OVERVALUATION THEORY AND THE WAVE EFFECT IN THE 1990S US MERGER WAVE

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ABSTRACT

Purpose. There is a dispute about efficiency and sustainability of acquisitions. Shleifer and Vishny (2003), in their stock market driven acquisition theory, claim that managers are rational and use mergers as arbitrage if the firm is overvalued. The aim of the current study is to test the predictions of the overvaluation theory on a sample of high technology industry MandA transactions in the 90s.

Methodology. This paper has the form of an empirical study. The author employs event study analysis, the market adjusted approach with standard parametric tests, and the Fama-French 3-factor model to explore the wealth effects for amalgamating firms in different stages of the MandA wave.

Findings. The results reveal a distinct wave effect: abnormal returns to bidders are lower in the second half of the merger wave. Bidders' performance in the early and late stages of the MandA wave follows the predictions of the overvaluation theory. Bidders exhibit particularly poor performance if the bid is announced in the late wave and the method of payment is stock. The long-run negative abnormal returns to the bidders cast out the neoclassical explanations of the wave effect and indicate market inefficiencies.

Value. The present study serves as a complementary argument in the widespread dispute about merger wave explanation theories. The outcome confirms the behavioural characteristics of merger activity, particularly stock market driven acquisition theory. Misvaluation as an integral factor of merger activity may have a detrimental effect on the efficiency of acquisitions.

Keywords: merger wave, wave effect, overvaluation theory, stock market driven acquisitions

INTRODUCTION

There is a dispute about the efficiency and sustainability of acquisitions. The author of this paper concentrates on the work of Shleifer and Vishny (2003), who claim that most merger activity is observed in periods of overall stock market overvaluation. Managers are rational and use mergers as arbitrage if the firm is misvalued. The efficiency and synergy gains of mergers are not the main factor.

In particular, the author of this study focuses on the so-called "wave effect" as defined by Floegel et al. (2005). In their work, the bidder and rival abnormal returns at the beginning of the industry merger wave were confirmed as different from those at the end of the wave. The author of this paper maintains that the wave effect is well-explained by the overvaluation theory of Shleifer and Vishny (2003) and applies this theory to empirical data on US high technology industry MandAs in the 90s. *The aim* of the study is to test the predictions of the Shleifer and Vishny (2003) stock market driven acquisition theory (hereinafter SMDA or overvaluation theory) with the help of an empirical study.

MERGER WAVES

There have been six global merger waves so far. The first and second merger waves of 1890-1905 and the 1920s in the US have been characterized as merging for monopolistic and oligopolistic reasons respectively (Stigler G. J. (1950)). The third merger wave in the 60s is known as merging for growth with the creation of conglomerates (Du

Boff and Herman (1989)). As defined by Shleifer and Vishny (1990), the next merger wave of the 80s was a result of massive restructurings in order to get rid of inefficient multi-divisional conglomerate forms of business amplified by financial innovations such as junk bonds and LBO (leveraged buyout) techniques.

The merger wave of the nineties was the biggest of all the merger waves in both value and number of transactions. The wave peaked in the year 2000, with the value of MandA transactions amounting to $1.8 trillion compared to the previous peak of $324bn in 1989. (Sudarsanam S. (2003)). The proportion of deals where only stock was used as a method of payment was the highest in the preceding three decades (Andrade et al. (2001)). The wave was characterised by "extensive overpayment, mega-deals, overvaluation and significant value destruction" (Alexandridis et al. (2011)). Merger activity in the high technology industry was especially notorious in this respect. One of the largest deals in the history of MandAs was the AOL acquisition of Time Warner in 2001, worth $165bn and financed with stock. The aftermath shows that nearly $200bn in market value was destroyed in the months following the announcement of the bid (Sudarsanam S. (2003)).

The sixth merger wave started in the US in 2003 and reached its peak in 2007 with the volume of mergers totalling around $1.53 trillion (Ma H. (2016)). Alexandridis et al. (2011) suggest that the bidders were less overvalued and the source of financing was merely cash as a consequence of abundant liquidity available on the market. The merger wave subsided in late 2007. Some analysts suggest that 2015 and 2016 exhibit a global mega-wave caused by quantitative easing policies in the EU and the US. The wave allegedly is larger than ever, with $4.7 trillion merger deals announced worldwide. The US peaked at 1.55 trillion for 12 months ending in January 2016 (Ma H. (2016)).

Owen S. (2006) argues that a unique theory explaining all the merger waves does not exist. Rather, different theories are applicable to a certain wave. While there are always some motivating factors that remain important across all the merger waves, (regulation, taxation, competition and cost of liquidity, financial innovation, etc.) there are also particular factors that influence one wave and do not apply to another. The author of this paper agrees with this view.

The 90s merger wave and dot com boom
The specifics of the 90s merger wave led to the emergence of the overvaluation theory of Shleifer and Vishny.

The fifth merger wave in the US occurred in the following extremely impulsive conditions:

• *Stock markets were overheated:* Ross (1999) argues that the stock market boom of the late 1990s was primarily a technology boom. The NASDAQ Index went up 1456 percent from October 1990 to March 2000. In comparison, SandP grew only 432 percent from October 1990 till the peak of September 2000 (as reported by Tseng (undated)).

