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Stock market bubble effects on mergers and acquisitions

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ABSTRACT

We investigate if and how mergers and acquisitions are affected by trends in the capital market, and particularly by a stock market bubble. Our main findings indicate that while the prevalence of M&A increased during the technology bubble, the pricing of M&A did not change. Moreover, the bursting of the bubble seems to have led to further cautiousness by investors, which extended throughout the years subsequent to the bursting of the bubble, even when prices on the exchange had rebounded. While we do not find robust evidence for changes in price multiples outside the exchange in concomitance with the changes on the exchange, we document changes in the information used by investors to value their targets. It seems that investors experienced a learning process in terms of the type of variables preferred, appearing to be more cautious since the bubble burst. This learning process investors undergo in concomitance to processes in the market seems to result in their being less affected by periodical or cyclical sentiments of euphoria and depression in the capital market.

1. Introduction

The technology bubble on NASDAQ at the end of the 1990s led to an unprecedented rise in stock prices of high-technology firms.[1] Studies document a "Contagious Effect" in the capital market during the bubble with overpricing spilling over from the high-tech sector towards more traditional sectors such as finance, manufacturing, trading and services (e.g., Brooks & Katsaris, 2005). In April 2000, the technology bubble burst, leading to a downturn in the capital market, followed by a rebound starting in 2003. Hence, in a span of only few years, the capital market underwent unusual vicissitudes. While the affect of these vicissitudes on share prices on the exchange is evident, extant research does not examine their affect on transactions taking place outside the exchange. This study attempts to fill this void in the literature. Using a broad sample of 4,166 U.S. public-firm targets acquired by other U.S. public firms over the time period of 1993–2005, we conduct a comprehensive analysis of transactions of mergers and acquisitions (henceforth, "M&A") from different aspects across four sub-periods surrounding the technology bubble. We thoroughly explore the prevalence of M&A transactions throughout these sub-periods, their pricing – as well as the factors affecting pricing (including the time factor), and the information used by investors to value their targets.

We conduct our investigation by dividing the sample period into the following time periods: the period prior to the technology bubble ("pre-bubble": 1993 through 1997), the bubble period ("bubble": 1998 through March 2000), the bursting of the bubble and the downturn in the capital market that followed the bursting ("bursting of bubble": April 2000 through 2002), and the rebound that occurred in 2003 and continued throughout the end of our sample period ("post-bursting": 2003 through 2005). The sample includes acquired firms from three major sectors: high-technology, low-technology (manufacturing), and trading & services. Consistent with prior studies, financial institutions are excluded from our sample to avoid the confounding effects of these highly regulated industries (e.g., Burgstahler & Eames, 2003; Core, Guay, & Van Buskirk, 2003; De Franco, Gavious, Jin, & Richardson, 2008; Rosner, 2003).

Notably, in contrast to investors buying shares on the exchange, in large transactions outside the exchange, buyers conduct due dili-

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[1] See, e.g., Asness (2005), Ljungqvist and Wilhelm (2003), and Ofek and Richardson (2002).

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gence procedures as part of a comprehensive investigation of the target firm's financial information, to minimize the information uncertainty faced by the buyer.[2] We seek to explore whether and how more informed buyers are affected by sentiments of euphoria and depression in the capital market.

We document a considerable increase in the prevalence of M&A transactions during the bubble for all sectors (a 95.0% increase in the high-tech sector compared with 66.5 and 41.9% in low-tech and trading & services, respectively), followed by a reduction to pre-bubble levels at the bursting of the bubble. In the following post-bursting sub-period, the frequency of M&A transactions in all sectors kept declining, even at a higher pace than the reduction during the bursting of the bubble, despite recovery in the capital markets during that time.

We examine changes in the pricing of M&A transactions throughout the four sub-periods, using a multiples analysis approach. Employing both a univariate and multivariate analysis that controls for differences in industry, time, firm size, profitability, risk and growth, we find that transaction multiples of high-tech firms did not increase during the bubble, compared with their pre-bubble level. Nonetheless, there is some evidence of a decrease in transaction multiples at the bursting of the bubble. No change in multiples is documented between the bursting and the post-bursting sub-periods. Similar results are documented for trading & services firms. For low-tech firms, we find that transaction multiples did not vary at all across the four sub-periods. The findings imply that investors buying shares outside the exchange were not affected by the euphoric atmosphere on the exchange during the bubble. The bursting of the bubble seems to have led to further cautiousness by these investors, which extended through the years subsequent to the bubble bursting, even when prices on the exchange rebounded.

While we do not find robust evidence for changes in valuation multiples outside the exchange in concomitance with the changes on the exchange, we document changes in the information used by investors to value their targets across the four sub-periods. The results reveal that the relations between financial information and transaction values of equity have undergone unusual changes throughout the investigated period. In particular, during the drastic events of the bubble and the bursting of the bubble, investor valuations tended to rely on expectations for the future (proxied by the change in sales and R&D expenditures) rather than on the current performance of the target firm (proxied by current earnings). In contrast, at the sub-periods prior to and after these market vicissitudes, current earnings rather than expectations for future earnings are found to contribute to the explanation of the variation in transaction prices, implying that investors may have been willing to attach a higher price to a proven ability to generate higher earnings, but refrained from the risk of attaching a higher price based on expectations for the future. We further compare the role that accruals play as proxy for expectations about the target's future cash flows, versus the role of the cash flow component of earnings. Results indicate that during the bubble sub-period, investors attached higher values to the accrual component of earnings. In contrast, at the bursting of the bubble, accruals lost significance, while cash flows became significant in the valuation of the targets. In the post-bursting sub-period, bidders seem to have placed greater weight on operating cash flows than on accruals. Interestingly, given the high likelihood of accrual manipulation prior to M&A transactions, the results imply that during the euphoric bubble sub-period, investors outside the exchange did take more risks, relying on possibly manipulated accruals and expectations for future earnings. However, these investors seem to have undergone a learning process in terms of the type of variables preferred, and in our case, appear to be more cautious and suspicious since the bursting of the bubble with regards to the quality of earnings reported prior to the transaction.

Our findings gain further support when we differentiate between expected and unexpected accruals. Prior studies indicate that the extent to which a firm manages its earnings would, in fact, be expressed in the magnitude of the *unexpected* – discretionary – accruals component of earnings (e.g., Dechow & Skinner, 2000). We show that during the bubble, investors were affected by the noisy, less persistent component of earnings, i.e., by unexpected accruals, rather than by expected accruals and cash flows. Markedly, this changed when the bubble burst. We find evidence that during the bursting of the bubble, investors discounted the price they were willing to pay once they detected upward earnings manipulation, as expressed in positive unexpected accruals. Investors seem to remain cautious with respect to indications for earnings manipulation through post-bursting years. Our results indicate that the use investors make of accounting variables in valuations of target firms is a dynamic process that changes over time. It seems that this learning process investors undergo in concomitance with processes in the market results in their being less affected by periodical or cyclical sentiments of euphoria and depression in the capital market.

The remainder of the paper proceeds as follows. Section 2 contains our literature review. Section 3 describes our sample and presents our hypotheses. Section 4 discusses our research methods and results. Section 5 summarizes and concludes.

