CAHIER D'ETUDES
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N°2

STOCK MARKET VALUATION OF OLD AND NEW ECONOMY FIRMS

by Patrick Lünnemann
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Abstract

Though stock prices are commonly not considered an integral part of central banks' monetary policy strategy, financial asset prices are highly relevant because they exert important impacts on inflation, on the real sphere of the economy, and on the financial system. This paper illustrates the evolution of selected primary and secondary equity markets and elaborates divergences and similarities between the pricing of old and new economy stocks. It is shown that the valuation of new economy stocks is subject to enhanced contingency. Prices of new economy stocks ceteris paribus react more sensitively to new information and modifications to external assumptions. From both a microeconomic as well as a macroeconomic point of view, the growth projections implicit in price earnings ratios observed in recent years seem unrealistic. Furthermore, from a utility maximising perspective, it seems unlikely that the observed shift in investment away from old economy stocks and into new economy stocks could have been achievable without a change in the aggregate risk preference. Panel regression analysis based on 219 EURO STOXX firms, though, confirms a significant impact of firm-specific and macroeconomic fundamentals on monthly returns for old economy companies as well as for telecommunication, media and technology (TMT) firms. The null-hypothesis of no statistically significant difference between TMT firms and non-TMT firms with respect to the role of firm-specific and macroeconomic fundamentals in explaining monthly stock returns is rejected. While theoretical considerations and empirical findings suggest that the monetary policy stance remains an important factor driving equity valuation, the growing passion for stocks and the more volatile pricing of new economy stocks bear important implications for central bank policy making.

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Central banks and stock markets:
an introduction

Few expressions have been hyped as much as the new economy has been recently. Still, the concept of the new economy phenomenon remains nebulous. Commonly, economists focus on the achievements of the US economy throughout the second half of the 90's, namely the simultaneous robust and exceptional economic growth and sustained remarkably modest price acceleration. Though the uncertainty applies to its driving forces as well, the emergence of a new economy is commonly considered a result of the confluence of advances in information and communications technology (ICT), improved macroeconomic management (both fiscal and monetary) and international elements (e.g., globalisation, economic activity abroad, foreign exchange), where pride of place is commonly going to the ICT revolution.[1] Contrary to numerous studies on the new economy[2], this document is not to assess the emergence of "higher speed limits". Instead, the aim of the document is:

i) To describe what makes the pricing of new economy stocks so special (section 2).

ii) To illustrate the rapid rise in equity prices, notably among new economy stocks, which accompanied the emergence of the so-called new economy phenomenon and to investigate its plausibility from a microeconomic and a macroeconomic perspective (sections 3 and 4).

iii) To investigate whether the aggregate risk preference of equity investors has been subject to change and to discuss the role of fundamentals in explaining equity returns in recent years (sections 5 and 6).

iv) To elaborate implications of recent stock market trends for central bank policy (section 7).

Though stock prices are commonly not considered an integral part of central banks' monetary policy strategy, financial asset prices are highly relevant because they exert important impacts on inflation, on the real economy, and on the financial system. Final demand, for example, is affected through both demand for consumption and demand for investment.

As for consumption, economic theory provides three main impacting channels. First, increases in financial asset prices are generally considered an increase in permanent income which, according to Friedman, translates into augmented private consumption ("wealth effect"). Second, Friedman's permanent income theory states that, in deciding on individual consumption, economic agents rely on their expected permanent income. Thus, once changes in equity prices incite agents to modify their expectations with respect to income generated by non-equity wealth, even consumption behaviour of non-equity holders may change.

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1. See, for example, European Central Bank (2000).
2. See, for example, Jalava (2001) and Lee (2001).

Third, changes in financial asset prices affect the borrowing capacity of households. If the latter drops, households will readapt their portfolio by reducing current consumption and increasing savings.

Investment demand of non-financial firms, too, may be affected via three channels. First, decreasing equity prices may imply a reduction of Tobin's q (i.e., stock market valuation of a given company over its existing net capital stock), thereby rendering new capital more expensive relative to the stock existing.[3] Second, investment activity could suffer from decreasing equity prices according to the flexible accelerator theory.[4] When coupled to the multiplier concept, changes in investment may bring about a more than proportional change in production. Third, decreasing stock market prices imply a reduction of the net value of firms and renders credit-taking more expensive and difficult.

Another important transmission channel from financial asset prices to the real economy runs through balance sheets of financial institutions. In a direct way, a harsh downward correction of stock prices would deteriorate balance sheets within the banking sector and reduce banks' lending capacity. Furthermore, rapidly shrinking asset prices may impact on the real sphere in an indirect manner by deteriorating the solvency of the private sector in general (through diminishing value of collateral held against loans). Once banks sell such collateral due to clients' non-ability to match their payment obligations, additional pressure is exerted on asset prices.[5]

Given that financial markets are highly integrated, the recent sharp fall in equity prices is commonly considered a risk not only for the USA, but for the global economy.[6] Finally, the mere anticipation of significantly shrinking equity prices may render specific currencies less attractive for international investors, thereby affecting underlying capital flows and exchange rates.[7] Thus, due to their impact on central bank information variables, intermediate targets and price stability and given the increasing passion for equity as well as the nature of new economy stocks, central banks are asked to monitor in detail the evolution of stock markets.

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3. According to the q theory, firm investment is a function of q. If market capitalisation exceeds the value of the company's assets, firms are encouraged to invest given that the expected revenue generated by the assets is higher than their costs. Conversely, if q remains below one, a firm is supposed to disinvest.

4. Felderer/Homburg (1994).

5. Putten/Vergnaud (2001).

6. As for the US, according to the OECD, a 20 % decline in equity prices – when coupled to a 4,5 % decrease in marginal consumption propensity – transmits into a 1,2 % decrease in private consumption. This, in turn, would correspond to a 0,6 % reduction in the annual growth rate (Boone/Giorno/Richardson (1998)).

7. From the perspective of the European Central Bank this may be particularly relevant for capital flows from the euro area to the US. According to the FMI, a 20 % reduction in equity prices may reduce the value of the US Dollar relative to the Euro by around one fifth (IMF (2000b)).

2

Peculiarities of new economy firms

2.1   Specific characteristics of new economy firms

2.1.1   The field of activity

In recent years, the valuation of stocks – in particular that issued by new economy firms – has been extensively discussed among the public, researchers and financial market practitioners. Still, there is no unanimous understanding as to what characterises a new economy firm. Two possible properties in characterising new economy firms refer to the field of activity and the business model. With respect to the field of activity, again, there is no unanimity. Whereas some economists analysing macro aspects of the new economy phenomenon consider but the ICT segments [8], others refer to the telecommunication, media and technology sectors (TMT). [9] Financial market institutions and their products related to the new economy, however, indicate a larger understanding reflecting that some entire stock market indices have become synonyms for the new economy (e.g., the German NEMAX and the US American NASDAQ). The NEMAX, for example, provides as much as nine high-tech sectors (see figure 1). The field of activity constitutes an important property underlying stock market valuation since it is subject to specific assumptions with respect to growth potential, future effective growth rates, corporate pricing power, barriers to market entry, etc. (see box 1).

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8. See, for example, Houben/Kakes (2001).

9. In general, the TMT approach embraces the ICT as well as other industries. This approach, however, requires a definition of the technology segment (see, for example, Brierley/Kearns (2001)).

Growth projections for the telecommunication sector are bright. Different scenarios apply to the existing business areas within this sector. First, whereas the voice transmission segment may lose pace, data transmission may benefit from rapid growth. Second, mobile and fixed communication may converge in terms of volume and price. One common element across business fields is rapid price erosion.

Potential growth in the media sector is giant due to the basically unlimited range of information provided and the increasing demand for specific information. Marginal cost of production and distribution are exceptionally low. However, barriers to market entry are low and prices subject to rapid erosion.

Growth potential and uncertainty in the software sector are substantial. Connectivity being the focal issue, the potential success may be very high, but strictly limited to a few players. Start-up companies depend essentially on rapid initial growth. Established companies benefit from significant market entry barriers.

The biotechnological product life cycle is different from common product and IT product cycles (slower product obsolescence, longer research and development phases).[11] Ultimately, risks may be binary and subject to ethical and/or legal criteria. In merchandising their products, biotech firms depend on the financing power and the logistics of pharmaceutical multinationals. Similar to the health sector and the IT sector, the biotech sector is subject to narrow markets due to high fixed research and development costs.[12]

The technology sector is relatively heterogeneous. Firms benefit from strong strategic positioning in well-defined markets and low price pressure. They may be highly dependent on critical components, which only make up a small fraction of their business in terms of value added.

Providers of new financial services face limited possibilities for business expansion. The frequency of financial transactions, in general, is sensitive to the overall market stance. Financial products are highly substitutable implying low corporate pricing power. Market entry barriers are barely existing.

Figure 1: The share of high-tech segments in the NEMAX ALL SHARE Index [%]
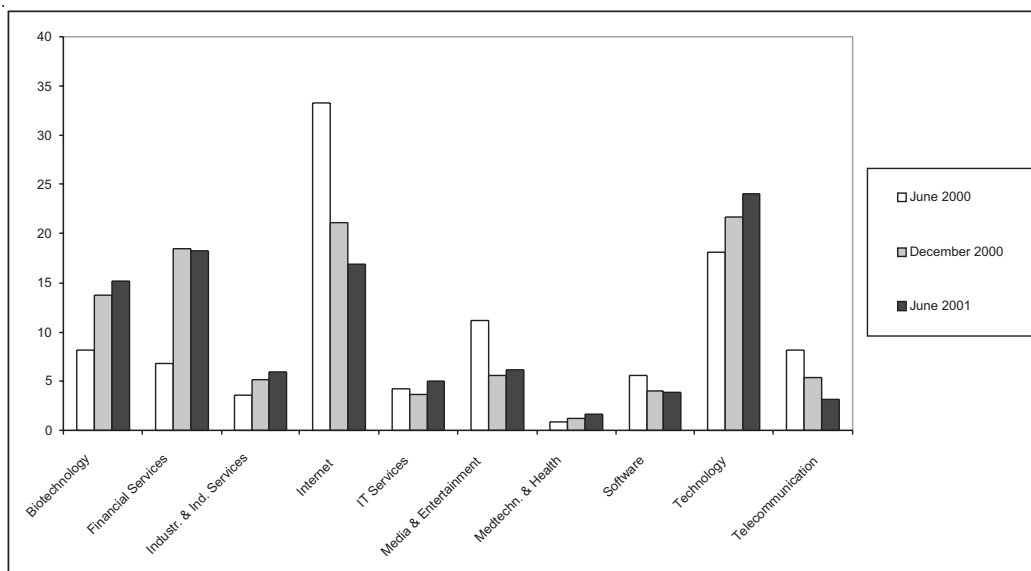
Source: Deutsche Börse AG, own calculations.

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10. On the following, see, for example, Fraikin (2001).
11. Brierley/Kearns (2001).
12. UBS Warburg (2001).

2.1.2 The business model

The business model may relate to numerous firm properties. Apart from sector-specific elements (such as the upside potential and the term of revenue generation), the characteristics specific to new economy firms, as a baseline, refer to their affinity to innovation, the kind of techniques employed, the source of their know-how as well as the financing sources for research and development activities (see table 1).

Table 1: Selected business model characteristics of old and new economy companies

	OLD ECONOMY COMPANIES	NEW ECONOMY COMPANIES
BUSINESS MODEL PROPERTIES	Relatively conservative	Innovative
	Use of established techniques	Use of new cutting edge techniques
	Historical know-how and expertise	Experimental know-how
	Use profits to fund research and development	Use investors money to fund research and development

2.2 What makes the valuation of new economy firms so special?

The specific character of new economy firms has important implications for equity valuation. Any assessment of new economy stocks will probably be subject to a higher level of contingency than the valuation of old economy stocks due to several reasons.

First, new economy companies are different in that they use new technologies and rely on new and probably more diverse business models. Obviously, any valuation of these is conditional upon the limited historical experience among potential investors.

Second, new economy firms frequently have been created only recently meaning that any valuation may not rely on back data.

Third, new economy firms much more than traditional firms rely on intangible assets (notably human capital). The greater role for intangibles creates additional uncertainty: on the one hand, there is currently no technique available allowing for a reliable assessment of such assets. On the other hand, the higher fraction of investment into intangible assets immediately and to the full extent shows up as costs in their balance sheets thereby reducing accounted current profits and rendering the evolution of profits less steady.[13]

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13. Mouriaux/Verhille (2000).

Fourth, the commitment of new economy firms to investment and intangible assets implies that investors buy future growth expectations at the expense of current earnings. Any valuation of new economy firms, therefore, relies increasingly on expected rather than actual figures.

Fifth, the valuation of new economy stocks may be more sentiment and/or news flows driven than that of old economy firms.

Sixth, prices of new economy stocks ceteris paribus react much stronger to given changes in external growth or inflation assumptions due to the discount leverage.[14]

BOX 2: Valuation techniques

Comparable Company Analyses:
New economy companies and those not making profit are notoriously difficult to value, and benchmarking them against a peer group is a common methodology.

Discounted Future Earnings:
Taking a representative measure of profitability and then discounting this back to present value is used as a proxy for current profitability. This method is simpler than a full-blown discounted cash flow analysis and relies on fewer assumptions. But the assumptions are, though fewer, more influential and therefore must be implemented with caution.

Discounted Portfolio Valuation:
The value of some new economy companies lies not in their current, near-term, revenue generation ability, but rather in the company's potential to bring value-enhancing products to the market. Such companies can have lumpy and unpredictable revenue streams that make them unsuitable candidates for a comparable company analysis. One way to get around this caveat is to assess each product in the company's portfolio in terms of its potential market and its probability of getting to market. A key driver is the likelihood of getting to market and to this extent a set of probabilities – each representing a specific development stage – is applied. Once the market potential and the likelihood to enter that market has been estimated, a relatively aggressive discount rate is applied to obtain the net present value of each product.

Risk-Adjusted Discounted Cash Flow:
This method is quite similar to the discounted portfolio method. Sales forecasts for the products in pipeline are risk-adjusted and the net present value is derived by assuming long-term growth rates, such as GDP growth. This method is primarily applied to later stage earnings driven companies.

