations) via interfaces and result in system instability.

Operators, and especially supervisors, of settlement systems seek to look at these systems in their totality. Ideally, the perspective of security will not only encompass the flow of information within systems but also into and out of systems. Electronic signatures and procedures based on related methods can provide the security services required to protect such information flows.

Therefore, developments in the field of electronic signatures (including the associated infrastructure) are of special interest to central banks with a view to ensuring financial stability.

Definition of Terms

Pursuant to the EU directive on electronic signatures the term "electronic signature" denotes data in electronic form which are attached to or logically associated with other electronic data and which serve as a method of authentication.

The concept "advanced electronic signature"[1]) means an electronic signature which meets the following requirements:

1. it is uniquely linked to the signatory;
2. it is capable of identifying the signatory;
3. it is created using means that the signatory can maintain under his sole control; and
4. it is linked to the data to which it relates in such a manner that any subsequent change of the data is detectable.

Thus, advanced electronic signatures are capable of ensuring authenticity (1 to 3) as well as integrity (4) and nonrepudiation (1 to 4).

Moreover, electronic signature methods can also help safeguard confidentiality.[2])

1 The term "advanced electronic signature" pursuant to the EU directive on electronic signatures seems more appropriate for a first definition of terms than the more comprehensive definition of the "secure electronic signature" pursuant to the Austrian Signature Act, which will therefore only be introduced later on, i.e. in "The Austrian Legal Framework" under the heading "Implementation."

2 See "Aside: Authentication and Confidentiality" under the heading "Security Issues" below.

Rationale for the Structure of Content

Following this introduction, the section "Cryptographic Background" illustrates the mathematical basis of electronic signatures currently in use. The section "Infrastructural Background" deals with the appropriate infrastructure required for the use of electronic signatures. Security issues to be taken into account in the context of cryptography and infrastructure are discussed in the section of the same title.[1]) The section "Implementation" looks into how cryptography and infrastructure for electronic signatures are put into practice so as to ensure the security principles described earlier. The section also deals with issues of compatibility that have a bearing on implementation. The following "Practical Example" illustrates how simple it is to use secure electronic signatures in practice. "Summary and Outlook" summarizes the most important results of this article and describes possible further developments in the field.

Of course, the reader is invited to skip individual sections (at first), depending on his or her interests. The paper is structured in such a way that it starts with the underlying basis and ends with practical applications.

Cryptographic Background[2])

Cryptography is the encryption of data using complex algorithms to protect the data from unauthorized access by third parties.

As will be explained in the following section, electronic signatures utilize the principle of asymmetric encryption and its application to hash values.[3])

Symmetric Encryption Processes

In symmetric encryption processes (secret-key procedures), the same key is used to encrypt and decrypt data. If third parties are to be prevented from decyphering the data encrypted that way, the key used for encryption (and subsequent decryption) is to be kept confidential (secret key).

DES (Data Encryption Standard) is the most widely known and time-proven algorithm for current applications. The DES algorithm is a product cypher in which the elementary encryption operations are substitution and transposition (permutation). Triple DES – an extension of the DES algorithm – uses three times (or twice) the key length of 64 (or 56 significant) bits customary in DES so that each data block is encrypted three times (or twice) in a row, each time using different keys.[4])

In AES (Advanced Encryption Standard) an algorithm called Rijndael has been established as the DES follow-up standard.

1 *If electronic signatures and their underlying methods are to be an infrastructural contribution to financial stability, they have to be appropriately secure, which is why the section "Security Issues" is central to this article.*

2 *See Böhmer, W. and Knöpfle, K. (2001); Das M+T Computerlexikon 2001; Lipp, P., et al. (2000); Network Associates (1999); Signature Directive; www.esat.kuleuven.ac.be/~bosselae/ripemd160.html.*

3 *The terms "asymmetric encryption" and "hash value" will be explained in this section.*

4 *However, if DES encryption were a mathematical group, which was not clear at first, Triple DES could be reduced to single DES encryption (with an unknown key) and would not provide additional security that way.*

Asymmetric Encryption Processes

If the key used for encryption is different from the key used for decryption, the process is called asymmetric. Here it is practically impossible to derive one key given possession of the other. In asymmetric encryption, pairs of keys are generated for one user each, and one of the keys is published (public key).

When a user encrypts a message, he uses the recipient's public key to encode the data, the recipient then uses his private key to decode the message.

These pairs of keys can also be used for authentication. Here one person encrypts data using his (secret) private key. Decryption will only be possible if the public key assigned to that person is used, which also proves that the previous encryption must have been carried out by this particular person.

The RSA algorithm, named after its inventors Ronald Rivest, Adi Shamir and Leonard Adleman of the Massachusetts Institute of Technology (MIT), is the first public key algorithm fit for encryption and digital[1]) signing.[2]) For encryption and decryption, RSA uses a modulo exponentiation which combines the operation of exponentiation with a subsequent modulo division.

ECC (elliptic curve cryptography) is based on elliptic curves. Elliptic curves consist of elements (x, y) fulfilling the following equation: $y^2 = x^3 + ax + b$. The addition of two points corresponds to the modulo multiplication in RSA and a multiple addition is the counterpart to a modulo exponentiation.

Aside: Hybrid Processes

Given appropriate decryption security, symmetric encryption differs from asymmetric encryption in that it requires comparatively shorter keys and features higher encryption speeds. However, it involves the disadvantage (or difficulty) that the recipient of the message has to be informed (via a secure channel) which key to use for decryption.

Hybrid encryption combines the advantages of both processes: The message is encrypted by means of a symmetrical key (session key) which is in turn encrypted using the (asymmetric) recipient's public key and subsequently transmitted to the recipient along with the encrypted message. Asymmetric encryption is relatively slow in comparison with symmetric encryption but it is only used for the symmetric session key, which is usually much shorter than the message, while message encryption using the session key applies a comparatively fast symmetric process.

1 *The term "digital signature" describes the currently only type of electronic signature put into practice in a useful way, i.e. using asymmetric encryption. As this article deals with the potential implementation of digital signatures in practice (see the section on the "Infrastructural Background"), the wording will return to the more general expression "electronic signature," which is neutral in technological terms. The Austrian Signature Act (see chapter "The Austrian Legal Framework," in the section "Implementation") has also been worded neutrally in technological terms in this context.*

2 *The Diffie-Hellman algorithm developed earlier also uses public keys but does so to negotiate a symmetrical key. Symmetrical keys are not suited for digital signatures.*

One of the most widely used hybrid encryption systems is PGP (Pretty Good Privacy).

Hash Functions

Hash functions in cryptography serve the purpose of generating a compact and unambiguous message digest, which is then processed instead of the entire message. In cryptography one-way hash functions are applied. Mathematically speaking, these are one-way functions turning different input data of variable size into different output data of a fixed size (hash value), while it is virtually impossible to calculate the input data on the basis of the output data (hence "one-way function").

RIPEMD-160 and SHA-1, which create 160-bit hash values each, are widespread hash functions. If the hash value thus obtained is smaller than required for onward processing, it can be extended by additional bits; this process is called padding.

Signing by Encryption

Using a hash function, a hash value is created from the data to be signed (e.g. the text of a contract). The hash value is encrypted with a secret private key in an asymmetric process and thus becomes a digital signature. The combined data[1]) and encrypted hash value form a digitally signed document.

To verify the digitally signed document, the hash value is computed from the data, and the digital signature is decrypted by means of the appropriate public key. If the two values are identical, the signatory has been clearly identified (authentication), and the fact that the data have remained unchanged is safeguarded (data integrity) so that repudiation is avoided as a consequence.[2])

Apart from the RSA and ECC variants, the Digital Signature Algorithm DSA is also suited for digital signatures. DSA is based on the discrete logarithm problem[3]) and cannot be used for encryption (as is the case with ECC variants based on DSA).

Infrastructural Background[4])

To be able to use electronic signatures in practice on a larger scale, certain infrastructure requirements have to be fulfilled; the following sections will describe the workings of such an infrastructure.

1 *The signed data in the signed document are basically not encrypted but clear and readable. If additional confidentiality is desired, the digitally signed document must be encrypted for security reasons. Otherwise, display problems will be encountered (see also "Signature Creation and Verification Security" in the section "Security Issues").*

2 *The private key is also called "signature-creation data" whereas the public key is referred to as "signature-verification data."*

3 *Find a constant x for different pairs of g and d in a mathematical group so that $g^x = d$ applies to all g and d that belong together.*

4 *See A-SIT (2000); Lipp, P., et al. (2000); Network Associates (1999); Signature Directive.*

Certificate

In the (direct[1])) context of electronic signatures, a certificate is a kind of attestation confirming that a public key is indeed assigned to a certain person.

For this purpose such a certificate has to encompass at least three elements:

1. the identity of the certificate holder;
2. the public key of the certificate holder; and
3. the electronic signature of the attesting issuer.

As regards trust in the correctness of the identity data on the certificate, the Certification Authority (CA) plays a role similar in importance to a passport issuing authority. Apart from the security features in a passport or certificate, trust in the authenticity of a passport depends as much on the credibility of the issuing authority as the credibility of a certificate is contingent on the credentials of its issuer.

