VALUING STOCK MARKETS AND THE EQUITY RISK PREMIUM

The purpose of this article is to present a framework for valuing stock markets. Since any yardstick aimed at valuing stock markets is surrounded by a large degree of uncertainty, it is advisable to use a broad range of measures. The article starts out by discussing how stock prices are determined and why they may deviate from a rational valuation. Subsequently, several standard valuation metrics are derived, presented and discussed on the basis of euro area data.

1 INTRODUCTION

Stock prices may contain relevant, timely and original information for the assessment of market expectations, market sentiment, financing conditions and, ultimately, the outlook for economic activity and inflation. More specifically, stock prices play an active and passive role in the monetary transmission process. The active role is most evident via wealth and cost of capital effects. For example, as equity prices rise, share-owning households become wealthier and may choose to increase their consumption. Alternatively, higher stock prices tend to lower the cost to firms of raising additional equity capital. This, in turn, can have an impact on the prospects for economic activity and inflation in the economy as a whole through its potential impact on aggregate investment and potential output.

The passive role played by stock prices is related to the information they provide about future economic developments according to equity investors. This channel is characterised by the fact that stock prices, like other financial asset prices, are inherently forward-looking. To this end, stock prices should reflect the discounted present value of expected future dividends, where dividends are usually paid out as a fraction of earnings. Earnings among a pool of firms are in turn crucially dependent on aggregated demand. As a result, stock prices may reflect the expectations of market participants about the future course of the economy. Indicators of future economic activity can also be obtained from other sources, such as business and consumer surveys, but most stock price-based indicators have the advantage of being available more quickly. Furthermore, an assessment of the value of stock markets and thus an insight into the expected return on equity is also important for monetary analysis, because of the interplay between the return on money and the return on other financial assets, including equity.

However, the information content of stock prices with regard to future economic activity is likely to vary over time. Stock prices can occasionally drift to levels that are not considered to be consistent with what a fundamental valuation would suggest. For example, this can occur in times of great unrest in financial markets, during which participants may overreact to bad news and thus push stock prices below fundamental valuation levels. Moreover, there are indications that, from time to time, investors become overly optimistic regarding the prospects of future stock returns, giving rise to what is usually termed an "asset price bubble".[1] In either case, such situations tend to blur the information content of stock prices and may lead to a misallocation of resources. Stock price misalignments could thus become a concern, because they can distort economic and financial decisions. Indeed, history has shown that the boom-bust cycles of stock markets associated with such periods can harm the entire economy.

In order to draw inferences about stock price movements that are as accurate as possible, a number of valuation models can be used. The purpose of this article is to present, from a methodological perspective, the most standard measures used within central banks and the financial community. Needless to say, all stock market valuation models presented here are surrounded by a large degree of uncertainty and should be seen more as suggestive tools for medium-term analysis than as measures to predict short-term directions of stock prices.

1 For a detailed description of stock price bubbles and monetary policy see the article entitled "Asset price bubbles and monetary policy" in the April 2005 issue of the Monthly Bulletin.

The article is structured as follows. Section 2 elaborates on the theoretical determination of stock prices and also discusses why stock prices may occasionally depart from a rational valuation approach. Section 3 presents a number of standard stock market valuation indicators on the basis of euro area data. Section 4 concludes.

2 THEORETICAL DETERMINATION OF STOCK PRICES

THE RATIONAL VALUATION APPROACH

In general, the price of a financial asset at any point in time consists of the net present value of the future cash flows investors expect to receive by holding the asset. The discount rates applied are the expected rates of return that investors demand for holding the asset in their portfolios. For stock prices, the cash-flow component consists of current and expected future dividends, whereas the discount rate is made up of the risk free interest rate and a risk premium. This results in the present value relation, which is known as the dividend discount model:[2]

$$P_t = E_t\left[\sum_{k=1}^{\infty} \frac{D_{t+k}}{(1+r)^k}\right] \quad (1)$$

where D is the payout in the form of dividends and r is the discount rate. Again, the expected rate of return must compensate for both the passage of time and the uncertainty related to future cash flows derived from the stock. Hence, the expected rate of return can be written as the sum of the expected real return from a risk-free asset (r_f) and an equity risk premium (erp) related to the cash flow uncertainty. For the time being, it is assumed that investors expect both entities to remain constant over time. The way in which the equity risk premium may be determined under more general conditions is dealt with later on. The present value model thus states that high prices today must relate to either high expected future dividend payments, low expected future rates of return or some combination of the two.

The model, in this simple theoretical representation, is based on very few assumptions. However, when turning to its practical application, it is necessary to rely on further assumptions. As evident from the pricing equation, there are two unknown components: first, the stream of future dividend payments and, second, the expected future rates of return. To implement the model in practice, some simplifying assumptions regarding the expected behaviour of these two components are needed. One way to go about this is by viewing the expected real rate of return on the stock (r) and the real growth rate of dividends (g) as constant. In this case, the present value relation is reduced to the "Gordon growth model":

$$P_t = \frac{D_t(1+g)}{r_f + erp - g} \quad (2)$$

Again, prices are high when dividend growth is expected to be high or the expected rate of return on the stock is low.