2. Literature review

2.1. The technology bubble

The technology bubble has been investigated thus far with regards to different aspects. For example, Ljungqvist and Wilhelm (2003) investigate the technology bubble effect on IPO pricing. They find that the IPO pricing behavior during the "dot-com bubble" was affected by firm characteristics such as marked changes in pre-IPO ownership structure and insider selling behavior over the period. When controlling for these elements, they find that differences in IPO underpricing between the bubble period and the 3 years preceding it are much reduced. Brunnermeier and Nagel (2004) examine the response of hedge funds to the technology bubble. They present findings that question the efficient markets notion that rational speculators stabilize prices; i.e., their findings indicate that hedge funds did not exert a correcting force on stock prices during the bubble. Specifically, they show that these funds were heavily invested in technology stocks capturing the upturn, however avoiding the downturn by reducing positions in stocks that were about to decline. Brooks and Katsaris (2005) document that the high-tech sector had a "Contagious Effect" on other sectors during the bubble. Other studies investigated analyst failure to predict and warn investors of the bubble. This is mainly explained by analyst tendency to over-optimistic forecasts (see, e.g., Liu & Song, 2001).

2.2. Mergers and acquisitions

The extent literature on mergers and acquisitions focuses on several important aspects of these transactions. Many studies

[2] De Franco et al. (2008) explain that "If this information uncertainty cannot be eliminated at a minimal cost through additional information acquisition as part of the due diligence process, then acquirers will require a higher rate of return". This higher required rate of return will reduce the target firm's valuation.

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have investigated the various reasons for M&A to take place. These include, *inter alia*, creation of synergies, economics of scale and product scope (e.g., Brush, 1996; Healy, Palepu, & Ruback, 1990; Ravenscraft & Scherer, 1987; Seth, 1990; Seth, Song, & Pettit, 2000)[3]; risk diversification (e.g., Chatterjee & Lubatkin, 1990; Markides, 1994; Nahavandi & Malekzadeh, 1988; Ravenscraft & Scherer, 1987); obtaining market (monopolistic) power (e.g., Borenstein, 1990; Chatterjee, 1991; Kim & Singal, 1993; Ravenscraft & Scherer, 1987); management change due to poor performance (e.g., Harris & Robinson, 2002; Ravenscraft & Scherer, 1987; Resti, 1998; Stavros, 1997; Vennet, 1996); maximizing managers utility and minimizing agent conflict (e.g., Datta, Iskandar-Datta, & Raman, 2001; Hadlock, Houston, & Ryngaert, 1999; Kesner, Shapiro, & Sharma, 1994; North, 2001). Notably, studies show that larger firms are more likely to experience agency problems that lead to empire building and hubris in takeover bidding acquirers (Jensen, 1986; Loderer & Martin, 1990; Moeller, Schlingemann, & Stultz, 2004; Roll, 1986; Schwert, 2000).

Some studies have compared acquisitions of private versus public firms. These studies investigate the existence of a private company discount. While it is widely asserted in the practitioner literature that private firms are evaluated at a discount relative to public firms, the empirical evidence presented to support the existence of such a discount does not produce consistent inferences (Pratt, 2001). For example, Officer (2007) attributes much of the private company discount to sellers who accept higher discounts because they need to liquidate their investments. Phillips and Freeman (1995), on the other hand, show that after controlling for size, profitability, and whether the transaction occurred in the banking industry there is no significant discount.

De Franco et al. (2008) estimate the private company discount to range from 21% to 37% using enterprise value to EBITDA and enterprise value to sales acquisition multiples.[4] Koeplin, Sarin, and Shapiro (2000) estimate a discount of 20–30% for enterprise value to EBIT and EBITDA multiples, but none for enterprise value to sales. Officer (2007) estimates the private company discount to be in the 15–30% range based on price-earnings, enterprise value to EBITDA, and enterprise value to sales multiples; however, he finds that the price to book value multiple is not lower, but significantly higher, for private firms.

Another strand of research explores the performance of M&A. Most studies on long-run performance for mergers and acquisitions document either negative or insignificant long-term abnormal returns (see, for example, Conn, Cosh, Guest, & Hughes, 2005; Elnathan, Gavious, & Hauser, 2009; Loughran & Vijh, 1997; Sudarsanam & Mahate, 2003).[5] Other studies show that in a bullish stock market, firms with overpriced shares are more likely to initiate an M&A transaction, preferring share rather than cash payment (see, e.g., Shleifer & Vishney, 2003). Forms of payment in M&A transactions are also investigated in additional contexts. For example, the use of equity as a form of payment is associated with greater information asymmetry between the bidder and the target (Hansen, 1987). Additionally, acquirers using common shares to purchase the target tend to create new equity block holders.[6] The creation of outside block holders increases acquirer firm value if these block holders more effectively monitor management (Chang, 1998; Shleifer & Vishny, 1986). Notably, thus far, no study has conducted a thorough analysis of the affect of stock market trends – and particularly bubbles – on M&A transactions.

3. Data and hypotheses

3.1. Data

Our sample of public transactions is taken from the *Thomson Financial SDC* database of mergers and acquisitions. The sample includes 4166 U.S. public-firm targets acquired by other U.S. public firms over the time period of 1993–2005. In the database, the buyer generally holds controlling interest after the transaction. For the sake of sample homogeneity, we eliminated firms in which the buyer does not hold controlling interest after the transaction.[7]

While the *SDC* database includes select financial statement data, it does not contain all the data we need for our tests. Hence, we obtain all financial statement data from *Compustat*. Public firms with insufficient *Compustat* data are excluded from the analysis. In the database, we identify acquired firms from four main sectors: high-technology, low-technology (manufacturing), trading & services and finance. Consistent with prior studies, financial firms are excluded from our sample to avoid the confounding effects of these highly regulated industries. Also, following previous literature (e.g., Brown, Lo, & Lys, 1999; Collins, Maydew, & Weiss, 1997; Core et al., 2003; De Franco et al., 2008), we restrict our sample to firms with positive book value of equity. To mitigate the effect of outliers in our analyses, we winsorize the top and bottom 1% of continuous variables. We winsorize outliers instead of deleting them to conserve data. The results do not change qualitatively when outliers are deleted.

We focus our analysis on M&A transactions across four main time periods surrounding the technology bubble: the pre-bubble sub-period (1993 through 1997), the bubble (1998 through March 2000), the bursting of the bubble (April 2000 through 2002), and the post-bursting sub-period (2003 through 2005). This categorization is supported by primary market measures (NASDAQ returns, venture capital fund activities measures and generally accepted economic indicators (e.g., GDP and private consumption))[8] and is

[3] Synergies are likely to be higher when the primary business of the acquirer and the target are in the same industry, compared to when the industries are different (Morck, Shleifer, & Vishny, 1990). De Franco et al. (2008) explain that "An acquirer in the same industry as the target will more likely understand the target's business model as well as its risks and opportunities. These acquirers experience less information asymmetry and likely require less effort in the due diligence process".

[4] De Franco et al. (2008) suggest that the private company discount can be explained by lower earnings quality in private firms. De Franco, Gavious, Jin, and Richardson (2009) suggest another explanation for the private company discount that is related to the information quality facing the buyer. Specifically, they present evidence that (not) hiring a Big 4 auditor increases (decreases) the sale proceeds of private firms.

