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FACTORS DRIVING RISK PREMIA

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ABSTRACT/RESUMÉ

Factors driving risk premia

This paper assesses the extent to which the fall in risk premia of a number of financial assets, which occurred throughout 2003, was due to improvements in factors specific to individual markets at that time or to general economic fundamentals coupled with OECD-wide abundant liquidity. Regarding the latter two factors, principal component analysis was used here to identify a common trend in risk premia in equity, corporate bond and emerging markets since early 1998. The analysis finds that both economic fundamentals and liquidity have played a statistically significant role in driving the common factor. It also finds that liquidity (measured as the GDP weighted average of M3 of the three major economies less its trend) performs better than similarly weighted short-term interest rates. By spring 2004, the common factor in different risk premia had fallen below what could be explained by economic fundamentals and liquidity.

JEL classification: C22, E44, G15

Keywords: Risk premia, factor analysis, principal components, fundamentals, liquidity.

Les déterminants des primes de risque

Ce document examine dans quelle mesure la chute des primes de risque de certains placements financiers au cours de 2003 peut être attribuée à l'amélioration de facteurs spécifiques à certains marchés durant cette période, ou aux fondamentaux associés à l'abondante liquidité dans les pays de l'OCDE. En ce qui concerne ces deux derniers facteurs, une analyse en composantes principales est appliquée afin d'identifier une tendance commune aux primes de risque dans les marchés boursiers, obligataires et les marchés émergents depuis le début de 1998. Cette analyse montre qu'aussi bien les fondamentaux que la liquidité ont joué un rôle statistiquement significatif concernant le facteur commun. De plus, la liquidité (évaluée comme la moyenne du M3 dans les trois principales économies pondérée par le PIB, moins la tendance) s'avère comporter un meilleur pouvoir explicatif que les taux d'intérêts à court terme (pondérés de manière similaire). Au printemps 2004, le facteur commun aux différentes primes de risque a chuté d'une façon qui ne peut s'expliquer uniquement par les fondamentaux et la liquidité.

Classification JEL : C22, E44, G15

Mots-clés : Primes de risque, analyse factorielle, analyse en composantes principales, fondamentaux, liquidité.

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FACTORS DRIVING RISK PREMIA

By Torsten Sløk and Mike Kennedy¹

I. Introduction and summary

1. For a number of asset classes (equities, corporate bonds and emerging-market debt), differences between their returns and those on risk-free government bonds -- *i.e.* their risk premia -- fell substantially starting in late 2002 and continuing well into 2004. In this paper, two possible explanations for this are explored. First, lower premia could have reflected a reduction in perceived risk of individual assets; this explanation is assessed in Section II by looking at developments in individual asset markets. Second, the synchronised nature of the changes across asset categories and national borders that occurred over this period suggests that possibly more general factors were at play. In particular, it has been argued that low interest rates over much of this period have generated abundant liquidity, which in turn sent investors on a hunt for yield, driving down risk premia, through portfolio effects across a variety of markets.² The extent to which this is the case is explored in Section III.

2. Anticipating the findings, the review of individual asset markets identifies some developments in economic fundamentals in each market that help explain the drop in risk premia that occurred. However, a number of signs -- especially an apparent lack of investor discrimination across asset classes -- indicate that the declines went beyond what can be accounted for by market-specific developments, suggesting that factors other than market- or country-specific events played a role in narrowing risk premia. In this latter regard, principal components analysis was used to isolate the common factor (defined as a variance-explained weighted average of the first two principal components) that had been driving risk premia in corporate, equity and emerging markets. This factor was then regressed on general economic fundamentals and OECD-wide liquidity,³ and it was found that both variables significantly explain movements in the factor driving risk premia in the period January 1998 to February 2004. The model also indicates that during 2003 both the OECD leading indicator and developments in liquidity have been important in pushing down risk premia although the role of liquidity was diminishing somewhat starting in late summer 2003. By early 2004, however, the driver of risk premia had fallen to the extent that the two variables combined were not able to explain the levels. In fact, the negative residual observed then was amongst the largest in the sample period (1998-2004), indicating that valuations appeared to have been substantially out of line with developments in fundamentals and liquidity.

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1. The authors are members of the Money and Finance Division of the Economics Department of the OECD. They would like to thank Jean-Philippe Cotis, Mike Feiner, Jørgen Elmeskov, Vincent Koen and Anne-Marie Brook for helpful comments and suggestions. They also wish to acknowledge the statistical assistance received from Catherine Lemoine and Laure Meuro and secretarial help from Paula Simonin, Sandra Raymond and Veronica Humi. The views expressed here are those of the authors and do not necessarily represent those of the OECD.
 2. Popular trades in a low or falling interest rates environment are the leveraged carry trade (where investors borrow short-term and place the money in higher-yielding longer-term bonds) and buying callable bonds for their high yield on the assumption that issuers will redeem these bonds quickly as rates fall.
 3. Liquidity is proxied by trend deviations of GDP-weighted money measures in the major three economies.

II. Recent developments in risk premia

Equity prices

3. The implied equity premium -- calculated as the earnings-price ratio minus the real long 10-year government bond yield⁴ -- fell during 2003 in most of the major economies. This development brought down the equity premium in the United States, Japan and the European Union (Table 1). A number of developments suggest that the overall health of the corporate sector had been improving at that time which could justify such a fall. Record low interest rates, both at the short and the long end of the yield curve, had allowed firms to restructure their balance sheets and get rid of more expensive debt. Combined with cost cutting and associated productivity gains, profits rose in some countries, particularly so in the United States. Indeed, US profits were high enough for internal funds to have been more than sufficient to finance investment projects, leading to the corporate financing gap turning negative and hitting its lowest level in decades. In Japan, as well, there were indications that profitability improved somewhat during 2003 and, by the end of the year, the gains, after being concentrated in manufacturing industries exposed to the external sector, began to be more broadly based. On the other hand, profitability did not show much of an increase in the euro area during that same period, although increases in equity prices were larger than and the decline in risk premia about the same as those in the United States.

4. However, several factors indicate that the decline in risk premia had gone beyond what could have been explained by improved corporate data. To cite one striking example: US equity valuations at the time reflected *inter alia* strong demand from households, which are often seen as less sophisticated investors. This is illustrated by the data for households' net flows into different kinds of mutual funds. Over the course of 2003, such substantial inflows into retail equity mutual funds were more than offset by outflows from money market funds. By early 2004, investors were buying equity funds at the same pace as they did during the stock market bubble in 1999 and 2000.⁵

Corporate bonds

5. Corporate bonds, both high-grade and high-yield, also experienced a dramatic compression of their risk premia. In particular, high-yield bond spreads, which had risen in the wake of corporate governance scandals, and were at a level of around 10 percentage points in both the United States and the euro area in the autumn of 2002, plunged to around 3 percentage points by March 2004 (Figure 1, top panel), although spreads in the spring of 2004 were higher than their lows in the summer of 1997. For high-grade bonds, a similar, although less dramatic pattern of spread compression was evident over this time period (Figure 1, lower panel).

