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### **The Internet, European Financial Markets, and the Valuation of New Economy Firms**

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- #17 “The Internet, European Financial Markets, and the Valuation of New Economy Firms,” Matthias Bank (Universität Innsbruck, Austria).

## TABLE OF CONTENTS

1. INTRODUCTION .....	1
2. THE INTERNET AS A PART OF THE NEW ECONOMY.....	2
3. RECENT DEVELOPMENTS IN THE EUROPEAN FINANCIAL MARKETS .....	4
4. VALUATION OF NEW ECONOMY FIRMS—THE INTERNET BUBBLE .....	8
5. CONCLUSIONS .....	13
REFERENCES .....	14

# **THE INTERNET, EUROPEAN FINANCIAL MARKETS, AND THE VALUATION OF NEW ECONOMY FIRMS**

Matthias Bank

## **1. INTRODUCTION**

The Internet is one of the most dynamic sectors in nearly every developed country. It is closely linked to the information and communication technology (ICT) sector, which has been the driving force behind the recent outstanding productivity and growth figures, especially in the United States. The rate of path breaking innovations in the last years is very high, as is the uncertainty over the future marketability of these innovations. Many of these innovations were developed in small start-up firms that require huge capital infusions for completing and marketing the resulting products. The process from innovations to final ICT products or services is normally a lengthy one without positive net cash flows, and that time period needs to be bridged with external cash infusions. The main problem here is the high level of uncertainty about the long-term success of the underlying business plans. However, risky projects must be undertaken in order to make a profit, and it is the very dynamic character of the competition in the Internet and ICT-sectors that made reliable mid to long-term forecasting for both—the entire market and individual firms—almost impossible. On the other hand, uncertainty makes short-term speculation based on past developments “reasonable.”

In recent years the capital markets stand ready to finance prospects that seemed “reasonable,” and there was virtually no shortage of capital until March 2000. The high valuation level in the secondary markets attracts a lot of firms to external equity finance by business angels, venture capitalists and initial public offerings. Other firms want to broaden their capital base with seasoned equity offerings in order to get “acquisition currency,” i.e. to pay in acquisitions with own highly valued stocks. Moreover, most of the cash proceedings were invested in mergers and acquisition activities in order to reach a larger market share. These investments contributed to the rapid expansion of the world capital markets in terms of listed firms, market capitalization and share turnover. The European financial markets greatly benefited from these developments. There is now a change underway that will transform continental Europe from a more bank-oriented financial system into a more market-oriented system (see e.g. Allen/Gale, 2000). Anglo-American investment banks stood ready to offer their services through the course of creating a single European market and introducing the euro. Moreover, the competition among the leading exchanges in Europe fostered the creation of the so-called New Markets for young innovative growth firms. A very positive feeling about the potential success of Internet and ICT firms arose in this environment. Last but not least, investors wanted to have the “new Microsoft“ in their own portfolios. This mobilized huge amounts of risk capital in the IPO-market. However, there may be major shortcomings with that development. When assets are mispriced, the available funds are allocated inefficiently. Moreover, firms rush to go public or offer additional capital in seasoned offerings when stocks are overvalued, a situation called a “hot issue” market. In the short run there are high growth rates because of the vast amount of money available, which may lead to over-investment. But the high growth rates may be not sustainable in the long run when the bubble eventually bursts and funds dry up, as they did in 2001.

The paper is organized as follows: After a short overview of the development of the Internet Economy and the recent trends in the European financial markets, the current situation is analyzed from the viewpoint of the behavioral finance approach. The approach will be used to

explain and understand the recent developments in the valuation of Internet stocks. Finally, a short conclusion is provided.

## **2. THE INTERNET AS A PART OF THE NEW ECONOMY**

The available data suggest that the Internet Economy is growing at a strong pace.<sup>1</sup> The number of Internet hosts per 1000 inhabitants has grown by about 67 percent per year on average in all OECD countries between July 1995 and January 2000. In January 2000 about sixty hosts per 1000 inhabitants were installed. On the country level, the number of hosts per 1000 inhabitants in January 2000 range from 148.1 in Finland, 141.5 in the United States to 34.0 in Germany and 25.8 in Japan (OECD, 2000, 60). The figures are similar with respect to secure servers, which handle e-commerce transactions over the World Wide Web. The growth of the number of secure servers in the OECD per 1 million inhabitants was about 114 percent per year between September 1997 and March 2000 (OECD, 2000, 62). It is interesting to note that the EU average in March 2000 was about 29.1 compared to the United States with about 170.4 (OECD, 2001). According to NETSIZER (2001), as of July 2001 the absolute number of hosts and Internet users worldwide was about 124 million hosts and 464 million people, respectively.