For stock market valuation purposes, it is common to scale stock prices by some component related to the cash flow. The two most common indicators are the dividend yield and the price-earnings ratio. Taking these in turn, equation (2) can be rewritten to give a simple expression for the dividend yield:

$$\frac{D_t}{P_t} = \frac{r_f + erp - g}{1+g} \quad (3)$$

According to this relation, the dividend yield will be low when investors expect high future dividend growth g, a low real risk-free rate of return r_f, a low equity premium erp, or some combination thereof. In these cases, the current stock price is high relative to the current level of dividend payments.

The pricing relation (2) may also be rewritten in terms of earnings instead of dividends. Given the assumption that a constant fraction (θ) of earnings

2 For a thorough description of the model see the article entitled "The stock market and monetary policy" in the February 2002 issue of the Monthly Bulletin. For ease of exposition, here we assume a constant expected stock return.

is paid out as dividends, the following holds: $D_t = \theta E_t$. Hence equation (2) may be used to obtain an expression of the price-earnings ratio:

$$\frac{P_t}{E_t} = \frac{\theta(1+g)}{r_f + erp - g} \quad (4)$$

The price-earnings ratio will thus be high when earnings are expected to grow at a high rate, when the expected rate of return on the stock is low or when some combination of the two holds.

Another popular valuation metric is the "Fed model". By assuming a 100% payout ratio, this model relates the expected return on stocks to the return on nominal government bonds r_f^N:

$$\frac{E_t}{P_t} = \frac{D_t}{P_t} = r_f + erp = r_f^N - E(\pi) + erp \quad (5)$$

where $E(\pi)$ is the expected rate of inflation. This expression follows from the fact that a pay-out ratio of 100% also implies zero long-term growth ($g = 0$). According to the Fed model, the difference between the earnings or dividend yield and the yield on a long-term nominal bond should be proxied by the equity risk premium minus the expected rate of inflation. Empirical measures of these valuation yardsticks will be shown in Section 3.

As mentioned above, the equity risk premium is an important determinant of stock prices and the derived valuation ratios. It is the risk compensation required by investors in order to hold a given stock. Thus the equity premium of a stock must contain both a measure of risk and the price of a unit of risk. Stock pricing models often define the risk component as the co-movement of the stock's return with specific financial or macroeconomic variables, while the price of risk is linked to the degree of risk aversion exhibited by investors. A vast amount of theoretical and empirical research has been carried out on the equity risk premium, and it is outside the scope of this article to provide an exhaustive overview. Box 1 gives an outline of some of the most common approaches to determining the equity risk premium.

Box 1

EQUITY RISK PREMIUM

The equity risk premium can be defined as the rate at which stock prices are expected to outperform the risk-free rate. The equity risk premium is therefore an ex ante and unobservable concept. Bearing these difficulties in mind, there are a number of approaches to modelling and estimating this component. Among the most prominent approaches are the Capital Asset Pricing Model (CAPM), the Consumption-Capital Asset Pricing Model (C-CAPM) and the Intertemporal-Capital Asset Pricing Model (I-CAPM). The purpose of this box is to provide a brief introduction to these standard approaches. An attempt to empirically estimate the euro area equity risk premium in an I-CAPM framework will be shown in Section 3. To simplify matters, log-linearised versions of the models are presented.

According to the CAPM, the excess return on risky assets (such as stocks) over the risk-free asset is determined by the covariance between the expected return on the asset (r_{t+1}) and the expected return on the market portfolio of wealth ($r_{m,t+1}$), which is often proxied by a broad stock market index.

$$E_t\left[r_{t+1}\right] - r_f \approx \mathrm{cov}_t\left(r_{t+1}, r_{m,t+1}\right)$$

To take as an example a single stock, the more its returns are expected to covary with the market portfolio, the riskier it is deemed to be. The intuition is that such a security provides a payoff which is not highly valuable, as it does not provide a hedge against times when the overall market is performing badly. This CAPM commonly does not include any measure of risk aversion, hence changes over time in equity risk premia must be driven by changes in the perceived riskiness of assets.