6. On the positive side, the improved enterprise fundamentals that may have reduced equity premia could also have been affecting corporate bond spreads. However, signs of excesses were evident as well. For example, there were indications for both the United States, and particularly for the euro area, of much less differentiation in the pricing of debt from companies with a high-grade rating and those with a high-yield rating from January 2003 to April 2004. In particular, movements in high-yield and high-grade bond spreads over this time period appeared to be much more correlated than was previously the case (Figure 2). This lack of differentiation and high correlation between different asset classes may have been a sign of a lack of investor discrimination. Furthermore, the underlying compression of spreads may have been even

4. Such a definition of the risk premium is consistent with the "Gordon formula" if it is assumed that retained earnings are re-invested up to the point where the growth of dividends is maximised.

5. Data for January 2004 show that a net \$40.8 billion flowed into equity mutual funds, the third highest monthly total since 1992. See Bank of America Securities, *Mutual Fund Liquidity Trends*, February 20, 2004.

larger than the data on average spreads indicate. At least for the United States, the trend of the average high-yield spread could have been biased upward by a significant jump in issuance by firms that are rated CCC or below. During the first few months of 2004, the share of CCC bonds in total issuance was running at 26 per cent compared with 7 per cent for 2003 as a whole (Figure 3).

Emerging-market bonds

7. Spreads on emerging-market debt over US government bonds also declined sharply over this period, falling to levels in early 2004 only observed just before the Asian crisis in 1997 (Figure 4, upper panel). For a number of countries, spreads were close to their lowest levels seen in the previous ten years, and for all individual countries examined they were substantially narrower than had been the case over the previous 12 months (Figure 4, middle panel). This recent decline followed a decade without much trend and should, at least to some extent, be evaluated in a longer-term context. With significant structural changes in emerging-market economies, including the adoption of floating exchange rates by most, the credit ratings on their debt over the period 1998 to early 2004 rose, going from a lower B to a BB rating, a move of three grades. As a result, more than 50 per cent of the emerging-market bond capitalization by early 2004 carried an investment grade rating, compared with less than 10 per cent five years earlier. Broad economic fundamentals in different geographical regions show that the improvements since the Asian crisis have been a lowering of inflation, which came down close to single-digit levels, and somewhat better current account positions (Table 2).

8. For the remaining indicators of fundamentals, however, improvements compared with the period before the Asian crisis were less obvious. For example, debt and debt-servicing burdens show uneven trends across groups of countries. While growth picked up in 2003 and forecasts for 2004 showed roughly a ½ percentage point increase for Eastern Europe and Latin America (Figure 4, lower panel), it still remained less than it was in 1994-97.

III. Explaining common movements in risk premia

The role of fundamentals and liquidity

9. The discussion above suggests that risk premia over 2003 and into early 2004 have been driven, at least in some cases and to some extent, by improving fundamentals specific to individual markets and economies. Nonetheless, their observed declines, which have been a feature across both asset markets and national borders, combined with the signs of unusual developments in individual financial markets, leave scope for other, more cross-cutting effects, such as overall economic fundamentals and a very accommodative monetary policy, to have played a role as well. This section examines the influence of these factors. As concerns activity, a forward-looking measure is the OECD's leading indicator of industrial production for the entire area, which started rising in late 2001.⁶ As concerns abundant liquidity, M3 growth in the three major OECD economies generally outstripped nominal income growth by a wide margin also starting in 2001 (Figure 5, upper panel).⁷ In level terms, liquidity increased relative to nominal GDP in all the three main economies (Figure 5, lower panel).

10. As a first step to examining whether or not proxies for the outlook for area-wide activity and liquidity developments have played roles in explaining movements of risk premia across different asset

6. The leading indicator (at a quarterly frequency) is highly correlated with the (GDP-weighted) average of growth in the three major economies.

7. Although broad money growth is also driven by demand and financial innovation, it appears from Figure 5 that it had been to a large extent driven mainly by the supply side, *i.e.* monetary policy, from early 2002 to early 2004.

classes as well as national borders, the principal components of the risk premia⁸ of US and European corporate bonds and equities (*i.e.* the series shown in Table 1 and Figure 1), and the spread on emerging-market debt (*i.e.* the series shown in Figure 4) were calculated for the period January 1998 to February 2004.⁹ The analysis shows that both the first and second principal components¹⁰ have eigenvalues greater than one and combined they explain about 82 per cent of the variation among the series (Table 3).¹¹ In what follows, the variance-explained weighted average of these two components will be interpreted as a joint driver of the various risk premia and will be referred to as *the common factor*.

11. While the common factor is able to account for quite a bit of the shared variation in the risk premia of these assets, it is useful to know how this constructed variable is related to the seven individual risk premia.¹² Their factor loadings, a measure of the correlation between the individual risk premia and the common factor, are fairly high in the case of corporate bond risk premia (Table 4). This shows that the common factor of risk premia is more closely linked to developments in corporate bond markets than those in other asset markets. The loadings for the other risk premia, at approximately 40 per cent, are all similar to each other. The part of the risk premia not explained by the common factor, its uniqueness, is low for corporate bonds, particularly for US high-yield instruments and correspondingly higher for the other asset classes. On average, the loadings are just less than 70 per cent and uniqueness is around 45 per cent, reflecting that there is still a good part of developments in risk premia in individual markets not captured by the common factor.¹³

Estimation results and sensitivity analysis

12. Next, the common factor driving risk premia was regressed on the OECD's leading indicator of industrial production and on trend-deviation of GDP-weighted M3 in the three largest economies. The regression shows that the common factor driving risk premia is significantly explained by each of these

8. This approach has also been used before to understand what is driving various financial markets. See for example, Feeney and Hester (1967), Farrell (1974), Fama and French (1993) and McGuire and Schrijvers (2003).

9. The Datastream codes for the series used are as follows: US and Euro-area high yield bonds: MLHEICU and MLAHYBD, US and euro-area high grade bonds: LHIGBAA and LHACBAE. From these series were subtracted government benchmark bond series to get the spreads. For emerging market debt the variable JPMPBDY was used. For calculating the equity risk premium the P/E ratios for the Datastream stock market indexes were used, and they have the codes: TOTMKEU and TOTMKUS.

10. For an example of a three factor model for the equity premium, see Fama and French (1996).

11. In choosing how many principal components to use, two common rules of thumb were employed. The first, referred to as the Kaiser criterion, uses only those components that have eigenvalues greater than one. The second, referred to as the variance-explained criterion, includes enough factors to explain 80 to 90 per cent of the variation. In the cases reported in the text, the first two components qualify for inclusion on both criteria.

12. A methodologically similar approach was adopted for emerging markets by McGuire and Schrijvers (2003) who look at 15 different emerging-market sovereign spreads.

