Stock Market Valuation of Old and New Economy Firms

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Bert Ayrer, Christian Upper and Thomas Werner

Deutsche Bundesbank

Wilhelm-Epstein-Str. 14
60431 Frankfurt am Main
Germany
Tel. +49 – 69 – 9566 4346/2398/2253
Fax +49 – 69 – 9566 3082
bert.ayrer@bundesbank.de
christian.upper@bundesbank.de
thomas.werner@bundesbank.de

Introduction and Executive Summary

New economy firms are notoriously difficult to value. The very essence of a „new economy“ is that, by definition, it involves a qualitative change relative to the past in how things are done. As a consequence, new economy firms have no track record to speak of that could be used to make inferences about their future prospects. In addition, new technologies often involve large initial capital outlays with the corresponding cash inflows expected in the future. Even small variations in the discount rate applied to these inflows may therefore result in wide differences in firm value. Furthermore, the high degree of uncertainty about both costs and revenues adds to the difficulties in choosing the appropriate discount rate.

In light of all these complexities in valuing new economy firms, it does not come as a surprise that the prices for their equity have been highly volatile. In Germany, the prices of stocks listed on the Neuer Markt, where many new economy firms are listed, have risen almost threefold between November 1999 and March 2000, while the market as a whole (including the Neuer Markt) gained ‚only‘ 50 %. Also the subsequent correction has been far more severe on the Neuer Markt than in the more traditional segments.

It is tempting to ask whether this sharp swing in the prices for equity of new economy firms was driven by changes in fundamentals or whether there was a speculative bubble in the technology sector. The answer to this question is of significant concern to the monetary authorities for a variety of reasons. Firstly, according to IMF estimates (IMF [2001]), the impact of a rise (or decline) in the equity valuation of technology firms will have a considerably higher impact on consumption in continental Europe than swings in the prices of other equities. A bubble in the new economy sector could thus have a significant effect on aggregate demand. Secondly, if the bubble has been financed by margin loans, then a drop in share prices may put the stability of the financial system in danger. Just witness the sorry state of the Japanese financial system after the bursting of the bubble in 1989.

Unfortunately, testing for speculative bubbles is difficult at best and impossible at worst. Nevertheless, and nonwithstanding these difficulties, analysts working in the financial sector do have to come up with estimates of how much firms are worth, and their estimates should be reflected in equity prices. In the first part of the paper, we look at how they value new economy firms. The results are based on interviews with a number of analysts who cover the new economy for German banks.

Not surprisingly, the analysts interviewed stress the importance of fundamental research. They focus mainly on firm-specific issues, although they profess to have an eye also on sector and market-wide factors. More interestingly, the gap between the valuation methods for old economy and new economy firms seems to have narrowed. Indicators like measures for web-traffic, which have been found important in explaining the prices for internet stocks in the US, seem to be loosing ground and analysts are returning to more traditional ways of valuing companies. Apart from financial indicators, soft factors like the quality of the management or

the overall strategy of firms play an important role. The analysts interviewed denied herd behaviour or irrationality on their part[1], and attribute the sharp reduction in the values of new economy stocks mainly to deteriorations in fundamentals. They acknowledge, however, that some valuation methods, for example those based on multiples of sales, may reinforce given trends. Beyond that, they admit that in a situation of strong capital inflows meeting a relatively scarce demand for funds, as was the case in the early days of the Neuer Market, share prices may rise well above their medium-term fair value. This, in turn, may put analysts under pressure to value a company above what would be justified by fundamentals.

The second part of the paper focuses on equity prices directly. Rather than providing our own estimate of which level should be deemed appropriate and where overvaluation starts, we test for how stock prices respond to firm-specific news. We ask the question of whether the share prices of new economy firms react to changes in fundamentals in the same way as those of old economy companies. If there are any differences in the behaviour between the two sectors, then this could help us to shed light on the accuracy and time path of the valuations used by financial market participants.

We find that during the boom on the stock market in late 1999 and early 2000, new economy stocks reacted more strongly to positive news than old economy equity, while there were no discernible differences in the reaction to negative news. During the period of declining prices after March 2000, however, it was the reaction to negative news that was more pronounced for new economy than for old economy stocks, while there was no significant difference in the reaction to positive news.