On a similar note, the C-CAPM states that the equity risk premium is determined by the covariance of the growth rate of aggregate consumption (c) with the return on the risky asset and by the coefficient of relative risk aversion γ:

$$E_t\left[r_{t+1}\right] - r_f \approx \gamma_t \operatorname{cov}_t\left(r_{t+1}, \Delta c_{t+1}\right)$$

The covariance term determines the risk of the asset and the risk aversion coefficient determines the price of risk. The larger the covariance between aggregate consumption growth and the asset return, the riskier the asset is deemed to be and the higher the required rate of return for holding the asset. Similarly to the CAPM, a stock which is expected to move broadly in tandem with aggregate consumption growth tends to deliver wealth when this is least desirable, i.e. when consumption is already high. A higher rate of return will be required by investors to hold this type of asset than for assets which help smooth the consumption path. How much higher this required rate of return will be depends on the investors' degree of risk aversion. A high degree of risk aversion, all else being equal, implies a high required rate of return for a risky asset. The degree of risk aversion may vary with the state of the economy so that, in times of recession or high levels of uncertainty about the future state of the economy, investors become more risk-averse than in times of high growth and stability.[1] This would imply cyclical variation in equity risk premia and hence in expected stock returns.

Finally, a discrete-time version of the I-CAPM of Merton (1973) may also be derived as a special case of the consumption-based model:[2]

$$E_t\left[r_{t+1}\right] - r_f \approx \lambda_t \operatorname{cov}\left(r_{t+1}, r_{m,t+1}\right) + \lambda_{t,z} \operatorname{cov}\left(r_{t+1}, \Delta z_{t+1}\right)$$

Like the CAPM, the I-CAPM includes the asset return covariance with the current market return as a risk component. However, additional risk factors relating to news about future returns on invested wealth are also priced. These news components are modelled through changes in "state variables" (z_{t+1}). These may be macroeconomic or financial variables which can be assumed to proxy for the changing investment opportunity set faced by the investor in the future. The λs represent sensitivities of the equity premium to the individual risk factors. The intuition is that investors care about the development of investment opportunities in the long run. Long-term investors will be unhappy about news that future investment returns are expected to be low, as this has a negative impact on the future consumption path. Investors will thus have a preference for stocks which do well on this type of news, allowing them to hedge uncertainty about future investment opportunities. An attempt to estimate the euro area equity risk premium in an I-CAPM framework will be expounded in Section 3.

1 See, for example, Chart 8 in the article "Extracting information from financial asset prices" in the November 2004 issue of the Monthly Bulletin.

2 See J. H. Cochrane (2001), "Asset Pricing", Princeton University Press, and J. Y. Campbell (1993), "Intertemporal Asset Pricing without Consumption Data", American Economic Review, 93, pp. 487-512.

DEVIATIONS FROM FUNDAMENTAL EQUILIBRIUM PRICING

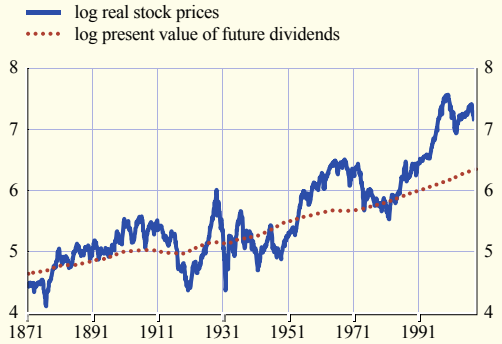
The rational present-value formula explained in the previous section is an equilibrium concept. Generally speaking, if investors are rational and able to anticipate the future dividend stream with a certain degree of accuracy (and also adopt an adequate discount factor), there should be little room for equity prices to experience prolonged periods of over or undervaluation. However, both the theoretical and empirical literature have shown that asset prices can drift to levels which are hard to reconcile with the rational valuation model stated above. This discussion is not new: as far back as the mid-1930s, Keynes likened the stock markets to a beauty contest, where "we devote our intelligences to anticipating what average opinion expects the average opinion to be".[3]

This notwithstanding, the prevailing view throughout most the second half of the 20th century was that financial markets were efficient and that asset prices tended to reflect their fundamental determinants. In the 1970s, Kindleberger was among the first academics to challenge this mainstream assumption by exploring historical episodes of financial crisis and arguing that investors tend to exaggerate good news, which can at times give rise to misalignments of asset prices.[4]

Later, a number of influential empirical studies conducted in the early 1980s indirectly supported the view of inefficiencies in stock markets and, in particular, the finding of "excess volatility". This logic can be seen as follows. If the rational valuation formula holds, stock prices for a single firm can be seen as rational forecasts of the firm's future dividend stream (holding the expected return as constant). For such a forecast to be rational, it should be less volatile than the dividend stream it intends to forecast. However, empirical evidence for the United States took notice of the observation that stock prices tend to be much more volatile than the underlying dividends.[5] Charts 1 and 2 illustrate this notion, which is applied to long samples of US and German data. The charts show fluctuations in stock prices that are much larger than the fluctuations in the present value of future dividends for both economies.