13. Applying factor analysis to only emerging-market spreads, McGuire and Schrijvers (2003) estimate average uniqueness to be 67 per cent.

variables (Table 5, first column).¹⁴ The results are only marginally sensitive to whether the first principal component or the two first principal components are used.¹⁵

13. An examination of the residuals reveals that the period of the US corporate scandals, starting around July 2002 and ending about a year later, is not well explained by the model, which is also reflected in a simple cusum of squares test for the entire sample period. Furthermore, recursive coefficient estimates also indicate unusual behaviour in the latter part of 2002. To examine their influence, the estimation period was truncated in mid-2002 and the model now explains more of the variation of the common factor (just over 70 per cent, compared with nearly 35 per cent for the longer period; Table 5, second column). While the coefficient on the leading economic indicator remains virtually unchanged, that on liquidity is larger and by a significant amount. This seems to suggest that the role of liquidity may be more important than the model estimated over the longer time period would indicate, implying that the observations in the wake of the corporate governance scandals should be either captured by using dummy variables or excluded (which amounts to more or less the same thing). The model was re-estimated excluding the period July 2002 to June 2003¹⁶ (Table 5, column three) and this preferred equation continues to confirm the significance of fundamentals and liquidity as drivers of the common factor of risk premia.

14. While the results are robust to other measures of broad money growth, for example when introduced as the simple growth rate, there are alternative ways to measure the effect of monetary policy. The most obvious proxy is interest rates and the equation was re-estimated with a GDP-weighted average of the short-term policy rates in the three major economies.¹⁷ The interest rate has the correct sign for two of the sample periods (a fall in policy rates lowers the premium), but this measure of liquidity appears not to do as well as the money supply in explaining the common factor (Table 6). Indeed, for the longer sample period, this measure is insignificant, partly reflecting that, while risk premia have fallen significantly over the past year or so, policy interest rates have been more or less unchanged. A possible interpretation is that the monetary aggregates have additional information on the impact on risk premia, particularly when policy rates have not varied a lot for an extended period of time.¹⁸

15. The preferred model was used to generate predicted values over the whole period (Figure 6). The large positive residuals that emerge at the time of the corporate governance scandals in 2002 have already been discussed and these only gradually subside over the remainder of the period. By late 2003, the residual changed sign; the common factor was now lower than can be explained by the equation. The model suggests that while liquidity had been putting some downward pressure on risk premia until the autumn of 2003, this factor was moving in the opposite direction starting in the third quarter of 2003. By contrast, risk premia continued to be under downward pressure from a buoyant outlook for activity up to the end of the sample period -- still based on this admittedly very rough-and-ready model.

14. Using a somewhat different approach, Baks and Kramer (1999) and Stahel (2003) also find evidence of liquidity affecting asset prices in various asset markets as well as across borders.

15. For the sample period, the coefficients on economic fundamentals and liquidity, using just the first principal component, were -0.25 and -1.48 respectively, and both were statistically significant.

16. The end-date in the sample period was chosen based on a simple Chow breakpoint test, which indicates when the value of the F-statistic is peaking. Furthermore, in this model with excluded observations, the Jarque-Bera test shows that the residuals are normal and the cusum test never falls outside its "tunnel", reflecting that the model is better compared with one that is estimated over the entire sample period. In addition, the Jarque-Bera test of normal residuals changes from being rejected to being accepted when these observations are excluded.

17. The results are similar if only the Fed Funds rate is used.

18. When both variables are included in the preferred equation, the coefficient on interest rates is insignificant, while that on the liquidity variable remains virtually unchanged from that shown in column 3 of Table 5.

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Table 1. The equity risk premia^a

	United States	Japan	European Union
Average, January 1973-April 2004	4.3	1.3	4.1
March 2003	4.3	2.3	5.3
April 2004	2.2	0.9	3.3

a) The premium is defined as the earnings price ratio less the real yield on long-term government bonds.

Sources: OECD and Datastream.

Table 2. Emerging-market fundamentals and EMBI+ spreads

	1994-1997	1998-2002	2003
Growth (per cent)			
Emerging Asia	8.4	5.8	6.4
Latin America	3.9	1.4	1.1
CEE	3.8	3.0	3.4
Middle East and Turkey	4.0	3.5	5.1
Inflation (per cent)			
Emerging Asia	10.6	3.3	2.5
Latin America	67.7	7.7	10.9
CEE	33.9	11.3	4.0
Middle East and Turkey	33.7	20.7	13.5
Current account balance (as per cent of GDP)			
Emerging Asia	-1.3	2.2	1.6
Latin America	-2.7	-2.7	-0.8
CEE	-2.4	-5.0	-4.6
Middle East and Turkey	0.6	3.2	4.4
External debt (as per cent of GDP)			
Emerging Asia	32.9	31.8	25.3
Latin America	35.4	41.0	44.1
CEE	n.a.	n.a.	n.a.
Middle East and Turkey	58.2	61.7	54.8
External debt service (as per cent of GDP)			
Emerging Asia	4.1	4.6	4.0
Latin America	6.9	8.9	8.6
CEE	n.a.	n.a.	n.a.
Middle East and Turkey	5.2	4.9	4.6
EMBI+ spread (basis points)	788	881	618
<i>Memorandum item:</i>	June 1997		2004 year to date ^a
EMBI+ spread (basis points)	395		436

a) Ends 12 April 2004.

Sources: Datastream and IMF.

Table 3. **Principal components**

	January 1998 to February 2004						
	1	2	3	4	5	6	7
Components							
Eigenvalue	3.85	1.91	0.70	0.34	0.11	0.06	0.02
Variance proportion	0.55	0.27	0.10	0.05	0.02	0.01	0.00
Cumulative proportion	0.55	0.82	0.92	0.97	0.99	0.99	1.00
Eigenvectors							
High yield							
United States	0.55	0.07	0.08	-0.08	-0.40	-0.12	-0.75
Euro area	0.45	-0.16	-0.24	0.56	-0.26	-0.40	0.41
High grade							
United States	0.46	-0.22	-0.01	-0.42	-0.27	0.59	0.38
Euro area	0.46	-0.04	-0.41	-0.21	0.75	-0.12	-0.10
Equity							
United States	0.19	0.61	0.35	-0.40	-0.02	-0.43	0.35
Euro area	0.22	0.60	0.11	0.52	0.18	0.52	-0.02
Emerging market	0.21	-0.43	0.80	0.17	0.32	-0.04	-0.01

Source : OECD.

Table 4. **Factor loadings and uniqueness measures**

	January 1998 to February 2004	
	Loading	Uniqueness
High yield		
United States	0.98	0.04
Euro area	0.87	0.23
High grade		
United States	0.90	0.19
Euro area	0.88	0.24
Equity		
United States	0.37	0.86
Euro area	0.42	0.82
Emerging market	0.37	0.86
<i>Average</i>	0.68	0.46

Source: OECD.

Table 5. **Explaining the common factor of risk premia**

Based on the first two principal components

	January 1998 to February 2004	January 1998 to June 2002	January 1998 to June 2002 and July 2003 to February 2004
Constant	0.22 (1.77)	-0.14 (1.61)	-0.13 (1.69)
Economic fundamentals ^a	-0.16 (4.08)	-0.14 (5.75)	-0.15 (6.34)
Liquidity ^b	-0.85 (2.76)	-1.50 (7.54)	-1.37 (7.41)
R ²	0.29	0.71	0.68
S.E. of regression	0.97	0.56	0.56

a) Defined as the year-on-year percentage change in the OECD leading indicator for the entire OECD area.

b) Defined as the detrended GDP-weighted cumulative growth in broad money for the three major economies. For detrending, the Hodrick Prescott filter was used with the standard smoothing parameter of 14 400.