[5] Except for Elnathan et al. (2009), who document a −56% abnormal return three years from the time of transaction, the lowest returns documented in other studies are about −20% for the same period.

[6] The creation of new equity block holders in this context is especially prevalent in acquisitions of private firms, because private firm ownership is highly concentrated.

[7] Our focus on controlling interests also allows us to abstract from the issue of minority-interest discounts.

[8] NASDAQ cumulative returns for the 5-year period beginning in 1993 and ending in 1997 are about 134%; for the 2.25-year period of 1/1998–3/2000 they are about 189%, for the 2.75-year period of 4/2000–12/2002, −67%, and for the following 3 years, 1/2003–12/2005, around 59%. VentureXpert™ Database by VE & NVCA displays a gradual and relatively slow increase in venture capital (VC) fundraising in US from 1993 through 1997. Between 1998 and 2000, the process accelerates, with amounts raised increasing dramatically, reaching up to $106 billion in 2000. In 2001 and 2002, the downturn in the capital market that followed the bursting of the bubble led to fundraising crashing down as low as $3.8 billion in 2002. Then, a rebound occurred in 2003 and continued, with fundraising reaching up to $28.6 billion in 2006. The number of US venture-backed IPOs as well as the amounts raised in these IPOs present a similar pattern. The number of venture-backed mergers and acquisitions (average deal value) increased consistently from 1998 [253 deals ($59 million)] to 2000 [458 deals ($214 million)]; steadily decreased in 2001–2002, from 402 deals with average deal value of $54 million in 2001 to 380 deals with average deal value of $28 million in 2002. In 2003, 2004 and 2005, the number of mergers and

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consistent with prior studies (see, e.g., Brooks & Katsaris, 2005; Brunnermeier & Nagel, 2004; Gavious & Schwartz, 2008).

Table 1 contains descriptive statistics for our sample, by time categories. Panel A presents unscaled financial variables. The total transaction values as well as stock market values increased (decreased) significantly during the (bursting of) the bubble. In the post-bursting sub-period, the total values generally remained similar to those in the bursting sub-period. The accounting-based size measures – book value of equity and total assets – are less affected by the trends in the market. Specifically, book values and total assets increased significantly during the bubble, however remained unchanged during the subsequent two sub-periods.[9]

Panel B of Table 1 shows scaled financial variables. Interestingly, sales growth does not seem to have changed (or more specifically, did not increase) during the bubble. Moreover, when the bubble burst, sales growth significantly increased, on average. A decrease in sales growth is apparent in post-bursting years rather than when the bubble burst. Additionally, three earnings measures – profit margin, ROA and ROE – indicate that firm's profitability was lower during the bubble than in pre-bubble years, and that it continued to decline during the bursting of the bubble. In post-bursting years, profit margin significantly increased, but not enough to increase the return on equity. The data implies that the increase in the volume of transactions during the bubble is not supported by indications for better performance by these firms.

3.2. Hypotheses

This paper explores if, and to what extent, M&A transactions were affected by the growth and bursting of the technology bubble. We hypothesize that the frequency as well as the valuations of M&A transactions dramatically increased during the bubble, particularly within the high-tech sector, in concomitance with technology stock pricing on the exchange rising to unprecedented levels. Then, following the bursting of the bubble, we expect to find that M&A frequency and pricing dropped, however we do not conjecture a hypothesis regarding the intensity of the decrease, as the extreme decline in share prices may have created favorable opportunities for bidders. For post-bursting years, we expect to find evidence for an increase in M&A frequency and pricing, in concomitance with the rebound in the capital markets. Again, the intensity of this recovery in M&A is not obvious, as investors in the post-bubble era are expected to be more skeptical and cautious in their investment decisions.

We also explore whether, and how, the relevance of financial variables for explaining transaction prices changed throughout the investigated period. Extent research investigates the time-series properties of the value-relevance of accounting information for firms generally (e.g., Brown et al., 1999; Francis & Schipper, 1999; Lev & Zarowin, 1999). These studies show that the value-relevance of financial information, measured by the association of stock returns with earnings and book value of equity, has declined consistently over time. In addition, Core et al. (2003) find that the ability of traditional financial variables to explain firm value of both high-tech and low-tech firms decreased in the "New Economy Period" (1996–1999), leading them to conclude that there is a greater variation in firm values during the "New Economy Period" that remains to be explained.[10] While there is an extensive body of research on the value-relevance of financial statement information in general, and for high-technology industries in particular, no study thus far has investigated if, or how, this relevance is affected by a stock market bubble and the fluctuations that occur in the capital market after the bubble bursts. We predict that the market is adaptive in that, in concomitance with the occurrence of major events, investors experience a learning curve, which is reflected in changes in the (importance of the) role accounting variables play in the valuation of an acquired firm. We conjecture that the relevance of conservative accounting decreases (increases) in times of euphoria or an upturn (crash or a downturn) in the market.

4. Research methods and results

4.1. Frequency of M&A transactions

The prevalence of M&A transactions throughout the sample period is presented in Table 2. In panel A of Table 2, we present the total number of transactions in each sub-period, by sector. To account for the different length of each sub-period, we further scale the total number of transactions executed during a sub-period by the number of months in this sub-period. The estimated number of monthly transactions, as well as the percentage change in the number of monthly transactions from the preceding sub-period, is displayed in panel B of Table 2. The results indicate that a considerable increase in the prevalence of monthly transactions occurred during the bubble – for all sectors. As expected, the highest rate of increase in the frequency of M&A transactions during the bubble occurred in the high-tech sector – 95.0% compared with 66.5% and 41.9% in low-tech and trading & services, respectively. With the bubble bursting, the frequency of monthly M&A transactions scaled back, approximately to their pre-bubble level. In the following post-bursting sub-period, the prevalence of M&A transactions in all sectors kept decreasing, even at a higher pace relative to the reduction during the bursting of the bubble. This downward trend in the prevalence of M&A during post-bursting years is surprising, as in these years capital markets demonstrated recovery.

We further differentiate between transactions by size, where size is defined as the value of 100% of the acquired company's equity based on the price paid by the acquirer. Analyzing the distribution of our sample transactions by size, we find that 45% of the transactions were valuated in the range of $0–100 million, 40% in the range of $100–1,000 million, and 15% were over $1,000 million. We refer to these size categories as small, medium and large transactions, respectively. In Table 3, we present the frequency of monthly transactions throughout the four sub-periods for each size category separately, to account for a possible size effect on our results.[11] The results indicate that the trend of an increase during the bubble and a decrease during the bursting of the bubble, followed by a contin-

acquisitions (average deal value) reached 338 ($39 million), 407 ($57 million) and 356 ($77 million), respectively. Finally, we utilize generally accepted economic indicators to examine the robustness of our time period categorization. These indicators include GDP of the Business Sector, private consumption, and private investments. All these measures, in general, support the pattern described above, as the activity in the capital market is naturally related to and affected by the state of the economy.

[9] Scaled size measures throughout the four sub-periods are analyzed in Section 4.2.