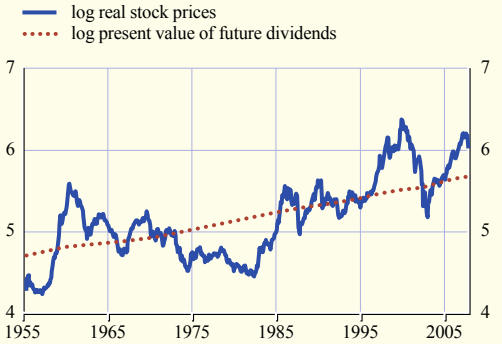
3 See J. M. Keynes (1936), "The general theory of employment, interest and money", Macmillan, London.
4 See C. P. Kindleberger (1978), "Manias, panics, and crashes", John Wiley & Sons, Inc.
5 See R. J. Shiller (1981), "Do stock prices move too much to be justified by subsequent changes in dividends?", American Economic Review, 71, pp. 421-36, and S. F. LeRoy and R. D. Porter (1981), "The present-value relation tests based on implied variance bounds", Econometrica, 49, pp. 555-74.

Chart 1 Real US stock prices and present value of subsequent dividends



Source: http://www.econ.yale.edu/~shiller/data.htm
Note: Corresponds to the S&P 500 index over the sample period 1871-2008.

Chart 2 Real German stock prices and present value of subsequent dividends



Source: Global Financial Data.
Note: Corresponds to the CDAX index over the sample period 1955-2008.

The only way to reconcile the existence of excess volatility with the rational valuation formula is to assume that the historically very smooth pattern of dividends is not representative of its ex ante potential fluctuations.

The empirical observation that stock prices can indeed drift away from levels implied by the rational valuation formula sparked a theoretical discussion as to whether there are any factors that may help to explain this presumed anomaly. To this end, two disciplines have improved the understanding of asset price fluctuations: models of asset price bubbles and insights gained from behavioural finance. These two fields are not in any way exhaustive, but practitioners and policy-makers have frequently used knowledge gained from these fields to better understand, in particular, the developments during the late 1990s, when the increases in stock prices were largely at odds with the efficient markets hypothesis.

One important strand of the literature which has formalised departures from fundamentals is that on asset price bubbles. Bubbles refer to asset prices that exceed an asset's fundamental value because current owners believe that they can resell the asset at an even higher price in the future. Asset price bubbles can be decomposed into the following four broad categories: first, models that assume that asymmetric information among investors can produce asset price bubbles; second, models that focus on the interaction between rational and behavioural traders; third, heterogeneous beliefs on the side of traders, which lead, in some circumstances, to an outcome where they agree to disagree about the fundamental value of equity prices; and fourth, bubbles that occur based on the assumptions that investors are rational and share the same information. In this last category, bubbles may be driven exclusively by the exogenous fundamental determinants of stock prices, namely expected future dividends. This type is referred to as intrinsic bubbles. In this setting, bubbles can cause prices to overreact to changes in fundamentals. Stock price increases in the late 1990s were particularly strong in the technology sector. At that time, many investors held the view that new internet-based companies, commonly referred to as dot-coms, would deliver earnings (and dividends) which would far exceed current earnings. Such a perceived structural change in fundamentals can probably explain much of the strong run-up in stock prices for many firms in the technology sector during that particular episode. This explanation is also in line with the intrinsic bubbles hypothesis.

Insights from the behavioural finance literature can also help to explain why asset prices sometimes drift to levels that seem stretched from fundamentals, for example, the elevated stock prices in the 1990s. This discipline uses research on human and social cognitive and emotional biases to better understand economic decisions and how they affect market prices.[6] One of the most important insights from this field is that individuals are not able to filter and process all of the information that could potentially affect asset prices. As they cannot cope with the complexity of processing all of the information, some investors will instead use simple anchoring rules to make decisions. The most likely anchor consists of the most recent asset price history.[7] For instance, a few years of steadily rising stock prices may serve as the anchor that investors use as an important input to their investment decisions. In this setting, market participants may therefore extrapolate the recent price history when projecting the future expected path of stock prices. This can turn into a feedback loop, whereby a second round of price increases eventually feeds back into even higher prices and so on.

The above-mentioned feedback loop can be further amplified by investors' tendency towards herding behaviour. Although people independently make use of all publicly available

6 The behavioural finance field was recognised with the award of the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel to Daniel Kahneman and Vernon L. Smith in 2002. For further information, see the webpage: http://nobelprize.org/nobel_prizes/economics/laureates/2002/

7 See D. Kahneman and A. Tversky (1974), "Judgement under uncertainty: heuristics and biases", Science, 185, pp. 1124-31.

information before taking a major decision, they are also heavily influenced by the decisions of others. Shiller provides a telling example.[8] If two restaurants are opening next to each other, the first customer has to judge the quality of the food based on his or her view from the outside. This information is surely not very accurate and, thus, the actual restaurant chosen is more or less random. Upon seeing the first customer eating in one of the restaurants, the second customer has additional information on which to base his or her decision. The result may be that all customers end up eating in the same restaurant. Investors can sometimes behave like a herd when it comes to investment decisions. Instead of thoroughly evaluating the probabilities and likelihoods of certain events, they may justify their own investment decisions based on other investors' actions. Apart from the above-mentioned overreaction to fundamentals in line with the intrinsic bubble hypothesis, herd behaviour and a widespread belief that the world economy reached a "new era" in the late 1990s can probably explain part of the strong upsurge in technology stocks in particular at that time.