• *High technology stocks were overvalued:* Crutchley et al. (2005), Hirchley (2003), and Kaplan (2002) conclude that investors were overestimating the values of high technology companies in the 90s. The valuations of the tech stocks were much higher than the underlying fundamental values, implying extreme growth opportunities that were hardly realistic.

• *High technology firms were merging intensively in the late 1990s:* Inkpen et al. (2000) report that the number of acquisitions in the computer and telecommunications

sector alone in the period of 1990-1999 was over 11,000 transactions, constituting 21% of all MandAs in the US. Of these, one third took place in 1998 and 1999.

   • *Acquirers preferred stock financing in acquisitions at the peak of the Internet bubble:* Kohers and Kohers (2004), in their sample of high technology firms merging in the 1990s, found that almost 30% were stock offers, while nearly 40% involved mixed offers of cash and stock. Inkpen et al. (2000) find that 60% of acquisitions in 1998-1999 involved partial or total stock financing.

   Taking into account the characteristics of the 90s merger wave, the author of this paper maintains that the Shleifer and Vishny overvaluation theory might be a reasonable explanation for the merger wave of the 1990s.

RESEARCH DESIGN

   Floegel et al. (2005) identify a wave effect in merger activity that manifests itself as a variation in bidder and target abnormal returns depending on the stage of the merger wave. The authors offer two main explanations for the wave effect. First, the competitive advantage edge, which suggests that bidders rationally overpay for targets in the later wave, because it is costly to lose the target to the competitor. There is also evidence in favour of the management's overconfidence explanation or hubris theory of Roll (1986). Due to the success in previous MandA deals, managers of the acquiring firms become overly optimistic about the subsequent MandAs and irrationally overpay for the target. However, the author of the present paper focuses on another finding of Floegel which is not emphasized: the average Tobin's q ratio (market value of a company's tangible assets to its replacement costs) of the bidders in the study was higher in the second half of the wave than in the first half of the wave. In this context, the author tries to find an alternative explanation for the wave effect which is associated with relative valuations of bidders and targets in the industry by applying the overvaluation theory (stock market driven acquisition theory).
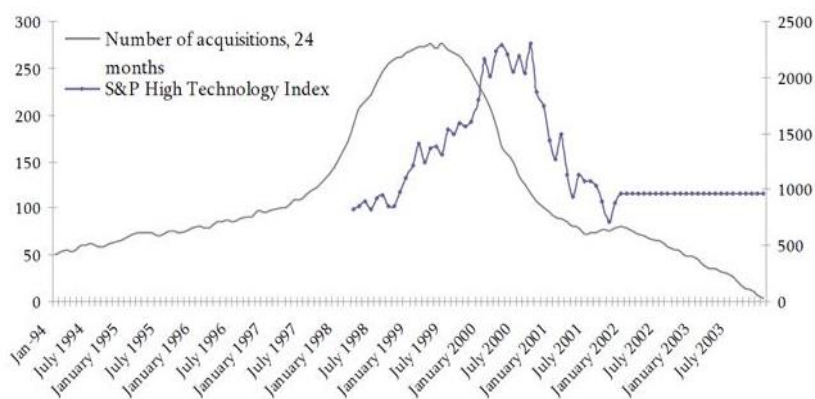

Figure 1. The merger wave in the sample and S&P Technology index.

The sample represents the acquisitions in US High Technology industry over the period between 1994 and 2004. The figure plots the 24 months number of acquisitions. The S&P Technology Index data starts at March 1998 and is no longer available after January 2002.
Source: DATASREAM 10/07/06 14:57 and Thomson`s One Banker June 2006

As can be seen in Figure 1, the merger wave preceded the peak in the stock market as measured by the SandP High Technology Index. The period of higher valuations is observable in the second half of the merger wave. Hence, the valuations of high technology firms are different in different stages of the merger wave. Shleifer and Vishny (2003), in their overvaluation theory, model the effect of disparity in target and bidder relative valuations in the takeover activity. They propose that managers use their inflated stocks to acquire less overvalued targets. The basic assumption of the theory is that capital markets are inefficient. The number of acquisitions increases when stock market valuations are high.

The overvaluation theory suggests that these discrepancies of valuations across the merger wave influence firms' decisions to undertake MandAs, the choice of the method of payment and the post-acquisition performance of the acquirers. The author of this paper constructs a particular research design and defines a testable hypothesis to find empirical support for this proposition.

1) Bidders that undertake acquisitions in the second half of the wave are defined as more overvalued than those announcing acquisitions in the early wave. Targets are defined as undervalued or less overvalued in the first half of the wave. This discrepancy in stock market valuations in different stages of the merger wave serves as a basis for an overvaluation explanation of the wave effect.

2) More specifically, more overvalued bidders acquire less overvalued targets in stock offers in the later wave. Hence, they suffer from greater losses in the long run as prices converge to fair values. Bidders are less overvalued in the first half of the wave; hence, price corrections are lower. In cash offers, overvaluation of the bidder is not important. What is important is undervaluation of the target. Therefore, there are higher abnormal returns to targets in cash offers and in the first half of the wave.