Traditional Criteria:
Frequently applied instruments are PE ratios (or PE to growth ratios), dividend discount models, price to sales ratios and price to book ratios (PB ratios).

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14. See also paragraph 4.2.

Seventh, from an empirical point of view, changes in projections about sales and profit growth themselves have been much more important for new economy than for old economy firms.[15]

Eighth, anticipating the business outlook for some new economy fields is more difficult due to the massive price erosion, which they are commonly subject to. Finally, valuation of new economy companies relies substantially on a qualitative assessment of the strength, quality and experience of the management, which mostly requires extensive on-site firm visits. Since these are frequently only available to large wholesale investors, this may – despite ubiquitous ICT - lead to structural valuation divergences between large institutional investors on the one hand and small-size investors on the other hand.

Apart from these sector-specific factors, there are also peripheral factors that may drive stock prices differently than in the past and/or may affect new economy stocks in a different way than old economy stocks.

For example, the emergence of electronic trading platforms and online brokerage has multiple achievements , such as more rapid trade execution and settlement, permanent access and reduced transaction costs as well as increased market liquidity. But they may also be conducive to contagion and/or intraday trading. They enable non-institutional investors (i.e., new behavioural patterns[16]) to enter the markets, which may have unknown effects on valuation and its volatility. Furthermore, electronic trading may have inclined dealers to "spoofing"[17] and some characteristics of technology stocks – small float, high volatility – appear well suited to investors who prefer these new channels of communication and stock market trading.

The increased role of index-linked management can amplify the spread of herd behaviour and lead to self-sustaining price increases: when prices of certain stocks rise, their relative weight in the index increases, thus prompting managers to accumulate these shares within their benchmark portfolios.[18] This may be particularly applicable to an environment characterised by small firm size and asymmetrically distributed market capitalisation.

Crowd behaviour may create financial bubbles according to the "bigger fool" theory. This theory may better apply to new economy stocks (more volatile and more sensitively reacting to modifications to external assumptions) since risk taking preferences may allow for more extreme "bets" among investors.

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15. See, for example, the ad hoc announcements published by the Deutsche Gesellschaft für Ad hoc-Publizität (according to German securities law, listed firms are asked to publish any firm-specific, not publicly known information that may significantly affect the price of its equity).

16. For example, according to a recent study by Schroder Salomon Smith Barney, non-institutional investors are particularly subject to certain patterns of investment conduct, such as the so-called psychological representative heuristics (Handelsblatt, 19/20 October 2001).

17. In fact, the National Association of Security Dealers, owner and regulator of NASDAQ, led investigations concerning price manipulations in equity trading (Neue Zürcher Zeitung, 24 August 2001).

18. Mouriaux/Verhille (2000).

Massive share buybacks may be one reason for a substantial increase in prices of new economy stocks due to the narrow linkage with stock options, which have become an increasingly popular way of remunerating staff within the new economy sector. By buying back shares, the management can, in effect, inflate its own pay – and, because stock options do not appear in the company's income statement, it can even do it without affecting recorded profits.[19]

The spread of a global equity culture, increased wealth across population and generation change (e.g., ageing baby-boomers anticipating retirement, younger people better endowed with financial resources and enriched by inheritances) may imply a reduction in the equity risk premium in general and a shift in investment towards more volatile new economy stocks in particular.[20]

The large media and marketing campaigns commonly organised prior to IPOs may affect stock prices and volatility in a way unknown before (e.g., by attracting an entirely new investor population, enhancing the news/sentiment driven impact on stock valuation). The impact of non-anticipated news on stock valuation is particularly relevant for high growth stocks.

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19. The Economist (2001a). Note, however, that share buyback programs have been launched by old economy companies too (e.g., in order to improve earnings per share). Anyway, the frequent use of stock options by new economy firms may provide an additional incentive for employees to pursue more closely the objective of bright stock market valuation.

20. Hannah (2000).

3

On the evolution of stock markets
from 1997 to 2001

3.1   The evolution of composite indices

From October 1998 to March 2000, it seems that the passion for equity bewitched world stock markets. The unusually bullish valuation of stocks was frequently seen in the light of the technological revolution, which notably the new economy firms promised to bring about. Accordingly, equity price inflation was less pronounced at the level of general stock market indices (e.g., the French CAC40 (+ 150 %)[21] , the German DAX30 (+ 130 %)), and more so at the level of "technology-based" indices (e.g., the German NEMAX (+ 1300 %), the US American NASDAQ (+ 300 %)). Though the general trajectory taken by stock markets is well known, two messages may be retained with respect to the period from March 1997 to April 2001. First, the major fraction of the stock price increases observed had been achieved within short periods of time. This is most obvious for euro area and "technology-based" indices. Second, though the new economy phenomenon is primarily associated with Anglo-Saxon economies in general and the US American in particular, euro area stock market indices performed stronger than Dow Jones and FTSE100. Interestingly, though the navigation into the new economy was frequently characterised by "Nasdaqmania"[22] , the relative increase in NASDAQ was only slightly superior to increases in the broad French CAC40 index.

3.2   The evolution of index components

Index components are mostly grouped by sectors.[23] Ideally, distinguishing by sectors may eliminate fixed sector effects and allows abstracting from diverging sector weights across stock market indices. Given its wide sector-based grouping scheme and our particular interest in the euro area, in the following, the focus is on the EURO STOXX. Whereas prices within old economy sectors (such as retail and construction) evolved steadily (increasing by around 70 % compared with their January 1997 score), TMT sectors increased by a stunning 400 % (telecommunication, technology) or 200 % (media). The three new economy sectors took off at the same time (from October 1999) and reached their zenith within the same month (March 2000). Throughout the bull period, the EURO STOXX telecommunication and technology sectors evolved in a remarkably

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21. Approximate maximum increase relative to the corresponding scores observed in March 1997.

22. L'Echo, 8 May 2000.

23. For example, the NASDAQ index offers a 7-sector grouping scheme (i.e., Bank, Computer, Industrial, Insurance, Other financial, Telecommunication and Transportation). The EURO STOXX index offers a breakdown into 18 groupings (i.e., Auto, Bank, Basic resources, Chemical, Construction, Cyclical goods and services, Energy, Financial services, Food and beverages, Healthcare, Industrial goods and services, Insurance, Media, Non-cyclical goods and services, Retail, Technology, Telecommunication and Utilities).

similar manner. At the same time, returns within the technology and the telecommunication sector departed steadily from old economy stock yields. Whereas throughout the 12 months prior to January 1998 correlation between price increases in the telecommunication and the technology sectors on the one hand and the retail sector on the other hand had been almost perfect (0,96 and 0,97), by January 2000 it was virtually zero and became even negative afterwards. Given that from a macroeconomic perspective the most important contribution of new technologies probably consists in the proliferation of productivity gains across the entire economy (instead of higher productivity within the ICT sector itself)[24] , it is questionable whether such a low degree of correlation is sustainable.

Apart from increasing more rapidly, new economy stock prices are commonly considered more risky.[25] Throughout 1997, however, the standard deviation within the telecommunication sector had been very similar to that observed within the retail sector. By end 1999, volatility in telecommunication stocks increased very rapidly and decreased again from April 2000 onwards. When adjusting for scale effects, one observes that even in 2001 price volatility within the new economy sectors remained on a very high level.[26] Within most old economy sectors, price adjusted volatility was not subject to systematic acceleration throughout the period considered. But the EURO STOXX new economy sectors did not necessarily behave different from old economy sectors. For example, the implicit "feasibility frontier" between monthly price increases and relative price volatility has been similar throughout the period under consideration.

3.3 Correlation between the United States and the euro area: the industrial and the telecommunication sector

In order to illustrate whether and to what extent the more intense new economy proliferation in the US is reflected by euro area stock prices we compare the evolution of those two sectors appearing in both the EURO STOXX and the NASDAQ (i.e., industry and telecommunication). The degree of co-movement may vary substantially across sectors and time. For example, monthly rates of return on industrial stocks correlated quite narrowly. The 12-month correlation coefficient was at any time above 0,6, ranged steadily around 0,8 and reached its peak (0,86) from September 1998 to August 1999. Conversely, correlation between US and euro area telecommunication stock returns has been subject to considerable changes. Whereas they hardly correlated at all in 1997 (correlation coefficient: 0,16), correlation increased rapidly reaching its peak from May 1999 to May 2000 (0,91). Although the main direction of rates of return pointed downwards from April 2000 onwards, correlation decreased rather rapidly to 60 % recently.

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24. Oliner/Sichel (2000).

25. We follow common textbook theory in defining risk by volatility (see, for example, Baume (1991)).

26. Within the technology sector relative volatility even increased in the aftermath of the stock price reversal in April 2000.

Figure 2: Changes in telecommunication and industrial stock prices: correlation between the euro area and the US
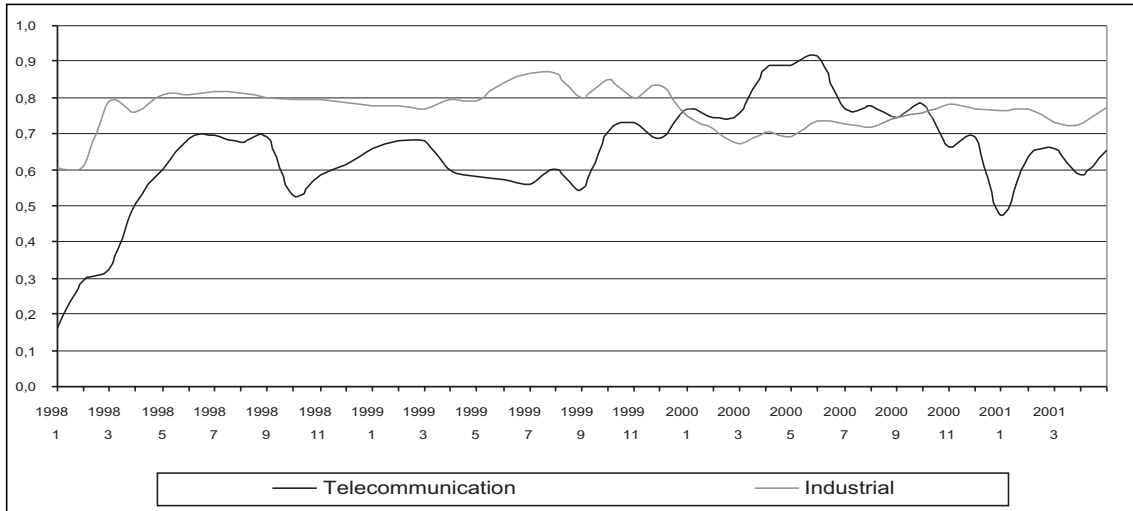
Source: Bloomberg, own calculations.

Closing price volatility and intraday spread in both sectors evolved similarly across the Atlantic though both measures indicate a slightly higher level of volatility for stocks listed at NASDAQ. With respect to the telecommunication sector, relative closing price volatility since end 2000 is very high again (similar to the level observed by the turning point in March 2000) both within NASDAQ and the EURO STOXX. The same holds for the intraday spread. Whereas by early 1998 the telecommunication intraday spread had been below 1 %, it exceeded 4 % (EURO STOXX) and 6 % (NEMAX) by March 2000. And again, a full year after prices peaked, the intraday spread is still very high.

In total, it seems that from mid 1999 until late 2000, the sector property (instead of the country property) had been the overriding factor of the return pattern. This seems to confirm the assumption that specific factors accompanying the new economy (such as globalisation of product markets, ubiquity of ICT and more integrated financial markets) reduced the relevance of country factors in achieving the optimum portfolio diversification through lower dependency on the country's cyclical position, improved information gathering and better use of cross-border mergers and acquisitions. Since late 2000, however, one observes again large discrepancies between the evolution of the NASDAQ (more volatile and more rapidly decreasing prices) and the EURO STOXX telecommunication sector stock prices possibly indicating a decreasing role for industry factors.

3.4 Descriptive evidence from firm-level data

3.4.1 EURO STOXX companies

This section illustrates the level and the volatility of return obtained on new economy and old economy stocks based on firm-level data. In a first step, we present key indicators for 219 firms covered by the EURO STOXX (from April 1998 to April 2001).[27]

Figure 3: Key indicators of monthly stock returns by EURO STOXX sector
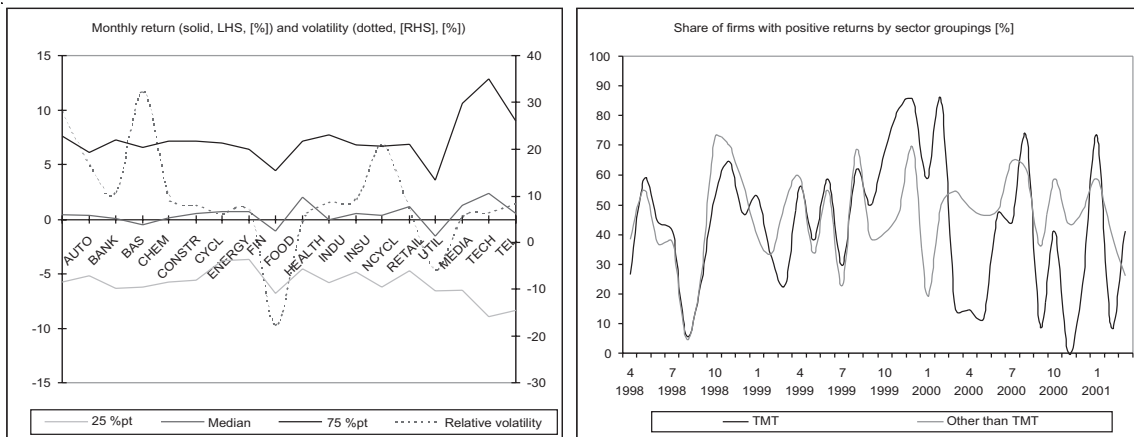
Source: Bloomberg, own calculations.