Research done by the Graduate School of Business, the University of Texas at Austin (Internet Economy Indicators, 2001), shows that it is useful to divide the Internet Economy into four layers: (1) the Internet Infrastructure Layer, (2) the Internet Application Infrastructure Layer, (3) the Internet Intermediary Layer and (4) the Internet Commerce Layer. Their analysis shows that job growth and revenues increased considerably for all layers. From an overall revenue of \$64,000 million in Quarter 1 1998, the amount jumped to \$173,601 million in Quarter 1 2000. That represents an increase of about 170 percent.

As one can see from Table 1, the overall Internet Economy employment jumped approximately 25 percent during the first two quarters of 2000. It is interesting to note that layers 3 and 4, which include firms like Yahoo, Commerce One, Dell, or Amazon, shows a considerably lower growth of employment than the other layers.

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<sup>1</sup> For recent overviews on the development of the Internet consult e.g. Welfens/Jungmittag (2000), EITO (1999), Welfens (1999).

**Table 1: Employment in the Internet Economy**

Internet Economy Indicators Quarterly Employment Figures Summary by Layer and Total Internet Economy				
	Quarter 1 2000	Growth over Q1 1999	Quarter 2 2000	Growth over Q2 1999
Layer 1- Infrastructure Indicator	877,245	51.8%	932,484	37.7%
Layer 2 – Application Indicator	711,396	62.3%	740,673	51.9%
Layer 3 – Intermediary Indicator	457,876	5.5%	468,689	3.9%
Layer 4 – Internet Commerce Indicator	1,020,416	12,6%	1,033,159	8,2%
The Internet Economy (After removing overlap)	2.986,913	29,1%	3.088,497	22.6%

Source: <http://www.internetindicators.com/keyfindings.html> (as of 11.07.2001)

Similar to the employment figures, the revenues grew at a very high rate (by about 60 percent per year). More timely data will show if these growth rates have survived the recent burst of the Internet bubble. Indeed, the bulk of daily news headlines suggest that there have been large numbers of layoffs in the last six months in Internet-related firms, especially in the e-commerce sector.

**Table 2: Revenues in the Internet Economy**

Internet Economy Indicators Quarterly Revenue (in \$ millions)				
	Quarter 1 2000	Growth over Q1 1999	Quarter 2 2000	Growth over Q2 1999
Layer 1- Infrastructure Indicator	\$67,656	69.3%	\$75,211	57.4%
Layer 2 – Application Indicator	\$33,930	73,5%	\$38,925	58.9%
Layer 3 – Intermediary Indicator	\$27,295	63.8%	\$36,704	84,6%
Layer 4 – Internet Commerce Indicator	\$60,341	66.7%	\$66,956	57,8%
The Internet Economy (After removing overlap)	\$173,601	64.2%	\$200,219	58.8%

Source: <http://www.internetindicators.com/keyfindings.html> (as of 11.07.2001)

Finally, “Dot Com” companies, which are the true face of the Internet Economy, account for only a small part of employees and revenues. These are firms with 95 percent or more of their revenues generated from the Internet. Only about 10 percent of the revenues of the Internet Economy can be attributed to “Dot Coms.” Likewise, only about 12 percent of the employees in the Internet Economy are “Dot Com” employees (Internet Economy Indicators, 2001).

**Table 3:** “Dot Com” Summary

Internet Economy Indicators ”Dot Com” Summary					
	Quarter 1, 2000	Percent of Total Internet Economy	Quarter 2, 2000	Percent of Total Internet Economy	Growth Q1 – Q2
“Dot Com” Revenue (\$ Millions)	\$16,144	9.3%	\$19,125	9.6%	18.7%
“Dot Com” Employees	362,487	12.1%	360,718	11.7%	-.5%

Source: <http://www.internetindicators.com/keyfindings.html> (as of 11.07.2001)

As the available data shows, the Internet is truly one of the most dynamic sectors in the Economy. But there are signs that the growth of Internet traffic will be slower than it has been in the last years and slower than expected (Krause, 2001).