3) In Shleifer and Vishny (2003) stock markets are inefficient. In this respect, one of the main hypotheses tested here is the market efficiency hypothesis. For this purpose, the author carries out a long-horizon event study. The presence of abnormal performance in the long run leads to rejection of the market efficiency hypothesis and serves as indirect evidence in favour of the overvaluation theory.

4) The next aspect of the analysis is based on the proposition that acquirers tend to use their overvalued stocks to acquire less overvalued targets. Based on the assumption that overvaluation is high in the later merger wave, one of the hypotheses tested in the present paper is whether there is a preponderance of equity-financed acquisitions in the later wave.

5) According to the predictions of the overvaluation theory, long-run abnormal returns to bidders in stock offers are negative for deals in both stages of the merger wave. Moreover, as overvaluation is higher in the later wave, stock acquirers should suffer from greater losses if the bid was announced in the later wave. Hence, the wave effect for bidders should be present in stock offers but not in cash offers.

6) The only rationale for use of cash in MandA financing is undervaluation of targets. Abnormal returns to targets in cash offers should be higher than in stock offers.

If these predictions are supported by the data in the present analysis, then these results rule out the hubris theory, the competitive advantage edge and the neoclassical

explanations of the wave effect. First of all, the presence of negative abnormal returns to bidders in the long run contradicts the market efficiency and profitability gains predicted by neoclassical theories. Secondly, if MandAs are not successful, there is no basis for acquirer managers to be overconfident as in the hubris theory. And finally, the competitive advantage theory, hubris theory and Q-theory are not able to explain the absence of the wave effect for bidders in cash offers. This also relates to the higher abnormal returns to targets in cash offers. These theories do not predict any difference in merger profitability concerning the methods of payment.

METHODOLOGY
The announcement effect – short event window

Short-term event studies examine the immediate reaction of capital markets upon the announcement of a bid. It is assumed that financial markets are efficient. In this respect, the market should incorporate all the information relevant to the takeover by the end of the event window.

Brown and Warner, in their broadly cited 1980 work on using daily stock returns in event studies, examine the event period of +5 to -5 days relative to day 0 (the event date). Similarly, an 11-day event window around the announcement date is defined here as the event window.

The market-adjusted approach is used to calculate short-term abnormal returns to companies involved in merger activity. The short-term abnormal returns estimation, cumulating techniques and significance testing methodology is identical to Draper and Paudyal (1999). The market-adjusted excess returns are estimated with the following formula:

$$AR_{it} = R_{it} - R_{mt} \tag{1},$$

where R_{it} is return to the i-th company on day t, calculated as $R_{it} = \ln(P_t) - \ln(P_{t-1})$ and R_{mt} is the market return on day t measured as the first difference of the log of the market index (SandP 500 Technology Sector index daily values downloaded from DATASTREAM).

The average abnormal return across stocks on a particular day in the event period is calculated as follows:

$$\overline{AR_t} = \frac{1}{N} \sum_{t=1}^{N_t} AR_{it}$$

(2),

where N is the number of deals on day t.

In the present study, the average abnormal returns are cumulated over 3, 7, and 11 days around the event day, and across six days after the announcement including day 0. Schipper and Thompson (1983) and Jarrell and Poulson (1989) show that bids may be anticipated by the market. Therefore, the average abnormal returns are cumulated over the period of day -5 to day -1 to indicate the market anticipation of the takeover announcement. The cumulative abnormal returns over the testing period are calculated with the following formula:

$$CAR_t = \sum_{-T}^{+T} \overline{AR_t}$$

(3),

The statistical significance of abnormal returns was examined under the null hypothesis that the average abnormal returns (AR) and cumulated abnormal returns (CAR) in the testing period are not significantly different from zero. Standard parametric tests are used to test the significance of estimates. Assuming that abnormal returns are independent random samples drawn from a normally distributed population, the t-statistics are used for the null hypothesis test. The t-statistics for average abnormal returns (AR) are estimated as:

$$t = \frac{\overline{AR_t}}{S(\overline{ARt})}$$

(4),

The t-statistics for the cumulative abnormal returns are defined as:

$$t = \frac{\sum_{-T}^{+T} \overline{AR_t}}{\sqrt{\left(\sum_{-T}^{+T} S^2(\overline{AR_t})\right)}}$$

(5),

where $S(\overline{AR_t})$ is defined as: $S(\overline{AR_t}) = \sqrt{\sum_{-5}^{+5}(\overline{AR_t} - \overline{\overline{AR}})^2 / 10}$

(6),

$$\overline{\overline{AR}} = \frac{1}{10}\sum_{-5}^{+5}\overline{AR_t}$$

and $\overline{\overline{AR}}$ is defined as: (7),

If the t-statistics indicate the rejection of the null hypothesis, announcement of the merger has a significant impact on the wealth of shareholders in the short run. The magnitude and sign (negative/positive) of abnormal returns has to be evaluated in relation to the wave effect. As stated in the research design, we expect the announcement effect to have more resonance for bids in a later merger wave. Thorough investigation of abnormal returns contingent on the phase of the wave, means of payment and the role of the company in the merger (target/bidder) will be conducted in the present paper.