Via the public key of the certification authority, everybody can check the authenticity of the certification authority's electronic signature while at the same time ensuring, via the hash value, the integrity of the content of the certificate (i.e. the identity of the certificate holder and the public key of the certificate holder, which is the minimum content). Trust in the certification authority generates trust in its certificates.

Web of Trust

In a model of direct trust, a user knows the holder of an electronic signature personally. In a hierarchical trust model, the user trusts certificates issued by a certification authority and subsequently he also trusts the electronic signature of a certificate issued by the certification authority. By issuing special certificates, certification authorities may also indicate that they trust the decisions of other certification authorities. This way, i.e. when users with a signature attest the trustworthiness of others, a web of trust can be created even though the certification authorities may not be institutionalized like an official agency.

The certification authority on the top of the pyramid of certification authorities – seen from the point of view of the end user – is called root certification authority. When checking a certificate, the end user tracks the certification path or certification chain from certification authority to certification authority until he gets to the root certification authority.

Public-Key Infrastructure

In a small group of persons, public keys or certificates can be exchanged manually, i.e. via data carrier or e-mail. Once a certain critical mass requiring such exchanges is reached (without defining the exact size of that mass), it makes sense, or it is even necessary, to create central systems to manage the certificates. Facilities which store certificates are called certificate servers, cert servers or key servers.

1 See the distinction between user certificates and issuer certificates in the chapter on "Types of Certificates."

When the process becomes more institutionalized – in the framework of a public-key infrastructure (PKI) – certificate management not only encompasses the issuance of certificates as described above but also the potential revocation of certificates and attestations as to their security.

Apart from the fact that certificates are in general granted for certain periods only[1]) (comparable to the validity of a passport), situations might occur when it is necessary to revoke a certificate. This might e.g. be the case when the private key was compromised or when a certificate is linked with a certain position in a company, and the holder of the certificate has ceased working in that position.

The revocation of a certificate, including the time of revocation,[2]) is entered in a so-called certificate revocation list (CRL) which can be accessed like a certificate server.

Certification-Service Provider

A certification-service provider (CSP) is an entity or a natural or legal person which issues certificates (i.e. an institutional certification authority) or provides other services related to electronic signatures.

These services include the generation of signature-creation data (private keys), signature-verification data which correspond to signature-creation data (public keys which then become part of the certificates), the storage[3]) of signature-creation data in signature-creation devices (e.g. smart cards) and the recommendation of data formats suitable for electronic signatures.

In addition to the issuance and revocation of certificates, the tasks of certification-service providers also comprise time-stamping services and signature renewal.

Time-stamping services denote the electronically signed attestation of a certification-service provider stating that certain electronic data were available at a certain point of time. This may serve as proof that deadlines were met, or in the context of signing, it may be evidence that the related certificate[4]) was valid.

Signature renewal means that a new, more secure electronic signature is added to an electronically signed document to avoid any reduced security that may be imminent.

Providers of root certification services from (originally) different trust hierarchies may attest each others' qualification as a certification authority. Thus, no certification authority basically ranks higher than the others, the stringent hierarchy of trust dissolves. Any trustworthy certification authority can hence be referred to as root certification authority.

1 *Given developments in computer technology, and also of mathematics, we have to assume that keys (and key lengths) cannot be considered secure for once and for all.*

2 *The point of time is required because it is necessary to know for how long a certificate was trustworthy.*

3 *Many processes also include the initial generation of signature-creation data in the signature-creation device.*

4 *Certificates are only valid for certain periods of validity or prior to revocation.*

Types of Certificates

Essentially, we distinguish between user and issuer certificates.

The user certificate is always the last link in the certification chain: First, a public key is assigned to a certain person.

The basic type of issuer certificate is the self-signed issuer certificate, which is at the root of the certification chain. Using its own private key, the certification authority assigns a public key to itself. Thus the holder and the issuer of the certificate are identical. If certification-service providers provide certifications to each other, these are called cross-certificates.

So-called attribute certificates assign certain characteristics to persons, such as the fact that a person is a staff member of a company or holds a certain position there. Attribute certificates do not contain public keys[1]) and may be issued by other issuers than those who issue conventional certificates.

Security Issues[2])

An electronic signature is considered secure under the following conditions:

- the cryptographic process is sufficiently secure;
- the hash value is sufficiently secure;
- the pair of signature keys is unique and its public portion is assigned to a certain person;
- the signature-creation device is secure and may only be used by authorized signatories.

To fulfill all these requirements, a number of security issues, ranging from certification-service providers to secure verification of signatures, needs to be addressed and resolved.

Certification-Service Provider Security

For signatures and certification services as well as for the creation and storage of certificates, certification-service providers issuing qualified certificates must use trustworthy systems, products and processes that are tamper-proof and ensure technical and cryptographic security. They have to take appropriate precautions so that signature-creation data are kept secret and data for certificates cannot be forged or modified without the forgery or modification being identified. Moreover, the signature-creation data of the certification-service providers have to be safe from unauthorized access because if they were compromised, all certificates for other electronic signatures issued with that signature would be compromised, too.

One method to keep certification-service providers' signature-creation data secret is to generate them inside the signature-creation device and use technical means to rule out any subsequent removal.

The most significant security requirements certification-service providers have to fulfill are the following:

1 *A public key is assigned to a certain person along with a conventional certificate already.*

2 *See A-SIT (2000); Cremers, A. B., Spalka, A. and Langweg, H. (2001); Das M+T Computerlexikon 2001; Kocher, P. C. (1995); Kocher, P., Jaffe, J. and Jun, B. (1999); Kömmerling, O. and Kuhn, M. G. (1999); Lipp, P., et al. (2000); Oswald, E. (2001); Posch, R. and Leitold, H. (2001); SCSUG-SCPP (2001); Signature Ordinance; TAC (1998); www.signatur.rtr.at = www.signatur.tkc.at.*

– operation of fast and secure directory services as well as prompt and secure revocation services;
– use of quality-assured information as to time (e.g. secure time-stamps) in certificates as well as directory and revocation services;
– maintaining the possibility of determining the time when a certificate was issued and revoked.

Apart from the technical security requirements which are described below, certification-service providers also have to observe certain organizational principles which are crucial to security. They must employ personnel which possess sufficient knowledge, skills and experience required for the services provided. In addition to management skills, a special emphasis has to be placed on know-how in the context of electronic signature technology and related security procedures. Moreover, suitable administration and management processes that correspond to recognized standards have to be introduced.

Signature Key Security

The security of a pair of keys depends on both the security of the cryptographic procedure used and its concrete specification as well as on the technically secure storage of the (private) signature key.

The theoretical security of cryptographic systems in common use today cannot be verified as the underlying problems are mathematically unprovable. However, one can consider the timeframes of the algorithms used to solve these problems. The security of RSA is based on two mathematical problems (the factorizing problem[1]) and the discrete logarithm problem[2])). If one of these problems were solved within a reasonable period, the algorithm would no longer be secure.

Today's minimum security level is 10^{12} MIPS years,[3]) which accounts for key lengths of 1,024 bits for RSA and DSA or 160 bits for ECC. The difference between key lengths required for various signature processes is already tremendous today but the gap will continue to widen for higher security levels (due to the mathematical problems underlying the individual processes).

As computer performance is constantly getting better and algorithms are improved all the time, the applicability of key lengths and cryptographic procedures has to be reviewed and possibly adapted to suit future signature needs on an ongoing basis. As described above in the section on certification-service providers, signatures on documents can be renewed, i.e. state-of-the-art signatures can be added to existing ones to counteract imminent reduction in security. However, this only makes sense if a time-stamp is used to prove that the signature renewal took place in due time.

1 *Specifically, RSA is about factorizing the value n (part of the public key) into its constituent parts, the integers p and q. The secret private key d can be calculated by using p, q and e (also part of the public key).*

2 *RSA deals with the calculation of the private key d from plain text M and encrypted text C, with C being generated from parts of the public key called n and e via* $C = M^e \bmod n$*: find the d for which* $C^d = M \bmod n$ *is true.*

3 *With a processor able to process one million instructions per second (MIPS),* 10^{12} *MIPS years would mean that on average, it needs a trillion years to crack the key.*

The state of the art method to store signature-creation data (private keys) and to protect them from unauthorized access is as follows: Ideally, the private key is generated inside the signature-creation device where it is not readable. Special smart cards, called signature cards, are suited, for instance, to combine the three functions of key generation, private key storage and signature creation in one medium. Authorized access to the signature function of the smart card (i.e. the encryption of the hash value using the private key) can be gained e.g. via a PIN code which is only known to the signatory.

Thus, the security of an electronic signature depends on the security of the smart card technology used. For this reason, smart cards have to be secured comprehensively because there are potential attackers with diverse know-how and resources. Usually, relevant expert knowledge comes from the field of semiconductor technology as well as software and hacking techniques or even from the specific structure of the chip under attack. Resources range from simple PCs, smart card readers and software routines that can be downloaded from the Internet, to complex smart card testing and measuring devices, which are often even commercially available. Moreover, there is ample published material on attacks.