The asymmetry in the impact of good and bad news is surprising. As we will argue below, it is unlikely that it is merely a reflection of differences in the quality of news. Instead, we believe that the link between the overreaction and the overall trend in equity prices suggests that the prices of new economy stocks reflect investor sentiment more readily than those of old economy shares. This does not mean that fundamental factors are not important for valuation, but that agents react more strongly to pieces of news that confirm their current beliefs, i.e. optimism during a boom, and pessimism in a slump. This may be due to psychological factors, e.g. representative heuristics or overconfidence, or due to the limits imposed on fundamental arbitrage by the renumeration and assessment structure of the fund management industry. Our interviews revealed that analysts find it difficult to give recommendations contrary to the prevailing market trend. There is also evidence, which is discussed in more detail below, that similar constraints apply to fund managers as well.

[1] They do admit, however, that technical analysis may play a role at the level of the fund manager or trader.

A Practitioner's View: How Analysts Value New Economy Firms

In order to find out how the market values new economy firms, we conducted a number of interviews with equity analysts at German banks, who specialised in the new economy. In addition, we evaluated several banks' research reports on new economy firms. The interviews took place in March and April of 2001, that is, about a year after share prices reached their peak in March 2000.

Most of the practitioners interviewed stressed the role of fundamental research to find out the ‚fair-value' of a share, although technical analysis may play a role at the level of the fund manager. Analysts seem to work mainly ‚bottom up' rather than ‚top down'. In other words, they focus primarily on company-related issues, although they claim also to have an eye on developments concerning the sector or the market as a whole.

Despite this agreement on the importance of fundamental research, there does not seem to exist a coherent valuation model that can be easily applied to all types of new economy firms or, indeed, to new economy and old economy firms alike. Furthermore, analysts working for different institutions often use different methods. In general, new economy firms tend to be more specialised than old economy firms. Indeed, some of them are essentially one-product firms or are based on a single business idea. Hence it does not come as a surprise that the people analysing the new economy often have a educational background related to the type of companies they are covering. For example, biotech firms are often covered by biologists.

Despite these differences, there seems to be broad agreement that the gap between valuation methods for old and new economy firms has narrowed. New valuation methods, e.g. web-traffic indicators for internet companies (Demers & Lev [2001], Trueman, Wong & Zhang [2001]) are losing ground and analysts are returning to more traditional ways of valuation.

As was mentioned before, firm specific data is of particular importance. In addition to balance sheet data and earnings and cash flow forecasts, so-called ‚soft factors' like the quality of the management or the overall strategy of firms seem to be of great importance. Regarding market or sector-related issues, the overall growth of the market, the relative strength of a company compared with close competitors, its relations with its customers, as well as its distribution channels were mentioned as being of great importance. The price-earnings-ratios of competitors, the so-called multiple methods, are often used to value new entrants to a market. However, the analysts recognised this method can lead to self-sustaining trends.

It does not come as a surprise that analysts deny the very existence of any herd behaviour on their part, and trace back the sharp decline in the valuation of new economy stocks over the last year to deteriorations in fundamentals. However, some of them admit that it can be quite difficult to give recommendations contrary to the prevailing market trend. For example, when prices were going up, analysts were under pressure to assign companies a value above it theoretical fair value. This was because the management of the firms involved was usually

interested in higher valuations (perhaps because it was paid in stock options), and the analysts‘ employers wanted to avoid any dissatisfaction on part of their clients.

When questioned on their views on the factors driving equity prices, analysts assigned great importance to the capital inflows into a market. They said that during the early days of the Neuer Markt, when only a few firms were listed, strong capital inflows met a relatively weak demand for funds, which drove up share prices. The withdraw of capital from the Neuer Markt during the subsequent bear market not only reduced the market capitalization of most companies, but also made it difficult even for profitable companies to raise funds. As a consequence, investors attached more importance to news on the ability to generate cash flow than they had done previously. A swing in investors´attitudes could thus lead to a significant reinforcement of market dynamics.

In the following chapter we try to shed some light on the question how market sentiment or the existence of certain trend may change the impact of news on market participants´ perception and behaviour.

The Impact of News on Old Economy and New Economy Stock Prices

In this section, we estimate the reaction of share prices for new economy firms and old economy firms to firm-specific news. In particular, we test whether new economy firms react differently to ad hoc announcements than old economy companies. The answer to this question could shed some light on the accuracy and the time path of the valuations used by financial market participants without forcing us to specify a structural pricing model.