Long-horizon returns to bidders

The stock return reaction upon the announcement of a bid in the long run tells us a lot about how efficient financial markets are. Shleifer and Vishny propose that market inefficiencies serve as stimuli for merger activity. Ideally, in informationally efficient markets the stocks of the bidder should not exhibit any post-acquisition abnormal performance in the long run.

The Fama and French three-factor model, which expands the classical CAPM model by including proxies for additional priced risk factors such as size and value

premium, is used for analysis. SMB is the factor which captures the size effect and is defined as return to small minus big capitalization portfolios. The HML factor controls for value premium or excess return of high minus low book-to-market portfolios.

The Fama-French 3-factor model employed in calculating the average abnormal return for bidders is defined as follows (Khotari and Warner 2006):

$$R_{pt} - R_{ft} = \alpha_p + \beta_p (R_{mt} - R_{ft}) + s_p \, SMB_t + h_p \, HML_t + \varepsilon_{pt} \qquad (8),$$

where R_{pt} is the equally-weighted return for calendar month T of firms with an event in month T or in the previous t months (t =12, 24, 36); R_{ft} is the risk-free return in month T, R_{mt} is the market return at time T, SMB is the "small minus big" return on month T, HML is the "high minus low" return on month T, β_p, s_p, h_p are the sensitivities of the portfolio to the factors; α_p - Jensen`s alpha is the average abnormal return of event firms over the testing period t.

The equally weighted returns and excess returns are calculated for each month portfolio. These time series excess returns are then regressed on the Fama-French 3 factors. The intercept provides an estimate of average monthly post-event abnormal return of sample firms over the whole testing period.

For the purpose of analysis, monthly prices for 36 months following the announcement of each bid were downloaded from the DATASTREAM and COMPUSTAT databases. The one-month US Treasury bill interest rate is a proxy for risk-free rate of return. The data on one-month US Treasury bill returns is extracted from DATASTREAM.

The market return is calculated as a monthly return on the value-weighted SandP 1500 Super Composite index. This broad index covers over 85% of US stock market capitalization and includes large, small and medium-size companies. The SandP High Technology Index cannot be used as a market index in the present long-horizon study. This index ceased to exist in January 2002, while the testing period of the present long-horizon study covers the period up to June 2004.

The SandP 500 Composite index is used as a proxy for large companies and the SandP 600 Small Cap index is a proxy for small companies. The SandP 500 Composite index represents 500 companies with the highest capitalization, while the SandP 600 consists of the small capitalization companies that represent about 3% of the US equities market. Hence, the SMB factor in the Fama-French model is calculated as a difference in returns on the SandP 500 portfolio and SandP 600 Small Caps portfolio. The proxy for "high" in the HML factor is the SandP 500 CITIGROUP Value index, while SandP1000 CITIGROUP Growth is a proxy for "low". The "high minus low" factor is calculated as a difference in returns on the above-stated indices.

The estimated alpha is a direct estimate of average abnormal return to bidders over the whole testing period. The t-test statistics are formed from the coefficient standard error of the regression. The average abnormal returns to each bidder are calculated using the event period. The Fama-French 3-factor model is used to estimate the average abnormal returns as follows:

$$R_{jt} - R_{ft} = \alpha_j + \beta_j (R_{mt} - R_{ft}) + s_j \, SMB_t + h_j \, HML_t + \varepsilon_{pt} \qquad (9),$$

where R_{jt} is the return to the bidder j in month t; R_{ft} is the risk-free return in month t, R_{mt} is the market return at time t, SMB is the "small minus big" return in month t, HML is the "high minus low" return in month t, β_j, s_j, h_j are the sensitivities of the bidder j return to the factors; α_j - is the average abnormal return of the bidder j over the testing period of 36 months.

Identically to the calendar time analysis, estimated standard errors from the regression are used to calculate the t-statistics for significance of the coefficients. If the t-statistics indicate significant abnormal returns, capital markets are inefficient and do not incorporate all the information relevant to the announcement of acquisition in the short term.

DATA ANALYSIS AND RESULTS
Data analysis

The Thomson One Banker database on mergers and acquisitions was used to obtain a sample of US high-tech takeovers within the investigated period of 1994-2004. The primary sample consisted of 1380 bids announced by 825 bidders (overall over the period, each bidder announced on average 1.67 bids).

A potential wave was identified using the methodology employed in previous similar studies, namely Mitchell and Mulherin (1996), Harford (2005), and Floegel (2005). This procedure shows a maximum concentration of 482 bids in the period of April 1999 to March 2001 with three spikes in merger activity: 30 bids a month in the 11th, 13th and 17th month after the potential beginning of the wave in April 1999 (Figure 2).
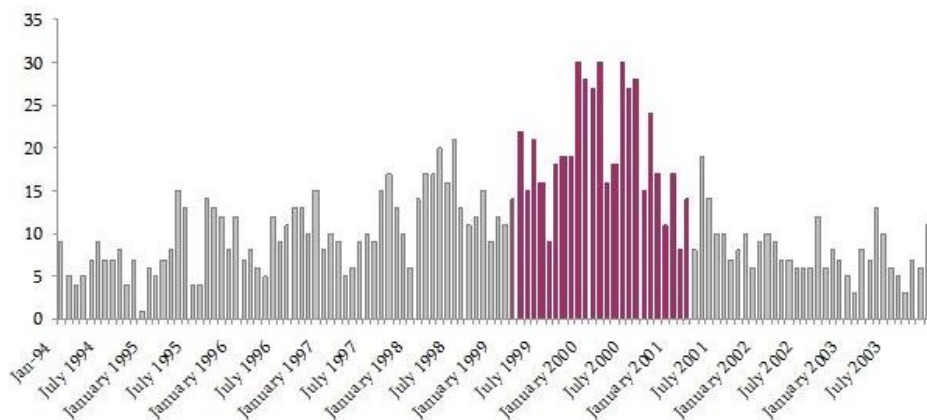