Contrary to the idea of a crude "high-tech mania"[28] , the high-tech property has by no means been a sufficient criterion for high returns throughout the period under consideration. In fact, the TMT segment constitutes the lower bound in terms of the 25 % quartile for monthly returns. Only at the 75 % quartile level have monthly returns been significantly higher within the TMT sector than across the old economy sectors. From April 1998 to late 1999, the fraction of TMT stocks for which positive returns had been recorded was very similar to the corresponding share across the 15 old economy sectors (i.e., around 50 %). Only from then on did the situation change significantly in that almost no negative returns were recorded among the 34 new economy companies until February 2000. A full year after the fall back in prices, the share of new economy firms subject to positive returns fluctuates vehemently indicating very high uncertainty and a rather low degree of transparency.

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27. I.e., firms located within the 4 major countries of the euro area (i.e., France, Germany, Italy and Spain). 34 out of these 219 firms are listed within the telecommunication, technology and media sectors, whereas 185 were taken from the remaining 15 old economy sectors of the EURO STOXX.

28. Financial Times, 16 March 2000.

Figure 4: Intraday spread and daily returns for TMT and non-TMT stocks
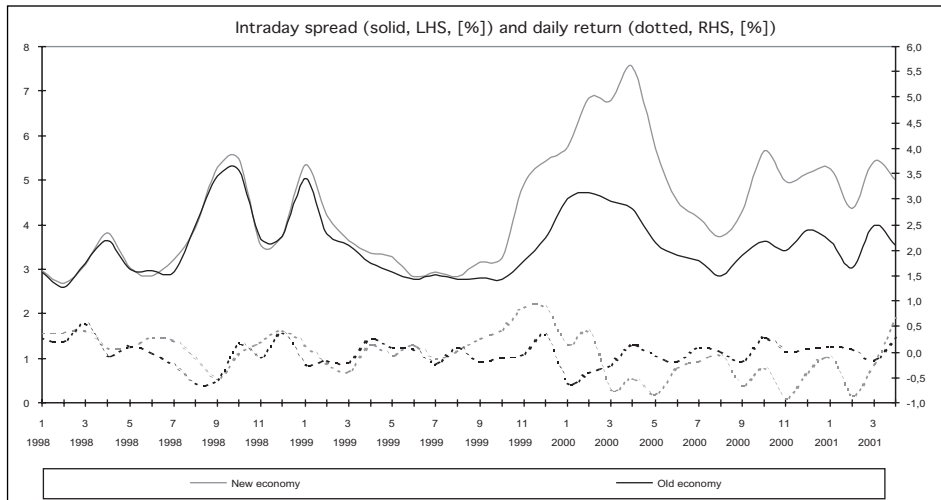
Source: Bloomberg, own calculations.

The intraday spread observed for new economy stocks, too, initially behaved very similarly to the spread observable for old economy firms (below 4 %). Only from late 1999 onwards did the intraday spread on new economy stocks rise quickly and almost doubled. This corresponds to an effective increase in intraday volatility since the rise in daily returns was substantially lower. The intraday spread observed for TMT stocks remained high in the aftermath of the fallback in April 2000.

3.4.2 A comparison with "genuine new economy firms"

Given the inherent character of the EURO STOXX, its TMT sectors predominantly include large companies, which do not necessarily reflect the "true character" of a new economy firm.[29] Unfortunately, the data availability and the recent establishment do not allow for analyses of returns on "genuine new economy stocks" on a broad scale. In order to separate the business model effect from impacts driven by the field of activity we compare two groups of telecommunication firms, i.e. former state-governed monopolists and selected newer privately managed competitors ("genuine new economy firms"). Whereas the choice of the ex-state monopolists is relatively obvious (i.e., Deutsche

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29. It is, however, questionable whether size is a characterising element of new economy firms. On the one hand, the bull period has been understood as a "technology-laden NASDAQ bubble" (The Economist (2001b)) and innovating new economy companies are commonly considered – along the lines of the early Schumpeter - rather new and small. On the other hand, within some markets shareholders valued large companies' stocks more than smaller firms' stocks by an increasing margin (Kopcke (2000)). Anyway, even the more recent high-tech firms reported important market capitalisations.

Telekom, Télécom France, Telecom Italia, Telefónica), the selection of "genuine new economy firms" is based on the assessment of asset management professionals of three major Luxembourg commercial banks.[30]

Figure 5: Average and standard deviation of monthly returns
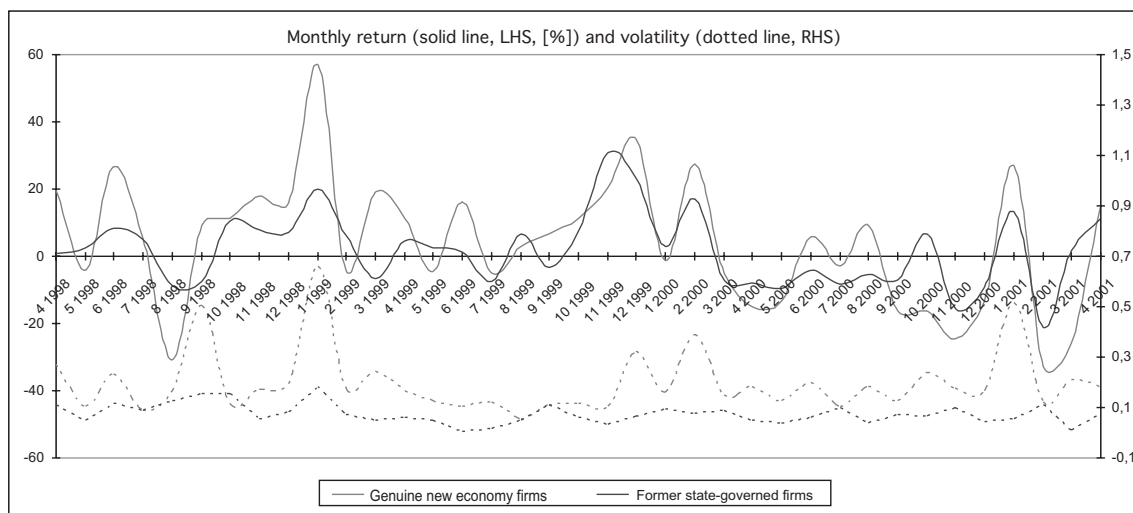
Source: Bloomberg, own calculations.

From this comparison one may derive two conclusions: First, "genuine new economy stocks" on average benefited from higher return at the expense of higher volatility. Whereas the "spread" at the 25 % quartile of return has been almost –700 basispoints, at the median it has been 160 basispoints and at the 75 % quartile level it has been 670 basispoints. The higher volatility across "genuine new economy firms" may be understood as a higher fluctuation of returns across firms and throughout time.[31] Second, throughout the period under consideration, stocks of former state-governed monopolist telecommunication companies, on average, participated in a good deal of the return potential offered by the "genuine new economy firms" and avoided the high return volatility associated to these.

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30. The professionals consulted were asked to name firms which, from the perspective of institutional investors, are commonly considered new economy firms, representative of their sector and benefit from a high recognition value. The set of new economy firms includes Nextel Communications, Covad Communications, Vodafone, KPNQ West, Cisco Systems, Ciena, Alcatel, Nokia, Yahoo and CMGI. Though, strictly speaking, these firms belong to different new economy fields of activity, most of them operate within the broader telecommunication business.

31. Vodafone stocks constitute an exception in that they performed better than those of the former state-governed monopolists "in spite of" lower return volatility.

Figure 6: The distribution of returns: former state-governed companies (LHS) and "genuine new economy firms" (RHS) in the telecommunication sector [%]
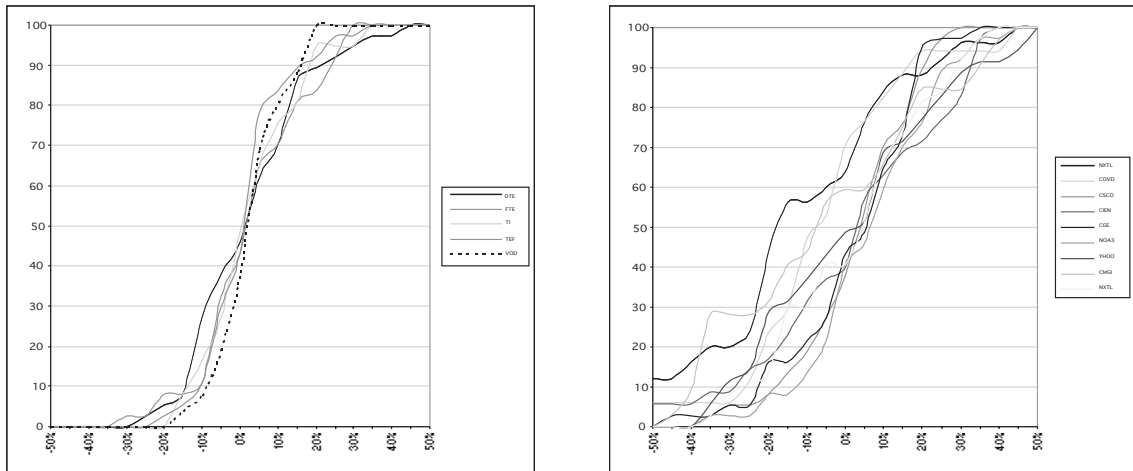
Source: Bloomberg, own calculations.

As it comes to the intraday spread, again, one observes substantial differences between "genuine new economy firms" and former state-governed monopolists operating in the telecommunication sector. Throughout the entire period the spread had been less accentuated among the former state-governed monopolists. Furthermore, whereas among the latter, intraday spreads in the aftermath of the fall back in prices stabilised at around 4 %, they increased among the "genuine new economy firms" exceeding, on average, 10 % by April 2001.

Figure 7: Daily returns and intraday spread: former state-governed companies and "genuine new economy firms" in the telecommunication sector
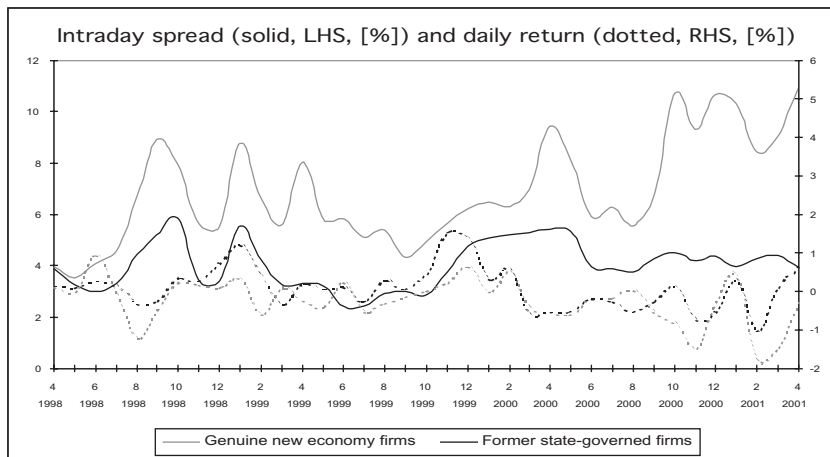
Source: Bloomberg, own calculations.

To sum up, the common assumption of higher returns on new economy equity bought at the expense of higher risk cannot be confirmed unanimously, but depends on the period considered. This is with respect to the volatility throughout time as well as that across firms. Some indicators were subject to

breaks already in the last quarter of 1999. Furthermore, whereas some indicators for new economy equity (e.g., return volatility across firms) point towards a return to "normal levels" after spring 2000, others (such as the intraday spread) still reveal a considerable spread.

3.5   On the evolution of price earnings ratios

An important indicator frequently referred to when discussing stock market valuation is the PE ratio.[32] PE ratios soared considerably throughout the bull period of the last four years. For example, the S&P500 PE ratio exceeded the mark of 44 in December 1999, a figure not seen since 1881.[33] Since January 1881, the average S&P500 PE ratio has been below 16, its 75 % quartile ranges around 18,5. But PE ratios increased even stronger within new economy sectors. Whereas in early 1995, the aggregate PE ratio for NASDAQ computer stocks was at around 30 (at a time when the S&P500 PE ratio navigated around 20), it reached a stunning 260 in February 2000 (i.e., almost five times the score observed for the S&P500 index). Meaning that, ceteris paribus, one would get into the black only at an implausible point in time, PE ratios for stocks in general and new economy companies in particular have often been considered unreasonable high. Though stock prices decreased substantially since February 2000, high PE ratios are not a matter of the past. It is true that PE ratios crushed in the aftermath of the turning point in spring 2000, but at least the NASDAQ computer sector PE ratio is back again to three-digit levels since mid 2001.[34]

Figure 8: PE ratios for S&P500 and NASDAQ computer stocks
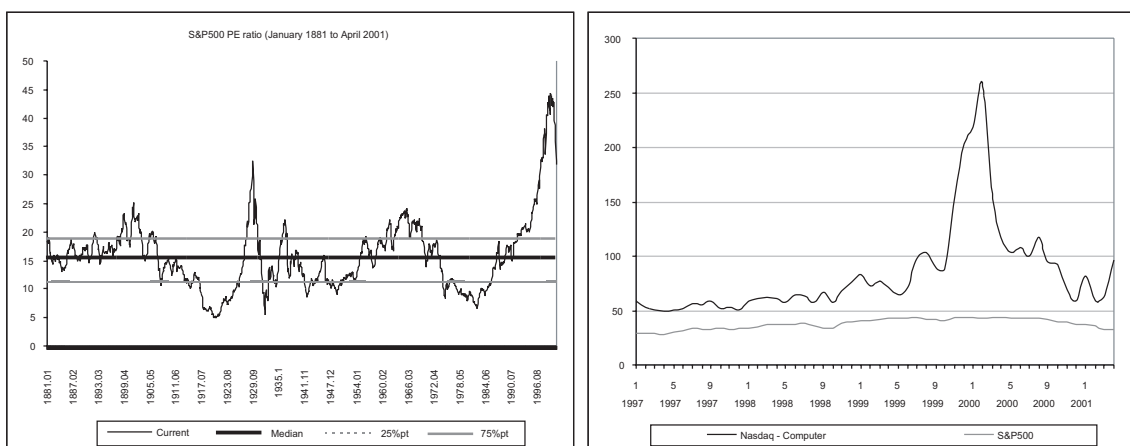
Source: Bloomberg, R. Shiller.

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32. Paine Webber (2000).