### 3. RECENT DEVELOPMENTS IN THE EUROPEAN FINANCIAL MARKETS

#### 3.1 European Financial Markets as a Source of Risk Capital for SMEs

Besides the various effects of the Internet on financial markets in terms of transaction cost reduction, electronic banking and trading or securitization (see e.g. Varian, 1998), the focus is on the supply of risk capital to Internet firms. The Internet is mainly ICT driven and is, as a consequence, capital intensive. This typically results in large amounts of initial investments in both technology and human knowledge. Moreover, it usually takes a long time (often years) to expect positive and stable cash flows from those investments. Finally, because of the huge past and projected growth rates for Internet-related business, Internet firms hope to get a “slice out of the cake.”

It is long recognized that developed equity markets play a major role in providing risk capital for young und innovative growth firms. The main example is the Nasdaq market, which was created in 1971. Special rules and regulations are imposed to protect investors from fraud and misrepresentation. In Europe, the Nasdaq was long seen as a blueprint for setting up stock exchanges for high growth firms. However, the stock markets played a minor role in providing risk capital, especially in continental Europe. At the beginning of the 1990s, more and more European high-tech firms got listed on the Nasdaq because they did not receive risk capital in Europe on adequate terms. The increasing competition among European Stock exchanges finally led to the creation of various stock markets and stock market segments for growth firms, which include the Easdaq in Brussels, the *Neuer Markt* in Frankfurt, the *Nouveau Marché* in Paris or the Alternative Investment Market (AIM) in London (European Commission, 2000).

The markets came at the right moment to provide financing for capital-hungry high-tech firms, most of them directly or indirectly connected to the Internet. Moreover, the “new markets” helped indirectly to finance start-ups in the seed financing stage before going public. Business angels and venture capitalists were eager to finance start-ups, because from their point of view, the “new markets” are attractive as exit channels to divest. Table 4 contains an overview over some of the specialized markets in Europe and the United States for financing high growth firms as of June 2000. It should be noted that the NASDAQ is still by far the most liquid market for equity in small und medium-sized enterprises (SME). However, the new European markets for financing young high-growth firms have gained importance in terms of capital raised and number of companies.

**Table 4:** Main markets specializing in SME financing (as of June 30, 2000)

	Euro.NM					EASDAQ	AIM	Tech-MARK	NASDAQ
	Le Nouveau Marché	Neuer Markt	NMAX	Euro.NM Belgium	Nuovo Mercato				
<b>Launch</b>	Mar 96	Mar 97	Mar 97	Mar 97	June 99	Nov 96	June 95	Nov 99	Feb 71
<b>Number of listed companies</b>	467					62	429	220	4843
	140	281	15	16	15				
<b>Market capitalisation (billion €) (B)</b>	240					50	22.6	1006	5818
	27	191	1.7	0.5	20				
<b>Capital raised (current year, billion €)</b>	13.4					0.3	1.6	3.1	33.2
	1.2	9.5	0.4	0	2.3				
<b>Average capitalisation per company (million €) (B)/(A)</b>	513					806	53	4574	1201
	192	678	116	31	1340				
<b>Capital exchanged (million €/day)</b>	537					32	48	3633	76680
	37	442	5	0.2	53				
<b>Performance of index since 30 December 1999</b>	+17					-8%	-11%	-8%	-3%
	+26%	+17%	+4%	+14%	+2%				

Source: European Commission (2000), p. 4.

As of June 30, 2001, 341 companies are listed on the German *Neuer Markt* with a market capitalization of about only €32 billion. According to the segmentation of the *Deutsche Börse AG*, 18.7 percent of the companies are in the Internet sector, 20.8 percent in the technology sector, 11.1 percent in the IT services sector, 14.3 in the software sector and 5.8 percent in the telecommunications sector. More than 70 percent of all firms listed on the *Neuer Markt* are part of the Internet Economy with a market capitalization of about €12.1 billion. The average market capitalization of a company listed on the *Neuer Markt* is now €93 million, which is a decrease of about 86 percent compared to June 2000. The average daily trading volume is now about €169 million/day, a reduction of about 60 percent (*Deutsche Börse*, 2001)

The figures are similar for the French *Nouveau Marché*. As at June 30, 2001, the market capitalization shrunk to €18 billion. One hundred and sixty-six companies were listed with an average market capitalization of €108 million, a reduction of nearly 44 percent from last year. The average daily trading volume decreased slightly to €337 million/day (EURONEXT, 2001).

