

Note

Remarks on the recent Market Volatility

"Stocks fluctuate, next question."

Alan Greenberg, CEO Bear, Stearns & Co, in response to questions about the crash, October 22, 1987

1. Summary

In recent weeks global stock markets have experienced sharp declines. This note attempts to put the current period of market turmoil into perspective in two ways. First, the size of the correction is compared to other instances of sharp stock market declines during the last two decades. Second, from an analytical perspective it is investigated which drivers are most likely to have contributed to the declines.

The correction has mainly affected European and Japanese stock markets, as well as emerging markets stocks and certain commodities.

It is concluded that it is an increase in the risk premium – triggered by signs of progressive tightening of global liquidity – that is the probable cause of the recent decline.

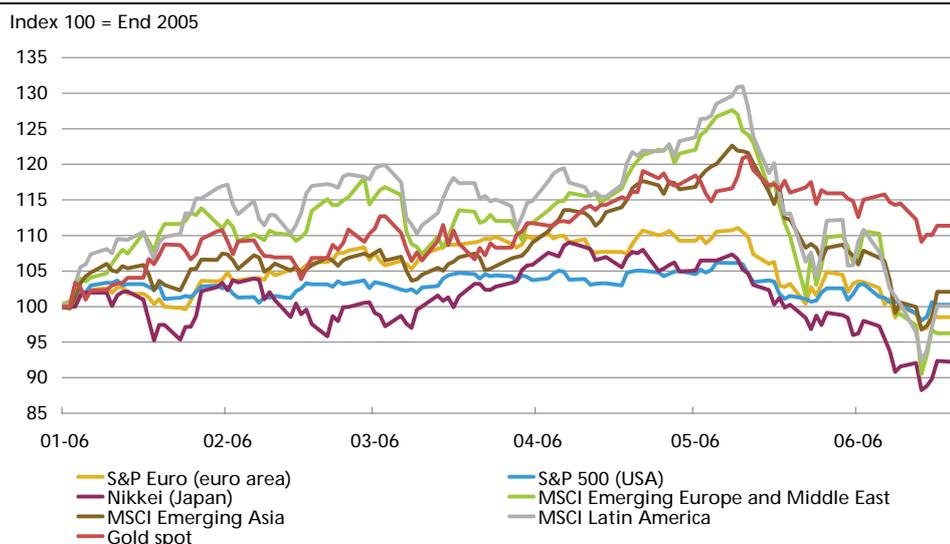
2. How dramatic are the current declines in asset prices?

As can be seen from chart 1, global stock markets declined substantially after May 10 this year. The declines were most significant in the emerging stock markets, particularly in Latin America and Eastern Europe. Also, certain currencies (not shown in the graph), of countries with weak external positions, such as Turkey and South Africa, have depreciated markedly.

In contrast, the US stock market was only lightly hit, reflecting that this market had not shared the same strong gains experienced by more risky stock markets in the first 1½ quarters of this year. As a general rule, the sizes of the declines since mid-May are of the same magnitude as the preceding gains in 2006.

STOCK MARKET INDICES AND THE PRICE OF GOLD

Chart 1



Source: Bloomberg.

Table 1 compares the recent decline to the experience of nearly two decades. The 30-trading-day decline of 7.1 per cent in the S&P 500 is by no means spectacular, as declines as large as this have happened 23 times since January 1988. The likes of the recent decline in the euro area stock market, which generally have been harsher than in the US, have been observed 14 times. Very unusual, however, are the drops in Emerging Europe (i.e. Eastern Europe) and in the price of gold.

NUMBER OF SAME OR WORSE DECLINES SINCE JANUARY 1988

Table 1

Index/asset	Size of current decline, per cent	Number of previous decline of at least same size	Largest one-day decline since May 10 2006, per cent
S&P 500 (USA)	-7.1	23	-1.8
S&P Euro (euro area)	-12.2	14	-3.2
Nikkei (Japan)	-17.1	11	-4.2
MSCI Emerging Europe and Middle East	-32.0	2	-7.9
MSCI Emerging Asia	-20.8	15	-4.5
MSCI Latin America	-20.9	15	-6.2
Gold spot.....	-20.7	0	-7.2

Note: The size of the current decline is calculated as the maximum decline for a 30-trading-day period ending after May 10, 2006.
Source: Bloomberg.