[10] The studies investigating changes in the relevance of accounting information over time attribute their findings of a consistent reduction in value-relevance to the growth and importance of intangibles in the economy that are either not booked or are treated improperly by GAAP. A significant body of literature explores whether financial accounting is suited for a changing economy, which increasingly relies on science-based emerging industries. A major area of research examines the value-relevance of accounting data for the case of high-tech industries. These studies yield mixed results (see, e.g., Amir & Lev, 1996; Callen, Gavious, & Segal, 2009; Core et al., 2003; Ely, Simko, & Thomas, 2003; Hirschey, Richardson, & Ruback, 2001; Rajgopal, Shevlin, & Venkatachalam, 2003).

[11] We conduct sensitivity analyses for value ranges included in our size categories. Inferences remain qualitatively similar to those presented for the $0–100, $100–1,000, and over $1,000 million ranges.

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Table 1
Descriptive statistics.

	Pre	Bubble	Bursting	Post	Bubble- Pre	Bursting-Bubble	Post-Bursting
Panel A: Unscaled financial variables							
No. of obs.	1,580	1,174	901	511			
Transaction value							
Mean	499.390	1,073.723	813.815	679.483	574.333	−259.908	−134.332
					(0.000)	(0.015)	(0.222)
Median	105.550	188.775	114.321	127.261	83.225	−74.454	12.940
					(0.000)	(0.000)	(0.100)
Std. Dev.	1,380.665	2,530.984	2,139.435	1,736.954			
Enterprise value							
Mean	778.173	1,628.349	1316.408	881.244	850.175	−311.940	−435.163
					(0.000)	(0.009)	(0.034)
Median	172.757	262.540	176.947	189.244	89.783	−85.593	12.297
					(0.000)	(0.001)	(0.994)
Std. Dev.	2,537.520	4,851.898	3,926.144	2,591.092			
Market value							
Mean	562.537	1,136.570	866.223	729.221	574.033	−270.346	−137.002
					(0.000)	(0.016)	(0.237)
Median	130.776	202.559	128.569	133.914	71.783	−73.990	5.345
					(0.000)	(0.000)	(0.707)
Std. Dev.	1,497.021	2,648.847	2,245.783	1,830.244			
Book value							
Mean	162.047	279.494	254.074	264.927	117.447	−25.420	10.852
					(0.000)	(0.421)	(0.777)
Median	44.800	59.600	57.400	58.350	14.800	−2.200	0.950
					(0.000)	(0.407)	(0.924)
Std. Dev.	405.644	703.586	648.657	658.747			
Total assets							
Mean	446.887	861.405	818.246	731.485	414.518	−43.159	−86.760
					(0.000)	(0.754)	(0.595)
Median	93.900	123.400	110.700	123.600	29.500	−12.700	12.900
					(0.000)	(0.417)	(0.699)
Std. Dev.	1,420.975	3,127.603	2,734.938	2,850.455			
Panel B: Scaled financial variables							
Sales growth%							
Mean	0.313	0.332	0.489	0.114	0.019	0.157	−0.375
					(0.576)	(0.002)	(0.000)
Median	0.128	0.122	0.112	0.034	−0.006	−0.010	−0.078
					(0.316)	(0.829)	(0.000)
Std. Dev.	0.728	0.838	1.222	0.599			
Profit margin							
Mean	−0.015	−0.104	−0.295	−0.152	−0.089	−0.191	0.143
					(0.022)	(0.000)	(0.033)
Median	0.097	0.095	0.054	0.079	−0.002	−0.041	0.025
					(0.279)	(0.000)	(0.003)
Std. Dev.	0.822	1.024	1.213	1.083			
ROA							
Mean	0.073	0.042	−0.052	0.008	−0.031	−0.094	0.060
					(0.002)	(0.000)	(0.001)
Median	0.116	0.107	0.069	0.077	−0.009	−0.038	0.008
					(0.030)	(0.000)	(0.226)
Std. Dev.	0.215	0.262	0.352	0.262			
ROE							
Mean	0.170	0.114	−0.089	0.001	−0.056	−0.203	0.090
					(0.082)	(0.000)	(0.124)
Median	0.240	0.217	0.143	0.144	−0.023	−0.074	0.001
					(0.007)	(0.000)	(0.275)
Std. Dev.	0.787	0.774	1.081	0.943			

This table reports descriptive statistics for our sample of 4,166 target firms. Extreme values (top and bottom 1%) of continuous variables are winsorized. *P*-Values for differences between the means and the medians of each variable across the four sub-periods are presented in parentheses (two-sided tests). *Transaction value* is the sale price of firm's equity. *Enterprise value* is the sale price of firm's equity plus total liabilities less current liabilities. *Market value* is market value of common shares outstanding measured based on target stock price 1 week prior to the original announcement of the transaction. *Book value* of equity and *Total assets* are from the target firm's most recent annual fiscal period ending prior to the date of the sale transaction. *Sales growth%* is the percentage change in the annual sales. *Profit margin* is *EBITDA* divided by *Sales*. *EBITDA* is earnings before interest, taxes and depreciation and amortization. *ROA* is *EBITDA* divided by *Total assets*. *ROE* is income before extraordinary items divided by *Book value*. All financial statement data is for the target firm's most recent annual fiscal period ending prior to the date of the sale transaction and are measured in $millions.

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Table 2
Frequency of transactions by sector and time period.

Panel A: Total number of transactions throughout the period

Sector	Total	Pre	Bubble	Bursting	Post
High-Tech	1,444	489	429	324	202
Low-Tech	1,078	435	326	212	105
Trading & Services	1,644	656	419	365	204
Total	4,166	1,580	1,174	901	511

Panel B: Monthly transactions throughout the period

Sector	Total	Pre	Bubble		Bursting		Post	
	# of trans.	# of trans.	# of trans.	% change	# of trans.	% change	# of trans.	% change
High-Tech	10.028	8.150	15.889	0.950	9.818	−0.382	5.611	−0.428
Low-Tech	7.486	7.250	12.074	0.665	6.424	−0.468	2.917	−0.546
Trading & Services	11.417	10.933	15.519	0.419	11.061	−0.287	5.667	−0.488
Total	28.931	26.333	43.482	0.651	27.303	−0.372	14.195	−0.480

Panel A of this table presents the total number of M&A transactions executed in each of our sample sub-periods, by sector. In panel B, the total number of M&A transactions in each sub-period, and in each sector, is scaled by the number of months in the respective sub-period. The sub-periods are categorized as follows: 1/1993–12/1997 "Pre" bubble; 1/1998–3/2000 "Bubble"; 4/2000–12/2002 "Bursting" of bubble; and 1/2003–12/2005 "Post" bursting. % change in panel B represents the percentage change in the number of monthly transactions from the preceding sub-period.

Table 3
Frequency of monthly transactions by sector and time period when transaction size is differentiated.