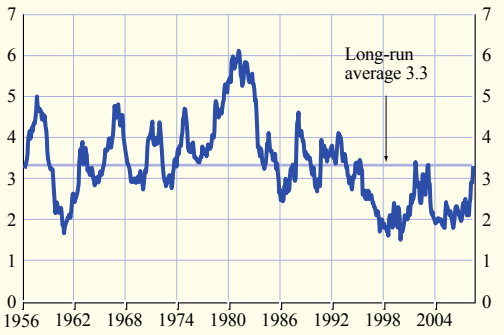
3 EMPIRICAL STOCK MARKET VALUATION METRICS FOR THE EURO AREA

ESTABLISHING A BENCHMARK FOR VALUATION INDICATORS

The main aim of this section is to present euro area empirical counterparts to the valuation indicators derived in the previous section. For this purpose, it is important to understand how these indicators should be interpreted. In particular, some sort of benchmark is needed in order to assess stock price valuations. A simple benchmark derives from the following stylised fact. Over sufficiently long periods of time, most valuation indicators tend to revert to some average level (mean reversion) after having reached cyclical peaks and troughs. Hence, historical averages appear as simple, but still reasonable, yardsticks for the long-term fundamental equilibrium levels of the various valuation indicators and are thus

Chart 3 Dividend yield for Germany

(percentages per annum)



Source: Global Financial Data.
Note: Corresponds to the CDAX index over the sample period 1956-2008.

widely employed among practitioners and policy-makers. However, it must be borne in mind that particularly high or low valuations in such a framework cannot be equated with mispricing per se, as they are also, in principle, consistent with equilibrium pricing when taking into account cyclical fluctuations in stock market fundamentals. In addition, persistent deviations from historical averages over previous periods may be observationally equivalent to the hypothesis of structural changes in the process generating the fundamentals.

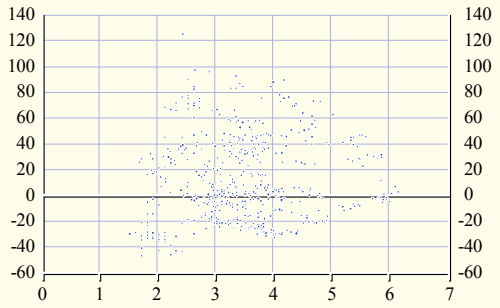
Chart 3 is an example of the use of mean reversion as a standard yardstick and shows the dividend yield for a German stock market index dating back to the mid-1950s. It shows that periods when the dividend yield drifted to levels significantly below or above the long-term average were followed by either an abrupt or a gradual reversion to some long-run mean.

Such a reversion to the mean could be brought about by changes in the dividend growth path and/or by a correction in stock prices. Charts 4 and 5 decompose the dividend yield series to evaluate whether future dividend growth and/or future stock price developments are responsible for the observed mean reversion.

8 See R. J. Shiller (2000), "Irrational Exuberance", Princeton University Press.

Chart 4 Dividend yield (x-axis) and five-year dividend growth for Germany (y-axis)

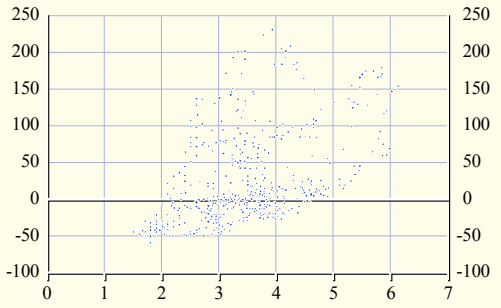
(percentage changes; monthly data)



Source: Global Financial Data.
Notes: Dividends for the CDAX index over the sample period 1956-2003. The five-year dividend growth is measured in real terms and total percentage changes over the next five years.

Chart 5 Dividend yield (x-axis) and five-year stock prices change for Germany (y-axis)

(percentage changes; monthly data)



Source: Global Financial Data.
Notes: Dividends and stock prices for the CDAX index over the sample period 1956-2003. The five-year equity growth is measured in real terms and total percentage changes over the next five years.

The horizontal axes of Charts 4 and 5 show the current annual dividend yield. Chart 4 scatter plots the current dividend yield against real dividend growth evolution for the following five years. The chart shows little co-movement between current and future dividend growth. The picture changes when five-year real stock price changes are instead plotted on the vertical axis, as in Chart 5, which shows a slight positive relationship between the two variables. Thus, on average, periods of above-average dividend yield tend to be followed by a positive stock price performance, whereas low dividend yield often signals subsequent declines in stock prices over the following five years. As a consequence, the observed mean reversion in the dividend yield tends to emanate mainly from adjustments in equity prices.[9] Evidence of weak long-run predictive content in dividend yields for future dividends also holds for other scaling indicators, such as price-earnings ratios, and is found across several major markets.[10]

EMPIRICAL VALUATION INDICATORS

As elaborated upon in the theoretical section, the "Gordon growth model" can be used to derive a number of valuation indicators which are then grouped into two categories. The first category uses earnings to scale stock prices, while the second category employs the equity risk premium as a yardstick for stock price valuations.