The case of gold is notable, since the gold price during previous corrections tended to be unaffected or even slightly increasing. This time, however, gold has been subject to speculative flows; not unlike those driving emerging market stocks. In other words, this time gold was not really available as a "safe heaven" to investors fleeing stocks.

Historically, there are several cases of periods with long lasting climbs in asset values, followed by severe falls. The recent development therefore

naturally raises concerns whether the fall in stock prices is the start of a major decline in asset values, or is a "smaller" correction. Since there is knowledge to be gained by examining historical events, developments around previous corrections are compared with the current market situation.

3. Historical corrections

Below is a list of modern time corrections, along with a short resume of what caused them.

- ◆ 1987: "Black Monday"; the largest one-day percentage drop in the US stock market history. The correction was caused by a sudden change in investor sentiment.
- ◆ 1990: Iraq invades Kuwait.
- ◆ 1997: Asian crisis: Western investors lost confidence in securities in East Asia and began to pull out money, creating a snowball effect.
- ◆ 1998: Russian crisis: Russia defaults on their government bonds. Investment funds, exposed to the Russian market, experience large losses.
- ◆ 2000-2002: the Dot-Com decline: Prices were driven by expectations of extremely high growth rates in future earnings, which never materialised.
- ◆ 2001: September 11: Terrorist attack on World Trade Centre in New York.

The corrections of *1990 and 2001* were driven by political events, and can therefore not be compared to the current situation. The market situations of *2000-2002* does not resemble the current conditions; prior to that period the pricing was driven by unrealistic *expectations* of future profitability, whereas today pricing reflects albeit very high *realized* earnings.

The *1987* correction was caused by panic among investors. There is of course nothing that can exclude this kind of market behaviour appearing again, but perhaps the lesson from 1987 is not that values can fall drastically, but rather that they may recover from a sharp correction relatively fast. This reflected that the economy fundamentally was in good shape.

Both *1997 and 1998* do to some extent resemble the current situation, where investors employing relatively more risky investment strategies, manage substantial amounts of capital. The volatile behaviour of for instance the emerging markets could be caused by reassessments of risks by these investors, although fundamentals in most emerging markets are much better now than in 1997 and 1998.

What then has caused this reassessment? Among the most popular explanations of the correction in the financial press is an alleged "inflation scare" and – related to this – uncertainty about how much further monetary policy will be tightened. Furthermore, expectations of a significant slow-down of

US/global growth have been proposed as an explanation. Finally, so-called "repricing of risk" may have played a key role.

The next section briefly discusses the merit of each of these candidate explanations.

4. What are the drivers behind the recent decline?

We start this discussion by first looking at the pricing mechanism, its components and what influences the expectations of these components.

Factors influencing the value of stocks

The theoretical stock price is given by the "Discounted Dividend Model":

$$P_0 = E_0 \left[\sum_{t=1}^{\infty} \frac{D_0(1+g_t)^t}{(1+i_t+rp_t)^t} \right]. \quad (1)$$

In the above equation D is dividends, g is the growth rate of dividends, i is the riskless rate, rp is the risk premium, and E is the expectation operator which simply denotes that the price today is a function of *expectations* of the expression inside the brackets. The current price is thus given by a sum of an infinite series of future cash flows/dividends, which are discounted to get present values. The discount rate that is used consists of a riskless rate and a (demanded) compensation for the risk related to the specific cash flows. The equation (1) thus shows that the price of an asset is driven by *expectations* regarding the evolutions of the components inside the brackets, i.e. the growth rate of dividends, the riskless interest rate and the risk premium.