33. See R. Shiller's web site (Harvard University).

34. Obviously, today's high PE ratios are not fully comparable to those observed prior to April 2000 since a number of non-profitable firms probably will not be part anymore of the PE ratio sample.

3.6   The primary market

Throughout 1997 to 2000, the substantial increase in stock prices had been accompanied by comprehensive initial public offerings (IPOs), notably in the new economy sectors. The emission volume of IPOs at the Neuer Markt in Frankfurt increased from € 373 m (1997) to € 13.066 m (2000). In 2000, almost 9 out of 10 IPOs at the Frankfurt Stock Exchange (FSE)[35] concerned the Neuer Markt, whereas in 1997 the share was only around 36 %.

Table 2: IPO activity at the Frankfurt stock exchange

Period	Number of IPOs			Emission volume [€ m]			Initial return		Corr vol/ init ret	Corr ret/rel issue price
	Total number	of which: Neuer Markt		Total volume	of which: Neuer Markt		Average	Median		
		Number	Share [%]		Volume	Share [%]				
1997	36	13	36,11	2 538	373	14,68	51,44	42,00	-0,32	0,34
1998	67	41	61,19	3 228	1 561	48,36	78,61	51,11	-0,13	0,15
1999	167	132	79,04	12 964	6 691	51,61	44,34	13,33	-0,03	0,32
2000	152	132	86,84	25 556	13 066	51,12	46,23	15,79	-0,07	0,37
2001Q1	9	5	55,56	1 670	107	6,39	20,78	6,67	-0,20	0,56

Source: Deutsche Börse AG, own calculations.

In general, IPO activity at the FSE Neuer Markt evolved very similar to secondary markets in a double sense. On the one hand, initial returns correlated positively with NEMAX price increases.[36] On the other hand, the emission volume mirrored the pattern of the NEMAX index. This co-play may imply destabilising elements in that during boom periods the incentive to raise capital becomes even stronger, whereas in recessions there is no demand for capital anyway. This is of particular importance for new economy firms, since in funding investment they rely predominantly on investor money. [37]

Figure 9: The secondary market versus the primary market
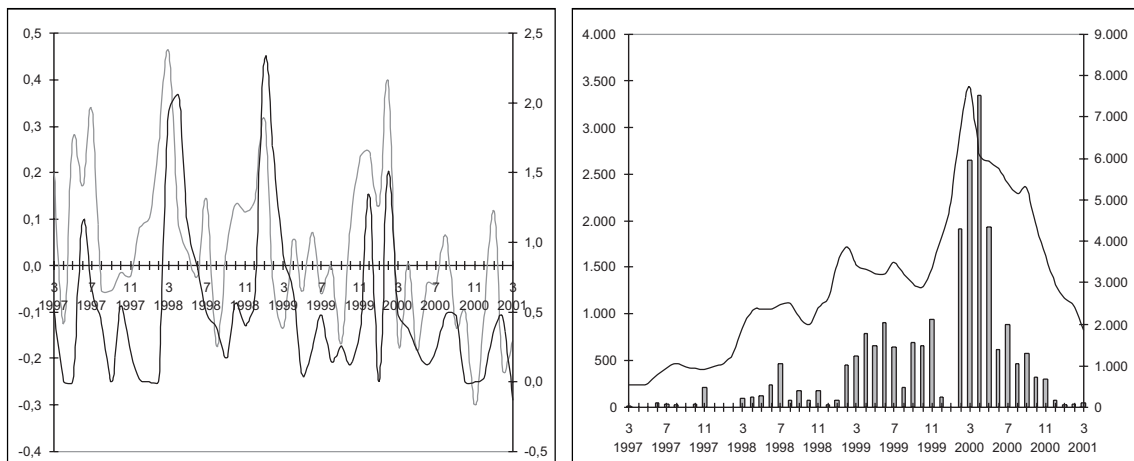
Source: Deutsche Börse AG, Bloomberg, own calculations.

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35. Due to issues related to data availability, the section on primary markets mostly refers to the FSE. According to estimated figures, the FSE is among the most important stock exchanges within the euro area in particular in terms of turnover, but also in terms of market capitalisation (The Economist (2001a)).

36. Initial returns, in the following, are defined as the relative difference between the submission price and the first trading price.

37. This reflects the dilemma between microeconomic and macroeconomic aspects which regulators face and reveals why capital regulation may not bite.

Throughout the bull period, initial returns on IPOs had been huge. In a number of cases they ranged above 200 % which by far exceeded the corresponding score for IPOs in other market segments at the FSE. Contrary to new listings on other FSE segments, within the Neuer Markt segment, subscription prices, in general, corresponded to the upper edge of the book building spread. Only from March 2000 onwards, subscription prices were fixed within or at the lower end of the book building spread. Since July 2000, in some cases the subscription price fell even below book building range and initial returns vanished.

Figure 10: Initial returns on IPOs and the relative position of the subscription price
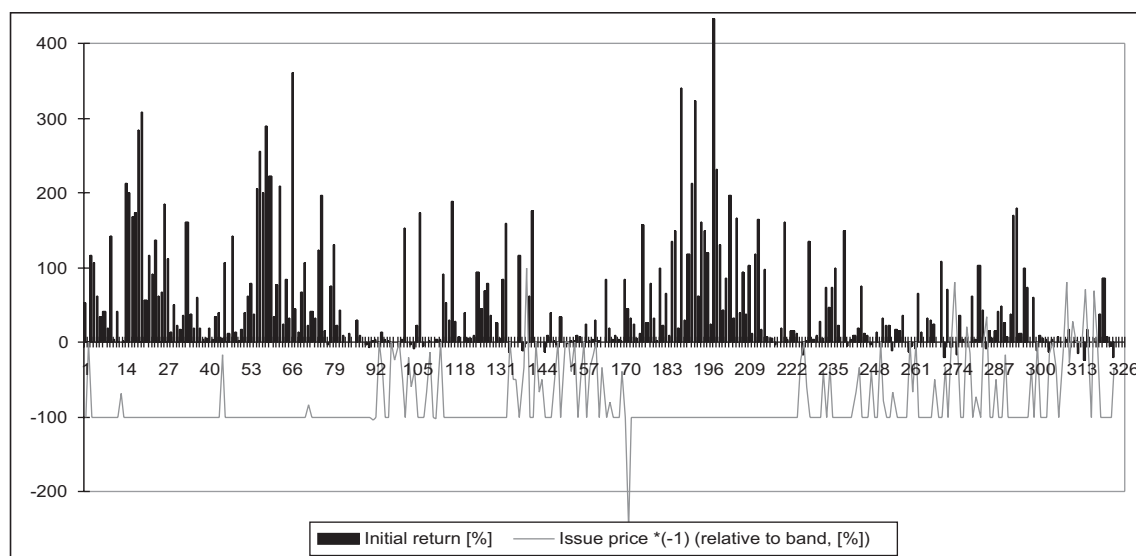
Source: Deutsche Börse AG, Bloomberg, own calculations.

As "aggressive" subscription pricing, in general, coincided with high initial returns (see figure above and table 2), it seems that the fixing of the book building spread did not fully anticipate the genuine supply-demand situation.[38] Contrary to the emission volume, the relative position of subscription prices within the book building spread and initial returns decreased considerably after March 2000. Maximum correlation between average initial returns of IPOs and aggregate emission volume is observed with volume lagging initial returns by 2-3 months, though the general level of correlation is rather weak. In total, initial returns reached their maximum level in 1998 (median: + 50 %), whereas emission volume peaked in 2000 only (i.e., at a time when the median initial return fell to around 15 %). At the individual IPO level, a slightly negative correlation between

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38. The sheer magnitude of initial returns observed at the FSE seems to be consistent with figures from other stock exchanges. At present, Wall Street's leading investment banks, including CSFB, Morgan Stanley, Bear Stearns and Goldman Sachs, are under siege from regularly probes into alleged malpractice in their allocation of shares in IPOs in three areas: first, it is alleged investment bank equity syndicate desks channelled shares to specific investors in exchange for supporting the value of the stock in the after-market. Second, it is alleged equity desks channelled generous IPO allocations to investors in exchange for a proportionate amount of unrelated business. Third, it is alleged banks won business by allocating popular IPO tranches to potential IPO candidates, including chief executives of start-up companies in Silicon Valley (The Economist (2001a)).

the size of the IPO and the initial return can be observed. However, one observes large discrepancies across sectors. For example, the return/volume pattern is rather neat in the biotech, media and technology sectors and less so in the telecommunication, software and Internet sectors. Differences across new economy areas were also observable with respect to initial returns and emission volume as well as the point in time at which IPO activity took off. For example, in the Internet sector IPO activity became significant by spring 1999 only when emission volume within the software segment already decreased. Whereas in most cases average monthly initial returns peaked at around 200 %, it exceeded 500 % in the technology field. Interestingly, with respect to the peak period of initial returns, the sectors can be classified into three groups. Initial returns on telecommunication and software IPOs peaked in early 1998, whereas those in the media and Internet sector peaked in early 1999 and initial returns in the biotech and the technology field reached their peak in early 2000.

4

On the plausibility of the recent valuation of equity

4.1   The evolution of earnings and dividends

According to classic portfolio theory, the pricing of equity depends predominantly on the evolution of earnings and dividends.[39] In order to assess the equity price stance observed in recent years, in the following, some key figures on earnings and dividends are provided.

As for earnings, we compiled data for 219 EURO STOXX firms from the major four euro area countries (of which 185 old economy and 34 new economy firms) as well as 1209 "genuine new economy firms" from the following business fields: Web portals, Internet incubators, multimedia, Internet content/info, television, cellular telecommunication, Internet connectivity, telecommunication services, networking products, telecommunication equipment, enterprise software, applications software, computer services, electronic components, computers and memory devices, e-commerce products and e-commerce services.

Table 3: The share of firms reporting negative earnings

SECTOR	1995	1996	1997	1998	1999	2000
Automobile	0%	0%	0%	0%	0%	0%
Bank	0%	0%	0%	0%	0%	0%
Basic resources	0%	0%	0%	0%	0%	0%
Chemical	0%	0%	25%	25%	25%	20%
Construction	20%	9%	9%	9%	9%	0%
Cyclical	13%	18%	16%	5%	0%	5%
Energy	0%	0%	0%	0%	0%	0%
Financial	0%	0%	0%	0%	0%	0%
Food	0%	0%	0%	0%	0%	0%
Health	0%	0%	0%	0%	20%	20%
Industrial	17%	16%	13%	17%	13%	9%
Insurance	0%	0%	0%	0%	0%	0%
Media	11%	10%	0%	0%	9%	18%
Non-cyclical	0%	0%	11%	11%	11%	22%
Retail	0%	0%	0%	0%	0%	0%
Technology	20%	30%	18%	18%	18%	9%
Telecommunication	0%	17%	25%	22%	20%	30%
Utility	0%	0%	0%	0%	9%	0%
Old economy sectors	5%	4%	5%	5%	5%	5%
New economy sectors	13%	19%	13%	13%	16%	19%
EURO STOXX old and new economy sectors	**6%**	**7%**	**6%**	**6%**	**7%**	**7%**
"Genuine new economy firms"	53%	58%	63%	70%	73%	74%

Source: Bloomberg, own calculations.

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39. Sharpe/Gordon (1990).

In general, the bright growth assumptions for earnings implicit in the pricing of new economy stocks have only partially been met in the past. Consider, for example, the phenomenon of negative earnings. Across the EURO STOXX old economy sectors, from 1991 to 2000, the share of firms reporting negative earnings ranged between 2 and 5 percent. Within the EURO STOXX TMT sectors, the negative earnings share has been considerably higher (13 to 19 percent). Moreover, apart from the early 90's when the telecommunication sector had not been as deregulated as today, within new economy sectors the share remained strictly positive.[40] This is in sharp contrast to old economy sectors, where the share of firms reporting negative earnings was frequently zero and a strictly positive share was mostly limited to a period of a few years. Among the 1209 "genuine new economy firms", the situation seems even more extreme in that the percentage share of firms reporting negative earnings increased from 41 % (1991) to 74 % (2000). The share of firms reporting negative earnings is well reflected by stock prices, in that the running count of stocks whose prices were rising fell behind that for stocks whose prices were dropping. The market seems to have had become more narrow, perhaps signifying cracks in the foundation of the bull market and indicating that already in 1999 for many companies a bear market had begun.[41] Furthermore, the share of firms that reported but negative earnings is about one quarter for a minimum of 8 observations, one third for a minimum of 6 years and more than a half for a minimum of three observations. The share of firms for which accumulated negative earnings exceed accumulated positive earnings throughout the period 1991 to 2000 is approximately 75 %. What is not well reflected by the evolution of new economy stock prices is the evolution of earnings themselves. Consider, for example, the evolution of average earnings for firms reporting positive earnings and those reporting negative earnings. Throughout 1991 to 1998 the average of positive earnings did not change significantly. Given that the share of firms reporting positive earnings shrank during this period and assuming that firms for which earnings became negative already faced lower than average profits before, the strong increase in stock market indices observed in recent years seems implausible.

Given that pay-out ratios may vary throughout time, the exceptionally bullish valuation of new economy stocks could have been more closely related to the pace of dividends rather than that of earnings. Based on figures for 1998 to 2001[42], however, the pace of dividends within the TMT sectors had been rather sluggish. On the one hand, in 1998, the dividend yield itself had been rather low among TMT stocks (less than 1% on average) relative to non-TMT stocks (around 1,3 %). On the other hand, the technology sector was the only new economy segment reporting strong dividend growth (though dividend growth within the basic resources sector had been even higher). The media sector and the telecommunication sector reported below average dividend growth.

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40. Apart from the media sector in 1997 and 1998.

41. This is also confirmed by evidence from US stock markets. In 1999, the five companies whose market value increased the most accounted for about 42 % of the increase in the total market value of all S&P500 companies and the top 100 companies accounted for 139 % (Kopcke (2000)).

42. Due to limited data availability and the small sample size of "genuine new economy firms" with a proven dividend track record, in the following, we focus on EURO STOXX firms.