Note: T-statistics in parentheses

Source: OECD.

Table 6. **Sensitivity tests: substituting short-term interest rates for the liquidity variable**

Based on the first two principal components

	January 1998 to February 2004	January 1998 to June 2002	January 1998 to June 2002 and July 2003 to February 2004
Constant	0.62 (2.32)	-1.34 (2.35)	-0.74 (2.85)
Economic fundamentals ^a	-0.15 (3.28)	-0.31 (5.60)	-0.26 (7.27)
Short-term interest rate ^b	-0.18 (1.54)	0.56 (2.50)	0.33 (3.06)
R ²	0.24	0.45	0.47
S.E. of regression	1.00	0.76	0.72

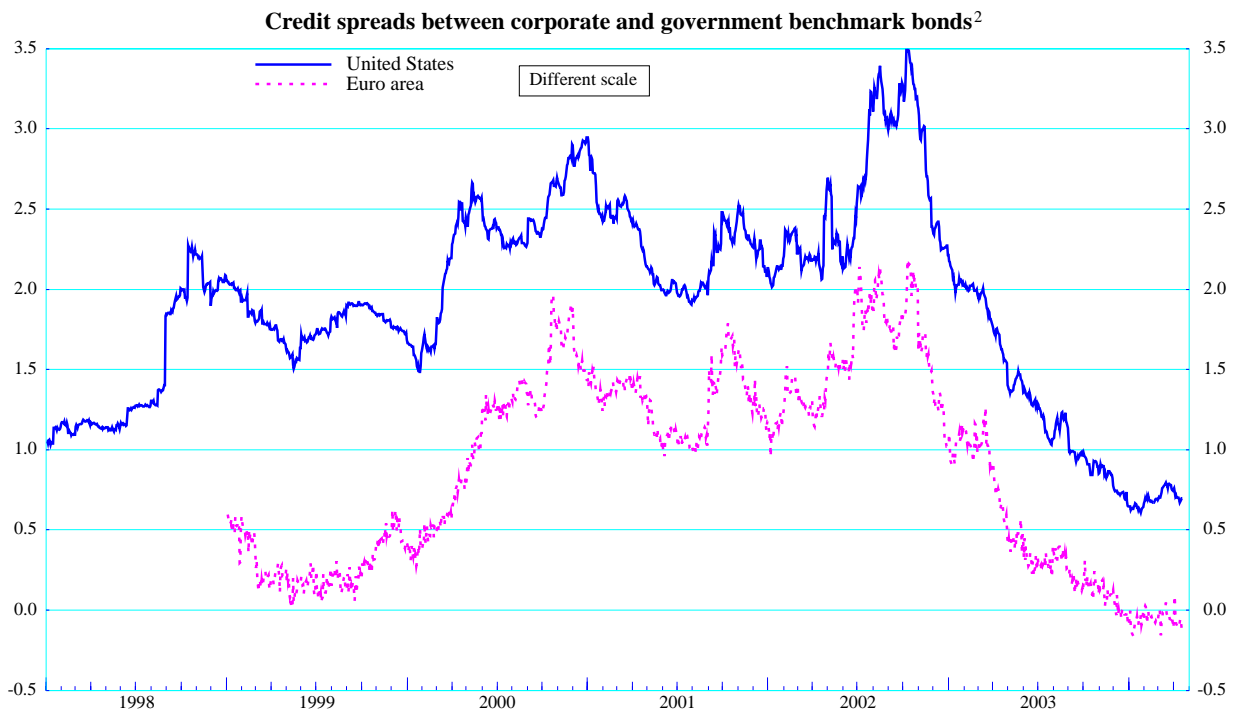
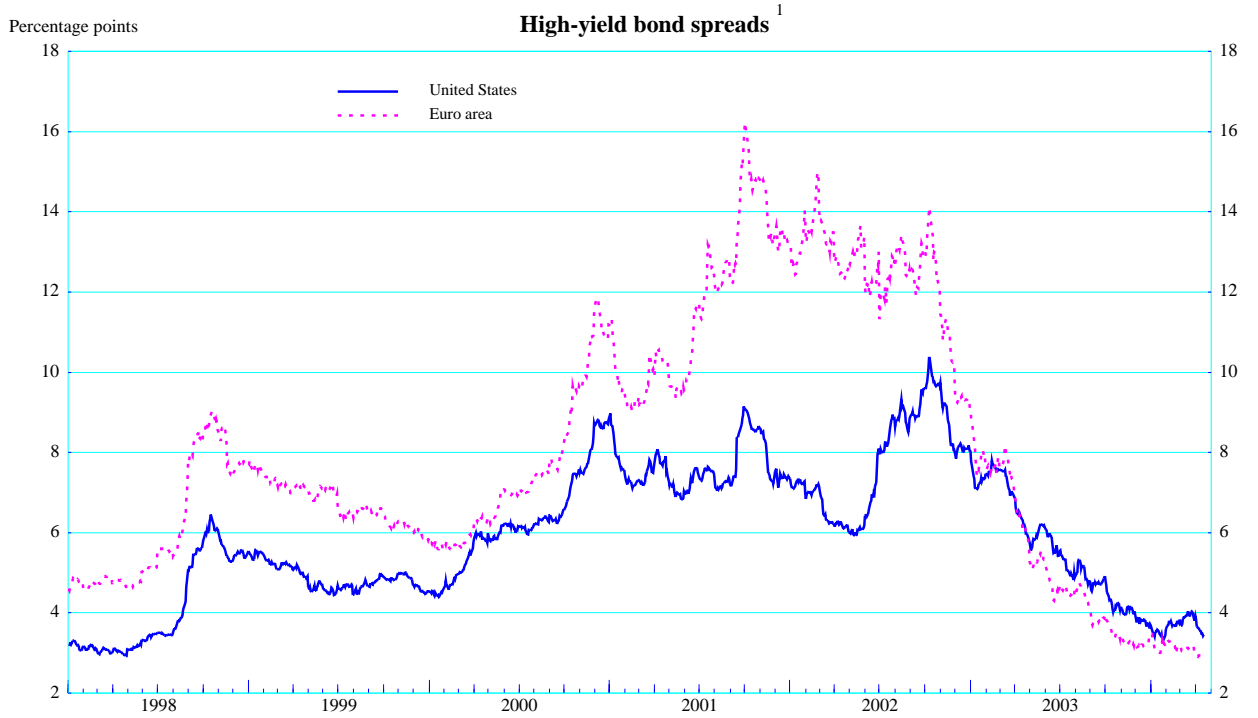
a) Defined as the year-on-year percentage change in the OECD leading indicator for the entire OECD area.

b) Defined as the GDP-weighted average of short-term policy rates in each of the three major economies.