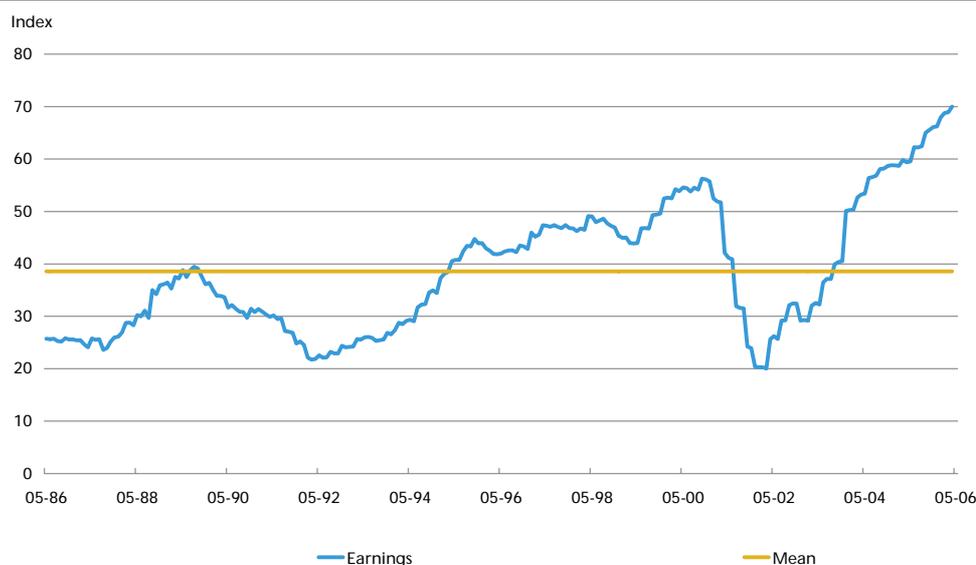
As the dividends are closely related to earnings, we will in the following, somewhat simplified, refer to earnings and dividends interchangeably. Prices may be high because earnings growths are expected to be high, because the risk-less interest rates are expected to be low or because risk-premiums are expected to be low. Furthermore, a sudden revision of these expectations can have severe effects on prices. It is therefore necessary to examine what currently influences these expectations, to analyse what causes movements in prices. We therefore next, look at the current status of these individual components and discuss the market expectations regarding their future evolution.

Earnings

To examine the current status of the earnings chart 2 below shows the plot of the S&P real earnings series, for the period May 1986- May 2006, along with its corresponding mean value over the period.

S&P REAL EARNINGS

Chart 2



Note: The index for earnings is derived from the P/E-ratio for the S&P index. The index for earnings is subsequently deflated by the US CPI.

Source: Bloomberg.

US earnings are currently above its mean, which implies that asset prices are currently high partly because earnings are currently high. Of course, as seen from the equation (1), what matters for prices are not only current earnings, but an infinite stream of future earnings. If the market has currently priced in a large expected growth rate in earnings, a revision in these expectations could result in large movements in prices.

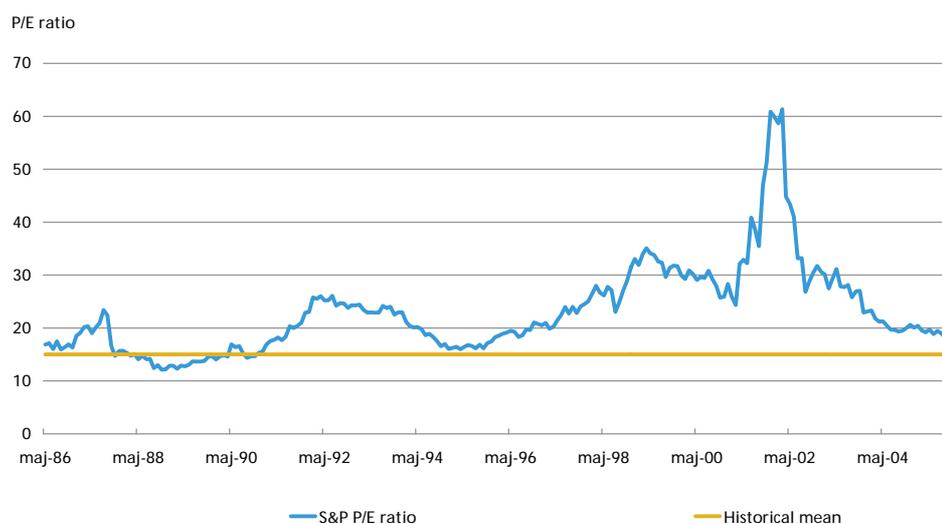
Before proceeding with indicators of expectations regarding future earnings, we will relate the current level of earnings to the current price, by looking at the Price-to-Earnings ratio.