The total market capitalization of the British AIM was about €222 billion at the end of June 2001. With a total of 576 companies listed, the average market cap was about €385 million. The average daily trading volume was about to €353 million/day (LSE, 2001).

### Venture Capital

Venture capital financing was a rapidly growing business in European countries, especially in Germany. Specialized intermediaries provide venture capital, mainly in the start-up stage, after the product has been test-marketed successfully and full-scale production and marketing has begun. Suppliers of venture capital are independent private and public venture capitalists or corporate (technology watching) venture capital firms. The total volume of investment of private equity and venture capital firms in the EU reached €34.9 billion in 2000, an increase of 39 percent compared to €25.1 billion in 1999 (EVCA, 2001). In the United States for comparison, more than 3,600 companies received venture capital of approximately \$58.8 billion in 1999 and amazing \$103.3 billion in 2000. In the first half of 2001, only \$19 billion were invested. The total investment in Internet-related firms was about \$5 billion in the first half of 2001 (Venture Economics, 2001).

As Table 5 for 1999 data shows, VC investment in the European Union scaled by GDP still lags behind the United States.

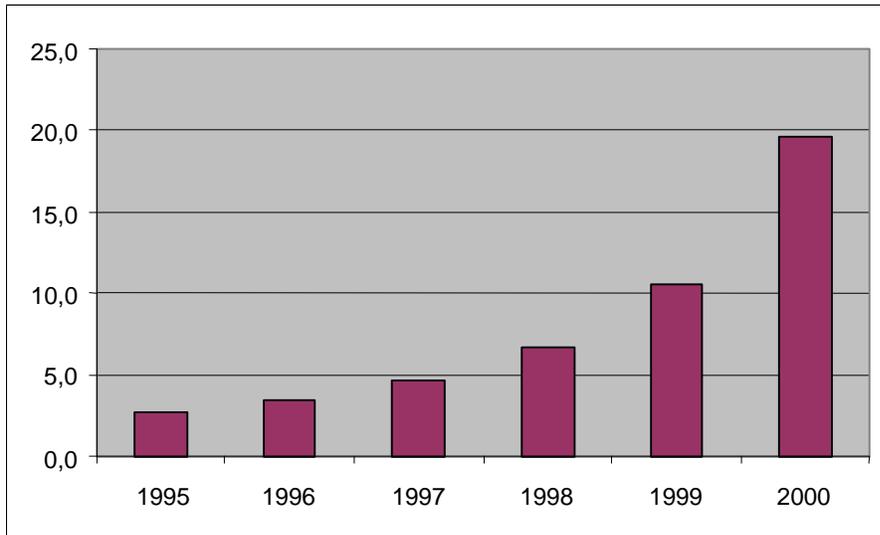
**Table 5: Venture Capital in the EU and in the USA in 1999 (in per cent of GDP)**

Financing Stage	EU	U.S.
Early Stage	0.03	0.14
Expansion Stage	0.105	0.23
Overall	0.135	0.37

Source: European Commission (2000), p. 5.

In 2000 the amount of private equity invested in venture capital (seed, start-up and expansion) reached €19.6 billion, which is a significant increase from 1999, when only €10.6 billion was invested in venture capital. Figure 1 shows the development of the last six years. The amount invested in the early stage (seed and start-up) in 2000 was about €6.7 billion going to 4,676 companies (EVCA, 2001).

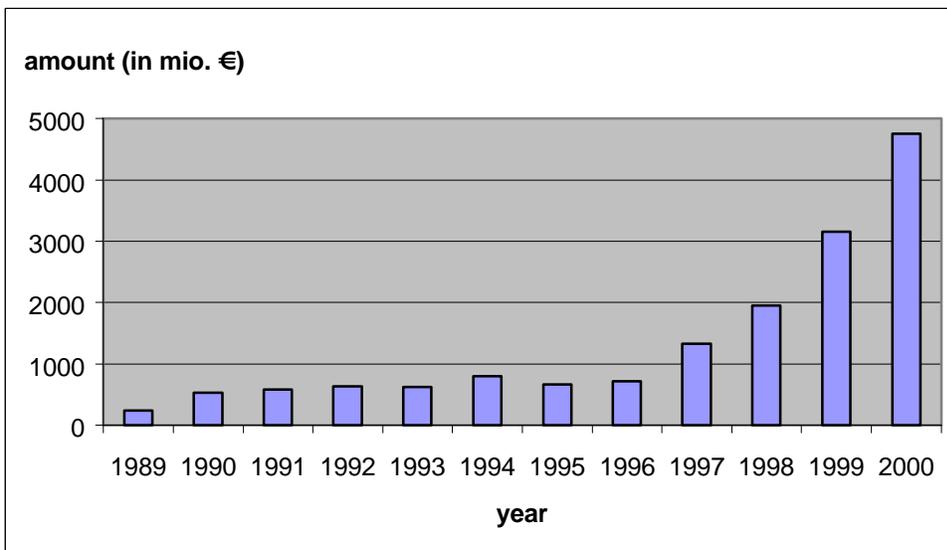
**Figure 1:** Investments in venture capital (seed, start-up and expansion) in Europe (in billion €)