As we mentioned before, valuing new economy firms involves a considerably greater degree of uncertainty than valuing established firms. However, it is not clear a priori how this should affect the response of stock prices of new and old economy firms to news. According to Bayes‘ Rule, the response of beliefs - or equity prices, if we assume a one-to-one relationship between the two – to news depends on the relative precisions of the prior belief and the signal. In our case, we would expect both the prior and the signal to be less precise for new economy than for old economy firms. As a consequence, the relative impact on equity prices of similar pieces of news is ambiguous and may even vary over time.

The pieces of news considered in this analysis are ad hoc announcements published by a sample of German firms that can be classified unambiguously as belonging to either the new economy or the old economy. The German securities law specifies that, in addition to the regular accounts, listed firms have to publish any information that is firm-specific, not publicly known and that may significantly affect the price of its equity. In order to be able to make sure that the news reaches all major market participants simultaneously, we only

consider ad hoc announcements published on the web site of the Deutsche Gesellschaft für Ad hoc-Publizität (www.dgap.de).[2, 3]

Our sample includes daily equity returns for 15 new economy firms listed on Neuer Markt and 13 old economy firms contained in DAX100 from the beginning of January 1999 to the end of January 2001. We first chose the sectors (software, telecom, biotechnology, internet, IT-services for the new economy, and automobile, retail, chemical and pharmaceutical for the old economy) and then randomly picked from the stocks that were active within these sectors in January 1999. Of the initial choices, only one (new economy) firm dissappeared over the course of our sample period and could therefore not be included. Two of the remaining new technology firms declared bankruptcy within the sample period, although their equity remained listed. We could therefore keep them in the sample. In addition, two (old economy) firms did not publish any ad hoc announcements and were therefore also dropped from the sample. Overall, there is little reason to believe that our results are distorted because of survivorship bias. A list of the firms included in our analysis is reproduced in the appendix.

We model the reaction of stock prices to news within the framework of event analysis.[4] In contrast to traditional event studies we do not model the effect of each event separately, but estimate a time series model for the returns of each stock over the whole sample period and introduce a dummy variable for every event. This gives a regression equation for security i

$$R_{it} = \alpha_i + \beta_i R_{mt} + \sum_{a=1}^{A} \gamma_a D_{at} + u_{it}, \qquad (1)$$

where R_{it} stands for the daily return of security i and R_{mt} for the market return. D_{at} is a dummy variable that is equal to one on the day an announcement is made and and zero otherwise. The coefficient γ_a thus measures the abnormal return for security i on day t.

Since it is likely that the residuals are correlated across equations, we estimate the return equations jointly using the seemingly unrelated regression method (SUR) of Zellner.[5] This has the additional advantage, which we are going to use later, that it allows us to impose cross-equation restrictions.

We begin our analysis by classifying the announcements into ‚good' and ‚bad'. For this purpose, we estimate equation (1) for each firm separately, using the broad CDAX index as our measure for market returns and including a separate dummy variable D_{at} for each announcement. The sign of the estimated parameters γ_a shows whether market participants

[2] The DGAP claims that it publishes around 95 % of all ad hoc announcements in Germany.
[3] Recently, there have been allegations of insider trading prior to ad hoc announcements on the Neuer Markt, although the companies involved are not included in our sample. This would make the dating of events more tricky, since prices may reflect the information content of the announcements prior to their release.
[4] See Binder (1998) for a survey on the event study methodology.
[5] For a general overview of SUR estimation see chapter 15 in Greene (2000) and in the context of event study analysis see Binder (1985).

considered the news to be ‚good' or ‚bad'. We the aggregate all "good" news on firm i into a single dummy variable g_i and all "bad" news into a variable b_i.

Since it is possible that the response to news differed not only across sectors but also over time, we split our sample period into three distinct phases. Figure 1 shows the evolution of German stock prices over our sample period. We use the DAX and the NEMAX as indicators for the share prices of old and new economy firms, respectively, but the picture would look virtually identical if we used some kind of average price of the firms in our sample. In the first phase (January 1999 to October 1999) the overall stock prices in Germany (measured by CDAX) moved more or less horizontally. The second phase (November 1999 to March 2000) covers the rise of stock prices in the run up to the all-time highs reached in March 2000. In the third period, lasting from April 2000 to February 2001, prices fell more or less continuously. This leaves us with six dummy variables for each firm shown in table 1.

	good news	bad news
phase I	g_I	b_I
phase II	g_{II}	b_{II}
phase III	g_{III}	b_{III}