In principle, we can distinguish between four attack techniques:

– Microprobing, the attempt to get directly to the surface of the chip to carry out measurements or manipulate the behavior of the chip;
– Software attacks, in which the usual communication channel of the chip, the interface, is used to detect possible vulnerabilities in the communication protocol or in the implementation of the cryptographic algorithm;
– Eavesdropping, when so-called side channels[1]) – which include the voltage and current curve in the electricity supply and the electromagnetic field – are monitored with high time resolution;
– Fault generation, the attempt to generate malfunctions in the chip – e.g. by reducing supply voltage – so as to make the information on the chip accessible.

In differential power attacks – one example of how imaginative attackers are – power consumption measurements are broken down into two groups[2]) on the basis of assumptions about parts of the key while input or output values are known (data or encrypted files); subsequently, the mean values are established for the measurements for each group (to reduce the noise) and then deducted from one another. If the assumption corresponds to reality – and the groups were formed correctly – an unprotected system will show a characteristic peak in the measurement curve where the part of the key which had been guessed was applied during encryption; this is the case because power consumption when processing a 1-bit is typically different from power consumption when processing a 0-bit.

1 *Therefore another common name is "side-channel attack."*

2 *Depending on whether 0 or 1 is expected to be the bit computed from the assumed portion of the key and the known value.*

In timing attacks, which can be regarded as a type of eavesdropping (via the timing side-channel), the time a smart card needs for the electronic signature is measured; here, attackers make use of the fact that the times which cryptographic systems require to output different input values vary, albeit very slightly.

Measures to counter different types of attacks range from built-in random changes in the clock frequency to the destruction of testing contacts used in the production process and additional layers added in the metallization process.

Signature Creation and Verification Security

For security reasons, the technical components used by signatories and the procedures for the creation of electronic signatures must allow the full display of the data to be signed. After all, one of the major security risks is that the data a signatory sees on his computer screen do not correspond to the data actually sent to the signature-creation device. In other words, it has to be ensured that "what you see is what you sign."

The data to be signed must be in special data formats. If dynamic changes[1]) or invisible data can be encoded in a format, the relevant codes must not be used.

A secure viewer can offer protection from dynamic documents and hidden content, or from signing a document different from the one shown on screen. Secure viewers may come as software or additional hardware.

After the content of the data to be signed has been verified, the hash value is computed. Good-quality cryptographic hash functions should in practice arrive at an unambiguous representative for each message.

Secure hash functions must have the following two properties; they must be

– collision-free: It is hard to find two messages which hash to the same value.[2])
– one-way: It is hard to find a message relating to a given hash value.[3])

Apart from the quality of hash functions used, another fact contributing to the improved fulfillment of these two requirements is the length of hash values; the longer the hash values prescribed in a concrete specification, the better the outcome. Hashes commonly used today are 160 bits long, which results in 2^{160} different individual hash values.

In general, it will most likely be considered useful to also implement the hash algorithm inside the smart card where the private signature key is stored and the actual signature function is carried out. Special precautions must be taken if the hash value is computed externally so as to avoid a signature being foisted upon the signatory. To make sure that the hash value signed on the smart card is identical with the hash value computed on the PC, the smart

1 *One example would be date dependency, i.e. a different content is shown as from a certain date.*

2 *Otherwise, it would be possible to submit a message for electronic signing while another message – having the same hash value – has been prepared to be subsequently foisted upon the signatory because the electronic signature is identical.*

3 *Otherwise, it would be possible to construct for a given hash value a message with a different content and subsequently to foist it upon the signatory.*

card reader may contain a small extra display. As is the case with the cryptographic key, hash functions also need to be adapted to improved computer performance and better algorithms; signature renewal might be required as a consequence.

Once the hash value has been generated, the signature as such can be created. The signature function in the signatory's signature-creation device must be designed in such a way that it can only be triggered after an authorization code (e.g. PIN input or fingerprint) has been applied; otherwise the procedure would not be secure. Unauthorized attempts to access the authorization code must be blocked by the code design and effective blocking mechanisms. The same authorization code must not be used in different applications (e.g. signature and ATM functions).[1]) The system elements must not store the authorization code input. There must be nothing to facilitate input when authorization codes are entered repeatedly. To avoid the code from being stored in the PC or tapped, a smart card reader with a built-in keyboard can be used.

Eavesdropping can e.g. be done via so-called Trojan horses. These are programs pretending that they perform a certain function while their actual purpose is entirely different. They often come disguised as new versions of popular software and once installed, they start working in a detrimental way in the background while the user is completely unaware of this.

One approach to counter the attacks of Trojan horses is the use of secure hardware, with the user's PC only serving to supply the data to be signed, while the signing process takes place in a secure hardware environment. No additional software can be installed on such secure hardware — hence there is no chance for Trojan horses. Secure software is e.g. based on procedures in which the Trojan horse gets information about a signature process when it is too late for intervention.

When verifying the signature, it has to be made sure that signature, signatory and document signed correspond to the available data in the case of an electronically signed document, and conversely, it must also be clear which data the electronic signature pertains to.

Security risks arising in this context are comparable with those connected with signature creation because again, precautions must be taken to avoid that things happening in the computer only seem to be what the user believes. Moreover, users must rely on systems outside their own sphere of influence, i.e. directory and revocation services, to check certificates offered by certification-service providers.

Aside: Authentication and Confidentiality

When business is conducted in cyberspace, it might be required for the parties (who, e.q., are about to sign a contract) to authenticate each other, and for negotiations to be confidential in nature.

So-called identification protocols enable one communication partner (the verifier) to be sure about the identity of the other partner (the

1 *On the one hand, the signaling effect would suffer (entering the authorization code triggers off the signature), on the other hand, there would be more of a chance for spying in case of PIN use.*

claimant). For the purpose, the verifier provides a challenge to the claimant which the claimant can only fulfil if he knows a secret. The verifier will recognize the claimant's identity if the solution (response) is correct. This procedure can be carried out with a signature process. If the claimant wants to identify himself vis-à-vis the verifier, the verifier will provide him with a random challenge which he will sign and return.[1]) The verifier gets the response (signature) and checks the identity of the claimant via the signature. If the two partners reverse the procedure, they will both be authenticated. In this process, it is important for the claimant to have an authentication key (not just the public key for the electronic signature replacing the physical signature) that is tamper-proof, i.e. certified.

Confidentiality can be safeguarded in that the messages to be sent are encrypted by means of the public (authentication) key of the recipient, or sender and recipient agree to use a joint symmetric key which – at the same security standard – works faster, e.g. via key transport procedures. These include one-pass transport systems where the key data to be transported are encrypted using the recipient's public key.[2]) Three-pass transport systems involve an additional signature process in which the key to be sent is signed with the sender's private authentication key. This way key authentication for the key transported by means of the one-pass system is ensured. In principle, the signature key pair can also be used for authentication and confidentiality, provided that the security requirements are met. However, this would not make sense because a signature function has to be triggered deliberately and by using an authorization code. Someone who is seeking authentication would have to add an electronic signature to, for instance, a document containing his name. Someone seeking confidential communication would have to add his electronic signature to a document containing the proposed joint symmetrical key.

It seems more sensible or it may even be the only practicable solution to use a second pair of keys for authentication and key negotiations. For security reasons, the algorithms and key lengths used should be similar to those for secure electronic signatures replacing physical signatures. The decision on whether an authorization code in the shape of a PIN should be used for these keys may be left to the card holder. However, in general, it will make sense not to use a PIN because inserting a smart card with an authentication key into a smart card reader suffices to signal that someone is seeking authentication and possibly negotiation on keys.

Apart from these developments, systems enabling authorities to access encrypted messages have already been developed. This could be accomplished

1 *The signature on the challenge of a verifier should not be confused with the signature on a document (as will be described below). The only common feature is that the technical process is the same. The verifier will not necessarily be able to differentiate between a random figure as a challenge and the hash value of a document (which value may have been foisted on him). If the latter was signed on the understanding that it is a random challenge, this would mean that the document (pertaining to the hash value foisted upon the party concerned) was signed. This is a problem of display (see above under the heading "Signature Creation and Verification Security"). For this reason the pairs of keys used for authentication or confidentiality (see below) are different from those used for secure electronic signatures (to substitute handwritten signatures).*

2 *In this context, please refer to "Aside: Hybrid Processes" under "Cryptographic Background".*

via key escrow systems which provide keys and store them in archives for possible authorized access by the authorities; it would then be mandatory to go through the key escrow. This article will not discuss the pros and cons of introducing an obligation to give authorities access to encrypted communications. On the whole it can be doubted whether such procedures can at all produce the desired results, given the wide variety of options offered by steganography. In this context, steganography refers to techniques which make it possible to hide messages or files in other files. For example, invisible and encrypted data can be hidden in an image file while the fact that such data are actually encrypted would remain undetected (thus, it would be impossible to identify any violation of the potential obligation to give authorities access to encrypted communications, which has been tentatively considered).

Comparison with Other Procedures

When we compare an electronic signature – provided that it is secure – with a handwritten one, the former will offer more security for a number of reasons: certificates ensure that a secure electronic signature can be attributed to one specific person, even if that person might not be personally known (authentication is safeguarded). An electronic signature is different for each document because it changes with the content of the document. In contrast to a handwritten signature, it cannot be copied onto another document (prevents repudiation) and the document cannot be changed while the signature remains the same (data integrity is safeguarded).