Source: EVCA.

The development of the German venture capital market was similar. Since 1996, there has been extraordinary growth in new investments, which reached €4.8 billion invested for about 300 companies for 2000 (BVK, 2001).

**Figure 2:** New investment of venture capital firms in Germany



Source: BVK

The newest available data for Germany indicate new investments of about €700 million for Quarter 1, 2001, about €870 million for Quarter 2, 2001 and about €570 million for Quarter 3, which is about €2.2 billion for the first nine month (BVK, 2001). Compared with the previous years that development can be termed a “normalization” in the venture capital market. It is interesting to note that in 2000 about 272 firms received an amount of €390 million in the seed financing stage. In comparison to the first three quarters of 2001, only eighty firms received an

amount of about €70 million in the seed stage. One has to wait for the data of Quarter 4, but it is safe to say that 2001 will show a remarkable decline compared to 2000.

### Business Angels

Finally, a very dynamic field in Europe is angel financing. So-called Business Angels finance SMEs, especially in the seed stage. They are private, wealthy investors who, in addition to cash injections, typically provide specific business and management know-how that they have gained through working experience or from past investments. The angel finance market is informal and highly non-transparent. There are no formal rules of conduct or codices. The number of active angels in Europe is estimated at 125,000 and the number of potential investors at 1,000,000. The available investment pool in Europe is estimated to fall between €10 and €20 billion. The average amount of investment per business angel is about €75,000. Business angels are typically organized in networks. From 1998 to 2000, the number of business angel networks increased from 62 to 110. In 1998, 80 percent of BANs were located in the UK, in 2000 the UK share dropped to 45 percent, which implicitly shows their development in continental Europe (EBAN, 2001).

### **3.2 Mergers, Acquisitions and Corporate Debt Markets**

Besides the new role of the European financial markets providing risk capital for innovative growth firms, two other aspects are worth mentioning: the increased merger and acquisitions activity and debt markets.

#### Merger & Acquisition Activity

The merger and acquisitions activity in Europe got a lot of momentum from the introduction of the Euro and the establishment of the single market. In the course of globalization and focused business strategies, many firms are reorganizing their business, which has led to spin-offs, initial public offerings or sales. Moreover, with the introduction of a new tax law on capital gains for corporations in Germany from 2002 on, a break up of the so-called “Deutschland AG” is on the agenda (see Gerke/Bank/Steiger, 1999). This will broaden and deepen the European financial markets despite the recent decrease in the merger and acquisition activity. For the first half of 2001, the worldwide number of deals has fallen by 25 percent compared with the same period last year, to 16,251 deals from 21,548. Values have fallen 53 percent to \$10,000 billion from about \$21,300 billion in the same period last year (*Wall Street Journal*, 2001).

#### Debt markets

Recently, there was a remarkable recent evolution of the corporate bond market in Europe, which might be directly linked to the creation of the euro (see e.g. (Santillián/Bayle/Thygesen, 2000). Up to the mid-1990s, the corporate bond market for continental companies was virtually nonexistent. The financing needs of telecommunications companies for investments in infrastructure, mergers, acquisitions and especially in licences for the third-generation cellular phones had forced them to raise billions of euro in the debt markets. The size of the European corporate bond market in terms of outstanding market value was about €700 billion in 1999 (U.S.: €3500 billion). In only a very short time the market for corporate bonds had become relatively liquid (Santillián/Bayle/Thygesen, 2000) Of course, there are only a few multinational companies with good credit ratings that use the organized European corporate debt markets to reduce their cost of capital.