Sector	Pre	Bubble		Bursting		Post	
	# of trans.	# of trans.	% change	# of trans.	% change	# of trans.	% change
Panel A: Small-size transactions							
High-Tech	3.133	5.630	0.797	4.424	−0.214	2.221	−0.498
Low-Tech	2.950	3.444	0.167	1.818	−0.472	0.922	−0.493
Trading & Services	4.100	4.852	0.183	4.061	−0.163	2.283	−0.438
Total	10.183	13.926	0.368	10.303	−0.260	5.426	−0.473
Panel B: Medium-size transactions							
High-Tech	3.083	5.852	0.898	3.394	−0.420	2.139	−0.370
Low-Tech	2.433	5.259	1.162	2.455	−0.533	1.167	−0.525
Trading & Services	4.050	6.259	0.545	3.727	−0.405	1.556	−0.583
Total	9.567	17.370	0.816	9.576	−0.449	4.861	−0.492
Panel C: Large-size transactions							
High-Tech	0.933	3.370	2.612	1.515	−0.550	1.000	−0.340
Low-Tech	0.850	2.444	1.875	1.758	−0.281	0.472	−0.732
Trading & Services	1.050	2.630	1.505	1.030	−0.608	0.944	−0.083
Total	2.833	8.444	1.981	4.303	−0.490	2.417	−0.438

This table presents the number of M&A transactions in each sub-period, and in each sector, scaled by the number of months in the respective sub-period, for different categories of size of transaction. In panels A, B and C the frequency of monthly transactions is presented for small, medium and large transactions, respectively, where small transactions fall in the range of $0–100 million, medium fall in the range of $100–1,000 million, and large transactions are over $1,000 million paid by the acquirer for 100% of the acquired company's equity. The sub-periods are categorized as follows: 1/1993–12/1997 "Pre" bubble; 1/1998–3/2000 "Bubble"; 4/2000–12/2002 "Bursting" of bubble; and 1/2003–12/2005 "Post" bursting. % change represents the percentage change in the number of monthly transactions from the preceding sub-period.

uing reduction in the post-bursting years, is robust to transaction size.

4.2. Analysis of transaction multiples

We now move to analyze changes in the pricing of M&A transactions throughout the four sub-periods. We test whether the price paid per dollar of accounting fundamental has changed in concomitance with the trends in the capital market. We utilize the Price-Earnings (P/E) multiple, which is most commonly used in practice to value firms, and which has received growing academic attention in the past decade.[12] P is sale price of the firms' equity and E is net income before extraordinary items. We also employ in our analyses additional multiples widely used to value firms, Price-to-Book (P/B) and Enterprise Value-to-Sales (EV/S).[13] B is book value of equity. EV is defined as the sale price of the firms' equity plus total liabilities less current liabilities and hence it measures the value of the entire enterprise as opposed to just the equity value. S is the firm's total revenues. E, B and S are from the most recent fiscal year ending prior to the date of the sale transaction.

Given that multiples are restricted to positive values, the P/B and the EV/S multiples have an important advantage as they can be used for firms with negative earnings, which leads to a larger sample that better represents the population of firms (see, e.g.,

[12] See for example, Alford (1992), Bhojraj and Lee (2002), Cheng and McNamara (2000), Lie and Lie (2002), Liu, Nissim, and Thomas (2002), Mukherjee, Kiymaz, and Baker (2004), and Penman (1996).

[13] See, e.g., Kaplan and Ruback (1995), Bhojraj and Lee (2002), Lie and Lie (2002), Liu et al. (2002), and Mukherjee et al. (2004).

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Bhojraj & Lee, 2002; De Franco et al., 2008). Notably, the prevalence of negative earnings in high-technology firms is relatively high due to the immediate expensing of research and development (R&D) expenses in accordance with Generally Accepted Accounting Principles (see for example, Amir & Lev, 1996; Ely et al., 2003; Hand, 2005; Lev & Sougiannis, 1996; Shortridge, 2004).[14] Our sample is restricted to firms with positive book value of equity. In practice, however, book values may be negative, and thus the *EV*/*SALES* multiple is often useful for evaluation of these firms.

Table 4 presents the univariate differences in transaction multiples across the four sub-periods. In panel A of Table 4, the results are presented for the full sample, and in panels B–D, we report results for the high-tech, low-tech and trading & services subsamples. The results for the full sample imply that, as expected, transaction multiples increased during the bubble, decreased when the bubble burst and increased in the post-bursting sub-period. These differences are generally statistically significant at the 5% level. Nevertheless, substantial inferences from a multiples analysis should be drawn when focusing on a specific industry, as industries differ in their characteristic financial ratios. Indeed, inferences change when we turn to focus on each industrial sector separately. Focusing initially on the high-tech sector, we find inconsistent results for the three multiples. While transaction *P*/*E* multiples seem to not have changed significantly throughout the entire sample period, the *P*/*B* multiple indicates a significant increase during the bubble followed by a significant decrease at the bursting of the bubble. In the post-bursting sub-period, *P*/*B* multiples did not change significantly from their level during the bursting sub-period. The results for the *EV*/*S* ratio are not robust (the parametric tests do not support results of non-parametric tests and vice versa). In all, results regarding changes in transaction price multiples of high-tech firms across the sample sub-periods are not robust. In other words, we do not find consistent evidence to support our expectation of an increase in pricing of high-tech firms in transactions taking place during the bubble, nor for a decrease during the bursting of the bubble. Interestingly, similar inferences are obtained when focusing on the low-tech sector; with the exception of evidence for a reduction in *P*/*B* in the post-bursting sub-period, both parametric and non-parametric tests imply that multiples did not change significantly throughout the sample period. For the trading & services sector, results imply that transaction multiples generally increased during the bubble and significantly decreased during the bursting of the bubble. Surprisingly, the technology bubble seems to have affected transaction prices of non-technology-based firms more than it did technology-based firms.

To further investigate the differences in valuation multiples throughout the four sub-periods, we move from a univariate analysis to a multivariate analysis. Differences in multiples can derive from factors other than industrial affiliation, time period or market trend. Other factors affecting valuation multiples include the target firm's profitability, risk and growth. For example, higher risk implies that the buyer, given a proxy for expected future cash flows, would use a higher discount rate, resulting in lower firm valuations.

The multivariate model that we employ is (see also, e.g., Bhojraj & Lee, 2002; De Franco et al., 2008; Francis, LaFond, Olsson, & Schipper, 2005):

$$\begin{aligned} ValuationRatio = {} & \beta_0 + \lambda_1 ROE + \lambda_2 PM + \lambda_3 SalesGrowth + \lambda_4 Size \\ & + \lambda_5 Lev + \lambda_6 PreBubble + \lambda_7 Burst \\ & + \lambda_8 PostBurst + \varepsilon \end{aligned} \quad (1)$$

This equation is estimated separately for the *P*/*E*, *P*/*B* and *EV*/*S* ratios. Consistent with prior studies, we use *E*/*P*, *B*/*P* and *S*/*EV* (the inverse of the *P*/*E*, *P*/*B* and *EV*/*S* multiples, respectively) as the dependent variables. Beatty, Riffe, and Thompson (1999) show that applying the inverse of multiples when using the method of comparables is advantageous, since the accounting variable is considered to be a noisy measure for expected cash flows, and thus placing it in the denominator leads to estimated coefficients that are positively biased. However, placing it in the numerator yields unbiased estimated coefficients.