Using a TAN (transaction number) to communicate along with the data can serve the purpose of authentication if each TAN disseminated has been assigned to one single person only. However, a TAN does not depend on the content of a document which is why this method cannot ensure data integrity or prevent repudiation.

Implementation[1])

The following section will show that the concrete implementation of secure electronic signatures (in Austria) seeks to set up a legal framework for the cryptographic and infrastructural background described herein, while attending to the security issues (which have also been described earlier); in particular, security issues are to be subject to regulatory supervision, secure electronic signatures are to be introduced in such a way that they can be used in public administration, and (internationally) compatible processes are to be applied.

The Austrian Legal Framework

Directive 1999/93/EC of the European Parliament and of the Council of 13 December 1999 on a Community framework for electronic signatures (Electronic Signature Directive) maps out the basic outlines of a European infrastructure for electronic signatures.

1 *See A-SIT (2000); Karlinger, G. (2000); Posch, R. (2001); Posch, R. and Leitold, H. (2001); Austrian Signature Act; Austrian Signature Ordinance; EU Electronic Signature Directive; www.a-sit.at; www.buergerkarte.at; www.signatur.rtr.at = www.signatur.tkc.at.*

The Austrian Signature Act[1]) (SigG) transposes the EU Signature Directive into Austrian law.

Pursuant to the Signature Act, so-called secure electronic signatures are treated as equivalent to handwritten signatures with very few exceptions[2]) (Article 4 SigG). The legal effectiveness of an electronic signature and its use as evidence cannot be ruled out merely because it does not meet the requirements of a secure electronic signature or other specifications under the Signature Act (Article 3 SigG).

According to Article 2 SigG, a secure electronic signature is an electronic signature which

a) is uniquely linked to the signatory;
b) is capable of identifying the signatory;
c) is created using means that the signatory can maintain under his sole control;
d) is linked to the data to which it relates in such a manner that any subsequent change of the data is detectable,
e) is based on a qualified certificate and created by means of the technical components and procedures meeting the security requirements as laid out in the Signature Act and the ordinances issued on the basis of that Act.[3])

A qualified certificate is one that contains certain information (Article 5 SigG) and is issued by a certification-service provider fulfilling certain requirements (Article 7 SigG). The most important features of a qualified certificate are the facts that the identity of the signatory has been checked by means of an official photo ID and that the certification-service provider has to meet stringent requirements, especially as regards the technical components it uses (Article 2 SigG).

Pursuant to the Signature Act, the Federal Chancellor has to issue the relevant legal provisions by mutual agreement with the Minister of Justice; these take the shape of ordinances implementing the federal act in keeping with the respective state of the art (Article 25 SigG).

The Signature Ordinance (SigV)[4]) governs matters such as fees, the budget for and technical issues pertaining to the Austrian infrastructure for electronic signatures. For example, Annex 1 of the ordinance lists parameters for technical components and procedures for secure electronic signatures (e.g. key lengths), while Annex 2 is about technical procedures and formats, such as hash procedures for secure electronic signatures as well as processes for the creation of secure electronic signatures (encryption of hash values).

1 *Signature Act, Federal Law Gazette I no. 190/1999, as amended by Federal Law Gazette I no. 32/2001.*

2 *This includes matters under domestic relations law and the law of succession, fields where public attestations, court certifications or notarizations as well as notarial deeds play a role, or when surety bonds are involved.*

3 *The definition of a secure electronic signature in the Austrian Signature Act corresponds to the definition of an advanced electronic signature as found in Article 2 of the Electronic Signature Directive. In addition, the concept of a qualified certificate is explicitly included in the definition, and the use of a secure signature-creation device is an implicit requirement ("Use of technical components …").*

4 *Ordinance of the Federal Chancellor on electronic signatures, Federal Law Gazette II no. 30/2000.*

Extension: The Citizen Card

Although the legal framework for the use of electronic signatures to replace handwritten signatures has already been created in Austria, further legal and organizational steps are required for the actual use of electronic signatures, e.g. in public administration (on the part of the citizens and the administration) so as to simplify procedures.

At a closed meeting of the government on November 20, 2000, it was decided to use smart card technology to speed up administrative procedures for citizens. To this end, the new social security card – for which the main Association of Austrian Social Security Institutions has invited tenders – is to be complemented by electronic signatures and turned into an open-design citizen card.

"The Austrian citizen card considers itself as an instrument supporting migration towards modern administrative processes close to the citizens via information technology (IT)."[1]) It is to be the key technology in the hands of the citizens which allows them to interact with public administration electronically throughout while proving their identities via the electronic signature. Vice versa, public administration is to become more efficient via e-government processes so as to offer better services in a more cost-effective way.

From the angle of technology, data (first name, surnames, etc.) can thus be attributed to people in a legally valid way, and electronic signatures render electronic business and administrative transactions possible.

"For the implementation of the citizen card administrative processes have to be made fit for the use of electronic signatures. This will be the decisive step required to eventually implement the desired automation of administrative processes. Even though applications in the administration need not be adapted to the smart card (…) the mechanisms of transfer and reception of electronically signed documents have to be integrated into processing. Moreover, the mechanisms of verifying electronic signatures and the required interfaces with directory and revocation services have to be implemented. (…) Some legal provisions presently contain obstacles (e.g. the act on the service of judicial documents [Zustellgesetz], the act on general administrative proceedings [Allgemeines Verwaltungsverfahrensgesetz], and the student directory ordinance [Evidenzverordnung]) which have not been entirely overcome under the general rules of the Signature Act. In some cases, interpretation will be required, in other cases an expedient adaptation of the law will be useful."

Regulatory Measures in Austria

Pursuant to Article 13 SigG the Telekom-Control Commission is the supervisory authority in charge of monitoring adherence to the provisions of the Signature Act.

The tasks of the supervisory body include, without being limited to, the following:

1 *Passages under quotation marks are literal quotations from Posch, R. and Leitold, H. (2001) in OeNB translation.*

– monitoring of compliance with the specifications made in security and certification concepts;
– monitoring the use of suitable technical components and procedures in cases where secure electronic signatures are provided (Article 18 SigG);
– accrediting certification-service providers pursuant to Article 17 SigG; and
– performing organizational supervisory duties for the confirmation bodies[1]) (Article 19 SigG).

In principle, each provider may decide independently which security and certification concepts he uses. The supervisory authority is only to verify whether the provider adheres to these concepts to ensure that the provider does not fall short of its own published security standards. However, providers of qualified certificates or secure signature procedures are also required to fulfill a number of minimum requirements stipulated in the Signature Act and the Signature Ordinance. The supervisory authority then monitors adherence to these standards. Providers that supply secure electronic signature procedures may obtain accreditation by the regulatory body before they start rendering such services.

The supervisory authority has a statutory obligation to maintain electronic directories of certification-service providers which are generally valid and updated at all times.[2]) These directories are to meet the same security criteria that have to be met by the qualified certification-service providers.

In accrediting[3]) a certification service provider, the supervisory authority confirms that this certification-service provider fulfills the requirements as laid out in Article18 SigG and that it is capable of supplying secure electronic signatures.[4]) The supervisory authority is in charge of ongoing supervision (Article 17 SigG) of the certification-service providers it has accredited.

In carrying out its supervisory tasks, the Telekom-Control Commission uses the services of the Austrian Regulatory Authority for Broadcasting and Telecommunications (Rundfunk und Telekom Regulierungs-GmbH, RTR-GmbH; a limited-liability company under Austrian law for the regulation of broadcasting and telecommunications, Article 15 SigG), which is also the operational office of the Telekom-Control Commission.

RTR-GmbH is responsible for, among other things, maintaining the above-mentioned directories of certification-service providers. If there are well-founded reasons to suspect that the security requirements under the Signature Act are not being met, RTR-GmbH may directly issue a temporary order to force a provider to discontinue its activities immediately or take suitable, more lenient measures.

1 The term "confirmation body" will be defined at a later point in this chapter.

2 As per October 15, 2001, five certification services (which are still active) have notified the supervisory authority of their activities as certification-service providers. One provider has ceased to operate, one notification was rejected due to lack of jurisdiction.

3 As per October 15, 2001, no certification-service provider was accredited by the Telekom-Control Commission.

4 This attestation concerning the fulfillment of the security requirements is informative in nature and specially valuable for users of electronic signatures as they are usually not in a position to appraise the situation on their own.

In technical matters the supervisory authority for electronic signatures uses the services of one of the confirmation bodies which it also supervises.

As to technical components and procedures for the creation of secure signatures a confirmation body has to attest that the security requirements have been met (Article 18 (5) SigG). These attestations have to be submitted along with the notification to the supervisory authority for electronic signatures stating that a certification service provider is launching operations. The absence of such attestations is considered a major security flaw.

The association Secure Information Technology Center – Austria (Zentrum für sichere Informationstechnologie – Austria, A-SIT) was the first confirmation body recognized by under the so-called A-SIT Ordinance.[1]) Thus, A-SIT was the first and still is the only Austrian confirmation body. Attestations are public documents, they are accessible via the A-SIT website.