Table 1

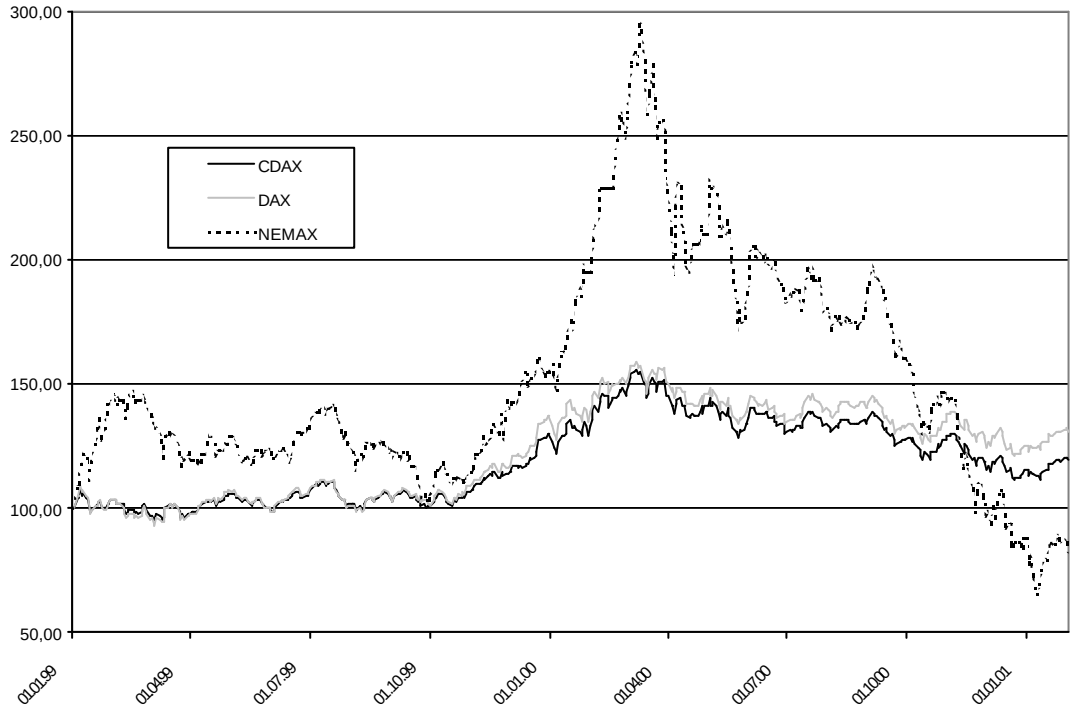

Figure 1

In a final step we estimate the returns for all securities jointly, restricting the coefficients of the dummy variables to be equal across new economy firms and old economy firms, respectively. The results are reproduced in table 2.[6] We can test for equality between the parameters of new economy firms and old economy firms by a Wald test.[7] The test statistic follows a c^2-distribution and are presented in the last column of table 2. One star symbolizes significance at the 5% level and two stars at the 1% level.

The results vary considerable over the three time periods. While we cannot reject the null hypothesis of equal coefficients for the first period, lasting from January to October 1999, we find statistically significant differences thereafter. In the second period, covering the stock market boom, we find that new economy firms react more strongly to to positive news than their old economy counterparts, while there seems to have been no differences in the reaction to bad news. In the third period, the slump, however, new economy firms show a more pronounced reaction to bad news than the firms of the more traditional sectors, but there is no difference in the reaction to good news.

	new economy	old economy	Wald test c^2
g_I	**0.0283** [74] (7.36)	**0.0335** [29] (8.18)	**0.85**
b_I	**-0.0185** [57] (-4.28)	**-0.0304** [13] (-5.59)	**2.95**
g_{II}	**0.0355** [46] (7.68)	**0.0208** [15] (3.71)	**4.05 ***
b_{II}	**-0.0333** [28] (-5.19)	**-0.0311** [13] (-6.03)	**0.07**
g_{III}	**0.0247** [81] (7.27)	**0.0242** [33] (7.34)	**0.01**
b_{III}	**-0.0436** [69] (-10.45)	**-0.0229** [19] (-5.47)	**12.33 ****

Table 2

We do not believe that the differences in the response to news found in the second and third period are merely a reflection of differences in the quality of news. Firstly, we aggregate over a large number of news events and firms. Secondly, the results are robust in the sense that they remain roughly unchanged if we drop firms from the sample. Another potential explanation that can be ruled out are fluctuations in the discount factor, for example because of time-varying risk premia. They may alter the responsiveness of prices to news, but cannot explain why a difference appears in the reaction to one type of news but not to the other. What

[6] The values in parentheses are the t-values, the numbers of news in each category are printed in squared brackets.
[7] See Greene (2000) p.153-156 or any other econometrics text.

we cannot rule out, however, is that bad news which may have not had any material impact in the second period may suddenly be relevant during the downturn. An example could be news concerning current cash flow, as has been indicated by the analysts in the interviews.