Note: T-statistics in parentheses

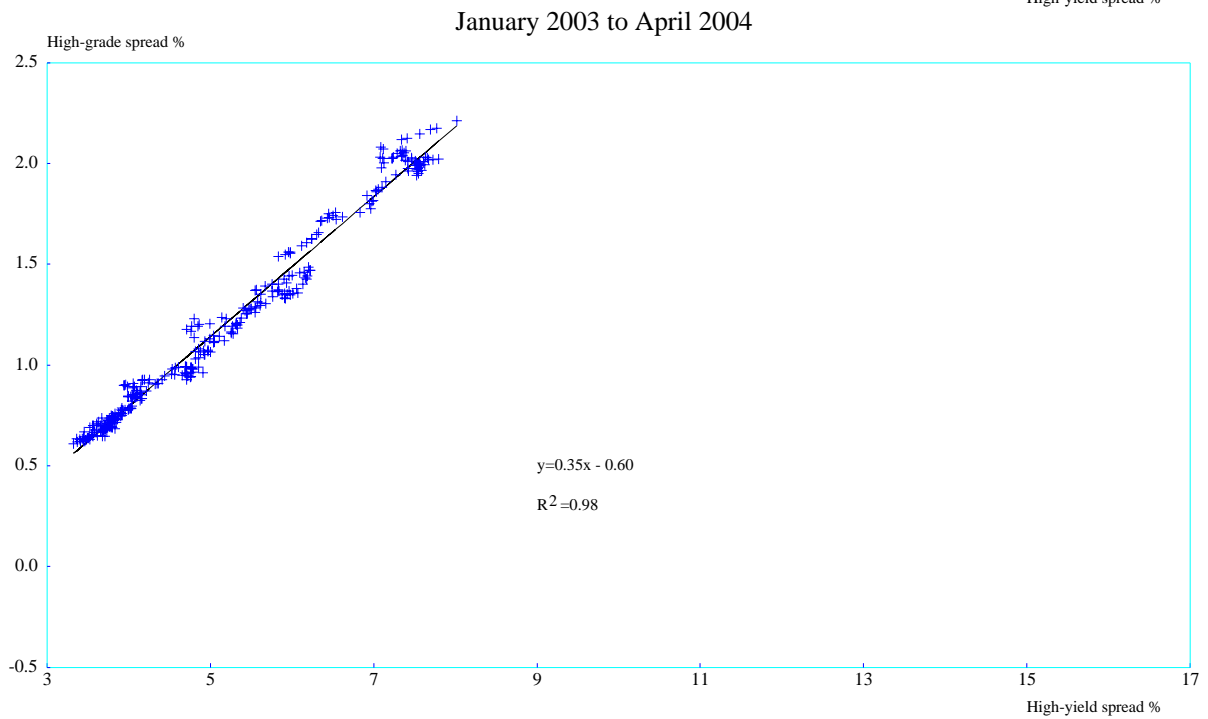
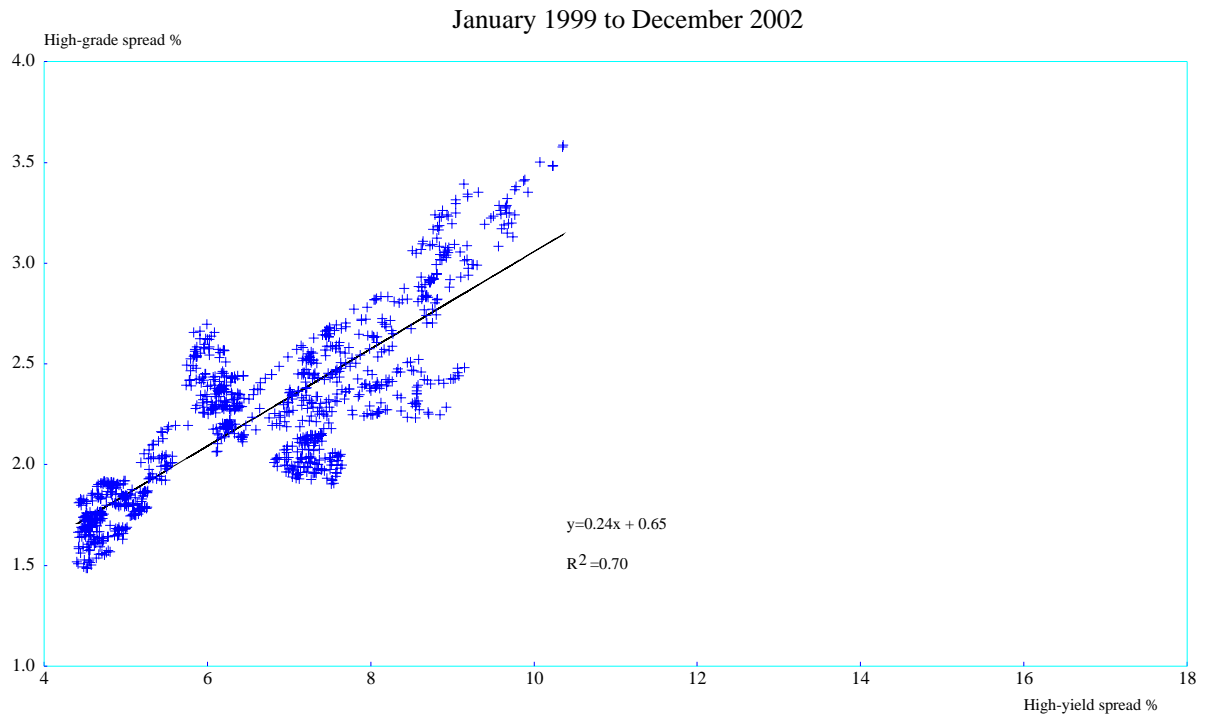
Source: OECD.