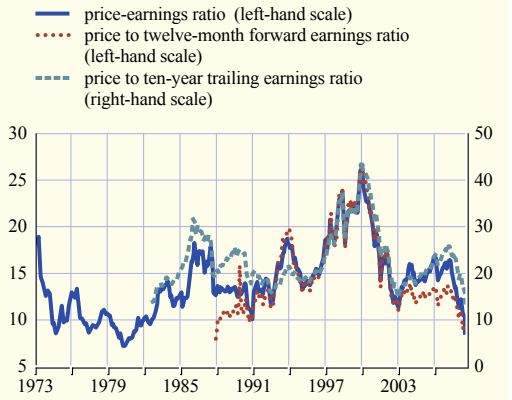
EARNINGS INDICATORS

Firms' earnings are the source of cash flows for stocks (as a proportion of the earnings are paid out as dividends). A natural starting point to gauge the "correct" level of firms' stock prices would therefore be to examine the way in which these are related to their actual and expected profitability. Applying this to the euro area, Chart 6 plots three price-earnings ratios based on earnings for different horizons. The first is a "classical" price-earnings ratio that employs the last reported earnings in the denominator. The second is a forward-looking price-earnings ratio, where the earnings component refers to the analysts' forecast of the expected earnings for the next twelve months. The third measure uses

9 It is, however, important to note that there are periods when this relationship does not hold. For instance, there is little co-movement between German dividend yields and future real stock price returns in the early 1990s.

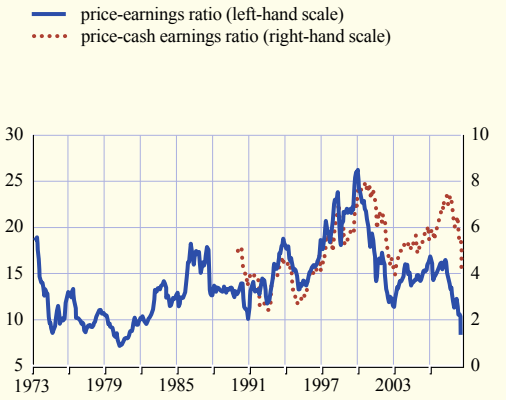
10 See J. Y. Campbell and R. J. Shiller (1998), "Valuation ratios and the long-run stock market outlook", Journal of Portfolio Management, pp. 11-26, and D. E. Rapach and M. E. Wohar (2005), "Valuation ratios and long-horizon stock price predictability", Journal of Applied Econometrics, 20(3), pp. 327-44. See also the article "Equity valuation measures: what can they tell us?" by A. V. Wetherilt and O. Weeken published in the Winter 2002 issue of the Bank of England's Quarterly Bulletin.

Chart 6 Euro area price/earnings with earnings calculated over different horizons



Sources: Thomson Financial Datastream and ECB calculations.
Note: Prices refer to the EMU total stock market index, except for forward earnings, where prices refer to the MSCI EMU index.

Chart 7 Euro area price/earnings and price-cash earnings ratios



Source: Thomson Financial Datastream.
Note: Prices refer to the EMU total stock market index.

a ten-year average of past earnings, which smoothes out the strong cyclicality observed in earnings.[11] The movements in all three price-earnings ratios are broadly similar over time. Moreover, all measures have, in the past, tended to fluctuate within some stable range, providing evidence of mean reversion. One notable exception was around the year 2000, when all price-earnings ratios rose to elevated levels, supporting the general opinion that there was a dot-com bubble during this period. The various price-earnings ratios suggest that, since the outbreak of the financial turmoil in the summer of 2007, the euro area stock market valuation has moved from slightly overvalued towards undervalued, at least when applying historical averages as a benchmark.

The above-mentioned earnings valuation measures reflect reported earnings, which refer to resources earned and resources used over an accounting period. This (accounting) definition, however, ignores the timing of cash receipts when recognising revenues and the timing of cash expenditures when recognising losses. In order to provide a broader overview, firms usually present a cash-flow statement in addition to the income statement. Thus, a firm can, at a certain point in time, show robust income growth, but have little cash at its disposal. As a result, a valuation assessment that is only based on reported earnings may occasionally be misleading.