Figure 11: Dividend yields (LHS, [%]) and dividend growth from 1998 to 2001 by EURO STOXX sector (RHS, 1998 = 100)
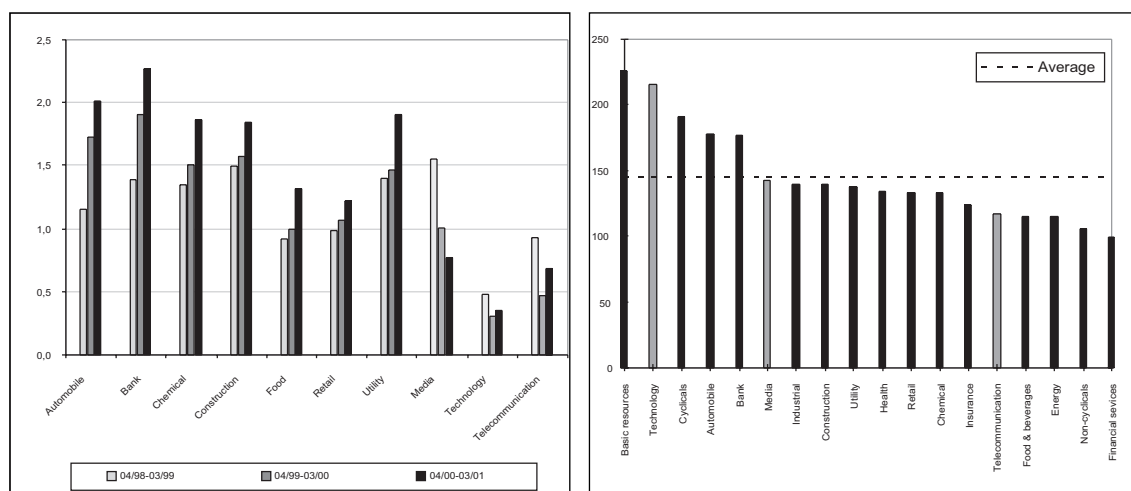
Source: Bloomberg, own calculations.

4.2 On the sensitivity of high growth stocks' price earnings ratios to growth expectations and inflation

When interpreting PE ratios across old and new economy stocks, one must consider that a couple of variables truly may drive PE ratios of new economy stocks differently from that of old economy stocks.[43] This may be shown by means of different versions of the dividend discount model, such as the constant growth and the multiple growth models.[44] According to the constant growth dividend discount model, the intrinsic value of a stock is given by: [45]

$$(1) \quad P = p * E_0 * \left[\sum_{t=1}^{\infty} \frac{(1+g_e)^t}{(1+r^n)^t} \right]$$

where p, g_e, P, r^n, r^r, π, E, 0, t denote the pay-out ratio, earnings growth, the stock price, the nominal equity discount rate, the real equity discount rate, the inflation rate, earnings, the start date and the time period identifier respectively. The normal PE ratio reduces to:

$$(2) \quad \frac{P}{E} = p * \left(\frac{1+g_e}{\pi + r^r - g_e} \right)$$

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43. In the following, high growth stocks (average growth stocks) are used as synonyms for stocks issued by new economy firms (old economy firms).

44. In spite of the deficiencies of models based on dividends and/or earnings (given that most of the total returns on stocks usually comes from capital gains), dividends and earnings do convey some information about stock valuation. For example, a dividend increase is taken as a signal that sustainable earnings and cash flow, and thus, the value of the firm, have increased. Higher earnings provide more funds from which dividends can be paid to shareholders or which generate more internal growth through reinvestment in the firm (Hannah (2000)). The implications derived within this section, however, apply also to other quantitative evaluation methods (e.g., Discounted Future Earnings, Discounted Portfolio Valuation, Risk-Adjusted Discounted Cash Flow (UBS Warburg (2001)).

45. See, for example, Sharpe/Gordon (1990).

In general, thus, lower inflation and higher growth boost PE ratios of both old and new economy companies. But contrary to the implicit assumptions of some financial indicators [46], the relationship between PE ratios on the one hand and inflation and growth on the other hand is geometric, not linear, and the impact of non-linearity may be substantial. For example, assuming 5 % earnings growth for old economy sectors, a decrease in inflation from an initial 2,5 % to some 2 % would boost the market's normal PE ratio from 17 to 23 (i.e., + 36 %). For a strong growing new economy environment (e.g., 11 %), the same inflation reduction would bring about an increase in normal PE ratio from 28 to 49 (i.e., + 74 %). Furthermore, high PE ratios may even be justifiable according to the constant growth dividend discount model in case higher earnings growth coincides with proportionally lower pay-out ratios (see white curve in figure 12 below).

Figure 12: Normal market PE ratio according to the constant growth dividend discount model
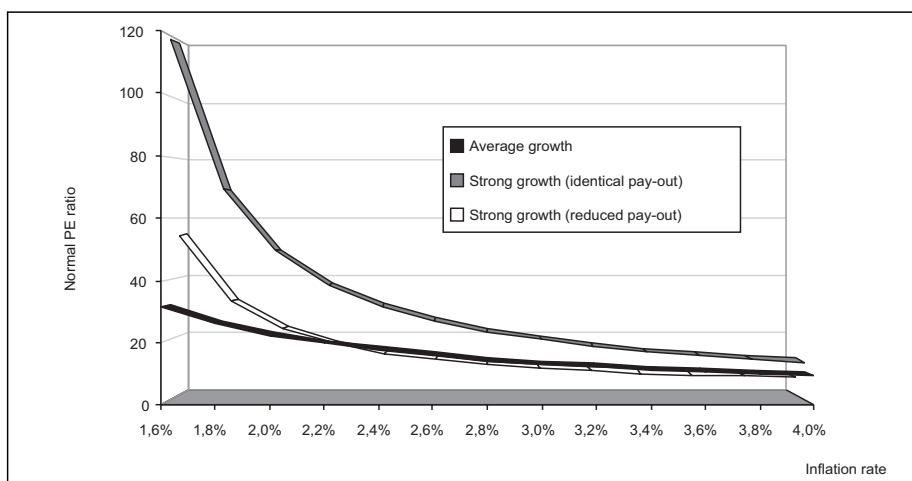
Source: Own calculations.

Based on the definition of the market's normal PE ratio, four messages may be retained. First, rapid growth projections may justify very high PE multiples. This may apply in particular to new economy stocks. Second, PE ratios of new economy stocks may react much more sensitive to changes in inflation than PE multiples within old economy sectors. Third, the decrease, which a given stock's PE multiple would experience, is highly dependent on the level of inflation prevailing. Finally, growth stocks' PE ratio appreciation, however, is a double-edged sword. Just as high growth stocks are rewarded more in a low inflation environment, they are punished quite severely if the expected high growth rate fails. For example, if it turns out that effective earnings growth is some 20 % below the expected figure, the normal PE ratio for high growth stocks would decrease - e.g., at some 2 % of inflation – by almost 29 %, whereas for average growth stocks the PE ratio would fall by slightly more than 8 % only.

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46. Such as the PE to growth ratio, which is defined as the PE ratio divided by the expected rate of growth of earnings over some selected period.

Figure 13: The impact of a 20 % decrease in earnings growth on the normal market PE ratio [%]
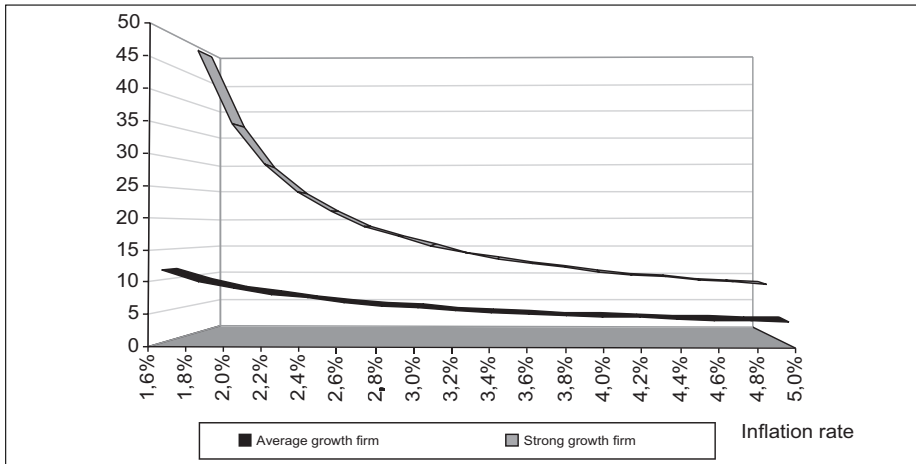
In general, therefore, PE ratios of new economy companies will react much more sensitive to new information of a given quality. If changes in assumptions about sales and profit growth themselves are more important for new economy than for old economy firms [47], this may transmit into much higher volatility of financial indicators. For purposes of illustration, we consider the multiple growth model. One commonly used idea of multiple growth is based on the view that companies typically evolve through three stages during their lifetime and at some point in time reach their terminal growth rate.[48] According to the multiple growth dividend discount model, the intrinsic value of a stock is given by the present value of all dividends up to and including the period T by which the stead-state is attained (V^{T-}) and the present value of all dividends after T (V^{T+}):

(3) $P = V^{T-} + V^{T+}$, or: $P = \sum_{t=1}^{T} \dfrac{D}{(1+r)^t} + \dfrac{D_{T+1}}{(r-g)*(1+r)^T}$

Rearranging yields:

(4) $\dfrac{P}{E} = \dfrac{p_1*(1+g_1)}{(1+r)} + \dfrac{p_2*(1+g_1)*(1+g_2)}{(1+r)^2} + ... + \dfrac{p_T*(1+g_1)*(1+g_2)*...*(1+g_T)}{(1+r)^T}$

$ + \dfrac{p*(1+g_1)*(1+g_2)*...*(1+g_T)*(1+g)}{(r-g)*(1+r)^T}$,

where D denotes dividends (for other variables refer to equation (1)). As a baseline, we use the old and new economy scenarios illustrated in table 4 below.[49]

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47. For evidence on this see, for example, the web site of Deutsche Gesellschaft für Ad hoc-Publizität.

48. These three stages are mostly titled by growth stage, transition stage and maturity stage (see, for example, Grigoli (1982)). Obviously, the standard three-stage model is not easily applicable to new economy companies, therefore a different lifetime model is used for new economy companies.

49. Obviously, any new economy company scenario is subject to criticism due to the high degree of contingency coming with them. The above scenario serves as an illustration, the impact of modifications to it are presented in the following.

Table 4: A baseline scenario for old and new economy firm evolution

	OLD ECONOMY FIRMS		NEW ECONOMY FIRMS
Stage 1	**Growth Stage** Rapidly expanding sales High profit margins Abnormally high growth in earnings per share Low pay-out ratio (due to high expected profitability of investment opportunities)	**Stage 1a** **Stage 1b**	**Start-up Stage** Rapidly expanding sales No or little earnings Low pay-out ratio (due to high expected profitability of investment opportunities) **Warm-up Stage** Still expanding sales Slowly growing earnings (in absolute terms)
Stage 2	**Transition Stage** Increased product saturation Profit margins under pressure Increased pay-out (due to fewer investment opportunities)	**Stage 2**	**Transition Stage** Increased product saturation Company begins to increase pay-out (due to fewer investment opportunities)
Stage 3	**Maturity Stage (Steady-state Stage)** New investment opportunities offer slightly attractive returns on equity Earnings growth rate, pay-out ratio, and return on equity stabilise around terminal levels		

Table 5 below illustrates the sensitivity of new economy stocks' PE ratio to modifications to various parameters. Hereafter, PE ratios of new economy firms may not only be very high relative to that observed for old economy companies, but may also fluctuate stronger in absolute as well as in relative terms. More specifically, a 30 % reduction in new economy firms' PE ratio may be perfectly justifiable by a whole brunch of minor assumption modifications (e.g., scenarios B, C, D and F). "Vehement" fluctuations in new economy company PE ratios, thus, as such are by no means an indicator of irrational exuberance. Most contributions focus on the uncertain longer-term projections of corporate earnings in the new economy segment due to a lack of back data, experience, etc.. However, this aspect will become less important through time, whereas the higher sensitivity with respect to macroeconomic assumptions will remain. Thus, in a new economy, central banks are more than ever asked to strengthen the case for well-defined and reliable price acceleration expectations.

Table 5: On the sensitivity of high growth stocks' PE ratio

	A BENCHMARK SCENARIO		B GROWTH FAILURE BY 20% AFTER 3 YEARS		C ENTRY INTO STAGE 2/1b ONE YEAR LATER		D TERMINAL GROWTH AFTER 8 YEARS		E TERMINAL GROWTH FAILURE BY 20%		F PAY-OUT FAILURE BY 20%		G +0,5 PP INCREASE IN INFLATION	
	OE	NE	OE	NE	OE	NE	OE	NE	OE	NE	OE	NE	OE	NE
Stage 1a:														
DUR	3	3	3	3	3	3	3	3	3	3	3	3	3	3
PAY	10	0	10	0	10	0	10	0	10	0	10	0	10	0
GRO	15	0	15	0	15	0	15	0	15	0	15	0	15	0
Stage 1b:														
DUR		2		2		2		2		2		2		2
PAY		15		15		15		15		15		15		15
GRO		50		40		50		50		50		50		50
Stage 2:														
DUR	7	5	7	5	7	5	7	5	7	5	7	5	7	5
PAY	30	25	30	25	30	25	30	25	30	25	30	25	30	25
GRO	10	30	8	24	10	30	10	30	10	30	10	30	10	30
Stage 3:														
DUR	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞	∞
PAY	30	30	30	30	30	30	30	30	30	30	24	20	30	30
GRO	5	5	5	5	5	5	5	5	4	4	5	5	5	5
Inflation rate:					2%								2,5%	
Normal PE ratio:														
	27	71	24	49	28	47	25	47	22	58	22	48	21	55
Impact on normal PE ratio:														
In absolute terms			-3	-22	+1	-24	-2	-24	-5	-13	-5	-23	-6	-16
In relative terms [%]			-11	-31	+3	-33	-8	-33	-18	-19	-19	-32	-21	-22

Remarks: DUR: duration of the stage (in years), PAY: pay-out ratio (in percentage terms), GRO: growth rate (in percentage terms); differences result from rounding; source: own calculations.