The control variables are defined as follows: *ROE* is net income before extraordinary items divided by the book value of equity; *PM* (profit margin) is *EBITDA* divided by *Sales*; *SalesGrowth* is the percentage change in annual sales; *Size* is the log of total assets; *Leverage* is the ratio of total liabilities less current liabilities to total assets. *PreBubble* (*Burst*,*PostBurst*) is an indicator variable that equals 1 if the date of the transaction falls within the pre-bubble (bursting, post-bursting) sub-period, 0 otherwise. This multivariate analysis is conducted for each industry separately to control for industry effects. Size and sales growth serve as proxies for risk and growth, respectively. We also take into account the role of profitability – ROE and profit margin – for our multiples. Consistent with prior studies (e.g. Bhojraj and Lee), we exclude ROE from the E/P regression because of the mechanical relation between these two variables.[15]

Theory suggests that growth and profitability should be positively correlated with multiples. Hence, we expect that our proxies of growth and profitability should be *negatively* related to the *inverse* of multiples. We do not form a prediction as to the sign of the coefficient on leverage and size. As for financial leverage, while on the one hand it captures risk (and hence should be negatively related to price multiples), on the other hand it serves as a proxy for creditors' demand for high quality and conservative earnings[16] (and hence should be positively related to price multiples). Size is another proxy for risk. For example, smaller firms may have lower multiples, and thus larger inverse of multiples, consistent with smaller firms being riskier than larger firms (see Francis et al., 2005). On the other hand, size may capture value drivers beyond firm risk, such as the future growth opportunities (e.g., De Franco et al., 2008), and hence the relation between size and transaction multiples is equivocal. The coefficients on *PreBubble*, *Burst*, and *PostBurst* capture the mean difference in the respective multiple between each of these sub-periods and the bubble sub-period, after controlling for differences in industry composition, risk, profitability and growth.

The results of the multivariate analysis are presented in Table 5 . Panel A (B and C) of Table 5 displays the results for high-tech (low-tech and trading & services, respectively) industries. For the high-tech sector, we find that *ROE*, *PM* and *SalesGrowth* are, as expected, significantly negatively related to the inverted transaction multiples. The coefficient on size is significantly negative for all three multiples, whereas the coefficient on leverage is signifi-

[14] We also apply another multiple, Enterprise Value to EBITDA which, like *P*/*E* and in contrast to *EV*/*S*, cannot be used when the accounting fundamental is negative. Nonetheless, this multiple yields the same qualitative inferences (untabulated).

[15] ROE and P/E are both defined as the ratio of net income before extraordinary items to equity value. For *ROE*, equity value is taken at book value, whereas for P/E it is the transaction value of the firms' equity.

[16] E.g., Fama (1985), Berlin and Loeys (1988), and De Franco et al. (2008).

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Table 4
Univariate analysis of transaction multiples by sector and time period.

	Pre	Bubble	Bursting	Post	Bubble- Pre	Bursting- Bubble	Post- Bursting
Panel A: Overall							
P/E							
Mean	39.839	52.696	42.468	43.298	12.857	−10.227	0.829
					(0.000)	(0.022)	(0.870)
Median	22.890	26.590	21.220	24.660	2.800	−5.370	3.440
					(0.000)	(0.000)	(0.046)
No. of obs.	1,365	905	598	380			
P/B							
Mean	3.838	5.349	3.841	4.027	1.511	−1.507	0.186
					(0.000)	(0.000)	(0.499)
Median	2.368	2.912	2.100	2.296	0.544	−0.812	0.196
					(0.000)	(0.000)	(0.072)
No. of obs.	1,580	1,174	901	511			
EV/S							
Mean	5.816	6.656	6.308	6.594	0.840	−0.348	0.285
					(0.027)	(0.468)	(0.597)
Median	2.249	2.440	1.957	2.406	0.191	−0.483	0.449
					(0.772)	(0.025)	(0.049)
No. of obs.	1,580	1,174	901	511			
Panel B: High-tech sector							
P/E							
Mean	66.684	73.411	77.375	63.073	6.727	3.963	−14.301
					(0.479)	(0.777)	(0.420)
Median	34.465	36.700	33.555	35.850	2.235	−3.145	2.295
					(0.490)	(0.624)	(0.865)
No. of obs.	398	288	173	123			
P/B							
Mean	6.068	7.730	5.382	4.996	1.662	−2.347	−0.386
					(0.008)	(0.001)	(0.584)
Median	3.628	4.305	2.631	2.981	0.677	−1.674	0.350
					(0.083)	(0.000)	(0.348)
No. of obs.	489	429	324	202			
EV/S							
Mean	5.720	7.108	7.412	4.508	1.388	0.304	−2.903
					(0.157)	(0.798)	(0.012)
Median	1.961	2.350	1.851	2.358	0.389	−0.499	0.507
					(0.028)	(0.082)	(0.786)
No. of obs.	489	429	324	202			
Panel C: Low-tech sector							
P/E							
Mean	38.858	38.807	39.165	44.457	−0.051	0.358	5.290
					(0.994)	(0.965)	(0.640)
Median	23.410	23.345	20.515	23.360	−0.065	−2.830	2.845
					(0.807)	(0.224)	(0.545)
No. of obs.	420	296	215	102			
P/B							
Mean	3.717	3.907	4.204	3.144	0.189	0.297	−1.060
					(0.667)	(0.574)	(0.068)
Median	2.514	2.570	2.628	2.026	0.056	0.058	−0.602
					(0.281)	(0.922)	(0.053)
No. of obs.	435	326	212	105			
EV/S							
Mean	2.346	2.074	2.217	1.979	−0.271	0.142	−0.237
					(0.540)	(0.721)	(0.530)
Median	1.163	1.304	1.187	1.196	0.141	−0.117	0.009
					(0.307)	(0.498)	(0.563)
No. of obs.	435	326	212	105			
Panel D: Trading & Services sector							
P/E							
Mean	43.934	74.679	44.631	40.61	30.745	−30.048	−4.021
					(0.000)	(0.006)	(0.687)
Median	30.800	35.695	21.980	28.410	4.895	−13.715	6.430
					(0.120)	(0.000)	(0.342)
No. of obs.	547	321	210	155			

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Table 4 (*Continued*)

	Pre	Bubble	Bursting	Post	Bubble- Pre	Bursting- Bubble	Post- Bursting
P/*B*							
Mean	4.564	6.422	3.618	3.131	1.857	−2.803	−0.486
					(0.001)	(0.000)	(0.225)
Median	3.139	3.114	2.000	2.006	−0.025	−1.114	0.006
					(0.321)	(0.000)	(0.870)
No. of obs.	656	419	365	204			
EV/*S*							
Mean	2.482	5.541	3.311	1.704	3.058	−2.229	−1.606
					(0.000)	(0.022)	(0.011)
Median	1.303	1.610	0.983	0.882	0.307	−0.627	−0.101
					(0.005)	(0.000)	(0.335)
No. of obs.	656	419	365	204			