Figure 2. The merger activity in the sample, monthly number of deals
The sample represents the acquisitions in US High Technology industry over the period between 1994 and 2004. The figure plots the monthly number of acquisitions. Bars coloured in dark colour represent the number of monthly deals within the merger wave.
Source: Thomson`s One Banker, June 2006

The first 12 months are defined as an early wave and months 13-24 are defined as a late wave. The peaks of merger activity coincide with the highest stock market valuations

of the SandP High Technology index (Figure 1). The mean number of deals within the wave is more than twice the 10-year average, with 13 deals on average per month in the first half of the wave and 10.1 deals in the later wave. The maximum of 25 deals a month is observed on the twelfth month of the merger wave, which may be considered the peak of takeover activity. There was a sharp decline in the number of mergers in the following two months with 11 mergers per month. The takeover activity reached only a maximum of 16 in the second semi-wave. The deals appear to be much larger within the wave with an average deal value of more than 1,000 million dollars in the first half of the wave. In comparison, the average deal value for the whole 10-year period was 818 million dollars. The bidders were on average bigger than the targets, with the average market value of the bidder totalling more than 27,000 million dollars for the whole period of 10 years and more than 47,000 million dollars in the second half of the wave. The targets were smaller with an average market value of only 856.06 million for the period of 1994-2004.

Concerning the method of payment offered to the target, we differentiate in the given sample between three categories. A deal is attributed to the "stock" group if only common share swaps were used to finance the acquisition. The "cash" category includes deals financed purely by cash and defined by the Thomson One Banker database as CASH and CASHONLY. The third group consists of mergers using a mixed method of consideration such as a mixture of cash, common shares, stock, options, the assumption of targets' liabilities, or earnouts, but not purely cash or stock.

Testable hypotheses and results

In line with the basic assumption of the SMDA theory that capital markets are inefficient *the main hypothesis tested was the market efficiency hypothesis. Under the null hypothesis the long-run abnormal returns to the bidders are not significantly different from zero* (**Hypothesis 1**). If the hypothesis is rejected, there is a possibility that some shares are not fairly priced. The market efficiency hypothesis (**Hypothesis 1**) is not supported by the data. There is considerable negative performance of bidders' stocks after the acquisition (see Table 1). The 3-factor model adjusted average returns to the bidders are -3.46% 12 months after the merger, -2.80% two years after the merger and -2.69% 3 years after the merger. All estimates are significant at a 5% significance level.

Table 1

The estimated long-run abnormal returns to the bidders[1]

Panel A3: Average 12-month abnormal (AR) returns to the bidders					
Means of payment	Total for the wave		early wave		late wave	
overall	-3.46%	***	-4.08%	**	-5.35%	***
	-2.73		-2.00		-3.67	
stock	-4.29%	***	-4.18%	*	-6.62%	***
	-3.09		-1.90		-4.31	
cash	-0.23%		-1.11%		0.05%	
	-0.23		-0.64		0.03	
mixed	-4.06%	**	-4.16%		-5.62%	***
	-2.01		-1.14		-2.58	

Panel A3: Average 24-month abnormal (AR) returns to the bidders					
Means of payment	Total for the wave		early wave		late wave
overall	-2.80%	**	-3.91%	***	-3.89%	***
	-2.30		*-2.63*		*-2.67*	
stock	-3.64%	***	-4.22%	***	-5.07%	***
	-2.84		*-2.70*		*-3.31*	
cash	-0.22%		-1.30%		0.51%	
	-0.22		*-0.88*		*0.44*	
mixed	-2.74%		-5.68%	**	-3.45%	*
	-1.43		*-2.06*		*-1.75*	
Panel A3: Average 36-month abnormal (AR) returns to the bidders					
Means of payment	Total for the wave		early wave		late wave
overall	-2.69%	**	-2.52%	*	-3.55%	***
	-2.55		*-1.87*		*-2.88*	
stock	-3.21%	***	-2.60%	*	-4.23%	***
	-2.67		*-1.76*		*-2.83*	
cash	-0.92%		-1.98%		-0.37%	
	-1.05		*-1.28*		*-0.37*	
mixed	-2.70%	*	-3.21%		-3.20%	**
	-1.84		*-1.32*		*-2.34*	

[1]*The average monthly abnormal returns estimated with the Fama-French 3-factor model. The t-statistics are given in italics under estimated variables (*, ** and *** stand for significance levels of 10%, 5% and 1%). The average abnormal returns are calculated for 36 calendar time portfolios of stocks: portfolios constructed for all deals, the whole period, early and late merger waves, stocks, cash and mixed offers for the testing period of 12, 24 and 36 months.*

The crucial hypothesis of this study **(Hypothesis 3)** was that *overvaluation in the later stages of merger waves would lead to an increased percentage of equity-financed mergers. As overvaluation only boosts stock swaps, the number of cash acquisitions is not likely to be influenced by overvaluation.* The structural analysis in relation to means of payment reveals the predicted finding: stocks are the predominant means of consideration for acquisitions announced in the period of increased merger activity (See Table 2).