Earnings relative to Prices - the P/E ratio

An often used variable for examining market conditions is the Price-to-Earnings, (P/E), ratio. The logic behind using this ratio, is that it seems reasonable to assume, that prices will not drift too far away from their normal levels, relative to some chosen measure of fundamental value; for instance earnings. Chart 3 below shows the plot of the S&P 500 P/E ratio for the period May 1986 - May 2006.

S&P P/E RATIO

Chart 3



Source: Bloomberg and Robert Shiller.

Remark The historical mean is calculated over a 150 year period.

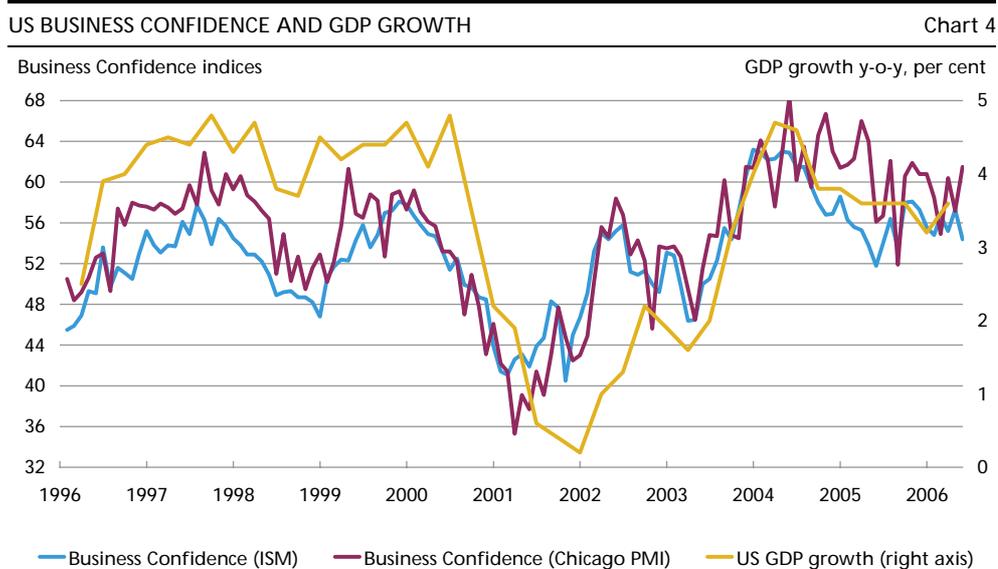
The P/E ratio seems indeed to have a tendency to revert to its historical mean. Furthermore, looking at its current level, the P/E ratio is *not* at a historically high level. There is therefore no evidence, based on the current level of the P/E ratio, that prices have "drifted away" in a bubble-like fashion from earnings.¹

Next we proceed with a discussion regarding the outlook for future business conditions and earnings growth.

Economic growth – business confidence

The message from standard leading business cycle indicators, such as business confidence surveys, is ambiguous. The most recent readings *do not* point to a considerable change in sentiment, cf. chart 4. Hence, standard indicators do not imply that economic growth in the US will decline dramatically. A modest decline, however, may be expected primarily caused by the on-going cooling of the US housing market and the effect of higher interest rates.