#### 4. VALUATION OF NEW ECONOMY FIRMS – THE INTERNET BUBBLE

In the following, an assessment of the recent developments in valuing Internet-related firms is provided using the Behavioral Finance Approach (Debondt/Thaler, 1995; Bank, 2000, Hirschleifer, 2001). One key point is that the high growth rates in the Internet-based businesses cannot necessarily be translated into high valuations for Internet firms. What really counts is to generate a sustainable positive net cash flow from Internet-related businesses. The hypothesis is that there was and perhaps still is a far too positive attitude towards possible profits generated through Internet-related business, which resulted in the crash of the so-called Internet Bubble.

**Figure 3:** The Internet Bubble



**Source:** Allen (2001); All indexes are normalized to 100 on 12/31/1997.

The experience with Internet stocks, represented by the CBOE Internet Index, compared to the Nasdaq and S&P 500 indexes, may serve as a good example. Figure 3 shows that the valuation of Internet stocks in March 2000 were seven times higher than twenty-seven months before (at the end of 1997). At the end of 2000 the valuation level – after the bubble burst – came down to more or less the same level as at the start.

Another good is the Internet business Webvan. Webvan was the leading U.S. online grocery store. Since the initial public offering in 1999, the firm “burned” \$1 billion in cash. Its highest market capitalization was about \$8 billion on December 3, 1999 (about eight times its book value). On July 9, 2001, Webvan filed for bankruptcy. (*Der Spiegel*, 2001, *Business Week*, 2001). A similar example of a highly mispriced and failed e-commerce firm is eToys, established in 1997 (Shiller, 2000). eToys went public in 1999 and only a short time later reached a market valuation of \$8 billion. In comparison, the long-established “brick-and-mortar” retailer Toys “R” Us had at this time only a \$6 billion market value. Significant are the differences in accounting data for both firms in 1998. eToys profits were negative at \$28.6 million, while Toys “R” Us’

profits were positive at \$376 million. Moreover, the sales of Toys “R” Us were \$11.2 billion compared to only \$30 million in the case of eToys. As Shiller (2000, p 176) put it: “The valuation the market places on stocks such as eToys appears absurd to many observers, and yet the influence of these observers on market prices does not seem to correct the mispricing.”

Why could such an overoptimistic attitude develop over the last few years? What are the reasons for such obvious mispricing? At this point, the Behavioral Finance Approach (BFA) may offer some answers. But first, I will provide an examination of the valuation of Internet-related firms.

#### 4.1 Shortcomings in the Valuation of Internet-related Firms

The valuation of a firm generally should be based on its business plan. The business plan roughly describes how firms will make sustainable profits. The evaluation of a business plan is a difficult task for external investors when new firms are acting in new markets, a situation typical for Internet-related firms. That is because such business plans are not directly comparable to already successful or unsuccessful ones. In a very dynamic environment with a high innovation rate, even successful business plans may be flawed in the short run. A further problem is that it takes a considerably long time (up to many years) before positive net profits can be expected as in the case of Amazon (see Schwartz/Moon, 2000 for a case study about Amazon and for Bond/Cummins, 2000 for a macroeconomic perspective on the valuation of New Economy, i.e. Internet-related firms).

From an investor’s point of view, there may be also an asymmetry of information about the quality of business plans among competitors for capital (Akerlof, 1970). When there is no mechanism to separate high-quality firms from low-quality firms, all firms are pooled, which leads to an average valuation. So it is very likely that “bad” firms will get a much too high valuation, and, as a consequence, high proceeds from selling equity.

Valuation generally depends on future profits, dividends or cash flows (see e.g. Copeland/Kollar/Murrin, 1996, Gerke/Bank, 1998), but expected profit growth is the most celebrated variable for Internet firms. Within the dividend discount model, the value of a company depends on its future dividends and the risk adjusted cost of capital. A variant, the Gordon Growth Model, links the current dividend, the cost of capital, and the dividend growth in a simple formula:

$$p_0 = E_0 \left[ \frac{1}{(1+k)^{t-1}} \frac{d_t}{k-g} \right] \quad \text{with } k > g,$$

$p_0$  as the present value of a share,  $d_t$  as the dividend per share at the end of the period  $t$ ,  $k$  as the risk adjusted cost of capital,  $g$  as the dividend growth rate and  $E_0$  as the expectation operator. It is assumed that a firm starts paying dividends in Period  $t$  and that the dividends grow at a rate of  $g$  forever. It is interesting to examine the price/earnings-ratio, which is one of the most popular measures to compare firm valuations:

$$\frac{p_0}{e_t} = E_0 \left[ \frac{d_t}{e_t} \frac{1}{(1+k)^{t-1}} \frac{1}{k-g} \right] \quad \text{with } t \leq T, e_t > 0, d_t > 0$$

and  $e_t$  as the expected earnings in the first period they are positive. The formula for P/E-ratio consists of three factors. The first factor is a payout ratio that links the first dividend payment in period  $t$  to the expected (positive) earnings in period  $t$ . The second factor is the discount factor and the third the capitalization factor.