The number of stock acquisitions within the wave accounts for more than half of all the stock acquisitions over the ten-year period from 1994 to 2004. The average number of monthly stock acquisitions is 7.8 in the wave, which is three and a half times bigger than outside the wave and twice bigger than on average over the ten-year period (2.2 and 3.6 respectively). However, the biggest concentration of monthly stock acquisitions is positioned in the first half of the wave: 58.8% of all stock acquisitions within the wave were announced in the first twelve months of the merger wave. This finding contradicts the hypothesized suggestion that stock is used as a method of payment more intensively at the end of the merger wave. **Hypothesis 3** is not supported by the data in terms of the equity financing preponderance in the later merger wave. At the same time, as regards cash financing, **Hypothesis 3** still holds. The average number of cash mergers per month is only 1.18 times higher within the wave than outside the wave. This is in line with **Hypothesis 3**,

which suggests that the number of cash acquisitions is not substantially altered by overvaluation.

<div align="right">Table 2</div>

The structural analysis of the sample[2]

	within the merger wave			outside the merger wave	overall for the period
	early wave	late wave	overall within the wave		
Number of deals	145	132	277	310	587
Number of stock acquisitions	110	77	187	166	353
Average number of stock acquisitions, monthly	9.17	6.42	7.79	2.21	3.57
Average number of cash acquisitions, monthly	1.80	2.00	1.90	1.65	1.71
Average number of mixed acquisitions, monthly	2.80	2.67	2.74	1.24	1.75
Proportion of stock offers	69.12%	58.54%	63.60%	41.02%	46.72%
Proportion of cash offers	13.48%	20.21%	16.85%	24.35%	23.06%
Proportion of mixed offers	14.82%	21.26%	18.04%	13.30%	14.31%

[2]Data throughout the whole period of 1994-2004, within the merger wave (24 months between April 1999 and March 2001, with the first 12 months as an early wave and the last 12 months as a late wave) and outside the merger wave. 100% cash as a method of payment defined as cash acquisitions and 100% stock as a stock deal. The deal is treated as mixed otherwise.

Hypothesis 2 was that *in the short event window, market reaction upon the announcement of a bid would result in fluctuations in the value of equity for both targets and bidders. The null hypothesis for the short-term data was that announcement of takeover has no effect on stock returns. Rejection of the hypothesis indicates the presence of the <u>announcement effect</u>.* The abnormal returns for target firms in the short event window are positive and significant (Table 3). The excess returns to the acquirers are not significantly different from zero in the eleven-day event window and significantly negative six days after the bid (Table 4). Thus, the null hypothesis (**Hypothesis 2**) of zero abnormal returns in the announcement period can be rejected. There is a significant announcement effect for both targets and bidders.

Table 3

The estimated abnormal returns to the targets[3]

Panel B1: Cumulated average abnormal returns (CAR) to the targets									
Day relative to the announcement (day 0)	stock		cash		overall		early wave		late wave	
3 days around day 0	**11.31%**	**	**21.58%**	***	**13.21%**	**	*10.05%*	**	**16.10%**	**
	2.20		*2.62*		*2.42*		*2.04*		*2.51*	
5 days around day 0	**19.70%**	***	**25.37%**	**	**19.75%**	***	*20.43%*	***	**19.13%**	**
	2.97		*2.38*		*2.80*		*3.20*		*2.31*	
7 days around day 0	**18.64%**	**	**27.65%**	**	**19.36%**	**	*20.38%*	***	**18.42%**	*
	2.37		*2.20*		*2.32*		*2.70*		*1.88*	
11 days around day 0	**19.05%**	*	**28.71%**	*	**19.85%**	*	*20.34%*	**	**19.40%**	
	1.94		*1.82*		*1.90*		*2.15*		*1.58*	
-5 to -1	**16.68%**	**	**23.39%**	**	**17.16%**	**	*17.54%*	***	**16.80%**	**
	2.51		*2.20*		*2.44*		*2.75*		*2.03*	
0 to 5	**2.37%**		**5.32%**		**2.69%**		*2.79%*		**2.60%**	
	0.33		*0.46*		*0.35*		*0.40*		*0.29*	

[3]*The daily average abnormal returns estimated using the market model with day 0 as the day of the announcement of the bid. The number in italics under the estimated variables is the t-statistics. The *, ** and *** stand for significance levels of 10%, 5% and 1% respectively. The average abnormal returns are cumulated throughout the 3, 5, 7, 11 days around event day 0, -5 to -1 and 0 to +5 days relative to the event day.*

With regard to the announcement effect, Shleifer and Vishny propose that in the short term, the market does not infer any information about the real value of the bidder or target from the choice of method of payment. The market prices the potential synergies positively, disregarding the means of payment. In this respect, **Prediction 2a** was that short-term abnormal returns should be non-negative for targets and bidders in both cash and stock offers. However, this applies to dollar amounts of abnormal returns. Concerning percentage gains or losses, the announcement effect may be negative for the bidders in stock offers. The results show that overall in an eleven-day event window, the abnormal returns to the bidders are significantly negative for stock offers (Table 4). Consistent with **Prediction 2a**, the abnormal returns to the bidders in cash acquisitions are non-negative (not significantly different from zero) and negative (-3.36%) in stock offers in the short term (Table 4).