This table presents the univariate differences between the means and the medians of transaction multiples across the four sub-periods. *P*/*E* is sale price of the firms' equity divided by net income before extraordinary items. *P*/*B* is sale price of the firms' equity divided by the book value of equity. *EV*/*S* is the sale price of the firms' equity plus total liabilities less current liabilities divided by the firm's total revenues. *E*, *B* and *S* are from the most recent fiscal year ending prior to the date of the sale transaction. In panel A, the results are presented for the full sample, and in panels B, C and D we report results for the high-tech, low-tech and trading & services sub-samples. *P*-Values are presented in parentheses.

cantly negative only for the *B*/*P* multiple. Turning to focus on the coefficients on the sub-period indicators, we find no evidence of a direct bubble effect on either of the transaction multiples (λ_6 which captures the difference between the pre-bubble and the bubble sub-periods is insignificant); i.e., it seems that transaction multiples did not increase during the bubble, compared with the pre-bubble period. In contrast, there is evidence (according to *P*/*B* and *EV*/*S* ratios, but not according to *P*/*E*) of a decrease in transaction multiples at the bursting of the bubble, compared to their levels during the pre-bubble and the bubble sub-periods. Specifically, λ_7 which captures the difference in multiples between the bubble and the subsequent bubble bursting sub-periods is significantly positive, implying higher inverted multiples (and thus lower multiples) during the bursting of the bubble. When comparing between the coefficient on the '*Burst*' (about 0.4) and the coefficient on the '*PostBurst*' (about 0.3) indicator variables, we find that the two do not differ significantly, indicating that multiples did not change significantly throughout these two sub-periods. These results are generally consistent with those found in the univariate analysis.

For low-tech industries, consistent with the univariate analysis, we do not find evidence for a direct time effect on transaction multiples (the coefficients on all three sub-period-indicator variables are statistically insignificant for each multiple applied). For trading & services, the multivariate analysis indicates that, in fact, a direct effect of the bubble on transaction multiples did not occur (λ_6 is insignificant according to all three multiples). Like in the high-tech sector, there is some evidence (according to *P*/*B* and *EV*/*S* ratios, but not according to *P*/*E*) of a decrease in transaction multiples at the bursting of the bubble, but no change between the '*Burst*' and the '*PostBurst*' sub-periods.

As a robustness check to our finding that transaction multiples did not change in the bubble sub-period, we repeat the multivariate analysis excluding the *PreBubble* indicator variable. If indeed multiples did not change during the bubble, compared with the pre-bubble sub-period, then a dummy variable indicating the pre-bubble sub-period is, in effect, irrelevant to the model specification. Untabulated results show that when *PreBubble* is excluded from the model, $Adj.R^2$ as well as the coefficients on all the remaining variables and their significance levels remain generally similar (all differences are statistically insignificant). This implied irrelevance of an indicator variable for the pre-bubble sub-period indicates that, consistent with the results from the univariate analysis as well as the results from the multivariate analysis which includes the *PreBubble* indicator variable, the difference in multiples between the pre-bubble and the bubble sub-periods is indeed insignificant; i.e., with the market bubble inflating, transaction prices do not seem to have changed significantly. The results are found to be robust to the multiple used and to industrial sectors.

Based on the two-stage analysis of univariate tests followed by multivariate models, we conclude that investors outside the exchange were not affected by the euphoric atmosphere on the exchange during the bubble with respect to high-tech investments. Nonetheless, the bursting of the bubble seems to have led to further cautiousness in their decision making, and they remained cautious even when prices on the exchange rebounded.

4.3. Price regression analysis

The results thus far indicate that valuations of transactions outside the exchange were not affected significantly by the bubble. We now extend our analysis of M&A pricing across the four sub-periods, focusing on the information used by investors to value their targets. The bursting of the bubble raised the question regarding the relevance of financial statements in reflecting the economic reality of a company's basic business (Olstein, 2006; Penman, 2003). We seek to explore whether financial variables played a different role as proxies for expectations about the future performance of a target firm in each sub-period.

We employ a price level analysis to explore changes in the relation between target prices and financial statement information across the four sub-periods. The price regressions are based on a version of the Ohlson (1995) model, where we regress the sale price of the firm's equity on the book value of equity, current earnings and proxies for expected earnings growth (see also Collins et al., 1997; Core et al., 2003; Dechow, Hutton, & Sloan, 1999, among others). Consistent with the literature (e.g., Collins et al., 1997; Hand, 2005), we define value-relevance as the adjusted R-square from the regression. Upon regressing prices on the financial variables, we separate earnings into positive and negative earnings. This differentiation between value implications of positive and negative earnings is based on prior literature that documents differences in the valuation of profits and losses (e.g., Basu, 1997; Collins et al., 1997; Hayn, 1995). Following prior studies (e.g., Core et al., 2003), we include in the model R&D expense and sales growth as proxies for expected growth. The model we employ is:

$$P_{it}=\beta_0+\beta_1 BV_{it}+\beta_2 E_{it}+\beta_3 Neg\_E_{it}+\beta_4 R\&D+\beta_5 SalesCh_{it}+\varepsilon_{it} \quad (2)$$

where *P* is the sale price of the firm's equity; *BV* is the book value of equity; *E* represents earnings before extraordinary items; *Neg_E*

Table 5
Multivariate analysis of transaction multiples.

	E/P	B/P	S/EV
Panel A: High-tech sector			
Intercept	0.081	0.274	0.953
	(0.000)	(0.001)	(0.000)
ROE		−0.024	−0.039
		(0.002)	(0.000)
PM	−0.110	−0.076	−0.095
	(0.000)	(0.004)	(0.026)
SalesGrowth	−0.093	−0.227	−0.497
	(0.001)	(0.000)	(0.000)
Size	−0.004	−0.091	−0.091
	(0.085)	(0.049)	(0.000)
Lev	0.001	−0.023	−0.012
	(0.677)	(0.000)	(0.193)
PreBubble	−0.012	0.101	0.129
	(0.442)	(0.336)	(0.300)
Burst	0.001	0.411	0.373
	(0.886)	(0.000)	(0.000)
PostBurst	0.027	0.359	0.262
	(0.100)	(0.015)	(0.075)
Adj.R^2	0.136	0.110	0.122
F-Value	8.912	12.569	14.045
	(0.000)	(0.000)	(0.000)
# obs.	982	1,444	1,444
Panel B: Low-tech sector			
Intercept	0.063	0.785	1.620
	(0.000)	(0.000)	(0.000)
ROE		−0.317	−0.071
		(0.000)	(0.001)
PM	−0.120	−0.091	−0.518
	(0.001)	(0.103)	(0.000)
SalesGrowth	−0.011	−0.106	−0.154
	(0.045)	(0.033)	(0.021)
Size	−0.065	−0.059	−0.202
	(0.004)	(0.163)	(0.000)
Lev	−0.004	−0.034	−0.035
	(0.253)	(0.054)	(0.166)
PreBubble	0.009	0.080	0.050
	(0.329)	(0.295)	(0.583)
Burst	0.002	0.105	0.070
	(0.896)	(0.241)	(0.601)
PostBurst	0.009	0.076	0.027
	(0.546)	(0.525)	(0.861)
Adj.R^2	0.056	0.046	0.073
F-Value	6.613	5.319	7.614
	(0.000)	(0.000)	(0.000)
# obs.	1,033	1,078	1,078
Panel C: Trading & Services			
Intercept	0.051	0.469	1.622
	(0.000)	(0.000)	(0.000)
ROE		−0.066	−0.332
		(0.093)	(0.000)
PM	−0.023	−0.052	−0.069
	(0.422)	(0.269)	(0.466)
SalesGrowth	−0.026	−0.017	−0.274
	(0.028)	(0.559)	(0.000)
Size	0.003	0.051	−0.077
	(0.504)	(0.238)	(0.336)
Lev	0.001	−0.024	0.013
	(0.867)	(0.118)	(0.653)
PreBubble	−0.011	−0.036	−0.001
	(0.159)	(0.609)	(0.991)
Burst	0.011	0.223	0.392
	(0.307)	(0.008)	(0.011)
PostBurst	0.004	0.185	0.375
	(0.718)	(0.070)	(0.041)
Adj.R^2	0.019	0.044	0.065