The discount factor is clearly lower than one. Because of the high risk of Internet firms,  $k$  is typically quite large (e.g. 0.35 or 35 percent, even higher). Suppose further that  $t = 5$ , which means that the first dividend payments will be made at the end of the fifth year, than the discount factor is about 0.3 ( $\approx 1/(1 + 0.35)^4$ ). What is about the payout ratio? Because earnings per share are typically very low for Internet firms (or even negative), the expected ratio may be quite high. Suppose for the moment the ratio has a (reasonable) value of about four. Finally, the capitalization factor for Internet firms may be also quite large. The factor depends on the expected growth rate of dividends. Suppose that the growth rate is about (extraordinary) 0.25 or 25 percent per year after the  $t$  periods. It follows that the implied P/E-ratio is only about 12. Variations of the input factors cannot account for the extremely high P/E-ratio of Internet firms even for today's "post bubble" valuations. The capitalization factor dominates the valuation and the P/E ratio may be very high (more than 100 or even 200) only when the growth rate of dividends is very close to  $k$ . But such P/E ratios are simply not reasonable. It would, for example, take about two hundred years based on the actual estimated earnings (when the P/E ratio is 200) to regain the present valuation.

In a recent article, Eduardo Schwartz and Mark Moon (Schwartz/Moon, 2000) applied real-options theory and capital-budgeting techniques to the problem of valuing Internet firms. They conclude that the high valuation of Internet firms may be rational provided that the growth rate of revenues and the volatility of expected growth rate of revenues – their most critical parameter – is high enough. Depending on a set of specific parameters, it may be indeed the case that the high valuation of Internet firms can be grounded on rationality. However, their analysis is very sensitive to variations of the underlying assumptions. For example, Schwartz and Moon made the assumption that the cost of goods sold (COGS) and other variable component of other expenses are in fixed proportion to the revenues. Moreover they assume that the fixed component of other expenses is constant over time (a period of twenty-five years!). As a consequence, their main conclusions are highly questionable. Their model can, however, serve as good starting point for further research.

#### **4.2 The Behavioral Finance Approach (BFA): A Short Overview**

The term "Behavioral Finance" was introduced in the mid 1980s. The BFA can be considered to be an answer to the empirical findings that standard finance theory, i.e. neoclassical theory with perfectly rational agents, cannot explain. Among them there is the equity premium puzzle (Mehra/Prescott, 1985), the size effect (Banz, 1981), the value effect (Fama/French, 1992), the momentum effect (Jegadeesh/Titman, 1993) and the mean reversion effect (De Bondt/Thaler, 1985). Attempts to explain these anomalies within standard finance theory are simply not convincing (for such attempts, see Campbell, 2000; Fama, 1998).

The BFA assumes that people act in an imperfectly rational manner, i.e. they do not have smooth standard preferences exhibiting risk aversion (Kahneman/Tversky, 1979) and they do not process information correctly (Tversky/Kahneman, 1974). Moreover, arbitrage by (truly) rational agents – the cornerstone of the standard finance model – may fail in very "normal" circumstances with obvious arbitrage opportunities (Lee/Shleifer/T, 1991; Shleifer/Vishny, 1997; De Long et al., 1990b). One celebrated example is the so-called closed-end fund puzzle. The market price of closed-end funds should be near the value of their net assets (NAV) to prevent arbitrage. Empirical research shows, however, that the difference between market price and NAV can be unreasonable large (a discount of about 10 percent or more) over a longer period of time (Lee/Shleifer/Thaler, 1991).

Departures from rationality emerge both in judgment and in choice. Examples include overconfidence, loss aversion, mental accounting, anchoring, and making judgments of frequency or likelihood based on salience (availability heuristic) or similarity (representativeness heuristic) (for an overview, see Kahneman/Slovic/Tversky, 1982, Rabin, 1999 or Hirschleifer, 2001).