One task of the confirmation body is to support the supervisory authority (i.e. the Telekom-Control Commission and RTR-GmbH) in technical matters. This also involves the ongoing observation of technical developments to safeguard the security of components and procedures used. In this context, proposals are made for supplements to or the adaptation of the technical provisions under the Signature Ordinance concerning cryptographic algorithms and key lengths. For this purpose A-SIT is also involved in international activities regarding electronic signatures and cryptography.

Compatibility

Web transactions involving clients of different certification-service providers require the cross-border recognition of electronic signatures as well as the technical compatibility of systems used by the clients of different certification-service providers.

As regards legal recognition, Article 24 SigG stipulates that certificates issued by a certification-service provider established in the European Community or the European Economic Area the validity of which can be verified in Austria are equivalent to domestic certificates. Qualified certificates of such certification-service providers have the same legal effect as domestic qualified certificates. Certificates issued by a certification-service provider established in a third country the validity of which can be verified in Austria are recognized in Austria. Moreover, under certain conditions these qualified certificates may also be considered legally equivalent to domestic qualified certificates.

The question of whether the validity of a certificate can be verified in Austria is significant: Above all it requires that the revocation service of the certification-service provider is accessible from Austria. This is normally the case.

Regardless of the legal validity of the certificates, a criterion of primary relevancy is whether the recipient of a signed message trusts the certificate

1 *Ordinance of the Federal Chancellor concerning the fitness of the association "Secure Information Technology Center – Austria" (A-SIT) as a confirmation body, Federal Law Gazette II no. 31/2000.*

and accepts it. Private recipients prefer domestic certificates simply because they know the domestic certification-service provider better or find it easier to understand the language of its certification concept. However, governmental bodies must not discriminate against foreign certificates (at least within the EU single market). In practice, users will consider certificates of business partners as qualified if their own certification-service provider regards them as qualified (see also "Certification-Service Provider," under "Infrastructural Background").

As to technical compatibility, the Signature Act and the Signature Ordinance leave ample leeway to the free market. However, the instructions for aspects central to the security of the electronic signature are clear. This method also results from the EU directive, for which reason the procedures for hashing as well as the cryptographic procedures applicable to electronic signatures are laid down clearly. International harmonization also plays an important role in this context.

In practice, users will be able to check the electronic signatures of their business partners even if they use signature-creation processes that are different from the ones used by the partners (but nevertheless common); verification is a mere software problem and does not require additional hardware. Just like texts written in other common word processing programs can be read in by one's own word processing program, electronic signatures originating from other processes can be read and checked by one's own system (however a software update might be required).

Extension: XML

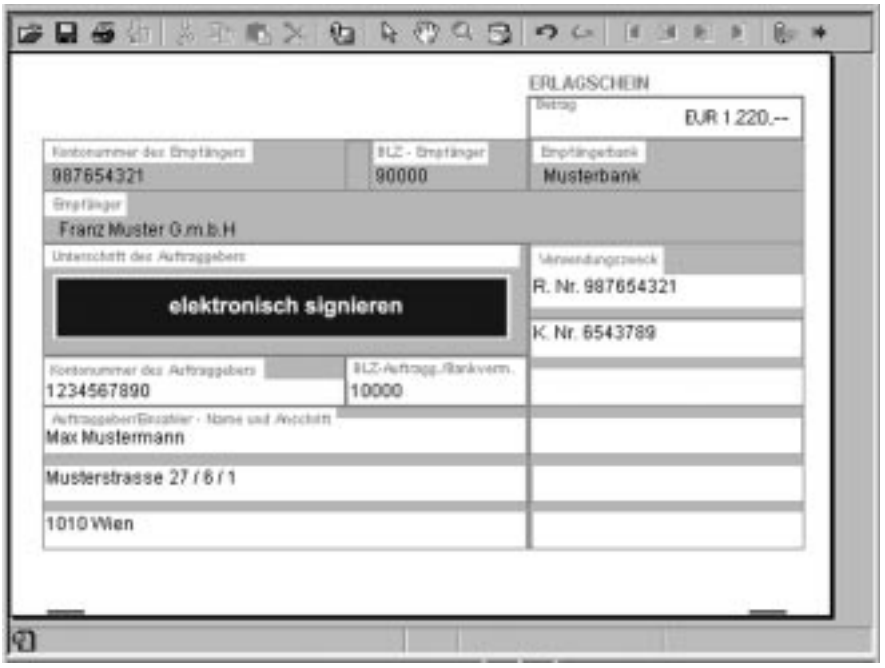
Extensible Markup Language (XML) is a descriptive language for documents containing structured information. Structured information comprises actual contents (text, images, etc.) and pointers to the roles which the contents play within a document. XML is specified at the international level and fit for signatures; a signature format – the XML signature – even uses XML to represent electronic signatures.

While HTML (Hypertext Markup Language), the most common Internet language today, focuses on the presentation of content, XML defines the presentation of content in separate style sheets after content has been described in detail. Style sheets can be designed for the computer platform used or the preferred language while the actual content in XML is independent of the system and platform, which allows for multi-lingualism and enhances compatibility.

For instance, the transfer form in the following practical example could be designed as a mask in German and English or in any other language using different style sheets. The user would sign the actual content (amount, transferor, etc.) while the style sheet would be regarded as part of the viewer, allowing for the form suitable in the respective case (language, computer platform).

Practical Example[1])

The following illustration shows a credit transfer form to demonstrate that secure electronic signatures can be applied in a very user-friendly way.



What the users see on their screens is a conventional payment slip. The only difference between this form and the hard copy version is the box "elektronisch signieren" ("sign electronically") where the transferor's handwritten signature has to be placed in the hard copy version. By clicking on the box the actual electronic signature process is triggered (request to place the signature card in the smart card reader, secure display, hash value computation, PIN input, etc.). Other orders for payments or securities transactions could be designed in a similar way.

Similarly electronically signed notes confirming successful payment or securities transactions can be displayed on screen on accustomed forms. Programs can carry out secure checks of related signatures in the background, either automatically or at request, and display them for the user. Updated information on stock exchange quotations might e.g. be secured by authentication keys[2]) (on request), and checks of such keys could again be run automatically as a background task.

With the exception of the security rules defined by the certification-service provider, the security requirements, complex technology and infrastructure underlying electronic signatures go unnoticed by the user.

1 *See A-SIT (2000).*

2 *Updated information on stock exchange quotations are usually not documents in nature but they should be authentic anyway (i.e. have been sent by the legitimate sender) which is why the use of secure electronic signatures (to replace a handwritten signature) does not seem indicated.*

Summary and Outlook

Secure electronic signatures as laid out in the Signature Act, and procedures based on the related methods are suited to protect the flow of information in payment and securities transaction systems, thus making an infrastructural contribution to financial stability.

The complex topic of electronic signatures – including the many security issues that need to be borne in mind – has been integrated into Austrian signature legislation. In spite of the underlying complex processes, the application of secure electronic signatures can be designed in a very user-friendly way.

In the future, it remains to be seen if and how fast the systems offered in the market will spread and be accepted.[1]) The process might be accelerated by the introduction of the citizen card or the interest of banks in security technology.

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2 *All Internet addresses as per October 15, 2001.*

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www.esat.kuleuven.ac.be/~bosselae/ripemd160.html: Personal Page. The hash function RIPEMD-160.

www.buergerkarte.at: Website of the Forum Bürgerkarte.

www.signatur.rtr.at = www.signatur.tkc.at: Website of the regulatory body for electronic signatures.

Assessing the Probability of Downturns in the German Stock Market

Ernst Glatzer,
Martin Scheicher

Introduction

Modeling the probability density of stock prices, stock indices, interest rates or exchange rates has received increased attention in recent years. Probability density functions (PDFs) measure market uncertainty about how much prices of financial instruments may rise or fall. Financial market analysis focuses on the left-hand tail of PDFs, i.e. on determining the probability of sharp declines. Sharp market downturns are not a rare occurrence, as evidenced by the 1987 stock market crash, the turbulences of August 1998 and the international stock market decline that started in March 2000. Since sharp stock price falls may make heavy inroads in the securities portfolios of financial institutions, they are a potential threat to the stability of the financial system. When crucial risk factors are monitored closely, it should be easier to identify emerging crises and to take timely action to avert negative consequences to the economy.

In financial econometrics two approaches are used to estimate a density function from asset returns. The traditional approach is to recover actual densities from historical return time series using a parametric model, such as Student's t distribution. A more recent approach is to estimate risk-neutral densities (RNDs) from option prices. Risk neutrality of investors is an assumption widely maintained in valuation models; it implies that the expected return of securities generally equals the risk-free rate of return. This second approach extends the widely used model of implied volatility in order to describe market uncertainty about the future fluctuation of the assets upon which options trade.