Table 4

The estimated short-horizon abnormal returns to the bidders[4]

Panel B2: Cumulated average abnormal returns (CAR) to the bidders				
Day relative to the announcement (day 0)	stock	cash	mixed	overall	difference cash/stock
3 days around day 0	**-0.94%**	**-0.25%**	**1.38%**	**-0.40%**	**-0.0163**
	-0.86	*-0.16*	*0.97*	*-0.39*	*-0.128*
5 days around day 0	**-1.49%**	**-0.23%**	**1.21%**	**-0.80%**	**-0.0144**
	-1.18	*-0.12*	*0.66*	*-0.60*	*-0.105*
7 days around day 0	**-1.57%**	**0.15%**	**0.77%**	**-0.89%**	**-0.0062**
	-1.13	*0.06*	*0.35*	*-0.57*	*0.042*

11 days around day 0	**-3.36%**	*	**-1.27%**	**0.74%**	**-2.22%**		**-0.0201**	
	-1.73		*-0.42*	*0.27*	*-1.13*		*-0.333*	
-5 to -1	**1.25%**		**0.95%**	**3.02%**	*	**1.53%**	**-0.0207**	
	1.36		*0.47*	*1.64*		*1.16*	*0.564*	
0 to 5	**-4.61%**	***	**-2.22%**	**-2.28%**	**-3.75%**	***	**0.0007**	
	-2.69		*-1.00*	*-1.13*	*-2.59*		*-0.650*	

[4]*The daily average abnormal returns are estimated with the market model. The numbers in italics under the estimated variables are the t-statistics and z-statistics under the estimates of the differences. The* *, ** *and* *** *stand for a Student's t-distribution significance level of 10%, 5% and 1% respectively. The test for the difference of the means was conducted for the difference of the estimates in cash and stock offers. The critical value of Z-statistics at a 5% significance level is 1.96. x stands for a significance level of 5%. Average abnormal returns are cumulated throughout 3, 5, 7, 11 days around event day 0, -5 to -1 and 0 to +5 days relative to the event day.*

Dong et al. (2006) report that higher valuations of targets are associated with lower announcement abnormal returns. Hence, the poorer short-term performance of targets at the later wave stages is an indirect indicator of targets' overvaluation in the second half of the merger wave. Overall, we expected abnormal returns to the targets to be lower in the second half of the wave **(Prediction 2c). Prediction 2c** is confirmed by the data (Table 3). An insignificant wave effect was detected with targets' abnormal returns being lower at the second half of the wave (Table 5).

With regard to the overvaluation theory explanation of the wave effect, **Prediction 1a** was that the acquirers' post-bid abnormal returns in the long run will be higher if the bid was announced in the first part of the wave (low overvaluation) than at the end of the wave (wave effect). The results suggest that the wave effect is clearly distinct in the data. The estimated 36-month post-acquisition average abnormal returns to bidders are -3.55% in the late wave compared to -2.52% in the early wave with the difference being significant (Table 5).

Table 5

The dynamics of abnormal returns to the targets and bidders across the merger wave and effects of financing method[5]

Panel A4: Average 36-month abnormal (AR) returns and 11-day CARs to the bidders					
	late wave		early wave		difference late-early
AR36	-3.55% **		-2.52% *		-1.03% x
	-2.88		*-1.87*		*-3.98*
CAR(-5 +5)	-3.94%		-0.83%		-3.11%
	-1.00		*-0.55*		*0.67*
CAR(0 +5)	-6.63% **		-1.42%		-5.21% x
	-2.28		*-1.26*		*2.30*
Panel B4: 11-day CARs to the targets					
CAR(-5 +5)	19.40%		20.34% **		0.94%
	1.58		*2.15*		*0.42*

[5]*The merger wave spans the period from April 1999 to March 2001 and is assumed to be 24 months long. The first and last 12 months of the wave are defined as the early wave and late wave respectively. The average monthly abnormal returns are estimated using the Fama-French 3-factor model. The average daily abnormal*

returns are estimated using the market model. The number in italics under the estimated variables is the t-statistics. The *, ** and *** stand for a significance level of 10%, 5% and 1% respectively. A test for the difference of the means was conducted. The critical value of Z-statistics at a 5% significance level is 1.96. x stands for a significance level of 5%.

According to the Shleifer and Vishny overvaluation theory, bidders make cash offers when they are less overvalued and offer stock otherwise. Hence, the long-run abnormal returns to cash acquirers are non-negative. **Prediction 1b:** We expected non-negative long-run abnormal returns for bidders in cash deals. We observe insignificant abnormal returns to the acquiring firms in cash acquisitions one, two and three years after the bid (Table 1).