Overall, the link between direction of the asymmetry and the overall trend in equity prices suggests a different explanation, however. It seems that the prices of new economy stocks reflect investor sentiment more readily than those of old economy shares, and that investors therefore react more strongly to news confirming the prevailing market trend than to news contradicting it. This does not mean that fundamental factors are not important for valuation, but that investors put too much weight on information that confirm their current beliefs relative to that contradicting them.

The reasons for this behaviour could either be psychological or reflect the institutional arrangements of the asset management industry. Especially the psychological factors should be more important in market segments associated with a large degree of uncertainty, such as that for the equity of new economy firms, than in traditional market segments.

The implications of psychological factors such as heuristics on investor behaviour and asset prices has been reviewed in the growing literature of behavioural finance. Two biases recognized in that literature may contribute in generating our results: representative heuristics and overconfidence. Representative heuristics have been studied by Tversky & Kahneman (1974) and are reviewed in Shiller (1999), Shleifer (2000), Hirshleifer (2001). They find that individuals tend to react more strongly to events that are similar to other events and that reflect the salient characteristics of these events. For example, a series of positive announcements coinciding with a sharp rise in equity prices may give investors the impression that this is representative of a firm's prospects, even though in practice it may merely be due to good luck. Overconfidence in one's own ability may explain also the overreaction to good news in good times and to bad news in bad times, because individuals seek confirmation of prior beliefs (Shiller [1999], Shleifer [2000], Hirshleifer [2001]).

Let us now turn to the asset management industry. We have already mentioned that analysts could be under pressure to revise their valuations in order to justify current equity prices. There is also substantial evidence that fund managers have incentives not to deviate from the prevailing market opinion, e.g. because their renumeration depends on their performance relative to some index of their peers. Survey evidence contained in Arnswald (2001) suggests that even those fund managers who choose their portfolio mainly according to fundamentals find it difficult to hold on to stocks when the market turns against them. This imposes important constraints on fundamental arbitrage and may contribute to patterns such as the one observed in our data.

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Appendix: Data

I. New economy stocks				
Name	Sector	NEMAX50	Capitalization[1]	Turnover[2]
1. IXOS Software	Software	x	115.5	11.3
2. SER Systems	Software	x	247.6	18.4
3. CE Computer Equipment	Software	-	300.1	13.9
4. Graphisoft	Software	-	107.7	2.1
5. Mensch und Maschine	Software	-	72.9	1.9
6. Beta Systems	Software	-	21.8	1.5
7. Mobilcom	Telecom	x	1,827.3	273.7
8. Teles	Telecom	-	89.2	12.8
9. Drillisch	Telecom	-	83.6	5.2
10. Tiptel	Telecom	-	11.5	1.0
11. Quiagen	Biotech	x	5,433.9	383.1
12. Brokat	Internet	x	726.0	152.7
13. Intershop	Internet	x	2,931.9	1,097.1
14. Datadesign	Internet	-	36.3	9.3
15. Heyde AG	IT-Services	x	544.5	50.7
Average			865.8	139.2
II. Old economy stocks				
Name	Sector	DAX30	Capitalization[1]	Turnover[2]
1. Daimler Chrysler	Automobile	x	45,354.4	3,633.4
2. BMW	Automobile	x	23,353.9	821.6
3. Volkswagen	Automobile	x	23,231.5	2,222.4
4. Porsche	Automobile		3,040.6	175.8
5. Metro	Retail	x	16,284.0	552.3
6. Fielmann	Retail		928.2	11.4
7. Kamps	Retail		917.4	90.2
8. Douglas	Retail		1,364.6	52.7
9. BASF	Chem & Pharm	x	29,913.3	1,354.5
10. Bayer	Chem & Pharm	x	40,804.2	2,874.7
11. Schwarz Pharma	Chem & Pharm		597.3	11.4
12. Fresenius	Chem & Pharm		4,061.2	125.7
13. Beiersdorf	Chem & Pharm		9,366.0	82.3
Average			15,324.4	923.7

Source: Deutsche Börse
[1] Million euro, end December 2000 [2] Million euro, December 2000