The purpose of this paper is to study the risk-neutral distribution derived from DAX option prices with a view to quantifying the probabilities market participants attach to different levels of the underlying asset price. This approach is thus considerably more comprehensive than an approach based purely on historical return series, and it has the added advantage of being future-oriented, since it produces a measure of the variability of DAX index prices that market participants anticipate until option expiry. Like yield curves, implied volatilities and densities are forward-looking variables. The future-orientedness of market participants can typically be explained by the factors that determine the price of a stock. Put simply, the value of a stock can be seen as its discounted expected payoff. In essence, today's prices are driven by market expectations about a given company's future profit performance. This is why the prices at which securities trade now can be used to infer expectations of future developments for different variables, such as interest rates across a range of maturities.[1])

Our sample consists of option prices, futures contracts and DAX index data spanning the period from January 1999 to September 2001, thus capturing both the latest rise and fall in German stock market prices. This enables us to analyze changes in market expectations during this turbulent phase, and to illustrate how market participants reacted when the "irrational exuberance" ended. Given the high liquidity of the DAX derivatives market

1 *Söderlind and Svensson (1997) offer a general overview of financial market indicators; Jackwerth (1999) presents different approaches to estimating implied density.*

and the depth of the market that the DAX tracks, this index, while not representative of the euro area as a whole, allows for the production of more precise estimations than euro area-wide contracts and thus offers more detailed insight into market expectations.

This paper is organized as follows: Section 2 outlines the methodology used to estimate the implied probability density, section 3 presents the results plotted into charts, and section 4 concludes.

Methodology

Options are derivative contracts that are used to take speculative positions or to hedge investment portfolios. They convey the right to buy or sell a particular asset at a fixed price (strike price) on or before a specified future date. Contrary to futures contracts, only the seller of an option is obligated to perform, while the buyer may decide not to exercise an option. Options to buy (call options) are acquired in anticipation of rising prices, whereas options to sell (put options) are bought in anticipation of falling prices. European-style options can be exercised by the holder only on the contract expiration date, while American-style options may be exercised at any time between the date of purchase and the expiry date. Stock options are traded on exchanges in a standardized form; exchange rate and interest rate contracts are also traded over the counter in large quantities.

The current value of an option is largely driven by the difference between the current price of the underlying asset and the strike price. If the difference is positive, i.e. if the underlying asset is worth more than the strike price, the holder of a call option stands to make a profit. Should the strike price of a call option lie above the current underlying asset price, this does not render the option invaluable as such, because the difference may yet turn positive until the option expires. In other words, the value of an option largely depends on how the price of the underlying asset develops over the life of the option. An important measure in this respect is how widely spread the prices are around the expected value (variance). For the holder of a call option, an option is the more promising the bigger the volatility of the underlying asset is. If the price of the underlying asset is much higher than the strike price, the value of the option increases considerably. Since options are future-oriented, market participants must anticipate the variances for the period until the contracts settle. These expectations are key drivers of option prices, which is why the observed prices of traded options "implicitly" account for the volatility or probability density that market participants expect the underlying asset prices to have until an option expires.

The implied risk-neutral density (RND) reflects expectations of the probabilities market participants attach to different levels of the underlying price, thus giving it a higher explanatory power than the measure of implied volatility, which generates only part of the information contained in density data. The density function fairly accurately describes how widely the stock prices market participants anticipate are spread around the expected value, and how probable price moves of which magnitude are from a present point of view. The density function also shows how probabilities change over time. Specifically, analysts study the skewness – or asymmetry – of the implied

density. As the skewness for a normal (Gaussian) distribution is zero, the skewness coefficient shows whether prices are more likely to increase or to decrease. The RND produces risk-neutral measures of the symmetry or lack of symmetry of the returns. In the following the results presented heuristically above are specified in equations.

A central result of financial market theory is that the theoretical price of a European-style call option equals:[1])

$$c(X,T) = e^{-rT} \int_X^\infty (S - X) f(S) dS$$

with

$c(.)$	price of a European-style call option
X	strike price
T	life of the option
$f(S)$	risk-neutral density of the underlying asset price
S	price of the underlying asset
r	risk-free interest rate

The above valuation equation shows that the price of a call option equals the expected (risk-neutral) option payoff, i.e. the discounted difference between the price the underlying asset commands on the option expiration day and the agreed strike price. Looking ahead, the value of an option expiring at T is influenced fundamentally by the probability of the underlying asset assuming higher or lower prices. This theoretical result illustrates the central role that the risk-neutral probability density plays in determining the theoretical price. Depending on the process assumed to be driving the underlying asset prices, the resulting theoretical option price will differ.

A very common choice is the Black-Scholes model (1973), which assumes that the price path of the underlying asset is described by geometric Brownian motion. This gives as theoretical price of a European-style call option

$$c(X,T) = SN(d_1) - Xe^{-rT}N(d_2)$$

with

$$d_1 = \frac{ln(S/X) + (r + 0.5\sigma^2)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}$$

with

$N(.)$	cumulative normal distribution
σ	volatility of the underlying asset price

Given that all other parameters are known, the Black-Scholes model allows for the estimation of the implied volatility. Thus it is possible to extract the variance forecast from the market price by numerical iteration.

1 *For an overview of option pricing models see Bates (1996).*

For the extraction of the RND, the Black-Scholes model is generalized. The RND model consists of the specification of the mixture of two lognormals for modeling the price path of the underlying asset (Melick and Thomas, 1997; Gemmill and Saflekos, 2000; or Jondeau and Rockinger, 2000). The mixture of two lognormal distributions $[LogN(.)]$ is defined as

$$f(S) = \theta LogN(a_1, b_1, S) + (1-\theta)LogN(a_2, b_2, S)$$
$$a_i = lnS + (\mu_i - 0.5\sigma_i^2)T$$
$$b_i = \sigma_i\sqrt{T}$$

with

θ	weighting coefficent of the lognormals $(0 \leq \theta \leq 1)$
μ_i, σ_i	mean and variance of the normal distribution
a_i, b_i	location and dispersion parameters of the lognormal distribution

The above specification of the stochastic process of the underlying asset price is based on two states with different moments, governed by the weights θ and $1-\theta$. In each state, the price of the underlying asset price is lognormally distributed. The assumption of a mixture of two distributions is flexible enough to generate a variety of PDF shapes deviating from the normal (Gaussian) distribution.

This property is required because the empirically observed PDFs of returns contrast sharply with the normal distribution produced by the Gaussian model (Pagan, 1996). This deviation results from two facts: first, large price changes occur more often than the normal distribution would suggest, and second, there are signs of asymmetry in stock returns. Empirically, negative and positive price moves are simply not equally probable. This empirical regularity is also apparent in the implied volatilities. If the implied volatility of an option is plotted against its strike price, the chart typically exhibits a U-shaped pattern, termed smile effect and extensively described in the literature. It reflects the fact that, contrary to the (one-lognormal) Black-Scholes assumption, the prices of options with widely dispersed strikes display significant deviations. Generally the above model allows for great flexibility in displaying market expectations of how the underlying asset price may develop during the time to maturity. In the literature the estimation results for a mixture of two normal distributions of stock prices point to a higher occurrence of low-volatility regimes than of high-volatility regimes. The latter are interpreted as a crash state in the literature. In the case of a single normal distribution, i.e. when the weighting coefficient assumes the boundary values of 0 or 1, the mixture model is identical with the Black-Scholes model.

We proceed as follows to estimate the implied risk-neutral density. Our sample consists of the closing prices for Eurex-traded European-style options and futures contracts on the DAX. A minimum of five strike prices are quoted for contracts trading on Eurex with a maturity of up to two years; for contracts with a maturity of up to six months a minimum of nine strike prices are mandatory. The contract value is EUR 5 per index point. The minimum price movement is EUR 0.5. The positions in options are marked to market

daily, and margin calls are made when the market moves against a position. The exercise date is the third Friday of the expiration month.

We use end-of-day settlement prices quoted 45 days before option expiry, in other words 45 days prior to the third Friday of every month. On average our data set covers 83 call or put option prices. This is a comparatively big sample, ensuring adequate precision of the estimation results. We repeat the calculation at monthly intervals, so that all calculations are based on constant maturities of one and a half months. Keeping the maturity constant is important because, as is evident from the literature, the implied volatility decreases as the option's expiry date approaches. Such effects make it harder to arrive at a straightforward interpretation of the estimates and are excluded effectively through the methodology of a constant 45-day horizon used here. As a proxy for the risk-free interest rate we use interbank interest rates. To match the 45-day horizon of the option with the maturity of the interest rates, a linear interpolation is applied.