Figure 1. Corporate bond spreads



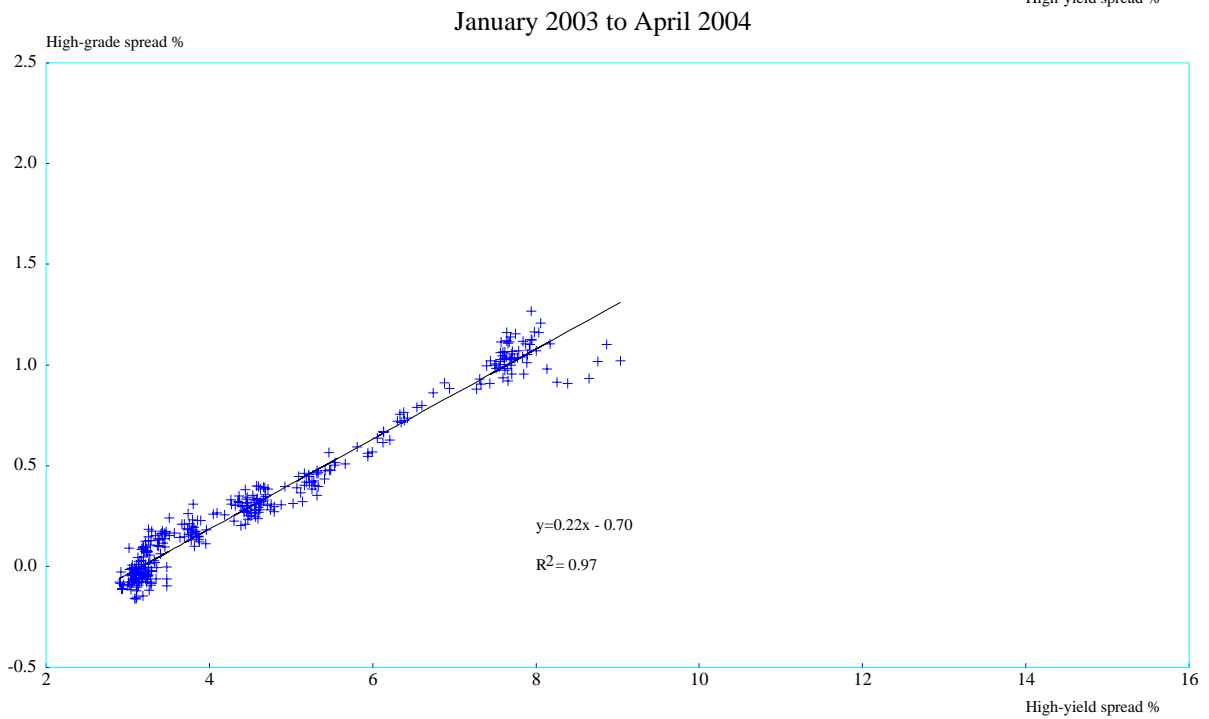
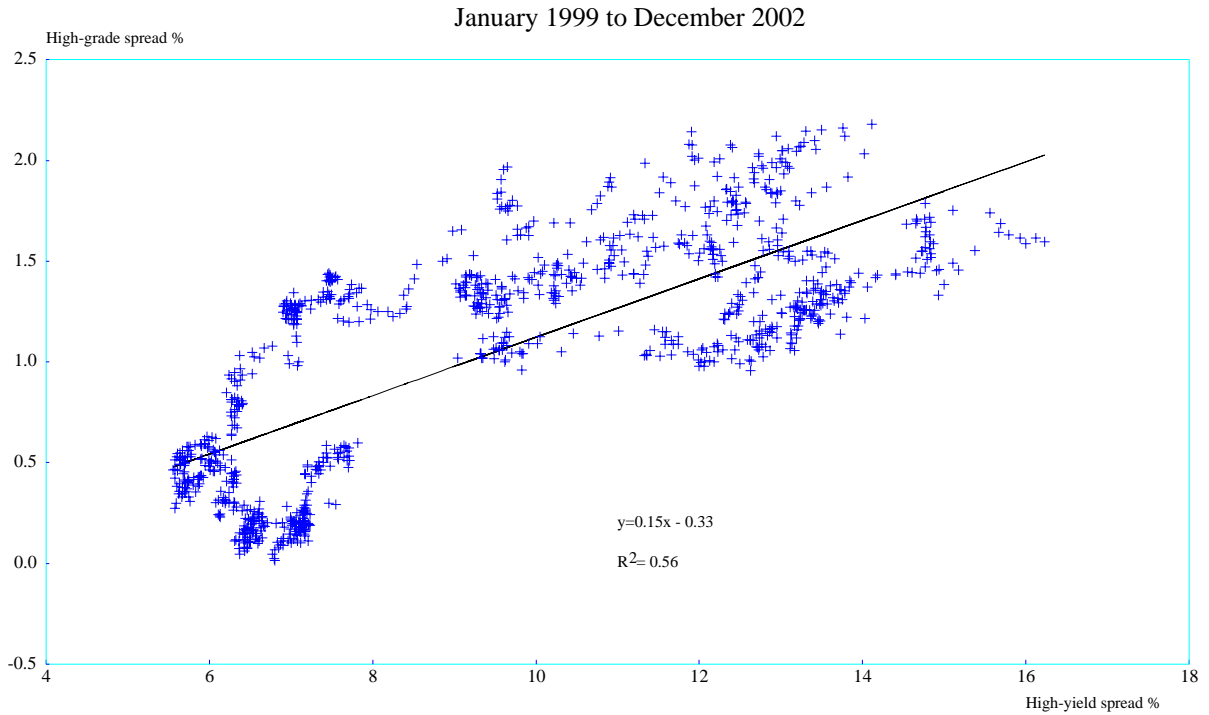
1. Spreads of high yield bonds (Merrill Lynch indices) over government bond yields (10-year benchmark bonds).
 2. United States: Lehman Baa corporate index; Euro area: Lehman euro Baa. Government bond yields are for 10-year benchmark bonds
 Source: Datastream.

Figure 2. Relationship between spreads on high-grade and high-yield bonds
United States
 (Daily observations)



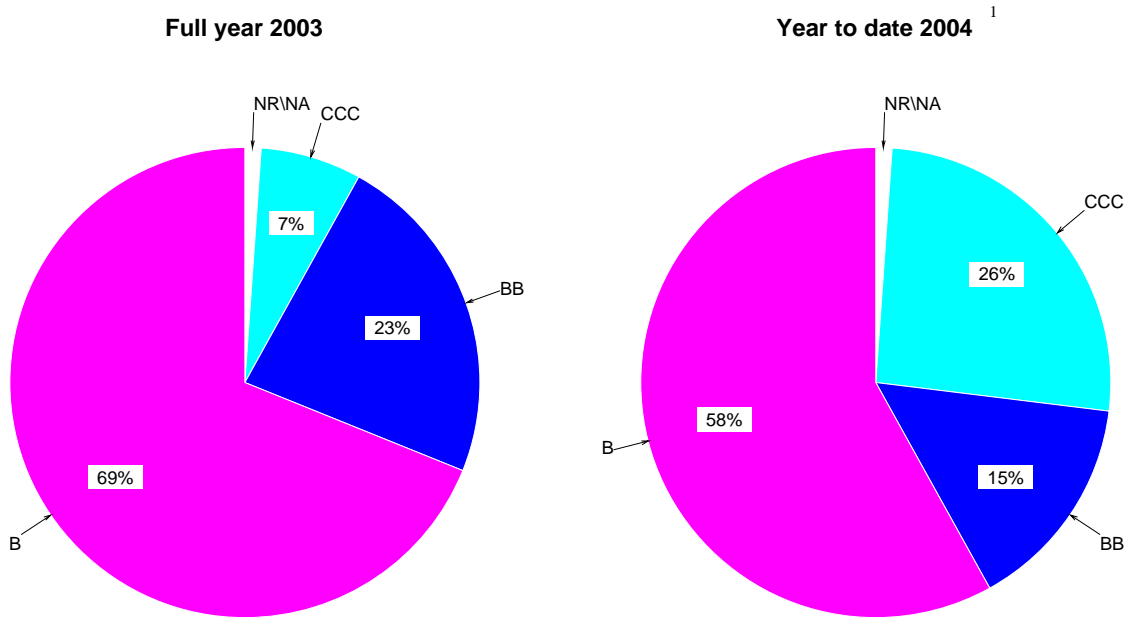
Source: Datastream.