Note, however, that most of the elements justifying higher PE ratios for new economy stocks (notably higher earnings and dividend growth) had not necessarily been met by new economy companies in recent years.[50] One has also to take into account that the earnings component includes – apart from intrinsic business activity growth – elements such as sector specific inflation (i.e., corporate pricing power) as well as the potential growth due to margin expansion and spending of free cash flow on acquisitions and share buybacks. Furthermore, and apart from the discount multiplier which investors realise by buying future growth expectations at the expense of current earnings, the commitment of new economy firms to investment and intangible assets fuel PE ratios for new economy companies relatively stronger, since the higher fraction of investment into intangible assets immediately and to the full extent shows up as costs in their balance sheets thereby reducing accounted current profits.

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50. See section 4.1.

A third element possibly justifying higher and more volatile PE ratios for new economy stocks could be lower real equity discount rates. However, given that new economy stocks are commonly considered riskier than old economy ones, this case seems but unrealistic. Thus, in spite of the high growth expectations promised by new economy stocks, according to the IMF, the recent rise in stock valuation had been particularly strong relative to the historical record. Previous technological revolutions, such as the dissemination of electricity-based industries in the 1920's (which brought about considerable and lasting productivity gains), did not produce the sharp rise in stock valuation similar to that experienced within the IT sector.[51] This is although there is still no consensus on whether the new economy measures up to the great inventions of the past in terms of an acceleration of economy-wide productivity growth.[52]

Apart from these rather numeric factors, PE ratios, obviously, may also have increased throughout recent years due to common factors. Possible explanations may include financial innovations that help reducing transaction cost and allow for enhanced portfolio diversification (i.e., lower equity risk premium), substantial productivity growth or the tax treatment of corporate profits, but this may neither explain the strong, asymmetric increase in PE ratios for new economy stocks.

4.3 On the plausibility of recent price earnings ratios

4.3.1 Microeconomic aspects

One way of commenting the plausibility of PE ratios for specific market sectors relative to broader market PE ratios is described by the Morgan Stanley Dean Witter Growth Discounter.[53] This concept basically consists of two steps. First, one is to estimate a perpetual growth rate for earnings per share discounted in today's markets.[54] The critical assumption of the Growth Discounter, in the second step, then is to assume that at a given point in time, all sectors will have a market PE ratio, or put alternatively, identical terminal growth rates.[55] With respect to investment in equities, thus, the following condition holds:

$$(5) \quad \forall s \in S : \left(\frac{P_s}{E_s}\right)^T = \left(\frac{P_m}{E_m}\right)^T, \ \text{or,} \ \ \forall s \in S : \left(\frac{P_s}{E_s}\right)^0 * (1 + g_m^{0T}) = \left(\frac{P_m}{E_m}\right)^0 * (1 + g_s^{0T}),$$

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51. IMF (2000a).

52. For example, according to Gordon, the Internet fails the hurdle test as a great invention on several counts since it involves substitution of existing activities from one medium to another and/or a duplication of existing activities and since much Internet investment involves defense of market share by existing companies, etc. (Gordon (2000)). For a more optimistic view of the importance of the Internet see, for example, Stobbe (2001).

53. For a full description of the Morgan Stanley Dean Witter Growth Discounter idea, see, for example, MSDW (2000).

54. This may be done according to Gordon's Growth Model (i.e., earnings per share growth rate = bond yield + risk premium - dividend growth).

55. Originally, the period of differential growth is assumed to be 10 years.

where s, m, g, P/E, 0, T denote the sector index, the aggregate market, the earnings per share growth rate, the PE ratio, the start date and the end date of differential growth respectively. From this, one can derive the implicit assumptions with respect to growth of earnings per share for a given sector throughout the period until terminal growth is attained. Finally, the implicit growth rates are assessed with respect to their plausibility. Obviously, the Growth Discounter idea is simple in that differences in beta or risk premium are ignored, and so are differences in terminal growth rates post the chosen point of PE ratio equivalence.[56]

Applying the Growth Discounter to the NASDAQ and the EURO STOXX, obviously, requires specific assumptions. As representatives of the new economy we selected the NASDAQ computer segment and the EURO STOXX media sector. As reference markets we use the Dow Jones Industrial and the aggregate EURO STOXX index respectively.[57] Bond yield is approximated by annual yields of the 10-year US Treasury bond and the German 10-year Bund respectively. For purposes of illustration, the risk premium is set to 2,8 % for the euro area. For the US, it is assumed to be 4,1.[58] The dividend yield is set to 1,8 % for the euro area (these figures correspond to the parameters used by Morgan Stanley Dean Witter within their September 2000 Growth Discounter exercise) and 1,4 per cent for the US market (i.e., the average dividend yield observed for the S&P500 from 1997 to 2001).[59] The resulting yardstick for earnings per share growth may also be approximated from a macroeconomic perspective. Consider the case for the euro area: one may assume that real GDP increases in line with trend GDP growth and inflation increases in line with the Eurosystem's definition of price stability. The residual could be attributed to restructuring benefits, an increasing share of profits in GDP and/or faster growth of the quoted sector.[60]

Figure 14 below illustrates the implicit growth assumptions resulting from the PE ratio spread for the NASDAQ computer segment and the EURO STOXX media sector from April 1997 to August 2001.[61] Until mid 1999, the implicit NASDAQ computer growth rate fluctuated around the 15 % level. From then on, the implicit growth rate increased very rapidly to more than 30 %. Similarly, the implicit growth

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56. According to Morgan Stanley Dean Witter, such simplifications may not be of high relevance since these factors may cancel each other out, because sectors with higher cost of equity are likely to have higher terminal growth as well.

57. The selection is largely based on issues related to data availability.

58. Obviously, any assumption concerning the magnitude of the equity risk premium is subject to criticism. The spread between the US premium and the euro area one (1,3 percentage points) is taken from IMF staff estimates (IMF (2000a)).

59. Obviously, these assumptions may be subject to criticism. However, modifications to the risk premium and the dividend yield would not change the results materially.

60. Note that the derivation of the reference value for monetary growth in the euro area (as announced by the European Central Bank Governing Council on 1 December 1998) was originally based on the assumption that trend growth in real GDP would range between 2 and 2,5 % (European Central Bank (1999)). Accordingly, the assumptions used here are fairly optimistic.

61. Series for the EURO STOXX media sector begin in January 1999 only. As regards the NASDAQ computer sector, no PE ratio data were available for February, July and August 2001.

rate of EURO STOXX media stocks had risen considerably from mid 1999 onwards. However, whereas the implicit growth rate for the US computer segment shrank markedly even before the turning point in stock prices in April 2000, the EURO STOXX media segment implicit growth differential was still on the rise. Contrary to this picture, the growth differential for US computer stocks rose dramatically throughout the recent months (even superior to that observed for the peak price period), whereas it returned to "old" levels among euro area media stocks.

Obviously, the assumptions regarding the number of years until terminal growth, the dividend yield and the equity risk premium drive results systematically. For example, reducing the period until terminal growth to seven years would increase the maximum growth rate from 35 to 52 (NASDAQ computer stocks) and from 27 to 41 (EURO STOXX media stocks). The shape of the implicit growth rate curve throughout time, though, remains very similar. Increasing the equity risk premium by one percentage point (or, alternatively, decreasing the dividend yield by a full percentage point) would imply an increase of the maximum growth rate by around 10 % leaving the general shape of its trajectory unchanged.

Figure 14: Implicit growth assumptions for NASDAQ computer and EURO STOXX media stocks [%]
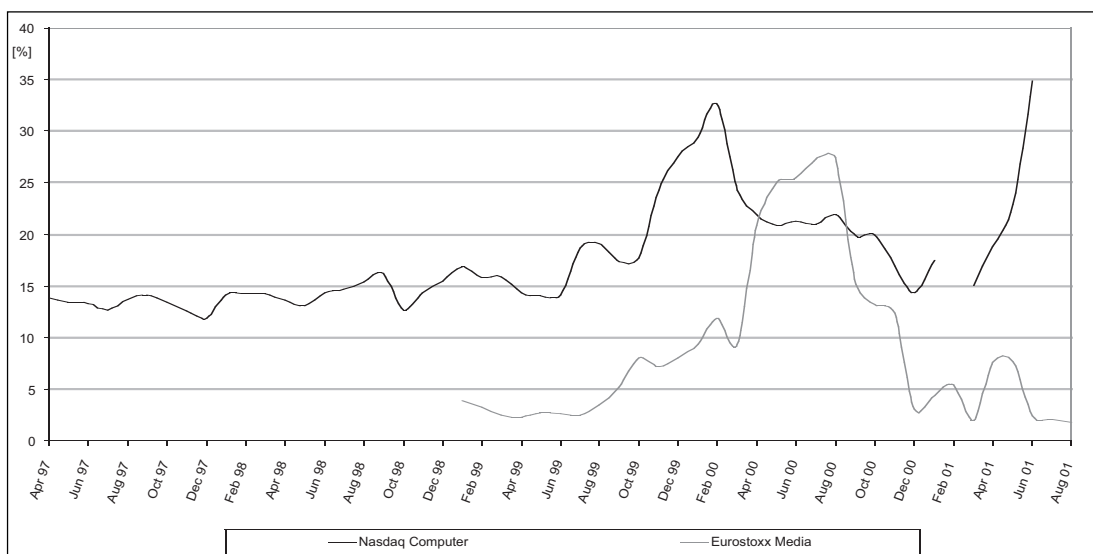
Source: Bloomberg, R. Shiller, own calculations.

According to Morgan Stanley Dean Witter, the estimated range of realistic 10-year earnings per share growth spreads from 6 to 12 percent (EURO STOXX media sector), 12 to 16 percent (EURO STOXX software) and 14 to 20 percent (EURO STOXX technology hardware and equipment). According to these yardsticks, one could say that from January 2000 onwards the valuation of EURO STOXX media stocks became implausibly high. Assuming similar growth projections for EURO STOXX and NASDAQ computer stocks, the growth assumptions implicit in PE ratios of NASDAQ computer stocks had been very plausible until late 1999 (both under the 10-year until terminal growth scenario).

4.3.2 Macroeconomic aspects

Apart from rather microeconomic reflections one may not forget the macroeconomic implications borne by economy-wide high PE ratios and their underlying growth assumptions. The most obvious macroeconomic implication refers to the future share of profits in GDP.[62] Consider again the case of current high stock prices reflecting above normal growth projections for a period of T years, after which growth returns to normal. In order to illustrate the implications borne by a given level of PE ratio, the following equation may be used:

$$(6) \quad \frac{P}{E} = \frac{p*(1+g)}{(1+r)} + \frac{p*(1+g)^2}{(1+r)^2} + ... + \frac{p*(1+g)^T}{(1+r)^T} + \frac{(1+g_E)^T * PE^*}{(1+r)^T} \, ,$$

where r, p, g, g_E, PE* denote the equity discount rate, the payout ratio, average dividend growth, the implied earnings growth rate and the PE ratio considered normal. Consider the case for the EURO STOXX and assume that:
1. Growth rates return to normal after ten years (i.e., T = 10),
2. As an approximation, the normal PE ratio corresponds to the average S&P500 PE ratio observed throughout 1881 to 2001 (i.e., PE* = 15),
3. The equity discount rate is equivalent to 7,65 %, where the risk-free rate is around 4,85 % (average yield of the German 10-year Bund from 1997 to 2001) and the equity risk premium is set to 2,8 % (i.e., r = 0,0765),
4. The pay-out ratio is equivalent to 40 % (i.e., p = 0,4),
5. The average dividend growth rate is equivalent to 3,9 % (i.e., g = 0,039), where dividend growth is approximated as the sum of euro area real GDP growth (2,5 % throughout 1995 to 2000) and GDP inflation (approximately 1,4 % throughout 1995 to 2000).

Figure 15: Growth expectations implicit in EURO STOXX PE ratios and the implicit shift in the profit share in nominal GDP
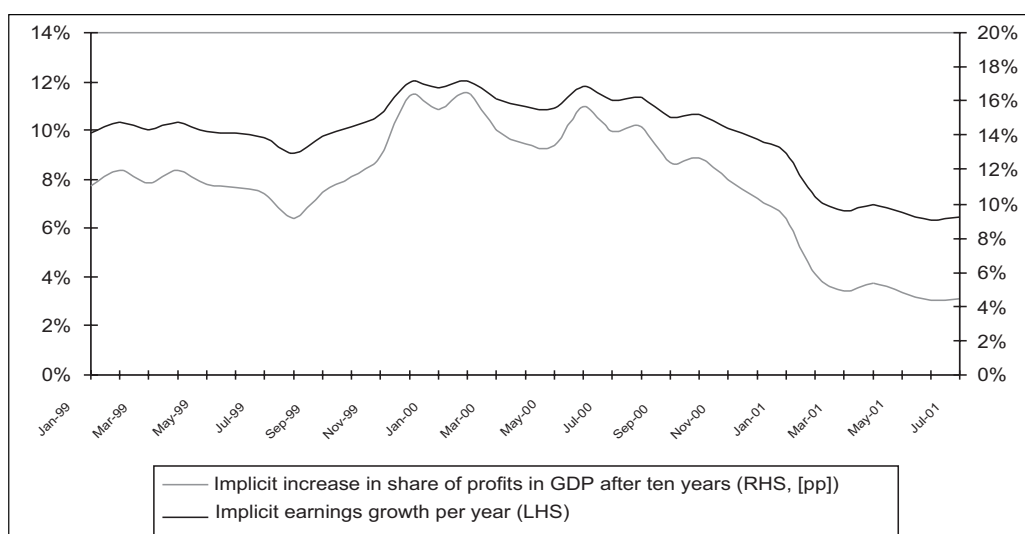
Source: European Central Bank, Bloomberg, R. Shiller, own calculations.

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62. Fair (2000).

According to equation (6), by February 2000 (when the EURO STOXX PE ratio was roughly 35), the implicit earnings growth rate would have navigated around 17,2 %. Now, assume that, initially, the ratio of after tax corporate profits to nominal GDP in the euro area would be roughly 5 %. Now, if earnings were to grow at 17,2 % per year over the next ten years and nominal GDP by only 4 %, the profit/GDP ratio at the end of 10 years would be above 16 %. A profit share of above 16 %, however, seems highly unlikely to occur since constraints on reaching this ratio would arise from social, political, and economic forces. Even if, as advocates of the new economy suggest, potential long-run economy-wide growth becomes significantly higher than 3 % because of a permanently higher track for productivity growth, such growth rates appear excessive.[63] From a macroeconomic point of view, thus, the earnings growth rates implicit in the PE ratios observed in large parts of 1999 and 2000 even for broader markets (and not only the new economy segment) seem unrealistic.[64]

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63. See Hannah (2000) for a similar assessment.