Chart 7 plots a ratio based on cash earnings, as well as the price-earnings ratio based on current reported earnings. Although both measures of the price-earnings ratio tend to co-move, there are indeed periods of conflicting signals. Around 2000, both ratios were at all-time highs, supporting the view that there was a dot-com bubble. By contrast, the price-cash earnings ratio suggests that, before the outbreak of the financial turmoil in the summer of 2007, euro area stock prices were on the high side compared with cash flows, but this is not borne out by reported earnings. This different behaviour reflects not only developments in certain non-cash expenses, but also the introduction in 2005 of new accounting standards in the euro area, namely the International Financial Reporting Standards. These changes in accounting standards tend to make reported earnings pro-cyclical, i.e. they result in higher reported earnings during economically "good" times and lower reported earnings during "bad" times.

11 As suggested by R. J. Shiller (2000), "Irrational Exuberance", Princeton University Press.

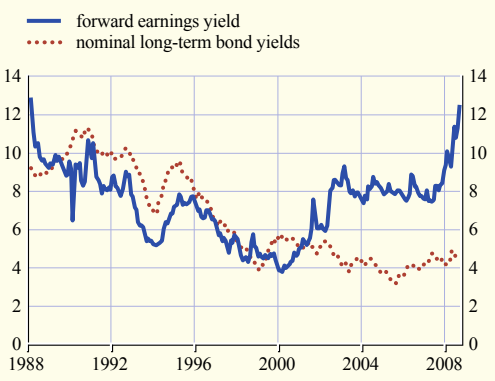
Other adjustments to earnings are possible, such as accounting and debt adjustments to earnings.[12] A popular adjustment among practitioners is to adjust the price-earnings ratio for growth, which is known as the price-earnings growth ratio. The latter, in turn, can be adjusted further for risk.[13] Another possible adjustment to the price-earnings ratio is to correct it for the level of the long-term interest rate and a proxy for the structural level of the equity risk premium, given that the dividend discount model suggests that it is not just earnings that determine stock prices, but also the risk-free interest rate and the equity risk premium.[14]

As shown in Section 2, the "Gordon growth model" can be used to derive a relative valuation tool between the stock markets (in the form of forward earnings yields) and the government bond markets (using long-term bond yields). This relationship was first examined in the mid-1990s by a few Federal Reserve economists. Given their employer, the model became known as the "Fed model".[15] This model stipulates that there is an alleged long-term relationship between the two assets by taking the viewpoint that stocks and bonds are two competing asset classes for investors. If the expected return on one of them is substantially higher, investors will shift their funds to that asset class. These portfolio shifts will reduce any differences in expected returns. In the same vein, the Fed model can be linked to the demand for money in the euro area.[16]

Chart 8 shows the forward earnings yield and long-term bond yields for the euro area since the late 1980s. The chart shows that the two indicators were both on a downward trend throughout the 1990s, signalling a relative "fair valuation" between the two asset classes. Since 2002, earnings yields have increased, whereas euro area long-term bond yields have hovered at relatively low levels. The low level of long-term bond yields over the past few years can be related to a number of factors, such as accommodative monetary policy rates, low term premia demanded on government bonds and strong demand from emerging markets. At the same time, euro area firms have delivered strong earnings growth over the same period, which has probably supported the forward earnings yield measure.

Chart 8 Fed model for the euro area

(percentages; annualised)



Sources: Reuters, Thomson Financial Datastream and ECB calculations.
Note: Forward earning yield is the ratio between the twelve-month forward earnings and the MSCI EMU index.

The main criticism of the Fed model is that it explores the relationship between a nominal variable, i.e. the yield on long-term government bonds, and a variable which is in theory a real quantity. As a result, periods of surging inflation expectations should induce investors to require higher yields offered on nominal long-term bonds. At the same time, stock prices should be unaffected by higher inflation expectations

12 See S. E. Wilcox (2007), "The adjusted earnings yield", Financial Analysts Journal, 63(5), pp. 54-68.

13 See J. Estrada (2005), "Adjusting P/E ratios by growth and risk: the PERG ratio", International Journal of Managerial Finance, 1(3), pp.187-203, and M. A. Trombley (2008), "Understanding the PEG ratio", Journal of Investing, 17(1), pp. 22-25.

14 See G. J. de Bondt (2008), "Determinants of stock prices: new international evidence", Journal of Portfolio Management, 34(3), pp. 81-92, and G. J. de Bondt (2008), "Determinants and future returns of sector stock prices", Colloquium Paper, 27th SUERF Colloquium on "New Trends in Asset Management: Exploring the Implications", Munich 12-14 June.

15 See J. Lander, A. Orphanides and M. Douvogiannis (1997), "Earnings forecasts and the predictability of stock returns: Evidence from trading the S&P", Journal of Portfolio Management, 23(4), pp. 24-35.