Prediction 1c: Overall, the long-run abnormal returns for the bidders should be negative in stock offers, with sharper declines for the announcements in the second half of the wave. The performance of bidders should be especially poor following the peak of the merger wave.

We find that bidders that finance their acquisitions with stock suffer substantial losses in the long horizon continuously three years after the acquisition (Table 1). The average monthly abnormal returns to the bidders are -3.21% three years after the bid. These losses are especially dramatic for the stock acquisitions announced in the second half of the wave. The 36-months average abnormal return to the bidders in stock acquisitions is -4.23% in the late wave, compared to the more moderate -2.6% abnormal return for the early wave bids. This suggests that bidders in the later stages of the merger wave were more overvalued. **Prediction 1c** is supported by the data. This result is strongly consistent with the SMDA theory. The presence of discrepancies between the long-run abnormal returns in cash and stock offers is due to market inefficiencies. The market does not incorporate all the relevant information from deal characteristics in the short term. Overvalued bidders offer stock as a method of payment for acquisitions.

The long-run negative abnormal returns to the bidders observed in this study cast out the neoclassical explanations of the wave effect. Although the Hubris hypothesis of mergers was not tested here explicitly, this hypothesis would have been rejected based on the finding that the mergers in the first half of the wave did not create value for bidders. The abnormal returns to the bidders were negative for acquisitions in the first half of the wave. Therefore, there was no basis for bidders to be overconfident about the success of the mergers. The competitive edge theory is also inconsistent with the findings of this paper. According to this theory, managers rationally overpay for targets in the second half of the wave, when the number of good targets is small. This overpayment leads to negative abnormal returns to the acquiring firms in the later wave. However, this pattern should be present in both cash and stock offers. This theory cannot explain the fact that there was no wave effect observed in cash offers.

CONCLUSIONS

This paper applied the overvaluation theory of Shleifer in Vishny (2003) in explaining the difference in returns available to targets and bidders over certain phases of a merger wave, i.e. the *wave effect*, previously detected in the study by Floegel et al. (2005). In the present sample of high-tech companies in the 90s merger wave, bidders' share price fluctuations as a response to the announcement of bids proved to be contingent on the means of payment and phase of the merger wave when the merger was initiated.

There are three crucial aspects in the results that allow for confirmation that the wave effect is associated with overvaluation. First, the data provided clear empirical evidence of a significant wave effect. The wave effect was detected for merging firms in both the short term and long term. The abnormal returns to the bidders in the short event window were significantly lower for the bids announced in the second half of the wave. A difference in abnormal returns to bidders in the late and early wave was also observed in the long run post-acquisition. When looking at the method of financing, the wave effect could be detected only for stock deals. Second, the data supported the main predictions of the Shleifer and Vishny theory. The main predictions of the Shleifer and Vishny overvaluation theory are as follows:

1) The preponderance of stock as a method of payment within the merger wave and particularly in the later wave. Stock acquisitions were the dominant method of financing within the wave with 63.6% of deals being financed with equity. However, most of the stock acquisitions were concentrated in the first half of the merger wave.

2) The presence of abnormal returns to the bidders in the long run. The bidders suffered from significant losses in share prices in the long run – broadly consistent with previous findings in long-horizon event studies (as summarized by Bruner (2005)). Negative abnormal returns to the bidders were observed up to three years after the bid. This finding indicates capital market inefficiencies, the necessary element of overvaluation theory.

3) Bidders' share prices converge to their fundamental values in the long run. More overvalued bidders suffer from sharper valuation correction. Consistent with the SMDA theory, there were lower negative abnormal returns to the bidders merging in the later phase of the merger wave.

4) The market prices potential synergies from mergers positively irrespective of the method of financing. The market reaction upon the announcement of a bid was not significantly affected by the method of payment. There were non-negative abnormal returns to the bidders and targets in the short run in the sample.

5) The long-horizon average abnormal returns to the acquirers in the sample were significantly lower when the stock was used as a method of payment. This was especially true for the bids announced in the second half of the merger wave.

6) Higher abnormal returns to the undervalued targets, that is, for the bids in the first half of the wave and in cash offers. The estimated abnormal returns were significantly higher for targets acquired for cash and those merging in the early wave.

Finally, the neoclassical theories are inconsistent with the market inefficiencies detected here (the long-run negative abnormal returns to the bidders). Besides this, the neoclassical theories are not able to explain the choice of stock financing in the majority of acquisitions in the sample and the contingency of stock behaviour on the means of payment.

In general, the analysis showed that the wave effect in the sample could be well explained by the overvaluation theory. The current study adds to the argument that merger activity may be amplified by misvaluations and therefore lead to potential value destruction on a systemic scale. The sample indicated value destruction for the bidders, thus conforming to the main characteristics of the merger wave of the 90s. Most merger waves have been followed by an economic recession (Rhodes-Kropf et al. (2004), Howard

Ma (2016)). Therefore, aggregate merger activity and its underlying factors will continue to be of scientific research interest going forward.

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