64. The US experience of the past five decades indicates that companies' earnings can grow more rapidly than nominal GDP in the short run, but over longer intervals they tend to grow at very similar rates (Kopcke (2000)).

5

Did preferences of equity investors change?

The strong rise in stock prices and PE ratios raises the question whether investor behaviour had been subject to change within the last years. Whether investors have become less risk averse has frequently been addressed from the perspective of a declining equity risk premium. Apart from the fact that credit spreads widened and IPOs dried out after spring 2000 [65], another way to illustrate modifications in risk aversion among equity investors relies on the utility function concept. This concept assumes that the utility an investor has for money can be measured by a utility function u(x) determining how much risk he is willing to take in order to obtain an expected amount of money. An assumption commonly made in this context is that the investor has constant risk tolerance over a range of alternative portfolios in the neighbourhood of a given allocation scheme. Constant risk tolerance implies that the equation for the indifference curve of investors is linear in a variance-return diagram. This implies conventional convex indifference curves characterising the return-standard deviation trade-off, implying that investors require more return to compensate for an additional unit of standard deviation as the risk of the portfolio increases.[66] One commonly used utility function in the framework of portfolio theory is given by:

(7) $u(x) = 1 - \exp(-kx)$,

where k denotes a risk aversion constant. One advantage of this utility function is that it allows for the modelling of constant risk tolerance. To see this, assume that the return vector is normally distributed with mean r and covariance matrix Q. Therefore, the expected return of the portfolio r^p is also normally distributed with mean m= r^Tw (where w denotes the weighting vector) and variance $s^2 = w^T Q w$. The expected value of utility may then be computed as:

(8) $E[u(x)] = \int_{-\infty}^{\infty} (1 - \exp(-kx))\varphi(x)dx$

$$= 1 - \frac{1}{\delta\sqrt{2\pi}} \exp\left[-kx - 0.5(\frac{x-\mu}{\sigma})^2\right]dx$$

$$= 1 - \exp(-k\mu + 0.5k^2\sigma^2)$$

Since $f(x)=1-\exp(-x)$ is strictly increasing in x, maximising utility is equivalent to maximising:

(9) $f(w) = k(r^T w - 0.5 k w^T Q w)$,

65. Federal Reserve Bank of San Francisco (2001).
66. Sharpe/Gordon (1990).

which yields the following common investor objective function with constant risk tolerance:[67]

$$(10) \quad f = \mu - 0.5k\sigma^2$$

Now, given a vector of return r, a covariance matrix Q and a risk aversion parameter k, one can determine a weighting vector w such that the corresponding portfolio maximises expected utility. Or, by applying the observed means and standard deviations for different investment alternatives one can derive – for a given risk aversion constant – the optimum weighting coefficients or – for a given weighting matrix – the corresponding risk aversion parameter. Resulting implicit modifications to the latter then may reflect changes in investor risk attitude.

Figure 16: Investor indifference curves by risk aversion parameter
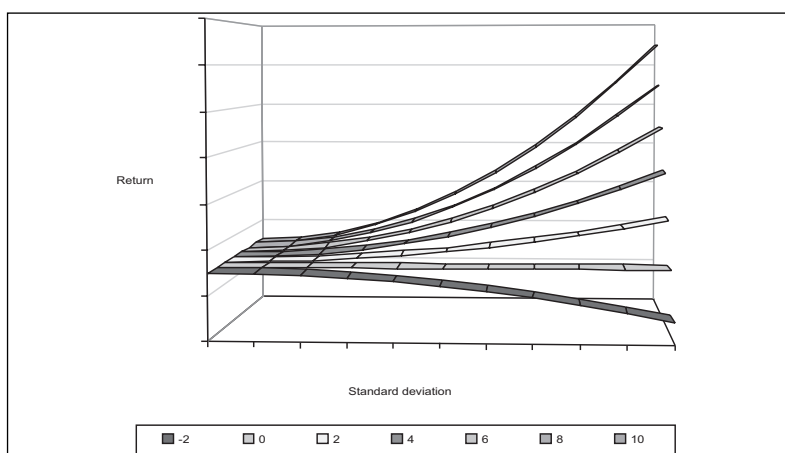
Source: Own calculations.

For purposes of facilitation and comparability, consider a dual investment decision, where one investment alternative is representative of the old economy (in our case the DAX30) and the other represents the new economy alternative (in our case the NEMAX). Obviously, the optimum portfolio allocation depends on how expectations are formed. In the following, it is assumed that expected return corresponds to a moving average of effective returns. With investors combining adaptive expectation formation and forward-looking expectation elements, moving averages rely on past as well as future return figures. In order to dampen the driving momentum of individual observations as well as due to issues related to data availability, the length of the moving average was set to nine months.[68] In order to avoid (time-variant) deviations from optimum portfolio allocation due to expectation errors, only effective return figures enter the expectation equation.

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67. See, for example, the web site of the Finance Department of the Wharton School of the University of Pennsylvania http://finance.wharton.upenn.edu.

68. Note that the NEMAX has only been established by March 1997. Obviously, the choice of the length of the moving average as well as the number of future return figures is arbitrary. However, modifications to these assumptions do not alter the estimates materially.

Figure 17: Optimum share of portfolio investment in the old economy (DAX) as a function of the risk aversion parameter
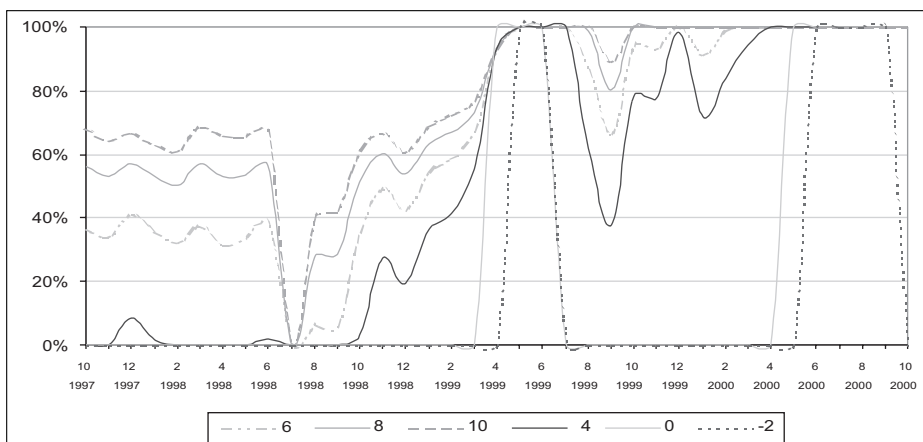
Source: Bloomberg, own calculations.

As illustrated by figure 17 above, for a given risk aversion parameter, the "optimum old economy share" in the total portfolio did not change materially until mid 1998. At that point in time, the DAX return expectations decreased substantially and so did the volatility of NEMAX returns.[69] As a consequence, the utility maximising DAX share became virtually zero even among risk averse investors. From then on, however, the optimum "old economy share" increased steadily among risk averse investors. By spring 1999, the utility maximising "old economy share" was 100 % even for risk neutral investors (by mid 1999, this was also the case for moderately risk loving investors). Due to the very high returns obtained in the NEMAX segment in late 1999, the "old economy share" temporarily shrank again, though not to those levels observed prior to mid 1998. By fall 1999, again, the "old economy share" increased rapidly and, by the beginning of 2000 attained 100 % among moderately to highly risk averse investors. By early 2000, only risk loving investors stuck to the NEMAX, but by mid 2000 even moderately to highly risk loving investors swapped their portfolio in favour of the "old economy".

Now, for the purpose of illustration, consider the case of a constant portfolio structure. More specifically, what implications are borne by an equivocal portfolio allocation between the DAX and the NEMAX with respect to the risk aversion parameter? In analogy to the remarks made above, in order to keep the portfolio allocation constant, initially, the utility maximising investor implicitly would have had to become less risk averse (until mid 1998 when the implicit risk aversion parameter peaked at 23). However, the constant allocation locus illustrates that from mid 1998 onwards, rational investors implicitly adjusted their risk attitude away from moderate risk aversion to virtual risk neutrality. Throughout the 1999 summer months, however, a constant allocation implicitly required an increase in risk aversion.

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69. This is true not only in absolute levels, but also relative to the volatility of DAX returns and the level of expected NEMAX returns respectively.

On the one hand, when interpreting the figures, one must bear in mind that portfolio structures characterised by minor NEMAX allocations (which were probably very common in 1997, say 10 %) ex-post were only compatible with very high risk aversion parameters and it is questionable whether a that high degree of risk aversion would have pertained. On the other hand, the same 10 percent NEMAX share from the beginning of 2000 onwards would have been justifiable by means of very low risk aversion (or even risk neutrality) only. Probably, the period under consideration was not one of constant portfolio structures. Instead, the new economy share most likely grew due to equity portfolio shifts as well as newly attracted equity investors. Whereas such a shift would have been quite understandable from the perspective of constant risk aversion throughout the 1998 summer months, this would have afforded an even stronger decrease of the risk aversion parameter from late 1998 onwards (see, for example, the upper line in figure 18 below for a continuous portfolio shift away from the DAX from an initial 80 % by autumn 1997 to 50 % by spring 2000).

Figure 18: The risk aversion parameter implicit in an equivocal portfolio allocation between the DAX and the NEMAX
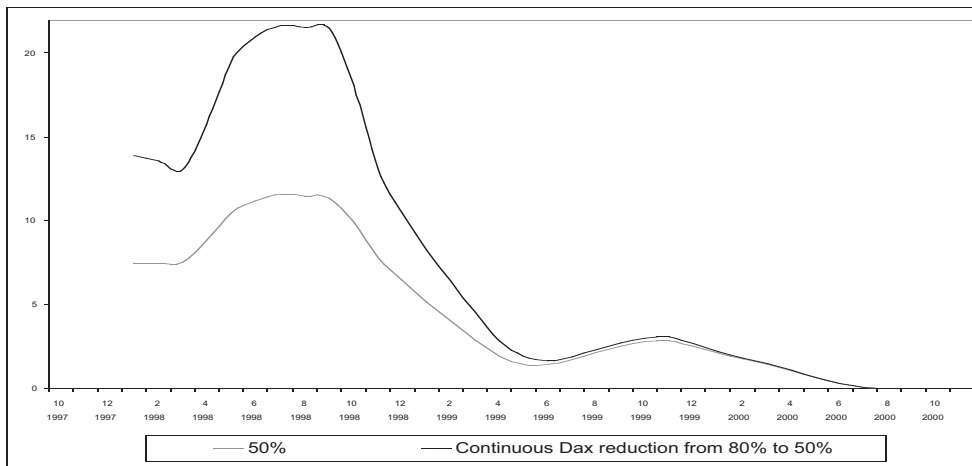
Source: Bloomberg; own estimations.

6

Stock prices and fundamentals

The sharp rise in new economy stocks observed throughout 1999 and 2000 led to discussions – across the public as well as among practitioners - on whether stock prices were still in line with fundamentals or, instead, expression of "irrational exuberance".[70, 71] In order to test the relevance of macroeconomic fundamentals, but also firm-specific hard facts in explaining stock returns we estimated a multiple-factor model. Estimations are based on observed monthly returns for 219 firms listed on the EURO STOXX.[72] The data on stock prices and dividends were collected from Bloomberg. The range of macroeconomic variables includes different types of deflators (GDP, services, communication), industrial production, productivity growth, exchange rates, central bank rates and money market interest rates. These figures were collected from the New Cronos database, from the European Central Bank and the national central banks concerned. The following specification is estimated:

$$(11) \quad r_{it} = \alpha_i + \beta_{ct} M_{ct} + \gamma_{it} F_{it} + \varepsilon_{it},$$

where r_{it}, M, F denote real returns in month t on stocks issued by company i, a vector of macroeconomic factors and a vector of firm-specific factors.

Initially, a common panel data analysis is applied to both the new economy sectors (i.e., 34 firms from the TMT sectors) and the old economy sectors (i.e., 185 firms from the remaining 15 EURO STOXX sectors). This done, poolability is tested by means of three tests, i.e. the F-test, the Wald test and by using interaction variables (see table 6). The baseline specification underlying these tests includes the money market rate r^m (or, alternatively, the central bank rate r^c), the exchange rate fx, industrial production IP and productivity growth φ[73] as well as the lagged PE ratio and two time dummies (one from September 1999 to March 2001 and the other from April 2000 onwards) as explanatory variables. According to the F-test[74] as well as the Wald test, the null-hypothesis that the coefficients in both equations are the same is rejected. According to the interaction variable approach, only in the case of the exchange rate no significant difference occurs between returns on old and new economy firm stocks.

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70. See for example Fornari/Pericoli (2000).

71. Though, at least among the broad public, the general feeling was that of stock markets having been overvalued in early 2000 (see, for example, Der Spiegel (2000)), some economists argued that the market was properly valued at that time (see, for example, McGrattan/Prescott (2000)).

72. For purposes of maximum data availability the exercise is restricted to firms located in one of the four major euro area countries (i.e., France, Germany, Italy and Spain).

73. Though under particular assumptions capital productivity is the measure most closely linked to share returns (see, for example, Davis/Madsen (2001)), productivity, in the following, due to issues of practicality and similar to most studies in this field, refers to labour productivity.

74. The F-test is merely done for illustrative purposes since it relies on the important assumption that the disturbance variance is the same in both regressions. The same is basically true for the specification using interaction variables (Greene (1997)).

Table 6: A case for non-poolability

	F-TEST	WALD TEST	INTERACTION VARIABLES
Evidence for non-poolability of the coefficient vector:			
Total	****	****	-
Evidence for non-poolability of the single coefficients:			
$\log P_{t-1}/E_{t-1}$	-	-	****
$\Delta \log r_t^m$	-	-	****
$\Delta \log fx_{t-1}$	-	-	
$\Delta \log IP_{t-1}$	-	-	****
$\log \varphi_1$	-	-	****
D1	-	-	****
D2	-	-	****

****, ***, ** and * denote significance at the 0,1%, 1%, 5% and 10% level, respectively.

In the following, thus, a two-sector multiple-factor model is estimated by running separate regressions for old economy firms on the one hand and for new economy firms on the other hand.