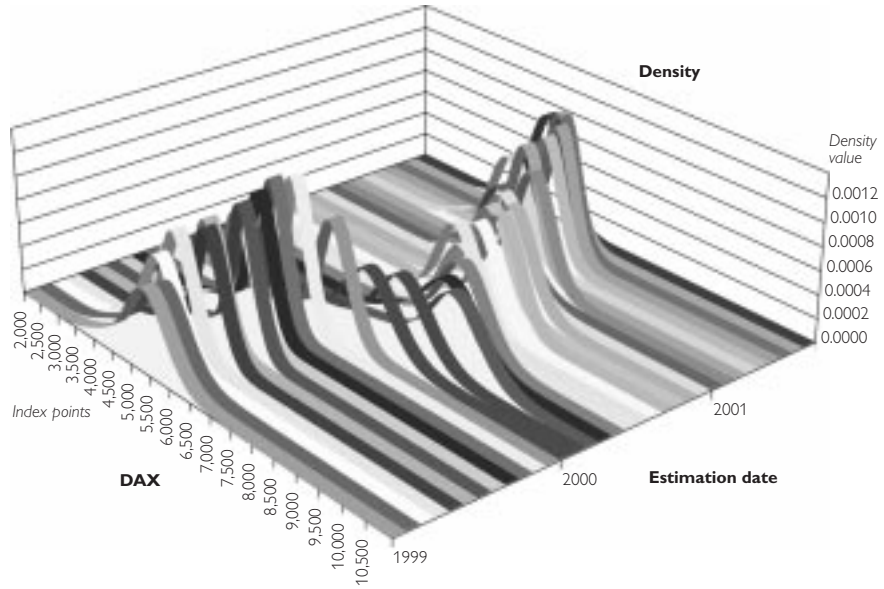
We use the nonlinear least squares method to estimate the five parameters of the lognormal distribution, i.e. we minimize the squared difference between the observed market prices and the theoretical prices based on the model outlined above. In this minimizing exercise we use forward prices to specify the mean. In the absence of arbitrage possibilities, the forward price thus equals the mean of the risk-neutral distribution. This restriction serves to simplify the estimation procedure. Another simplification is that the mixture model used to extract the theoretical option prices is expressed in a closed form. The results of this estimate that is based on a given day of the month and a single maturity are the joint density parameters that provide a complete definition of the RND. This allows us to produce a graphic representation of the probability density and to calculate the descriptive statistics. Our sample generates a total of 34 estimation results at monthly intervals, with the RND calculated for the period from early September to end-October 2001 being the last data point.

Empirical Results

Chart 1 summarizes the information from the monthly RND estimates in a three-dimensional graph. During our sample period, the DAX moves in a range of 2,000 to 10,000 index points. The relative frequency is plotted on the vertical scale in basis points. Around the mean we find significant movement in the probability mass distribution. The probability mass around the mean is lower initially, increases in the summer of 1999, decreases at the beginning of 2000, and finally rises again at the end of the sample period. The rises and falls in volatility that this chart reflects are a market measure of uncertainty about future price movements. A flatter distribution corresponds to a lower mass around the mean and thus higher volatility. In such case, market participants anticipate the index to fluctuate more strongly in the one and a half months ahead. The chart moreover indicates a comparatively high consensus of market expectations on future developments at all observation points. If market expectations were mixed, the distribution would be bimodal.

Chart 1

Risk-Neutral Densities at Monthly Intervals

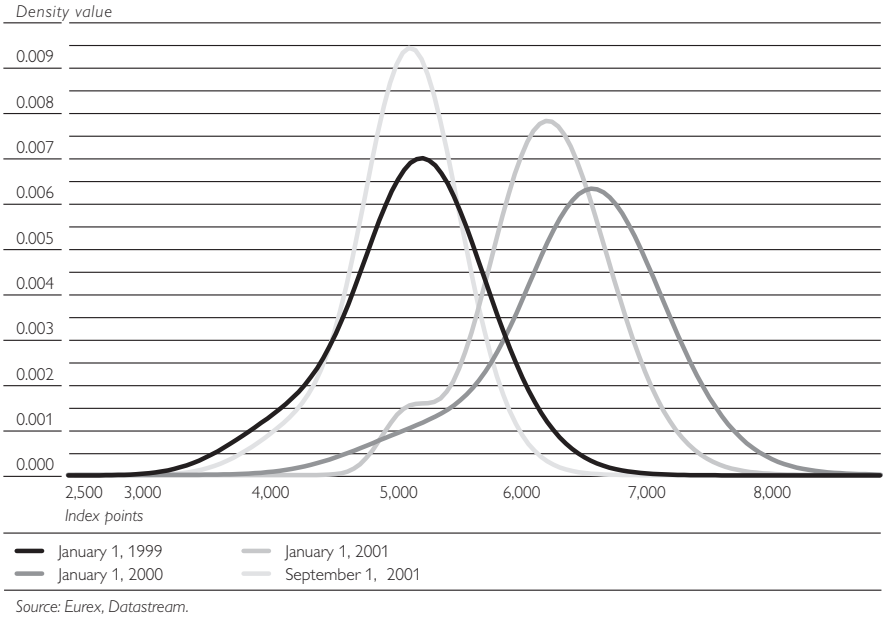


Source: Eurex, Datastream.

Chart 2 documents densities at yearly intervals (January 1999, January 2000, January 2001 and September 2001) and reflects a significant shift in the probabilities of certain index values. The shift coincides with the heavy decline of German stock market prices in the spring of 2000 on the tails of the U.S. stock market downturn. Consequently, the RND of January 1999 is very similar to the latest RND (September 2001), as the DAX lost much of

Chart 2

Densities at Yearly Intervals



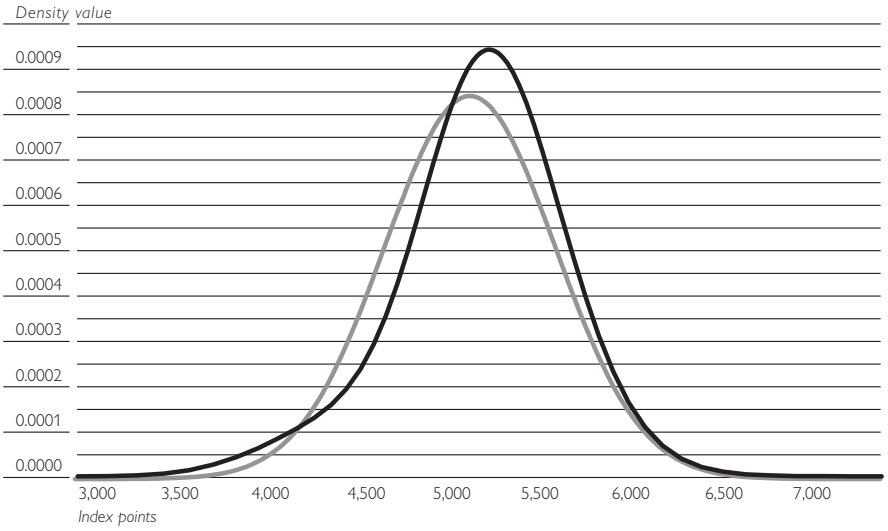
Source: Eurex, Datastream.

its earlier gains in the course of 2000. In January 1999, the right-hand tail of the RND stretched to more than 8,000 points, and the probability of the index dropping to 4,000 was almost nil. In the intervening years, this has become a lot more likely. Note also the hump toward the left of the density estimated for January 2001, which reflects an increased risk-neutral density for an index level of 5,500 points.

As mentioned already in the section "Methodology," the literature confirms that the empirically observed distribution contrasts markedly with the theoretical distribution suggested by the Gaussian model. For the DAX, this difference is shown in chart 3. The two distributions are found to intersect a few times, and the Gaussian distribution exhibits a higher mass around the mean. Large negative price changes, i.e. DAX values in the range of 3,500 to 4,000 index points, appear more probable in the density distribution extracted from option prices. This observation illustrates that marked price declines are in fact more frequent than the common Gaussian model would suggest.

Chart 3

Theoretical Distribution versus Normal Distribution

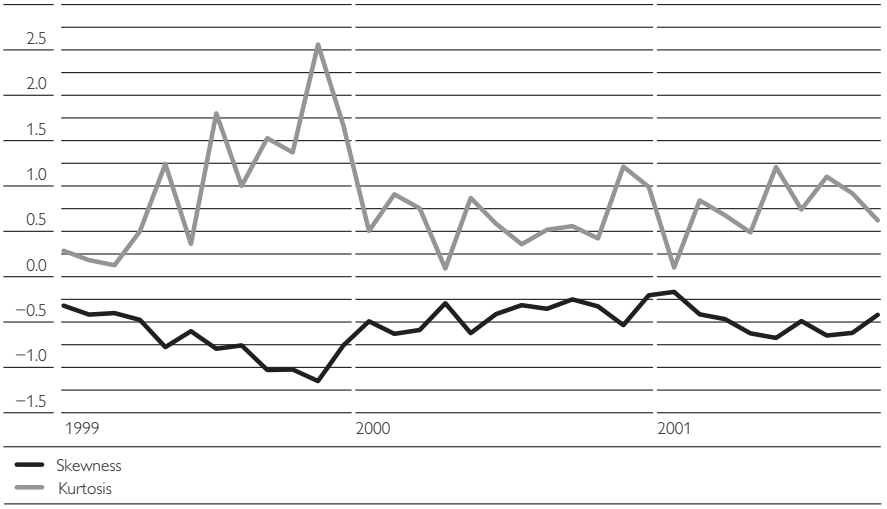


Source: Eurex, Datastream.

Chart 4 plots the time series of the higher moments of the distribution, namely skewness (third moment) and kurtosis (fourth moment). The first observation is that the risk-neutral distribution indeed deviates consistently from the hypothesis of Gaussian price changes, according to which both skewness and kurtosis would have to be zero. This not being the case at even a single sample point, the hypothesis of normally distributed price changes can be rejected. The skewness is a measure of the symmetry of market expectations. The observed option prices will tell whether market participants consider a rise in prices to be just as likely as a decline. The third moment fluctuates, but stays invariably negative. It averages –0.47 over

Chart 4

Skewness and Kurtosis



Source: Eurex, Datastream.