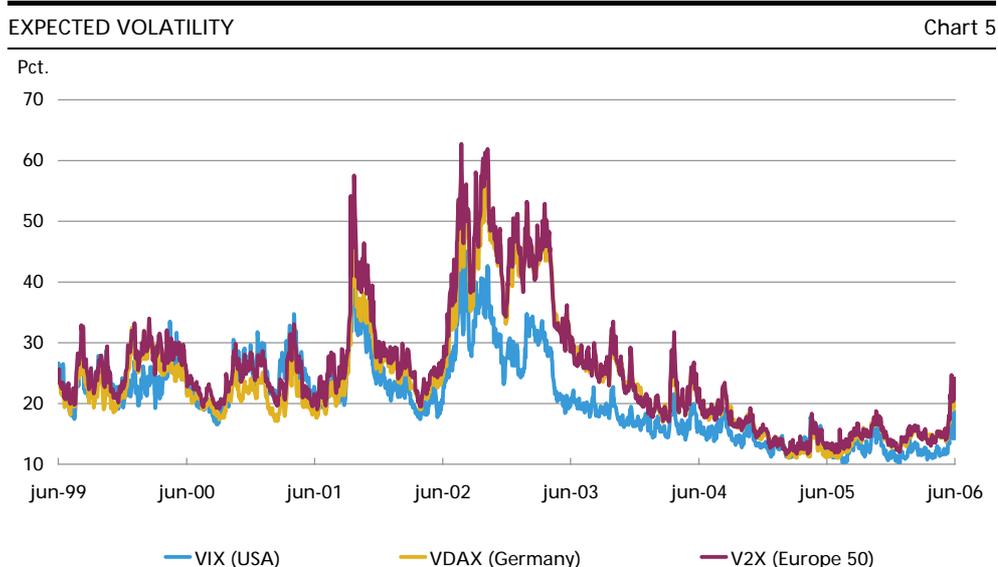
¹ Some analyst use moving averages of earnings in calculating the P/E-ratio. This gives a less benign view of current stock prices.



Source: Bloomberg.

Monetary policy and the increase in the risk premium

The sudden and simultaneous nature of the declines, in particular the more significant impact on riskier assets, such as stocks from emerging markets, points to some extent toward a general increase in the demanded risk premium, after an extended period of investor complacency. The development in the VIX, VDAX and V2X, often called the fear gauge of markets, supports this hypothesis. These indexes, which show expected volatility, have increased strongly, cf. chart 5:



Source: Bloomberg.

However, in a longer term perspective, they were at historically very low levels prior to their recent increase. An increase in the risk premium can to some extent be self-fuelling, as increasing volatility may force institutions

to cut back equity exposure either from "Value-at-Risk"² considerations or being "stopped-out" because of leveraged positions³. However, the self-fuelling arguments do not explain the initial increase in the risk premium.

The initial increase in the risk premium may be related to a fear in markets that global, and more specifically US monetary policy might not any longer be capable of supporting a "goldilocks scenario", where the economy is neither too hot nor too cold. Monetary policy is often described by the Taylor-rule:

$$i_t = \pi_t^* + r_t^* + \alpha_\pi (\pi_t - \pi_t^*) + \alpha_y (y_t - y_t^*) \quad (2)$$

Where i is the central banks target rate, π is inflation, π^* is the inflation target, r is the equilibrium real interest rate, y is production and y^* is potential production. Normally it is assumed that $\alpha_\pi > 1$ and $\alpha_y < 1$. Thus, if inflation is above the target, the central bank will raise interest rates more than one-to-one. This will however in turn also have an offsetting effect on production growth, as it will dampen demand.

The Fed has been tightening US monetary policy at each FOMC-meeting since June 2004, and as such, the tighter liquidity is not a new issue. However, since the beginning of this year, market participants have raised their expectation for the Fed Funds Rate at the end of this year by further 3 x 25 basis points, cf. chart 6 below. The latest economic figures have indicated decreasing growth and increasing inflation. The increasing signs that the Fed may continue to raise rates to keep inflation at bay, despite a more fragile growth outlook, may have initiated the current stock market correction.