Figure 2 (cont.) Relationship between spreads on high-grade and high-yield bonds
Euro area
(Daily observations)



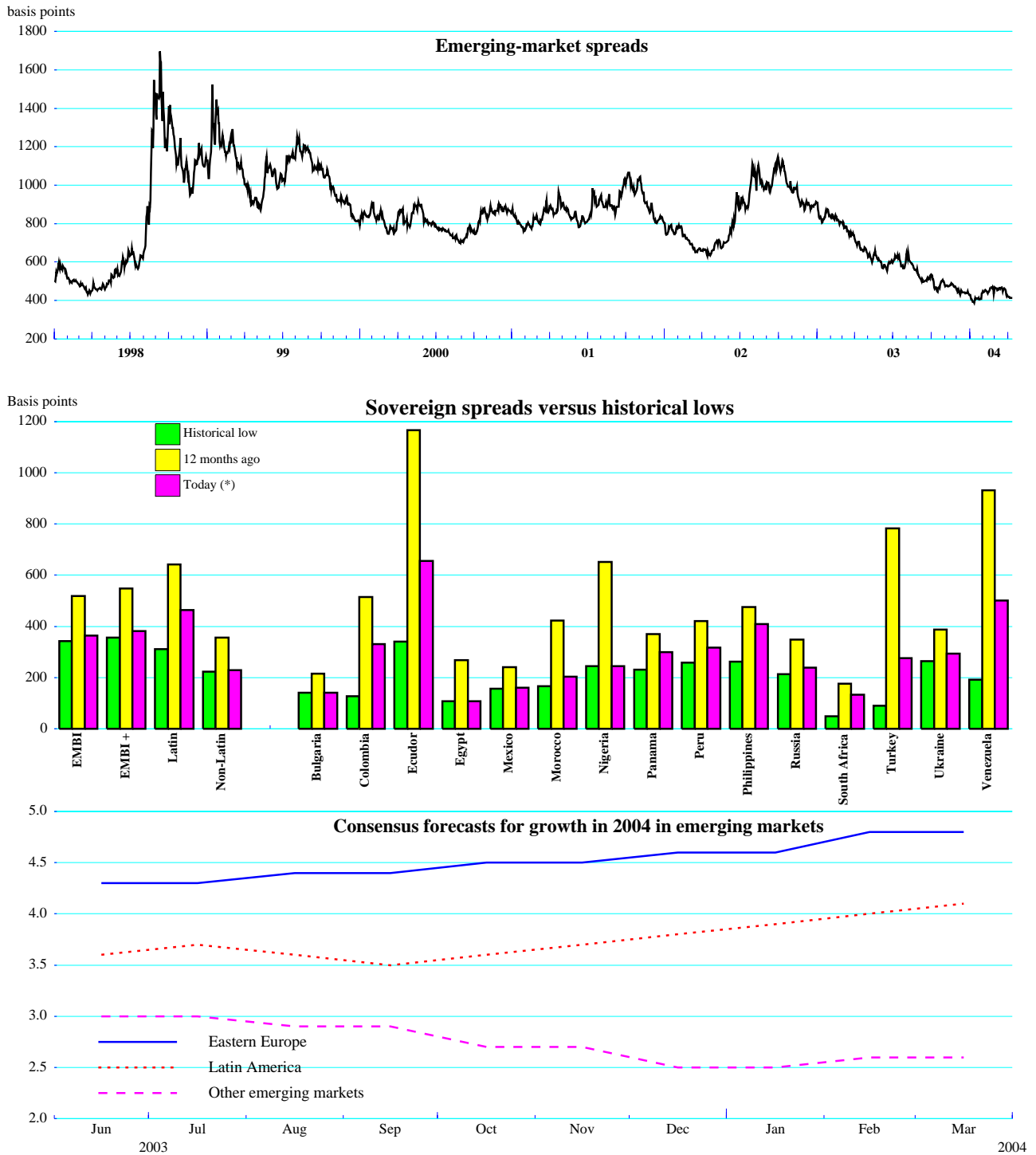
Source: Datastream.

Figure 3. High-yield new issuance by rating category
 (As a share of total issuance)



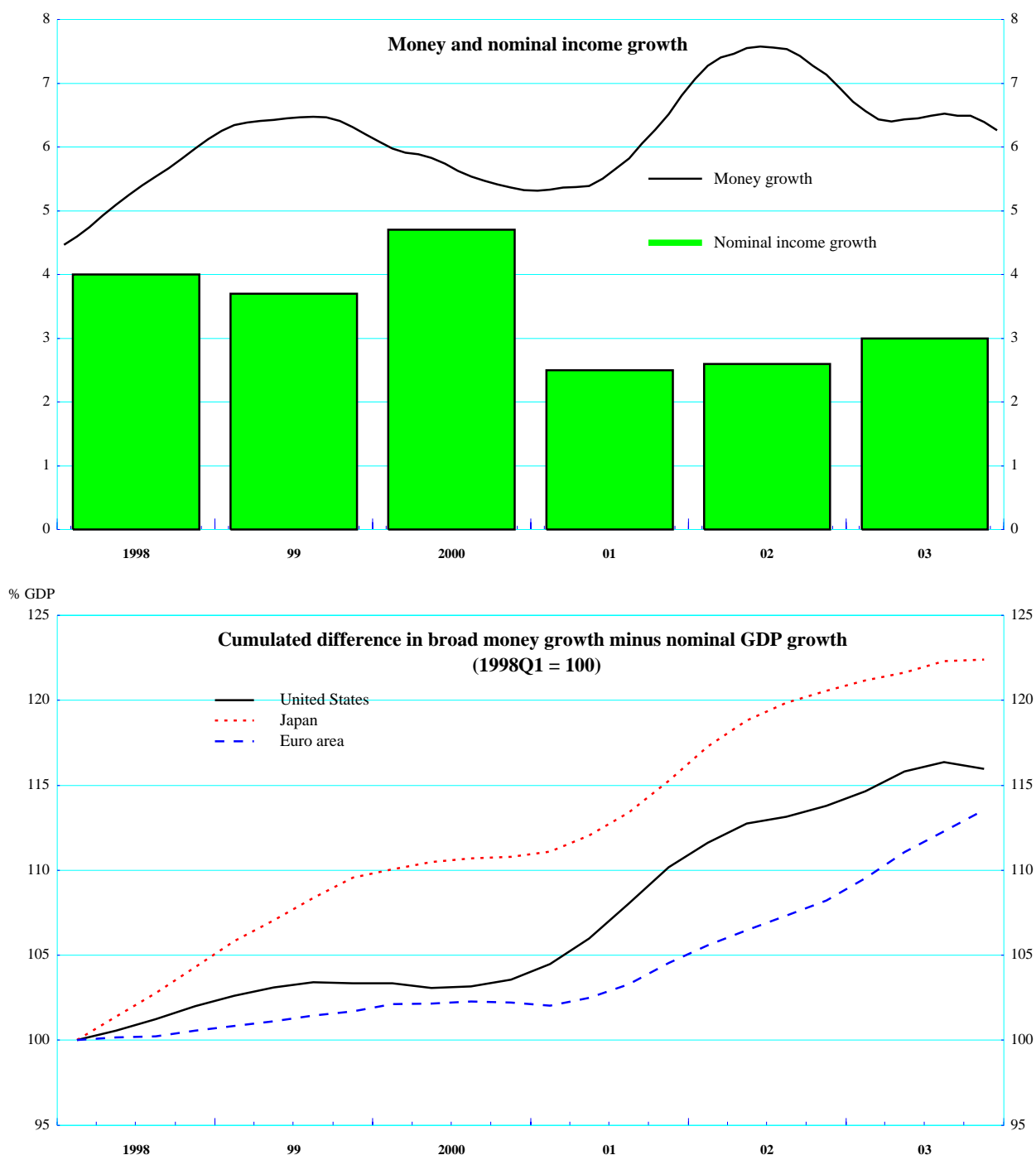
1. As of end of February.
 Note: B, BB, and CCC are composite ratings derived from Moody's and S&P ratings.
 Source: Bank of America Securities.