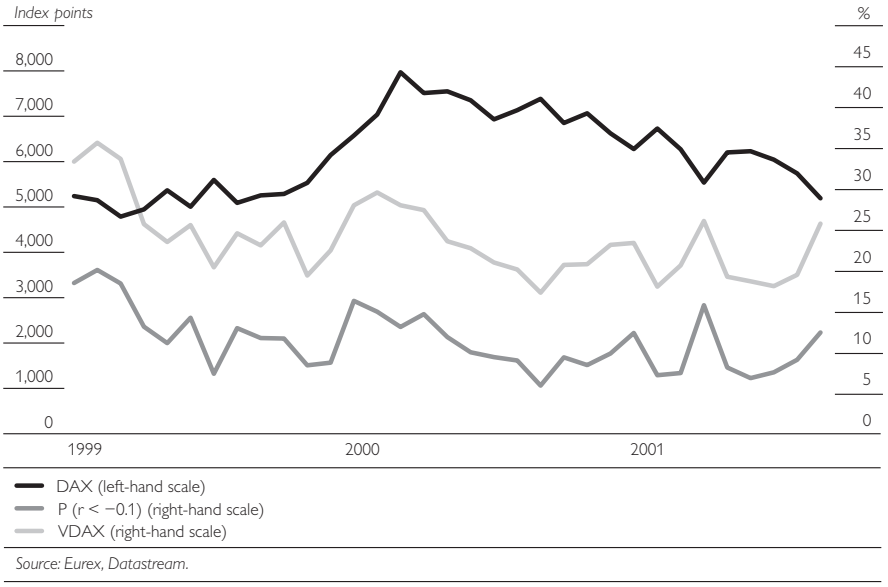
the whole period; minimum skewness is –1.13 and maximum skewness is –0.15. The persistent negative skewness means that price declines are more likely than price increases. In essence, market agents expect the German stock market, as tracked by the DAX, to lose rather than gain value over time. This observation was also documented for the U.S. stock markets and termed "crashophobia" (Jackwerth and Rubinstein, 1996). Fears of a crash emerged particularly after the events of October 1987. Turning to the fourth moment, kurtosis measures the fatness of the tails of the distribution, or how peaked a distribution is. It gives an indication of the frequency with which major price movements occur. The sign is not taken into consideration, since this aspect is already covered by the third moment. Kurtosis measures between 0.1 (April 2000) and 2.5 (November 1999), with a median of 0.74.

Chart 5 plots the development of the DAX, the implied volatility (VDAX) and the implied probability that the DAX will fall at least 10% below the currently expected value within the next 45 days. This probability is found to hover around 11%. Comparing this result with the actual relative frequency of price falls, we see that the DAX in fact declined with a frequency of 8% to 10% over rolling intervals of 45 days. In other words, the actual frequency of price declines is close to the mean of the probability expected by market participants. The small difference between actual and risk-neutral probabilities shows that the expectations of agents trading on option markets are not systematically flawed. The implied standard deviation and the probability time series are found to move in sync over time.[1]) Both the implied volatility and the implied probability peak in April 2001, when the DAX fell sharply. This implies that the probability of price declines is driven largely by stock price volatility. The implied volatility measured 23% on an annual basis during the observation period. Chart 5 moreover

1 *The correlation coefficient between volatility and probability is 0.96.*

Chart 5

DAX, Implied Volatility and Probability



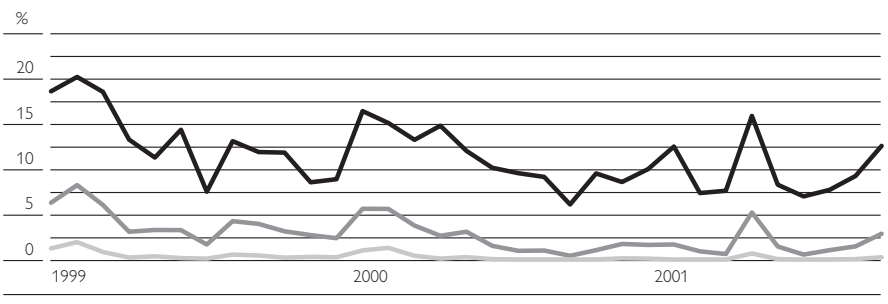
Source: Eurex, Datastream.

documents that the downturn in the German stock market since March 2000 was not matched by a permanently increased probability of further declines. Only since May 2001 there has been a marked increase in the downside risk-neutral probability, and thus in volatility, from 18% to 25%. The increase in both risk factors implies that market expectations about the future course of stock prices have turned increasingly pessimistic. In parallel, uncertainty on the stock market has risen.

Chart 6 shows the probability the market attaches to potential stock market falls over a 45-day horizon, notably the probability that prices may drop by 10%, 20% or 30%. A 30% decline is deemed very unlikely, with the likelihood lying within a range of 0% to 2%. By comparison, the market attaches a median probability of around 2% to a decline by 20%, while the measure for a 10% decline is as high as 11%. All three time series are significantly correlated, displaying a peak in April 2001 and a trough

Chart 6

Probability of Different Magnitudes of Price Declines



Source: Eurex, Datastream.

in September 2000.[1]) This implies that the balance of uncertainty is not very dependent on the percentile of risk-neutral density under observation.

Summary

The aim of this paper was to estimate and interpret market expectations of a decline of DAX values. The sample covers the volatile period from January 1999 to September 2001. We constructed a mixture of two lognormals that we estimated from market prices. The data estimated at monthly intervals show that market expectations of future uncertainty were fairly volatile over time. Most importantly, we find that market participants expect prices to go down rather than up. The probability of a 10% decline in the equity prices of companies tracked by the DAX over a horizon of one and a half months is shown to be 11% on average. Furthermore, our estimates document a discernable deviation of the empirical distribution from the normal distribution. Finally, our estimates show that previous downturns in the German stock market were not matched by an increase in the probability of further price falls.

To extend the results presented here, two approaches appear particularly promising. One approach could be to investigate in how far the results are model-dependent. For instance, alternative techniques to estimate RNDs could be compared, as Jondeau and Rockinger (2000) did for foreign exchange options. The other approach could be to undertake a detailed analysis of crash probabilities so as to learn more about how market expectations work. Such insight could best be gained by examining the underlying factors of the probability time series. Here, the role of the U.S. stock markets, other common risk indicators (such as spreads of corporate bonds or interest rate swaps), or macroeconomic variables could be evaluated through regressions.

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1 The correlation coefficients between the three probabilities are above 0.8.

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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
A-SIT	Secure Information Technology Center – Austria
ATX	Austrian Traded Index
BIS	Bank for International Settlements
B-VG	Bundes-Verfassungsgesetz (Federal Constitutional Act)
BWA	Bundes-Wertpapieraufsicht (Federal Securities Supervisory Authority)
BWG	Bankwesengesetz (Banking Act)
CEECs	Central and Eastern European Countries
CPA	Certified Public Accountant
CPI	Consumer Price Index
DAX	Deutscher Aktienindex (German Stock Index)
EBRD	European Bank for Reconstruction and Development
EC	European Community
ECB	European Central Bank
EEC	European Economic Community
EMU	Economic and Monetary Union
EONIA	Euro OverNight Index Average
ESCB	European System of Central Banks
EU	European Union
EURIBOR	European Interbank Offered Rate
Eurostat	Statistical Office of the European Communities
Fed	Federal Reserve System
FEFSI	Fédération Européenne des Fonds et Sociétés d'Investissement
FIRREA	Financial Institutions Regulatory Reform and Enforcement Act
FMA	Finanzmarktaufsichtsbehörde (Financial Market Supervisory Authority)
FMABG	Finanzmarktaufsichtsbehördengesetz (Financial Market Supervisory Authority Act)
FOMC	Federal Open Market Committee
FRAs	Forward Rate Agreements
FSLIC	Federal Savings and Loan Corporation
GDP	Gross Domestic Product
HGB	Handelsgesetzbuch (Commercial Code)
HICP	Harmonized Index of Consumer Prices
IAS	International Accounting Standards
IATX	Immobilien-Austrian-Traded-Index (real estate Austrian Traded Index)
IHS	Institut für Höhere Studien (Institute for Advanced Studies)
IMF	International Monetary Fund
LTCM	Long-Term Capital Management
NASDAQ	National Association of Securities Dealers Automated Quotation System
NBG	Nationalbankgesetz (Federal Act on the Oesterreichische Nationalbank)
NEMAX	stock price index on Frankfurt's Neuer Markt
OECD	Organisation for Economic Co-operation and Development
OeKB	Oesterreichische Kontrollbank (specialized bank for export financing, central depository for securities)
OeNB	Oesterreichische Nationalbank
P/E ratio	price/earnings ratio
ROA	return on assets
ROE	return on equity
SigG	Signaturgesetz (Austrian Signature Act)
TARGET	Trans-European Automated Real-Time Gross Settlement Express Transfer System
VAG	Versicherungsaufsichtsgesetz (Insurance Supervision Act)
VaR	value at risk
ViDX	Vienna Dynamic Index
VÖIG	Vereinigung Österreichischer Investment-gesellschaften
WAG	Wertpapieraufsichtsgesetz (Securities Supervision Act)
WIFO	Österreichisches Institut für Wirtschafts-forschung (Austrian Institute of Economic Research)