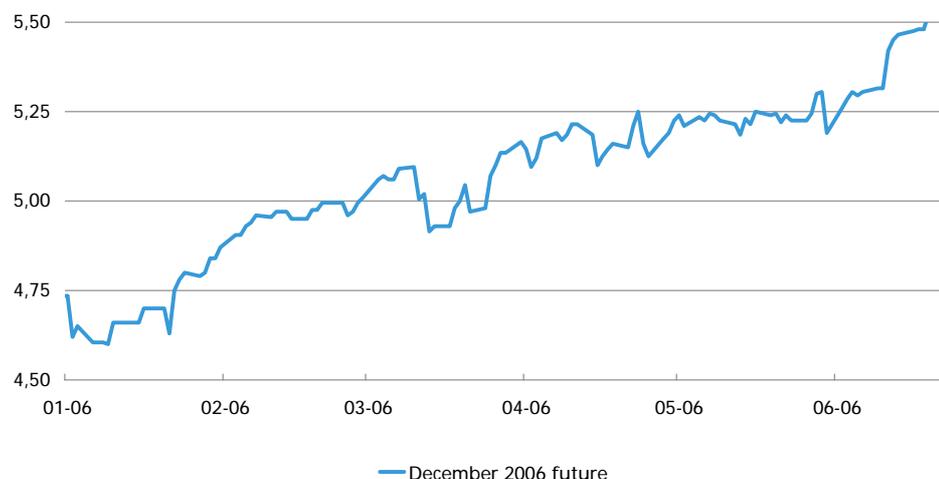
² Investors who manage their portfolios with respect to "Value-at-Risk" (i.e. minimum size of loss in the 5 per cent worst outcomes), will have to cut back equity exposure when volatility increases, if Value-at-Risk is to be kept constant.

³ This may occur when e.g. hedge-funds buy stocks with borrowed money. The lender requires a margin payment, and in case the investor is liquidity constrained, he may ultimately be forced to liquidate the loss-giving position.

FED FUNDS FUTURES

Chart 6

Per cent



Note: Calculated from Fed Funds futures.
Source: Bloomberg.

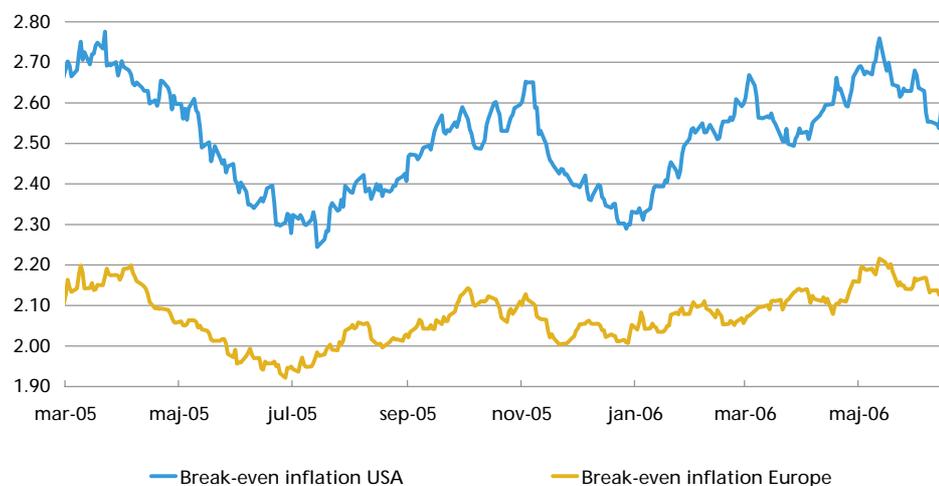
Monetary policy and inflation expectations

One measure of forward-looking inflation expectations is the so-called break-even inflation, which is calculated by subtracting the yield of an inflation-indexed bond from a comparable nominal bond. Chart 7 shows that using this measure, inflation expectations peaked around the beginning of the stock market correction, and has since declined. Although causality is always a difficult issue, this would be consistent with that the Fed has sent signals that it would not accept the increase in inflation expectations and would be willing to take actions despite its consequences for economic growth.

BREAK-EVEN INFLATION USA AND EURO AREA

Chart 7

Per cent



Note: Calculated from TII 1.625 01/15/15 and T 4 02/15/15 for the USA and FRTR 1.6 07/25/15 and FR0010163543 for the euro area (France).
Source: Bloomberg.

Unless the recent correction in stock markets feed back to the real economy, possible in combination with other events (say a housing price bust) the reactions of market participants suggest an interpretation of the correction as a modest reaction to an upgrade in the risk premium. The likelihood of a less benign economic scenario has possibly increased in the eyes of market participants, but such a scenario seems not yet to be their central scenario.