Figure 4. Emerging-market indicators



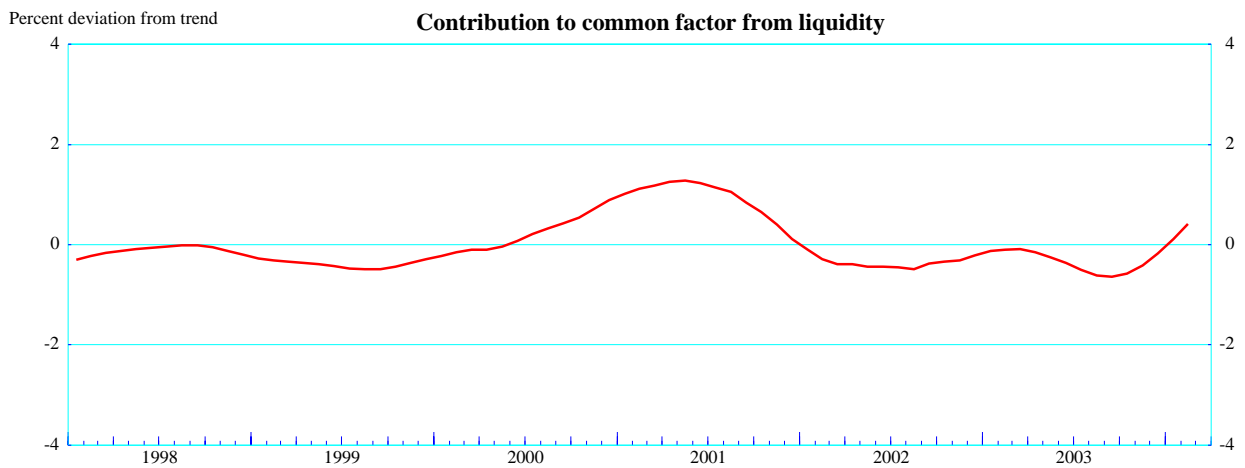
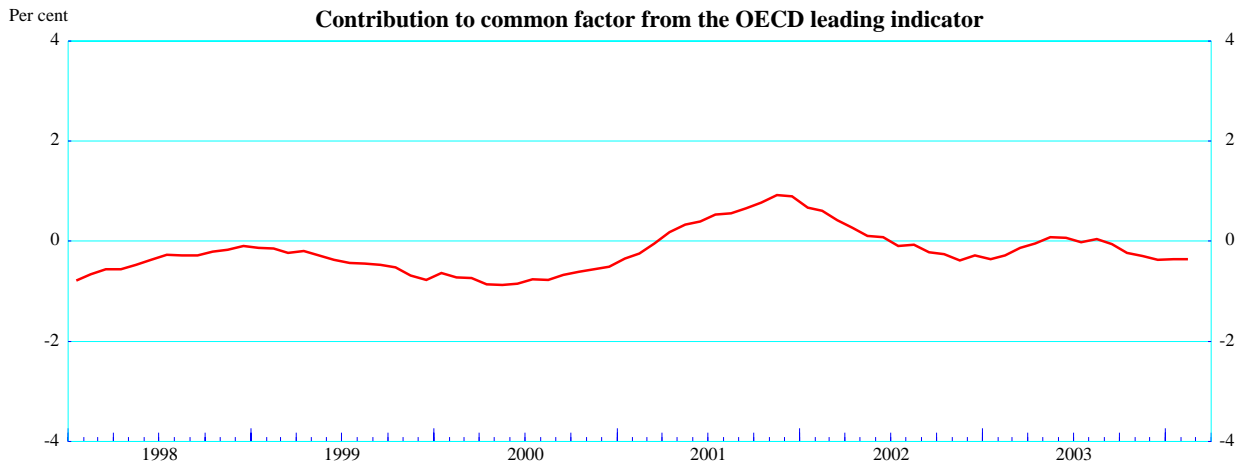
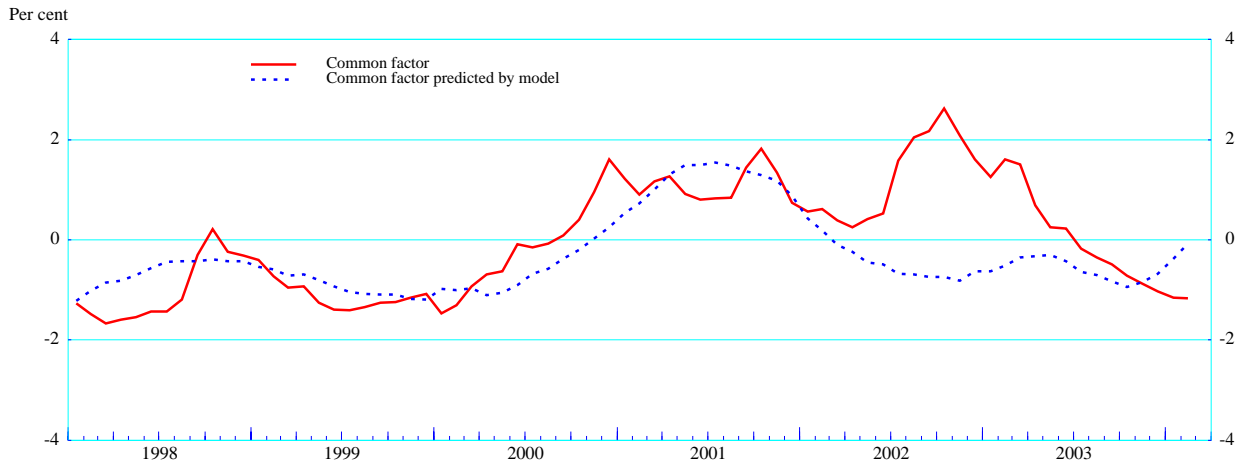
Note : Top graph : The series is the JP Morgan EMBI+ spread.
 Middle graph : Today corresponds to April 13, 2004.
 Bottom graph : Other countries include Egypt, Israel, Nigeria, Saudi Arabia and South Africa.
 Sources : Datastream and Consensus Forecasts (June 2003 to March 2004).

Figure 5. Measures of liquidity



Note : In the top table, the line represents the 12-month moving average of GDP weighted broad money growth for the United States, Japan and the euro area.
 The bars represent nominal income growth for the three major countries, weighted by GDP.
 Source : OECD.

Figure 6. The common factor and its explanatory variables



Source: OECD.

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