Table 7 below illustrates the empirical results for non-TMT stocks based on fixed effects estimation (based on different variable sets in order to illustrate the robustness of the results).[75]

With respect to old economy stocks, the assumption that stock returns behaved independently from fundamentals may not be confirmed. Instead, it seems that not only firm-specific fundamentals, but also macroeconomic fundamental variables exerted a significant impact on monthly stock returns throughout the last three years. For example, important scores of the PE ratio and/or the PB ratio in the past significantly reduced current return rates. Interest rates, too, seem to have exerted a negative impact on monthly returns. Industrial production growth as well as productivity growth seem to have fuelled stock returns. The same holds true for a depreciation of the domestic currency vis-à-vis the US Dollar.

Whereas the sign of the coefficients are according to expectations, their magnitudes are not self-explaining. On the one hand, though robust in terms of sign and significance, the coefficients for the money market rate and the exchange rate vary substantially. Coefficients for the PE ratio, the PB ratio, industrial production and productivity growth, though, are relatively robust across specifications. On the other hand, the implications borne by the coefficient estimates may be questioned. For purposes of illustration, consider the case for scenario VIII. When evaluated at the median level of each of the variables concerned (if done so, the theoretical "median monthly return" is approximately 0,5 %), one may derive the following implications. A PE ratio of 50 % higher than median (i.e., 35,2 instead of 23,2) would imply a decrease in monthly returns by 1,3 percentage points. An increase in money market rates

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75. Given the very parsimonious character of the specification, obviously, the estimates may only serve for illustrative purposes.

by 0,5 percentage points would have reduced monthly return rates by 1,5 percentage points. Then, a 5 % increase in industrial production would have increased the monthly return by 0,3 percentage points and a 10 % increase in the exchange rate would have fuelled monthly return by 1,3 percentage points.

Table 7: Monthly returns on stocks other than TMT

	SPECIFICATION							
	I	II	III	IV	V	VI	VII	VIII
Dependent variable	$(P_s^{t+1} - P_s^t + D_s^{t,t+1})/P_s^t$							
Sample period:								
From	04/1998	04/1998	04/1998	04/1998	04/1998	04/1998	04/1998	04/1998
To	03/2000	05/2001	05/2001	03/2000	05/2001	03/2000	05/2001	05/2001
No. of Cross-sect.	176	180	179	178	180	178	179	179
Observ.	1845	3198	2995	3115	5522	3115	3075	5171
$\log PE_{t-1}$	-0.04***		-0.03***	-0.03***		-0.03***	-0.03***	-0.03***
	0.01		0.01	0.01		0.01	0.01	0.00
$\log PB_{t-1}$		-0.06***			-0.06***			
		0.01			0.01			
$\Delta \log r_t^c$						-0.07**		
						0.03		
$\Delta \log r_t^m$	-0.17***	-0.16***	-0.16***	-0.14***	-0.11***		-0.13***	-0.12***
	0.04	0.03	0.04	0.03	0.02		0.04	0.02
$\Delta \log IP_{t-1}$	0.07***	0.07***	0.07***	0.06***	0.06***	0.05***		0.07***
	0.02	0.01	0.01	0.01	0.01	0.01		0.01
$\Delta \log fx_1$	0.24***	0.26***	0.26***	0.10*	0.17***	0.11*	0.29***	0.14***
	0.07	0.05	0.05	0.06	0.05	0.06	0.05	0.05
$\log \varphi_t$	-0.01***	-0.01**	-0.01*				-0.01***	
	0.00	0.00	0.00				0.00	
D1		0.02***	0.02***				0.02***	
		0.01	0.01				0.01	
D2		-0.00	-0.00				-0.01*	
		0.00	0.00				0.00	
R-Squared	0.18	0.15	0.13	0.11	0.10	0.11	0.12	0.08
Adjusted R-Squared	0.09	0.10	0.07	0.06	0.07	0.05	0.06	0.04
F-Statistic	92.81	89.56	70.55	123.51	189.31	119.27	78.38	136.77
DW	2.07	1.94	1.99	2.16	2.05	2.14	1.99	2.09

***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Estimates are heteroskedasticity consistent. Standard errors below coefficients.

Obviously, the period under consideration probably bears behavioural shifts and structural changes. Unfortunately, due to the small sample size (at least for the period of decreasing prices), a genuine separation by means of a sample split is not feasible. As an approximation, we use dummy variables referring to the period from September 1998 to March 2000 (i.e., D1) and from April 2000 onwards (i.e., D2). Estimates suggest that there has been an otherwise unexplained "remainder" affecting monthly stock returns in a significant way. Estimated coefficients for dummy period 1 are significantly positive, whereas those for dummy period 2 are significantly negative (though small in size). Significance, sign and magnitude of both dummy variables are robust across specifications tested.

Table 8: Monthly returns on TMT stocks

	SPECIFICATION			
	I	II	III	IV
Dependent variable	$(P_s^{t+1} - P_s^t + D_s^{t,t+1})/P_s^t$			
Sample period:				
From	04/1998	04/1998	04/1998	04/1998
To	05/2001	05/2001	05/2001	05/2001
No. of cross-sections	33	29	29	33
Observations	556	468	483	455
$\log PE_{t-1}$		-0.07 ***	-0.06 ***	-0.11 ***
		0.02	0.02	0.01
$\log PB_{t-1}$	-0.07 ***			
	0.03			
$\Delta\log r_t^m$	-0.25 **	-0.26 **	-0.25 **	0.12
	0.10	0.11	0.11	0.09
$\Delta\log IP_{t-1}$	0.05	0.02		0.02
	0.04	0.05		0.05
$\Delta\log fx_t$	0.83 ***	0.70 ***	0.69 ***	0.97 ***
	0.18	0.17	0.18	0.21
$\log\varphi_t$	-0.01	-0.01	-0.01	-0.02 **
	0.01	0.01	0.01	0.01
D1	0.16 ***	0.16 ***	0.15 ***	
	0.02	0.03	0.03	
D2	-0.04 **	-0.04 **	-0.04 **	
	0.02	0.02	0.02	
R-Squared	0.35	0.37	0.36	0.22
Adjusted R-Squared	0.30	0.32	0.31	0.16
F-Statistic	46.41	41.79	50.82	30.45
DW	1.91	2.09	2.08	1.64

***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Estimates are heteroskedasticity consistent. Standard errors below coefficients.

Now consider the case for the TMT segment of the EURO STOXX (again using fixed effects). According to expectations, the role of fundamentals in explaining TMT stock returns seems to have been less transparent than among non-TMT stocks. Regressions for TMT stocks seem to be more sensitive to the set of explanatory variables, the number of lags, etc. and the standard errors are much more important. This is with the exception of the firm-specific variables, such as the PE ratio and the PB ratio, where coefficients are significantly negative and of similar magnitude across different specifications. Contrary to the case for non-TMT stocks, the role of the dummy variables becomes crucial and this is well reflected in R-squared. Without them, the coefficients for macroeconomic variables become doubtful (e.g., positive coefficient for money-market rates). By using the dummy variables mentioned above one may derive the following messages. First, increases in money market rates seem to have had a significantly negative impact on returns. Coefficients are considerably higher than for non-TMT equity. Second, the exchange rate coefficient is significantly positive.

Though results suggest a stronger impact of exchange rate changes for TMT stocks than for non-TMT stocks, the magnitude of the coefficient is not robust. Third, coefficients for both dummy variables are significantly different from zero even at high significance levels. In both cases, the size of the coefficient is robust and of higher absolute value, which is according to a priori expectations. Finally, neither industrial production growth, nor productivity growth was found to exert an impact significantly different from zero on monthly stock returns.

All specifications used hitherto rely on past or current values of the explanatory variables. Finally, we test whether, according to common theory, stock markets are rather forward-looking and whether returns on new economy stocks - given their more forward-looking character - are more so than those of old economy equity. Abstracting from expectation errors we regress monthly returns on future values for macroeconomic variables. As for the microeconomic fundamentals, we refer to the lagged values since in the very short-term only prices will vary. Results are illustrated in table 9 below for a very rudimentary specification and a more comprehensive one.

Table 9: Monthly returns on stocks (leading specification)

	SPECIFICATION							
	I				II			
	SECTORS OTHER THAN TMT		TMT SECTORS		SECTORS OTHER THAN TMT		TMT SECTORS	
Dependent variable	$(P_s^{t+1} - P_s^t + D_s^{t,t+1})/P_s^t$							
Sample period: From To	04/1998 05/2001		04/1998 05/2001		04/1998 05/2001		04/1998 05/2001	
No. of Cross-sections Observations	179 2967		29 464		171 2968		28 464	
$\log PE_{t-1}$	-0.04 0.01	***	-0.07 0.02	***	-0.03 0.01	***	-0.02 0.02	
$\Delta \log r_{t+1}^m$	-0.20 0.03	***	-0.30 0.11	***	-0.21 0.03	***	-0.53 0.11	***
$\Delta \log IP_{t+1}$					0.04 0.02		-0.02 0.06	
$\Delta \log fx_{t+1}$					0.05 0.06	*	0.35 0.21	
$\log \varphi_{t+1}$	-0.00 0.00		-0.05 0.01	***	-0.01 0.00	**	-0.01 0.01	**
D1	-0.00 0.01		0.10 0.02	***	0.03 0.01	***	0.17 0.02	***
D2	-0.01 0.00	***	-0.00 0.02		-0.01 0.00	**	-0.08 0.02	***
R-Squared	0.11		0.26		0.12		0.39	
Adjusted R-Squared	0.05		0.21		0.06		0.35	
F-Statistic	86.00		38.44		63.08		46.56	
DW	2.08		2.18		1.96		2.36	

***, ** and * denote significance at the 1%, 5% and 10% level, respectively. Estimates are heteroskedasticity consistent. Standard errors below coefficients.

The inclusion of forward-looking elements modifies the picture emanating from the lagged variable specification in two ways. First, the exchange rate becomes insignificant. Second, productivity growth becomes significant in explaining returns on new economy stock, and this is robust across specifications. The two elements common to all specifications relate to the role of the microeconomic fundamentals and the relevance of monetary policy (assuming that central bank signals transmit efficiently into money market rates). In general, results seem to be more sensitive with respect to the use of lagged versus leading explanatory variables rather than with the number of lags/leads (up to a quarter) itself. The question therefore emerges whether returns on new economy stocks are more forward-looking than old economy stock returns. The answer to this depends essentially on the availability of longer time series and data on expectations regarding growth, inflation, etc. and merits further investigation.

7

Implications for central banking and conclusion

The emergence of a new economy and the navigation into an environment increasingly based on more and better information and communication, incidentally, may augment the uncertainty momentum underlying investor activity as well as central banking. Any assessment of new economy firms may be subject to enhanced contingency for a number of reasons, such as the lack of historical data, the greater role of intangibles and the higher importance of expected rather than actual figures. But given the forward-looking character of new economy firms, equity indicators and stock prices may for good reasons also become much more volatile. Apart from these, the valuation of high growth stocks may be subject to otherwise less explainable factors (see, for example, the issue of "spoofing" and the allocation of IPO tranches).

Central bankers, in particular, are affected in a double sense. Classic portfolio theory as well as preliminary empirical findings suggest that monetary policy remains an important factor intervening in the pricing of new economy stocks. But, on the one hand, due to impacts of stock prices on inflation, the real economy, and the financial system and given the theoretically justifiable perspective of more volatile new economy stocks, central bankers nowadays are more than ever asked to closely monitor stock markets as well as investor behaviour world-wide. The potential macroeconomic impact of stock market fluctuations may turn out self-reinforcing in that rising equity prices by themselves may fuel the passion for equity among the broad public. The common view of an equity culture developing across the "old continent" within the next years may be particularly challenging for the European Central Bank. In monitoring equity markets, it is essential for central banks to separate effects driven by changes in inflation expectations from those incurred by modifications to growth projections as well as those produced by changes in risk preferences.

Furthermore, central banks may be increasingly challenged in balancing supply-side and demand-side effects stemming from stock market pricing. In particular, the greater role for earnings expectations (rather than actual figures) may temporarily allow for a higher spread between the actual condition of the real economy and the "facial picture" emanating from the stock market. This is particularly obvious in the start-up phase of new economy firms, since these by their very nature depend on rapid initial growth (instead of effective earnings) in order to overcome the contestability issues inherent to network economies. Higher spreads, in turn, may raise the issue of a "reversion in causality" between equity prices and fundamentals. An increasing passion for equity may also render the traditional projection of changes in consumer spending (i.e., by primarily relying on changes in household income) insufficient. Instead, a change in the value of equity, similar to other assets, may become increasingly important in explaining future inflation. Since it is highly unlikely that equity wealth affects

spending decisions similar to common household income, volatile equity prices can create serious uncertainty for the central bank. Thus, in order to fulfil its mandate successfully, any central bank striving for price stability is asked to have available data on income stemming from equity gains (similar to other forms of capital gains). Furthermore, central bankers are asked to analyse in detail how this type of income affects spending and to address the issue of double symmetry (i.e., whether a decline in equity wealth causes spending to fall to the same extent that an increase of the same magnitude causes it to rise and whether the sequence matters).

On the other hand, the deliberation and implementation of central bank policy must take into account the increasingly leveraged impact of inflation and real interest rates on stock markets in an environment increasingly characterised by high growth stocks. Thus, central banks are more than ever asked to strengthen the case for well-defined and reliable price acceleration expectations. But, given the considerable uncertainties surrounding any assessment of new economy firms, integrating more thoroughly the analysis of stock markets into central bank policy making (as for example within the second pillar of the European Central Bank monetary policy strategy) may also increase contingency. Finally, the common practice of new economy firms to fund investment by investor money may incur additional problems with respect to financial market stability and capital regulation due to the close co-play between primary and secondary markets.

8

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N°2

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by Patrick Lünnemann
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