16 See R. A. De Santis, C. A. Favero and B. Roffia (2008), "Euro area money demand and international portfolio allocation: A contribution to assessing risks to price stability", ECB Working Paper No 926; also presented at the ECB workshop entitled "The external dimension of monetary analysis", Frankfurt am Main, 12-13 December 2007.

if the cash-flow component is revised upward by a similar magnitude as the discount factor. Consequently, the information content from the Fed model may be blurred. In addition, it should be noted that the Fed model uses earnings forecasts provided by market analysts to derive the forward earnings yield. These forecasts might, however, be biased.[17]

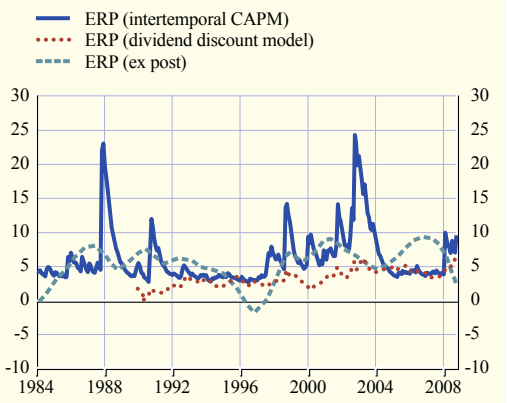
EQUITY RISK PREMIUM INDICATORS

As discussed in the theoretical section of this article, the equity risk premium is the rate at which risky stocks are expected to outperform the return on risk-free interest rates. A myriad of techniques are available to estimate the equity risk premium, but all estimates are surrounded by a large degree of uncertainty, as the premium is an unobservable component.

Chart 9 shows three measures of the equity risk premium for the euro area, of which two are model-based and one is an ex-post measure. The first measure uses a conditional I-CAPM methodology, whereby returns of the euro area portfolio depend on the market risk, as well as on the risk that the investment opportunity set changes over time, proxied by the yield curve spread as the intertemporal factor.[18] The second model-based measure employs the dividend discount methodology to back out the implied equity risk premium for the euro area.[19] The third measure is a simple moving ten-year average of the ex-post equity risk premium.

Three features can be noted from the chart. First, the three measures provide a relatively similar level of average equity risk premium over longer periods of time. Over the sample period from January 1990 to October 2008, the unconditional mean of the I-CAPM, the mean of the premium from the three-stage dividend discount model and the simple moving average of realised returns were 6%, 3% and 5% respectively. Second, estimates of the equity risk premia can, in certain periods, decouple from one another. It is reasonable to assume that the simplifying assumptions made in order to make the models tractable can result in temporarily noisy estimates. It is therefore important to cross-check equity risk premium developments using a broad set of models. Third, during the stock market correction between 2000 and 2002, the model-based measures suggested that investors required a higher premium for investing in the stock markets. Such a sudden shift in the equity premium may have amplified the stock market correction taking place at that time. Moreover, while the dividend discount model clearly suggests that a gradual decline in the equity premium contributed to the increasingly higher valuation of stocks during the dot-com boom period around 2000, the evidence from the I-CAPM is less conclusive in this regard.

Chart 9 Equity risk premium (ERP) measures for the euro area



Sources: Thomson Financial Datastream and ECB calculations.

17 For euro area evidence, see the box entitled "What is the information content of stock market earnings expectations held by analysts?" in the March 2004 issue of the Monthly Bulletin.

18 For more details, see L. Cappiello, M. Lo Duca and A. Maddaloni, "Country and industry equity risk premia in the euro area: an intertemporal approach", ECB Working Paper No 913, 2008.

19 This estimate is based on a "three-stage dividend discount model". The model assumes that corporate earnings growth is expected to develop in three stages. In the first stage, which is assumed to last for four years, earnings are expected to grow at a real rate which equals professional stock market analysts' three-to-five year ahead earnings per share growth forecasts minus average five-year ahead Consensus Economics inflation forecasts. The second stage is an interim period (assumed to last for eight years) where earnings growth is expected to adjust in a linear fashion to a constant long-term steady-state growth rate of corporate earnings, which is assumed to prevail throughout the third infinite stage. The long-term real earnings growth rate is assumed to be at a constant level of 2.25%, which is in the range of longer-term potential growth estimates for the euro area economy.

4 CONCLUSIONS

A simple fundamental valuation model of stock prices suggests that they should reflect current and future expected dividends, discounted by an appropriate discount factor. However, theoretical research on stock price bubbles and insights from behavioural finance have shown that, on certain occasions, stock prices can drift to levels beyond those considered consistent with an appropriate valuation. The strong stock price corrections that tend to take place after episodes when stocks have been overvalued can harm the entire economy.

Notwithstanding the difficulties involved in identifying stock price misalignments from fundamentals in real time, this article has shown that a number of metrics can help in this context. In particular, valuation yardsticks that scale stock prices by their earnings component are able to signal strong misvaluations with a certain degree of accuracy. The article also argues in favour of applying a multi-model approach when valuing stocks. Around the year 2000, the vast majority of the valuation indicators clearly supported the view that there was a dot-com bubble. Recently, at the outbreak of the financial turmoil in the summer of 2007, all stock market valuation metrics indicated a lower valuation.