One of the best-established facts of departure from rationality is overconfidence (De Bondt/Thaler, 1995). Overconfident people tend to underestimate the range of possible outcomes. They think they make fewer mistakes in judgment than they actually do. Overconfidence can cause asset prices to over or under react to new information, which make positive or even negative bubbles likely (Daniel et al. 1998; Odean, 1998; Bank, 2000). Research done by Griffin/Tversky (1992) indicates that professionals such as lawyers or bankers are well calibrated in transparent situations but exhibit substantial overconfidence in opaque settings.

#### **4.3 A Behavioral Finance interpretation for the Internet Bubble**

The Behavioral Finance Approach blames the unreasonable valuation of Internet-related firms (telecommunication firms included) to shortcomings in information processing, overconfidence, and reference point dependence.

Reference point dependence can be illustrated by a specific example. In the second half of 1999, the internet-related cellular telephone company Vodafone made a successful attempt to buy Mannesmann, a German cellular telephone company. Vodafone offered the shareholders of Mannesmann an extraordinary high share price (at least compared with the stock price of Mannesmann before the offer). The point here is that this price and the implied expectations served as a very salient reference point for investors in the course of valuing other Internet-related firms. The battle between the two telecommunications “giants” can be viewed as a starting point for revaluation of the telecommunication firms that led to record highs in stock prices in the whole technology sector. The investors learned that (historically) very successful professional managers, i.e. the top management of Vodafone, – “who should really know what they are doing” – are willing to pay such a high price. In the meantime, we all learned that such prices were unsustainable. The share price of Vodafone went down more than 60 percent (as of December 2001) since the acquisition of Mannesmann.

The shortage of reliable information for future developments made investors, analysts and the (mass) media dependent on historic trends and figures. Moreover, the good news was outweighed by more reliable “base rate” information, which includes relatively hard facts (for example: the reasonability of the underlying business plans of Internet firms). In addition, the momentum in stock prices gave support to further price increases. The availability of specific information, representativeness of information and valuation patterns (extrapolation) make investors to believe in further capital gains. More realistic or “rational” professional investors (arbitrageurs) did not bring the prices down for at least two reasons (see also Shleifer/Vishny, 1997). First, it might be the case that their belief in an overpriced market may be simply untrue. As a consequence, so they are getting increasingly under-confident when stock prices only rise. Moreover, not to be invested in a soaring market might be worse when all competitors are invested, because the money flows to the proven “successful” asset managers (Gruber, 1996). Second, it might be very rational to jump on the market momentum, even when the market is over valued (De Long et al., 1990a). What is important is to leave the market early enough before the bubble bursts, which is a very difficult task.

Flawed information processing is interconnected with overconfidence. News that is in line with the given expectations tends to be overweighed. On the other hand, when the news is not in line with expectations, it is likely that they tend to be under-weighed. Over-weighed “good” news may be one major reason behind the ongoing overreaction in the course of the inflating asset prices (Bank, 2000).

## 5. CONCLUSIONS

The dynamic development of the Internet and Internet-related firms strongly contributed to the broadening and deepening of the European financial markets in terms of newly listed firms, capital raised, seasoned offerings, corporate debt financing, turnover ratios, and increased liquidity. However, the major downturn in asset prices of Internet-related stocks leaves many investors without faith in the market. This may lead – and surely has already led – to the exit of many investors and a severe lack of risk capital needed. Further investments to develop the Internet environment may be simply not available.

In hindsight, the raised capital was sold at inflated prices to investors. There is every reason to assume that this had caused over-investment on the part of the firms, which, in turn, supported the inflated asset prices. With the step-by-step deflation of the so-called Internet bubble, the question arises how such a long-lasting mispricing could develop in the first place. Among the reasons for this might be overconfidence, reference point dependence, and the flawed information processing of professional and private investors. As investors lose the faith in fair asset valuation, there is the danger that the ability to further finance the growth of the Internet and Internet-related innovations may decrease. Moreover, it may be the case that asset prices are now too low relative to market efficiency, inducing firms to wait before raising new capital and investing. A consequence may be underinvestment, which, in turn, reinforces the downturn. Last but not least, such a development will probably slow down growth figures in the overall economy.

“Irrational Exuberance,” to quote Robert Shiller (2000), is not good in either direction: inflated or deflated asset prices. What is needed is more stability in the financial markets, which should be in line with the fundamentals to improve the conditions for Internet-related firms for getting risk capital at adequate terms.

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