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Table 5 (*Continued*)

	E/P	B/P	S/EV
F-Value	3.080	7.438	10.270
	(0.003)	(0.000)	(0.000)
# obs.	1,233	1,644	1,644

This table presents the parameter estimates together with their significance levels for the following regression model:
$ValuationRatio = \beta_0 + \lambda_1 ROE + \lambda_2 PM + \lambda_3 SalesGrowth + \lambda_4 Size + \lambda_5 Lev + \lambda_6 PreBubble + \lambda_7 Burst + \lambda_8 PostBubble + \varepsilon$.
The regression is estimated separately for *E*/*P*, *B*/*P* and *S*/*EV* ratios, as well as for each sector. *P*/*E* is sale price of the firms' equity divided by net income before extraordinary items. *P*/*B* is sale price of the firms' equity divided by the book value of equity. *EV*/*S* is the sale price of the firms' equity plus total liabilities less current liabilities divided by the firm's total revenues. *E*, *B* and *S* are from the most recent fiscal year ending prior to the date of the sale transaction. *ROE* is net income before extraordinary items divided by the book value of equity; *PM* (profit margin) is *EBITDA* divided by *Sales*; *SalesGrowth* is the percentage change in annual sales; *Size* is the log of total assets; *Leverage* is the ratio of total liabilities less current liabilities to total assets. *PreBubble* (*Burst*,*PostBurst*) is an indicator variable that equals 1 if the date of the transaction falls within the pre-bubble (bursting, post-bursting) sub-period, 0 otherwise. *P*-Values of the coefficients are presented in parentheses.

is negative earnings before extraordinary items, 0 otherwise[17]; *R&D* is research & development expense; and *SalesCh* is the annual change in sales.

Prior research advocates deflating financial data in accounting research by a proxy for scale (rather than including a scale proxy as an independent variable; see, e.g., Lo, 2004). The advantages of deflation by a scale proxy include, *inter alia*, mitigation of heteroscedasticity, R^2 bias and coefficient bias. We thus deflate Eq. (2) by the book value of equity. All observations are conserved as our sample is restricted to firms with positive book value.

Our deflated regression model is:

$$\frac{P_{it}}{BV_{it}} = \beta_0 \frac{1}{BV_{it}} + \beta_1 + \beta_2 \frac{E_{it}}{BV_{it}} + \beta_3 \frac{Neg\_E_{it}}{BV_{it}} + \beta_4 \frac{R\&D_{it}}{BV_{it}} + \beta_5 \frac{SalesCh_{it}}{BV_{it}} + \varepsilon_{it} \quad (3)$$

The intercept in the deflated model can be interpreted as the coefficient on book value of equity in the undeflated model. Consistent with prior studies, we retain the inverse of book value of equity as an explanatory variable in the deflated regression model. According to Core et al. (2003), the inverse of book value of equity should be retained in the deflated regression, "because we include the intercept in the unscaled model to explain economic variation in market values that is not captured by our other explanatory variables." In each regression, we include intercept dummies for industry to control for industry fixed effects. The regressions include White's (1980) correction.

The results of the deflated regressions, for each sub-period separately, are presented in panel A of Table 6. The results indicate that in the time period preceding the bubble, accounting fundamentals are value-relevant for pricing of M&A transactions. Specifically, the signs of the estimated coefficients are consistent with prior research; the coefficients on *BV* and *E* are significantly positive whereas the coefficient on *Neg_E* is significantly negative. Notably, while the coefficient on positive earnings is, as expected, significantly positive, the coefficient on negative earnings (sum of *E* and *Neg_E*) is not significantly different from zero. The value irrelevance of negative earnings may imply investor uncertainty with respect to the future prospects of the acquired firm; i.e., the negative earnings may precede either positive future cash flows due to the transitory nature of losses (see Core et al., 2003) or more negative cash flows. As for *SalesCh* and *R&D*, the coefficients are positive, consistent with these variables capturing expected growth in earnings, however statistically insignificant. During the bubble and the bubble burst, the results show that current earnings lose their relevance whereas variables capturing future growth in earnings become value-relevant. Both the coefficients on *SalesCh* and *R&D* are positive and significant at the 1% and 5% level, respectively. In post-bursting years, earnings become value-relevant again in concomitance with *SalesCh* and *R&D* losing their significance. Hence, the relations between financial information and equity values have undergone unusual changes throughout the investigated period. In particular, during extreme events that the capital market has undergone – the bubble and the bubble bursting – investor valuations tend to base on expectations for the future rather than on the current performance of the target firm. In the sub-periods prior to and after these market vicissitudes, current earnings rather than expectations for future earnings are found to contribute to the explanation of the variation in transaction prices.

It seems that, in concomitance with the occurrence of major events, investors experience a learning curve, which is reflected in changes in the (importance of the) role accounting variables play as proxies for expectations of future cash flows. Specifically, after these events occurring, investors may be willing to attach a higher price to a proven ability to generate higher earnings, but refrain from the risk of attaching a higher price based on expectations for the future. Note that the book value of equity retained its significance throughout the years. As the role of the balance sheet versus the income statement in explaining market values depends on investors' perception of earnings persistence, our finding that *BV* was systematically value-relevant while earnings lost and gained relevance throughout the investigated period, may be explained by investors suspecting lower persistence of earnings.

4.3.1. The ability of accruals versus cash flows in explaining the purchase price

We now disaggregate the income statement into accrual and non-accrual components. We seek to compare investor reliance on these components in the setting of M&A transactions, where the motivation for earnings manipulation is considerably higher. In this setting, firm managers have incentives to take actions that increase their sale price. If management expects price to be a positive function of earnings, firms could manage accruals upwards. Given the high likelihood for an accrual manipulation, we seek to distinguish between the role accruals play as proxy for expectations about the target's future cash flows, versus the role of the cash flow component of earnings. Using the accounting identity that net income equals the sum of cash flows from operations and accruals, we re-estimate our basic price regression model, Eq. (3), by decomposing

[17] We define *Neg_E* as earnings before extraordinary items, if earnings before extraordinary items <0, 0 otherwise. Thus, *Neg_E* takes on only non-positive values. We also include in the regressions a dummy variable that equals 1 if earnings before extraordinary items are negative, zero otherwise. The dummy is nonsignificant for all years (untabulated). Additionally, in an untabulated analysis, we add to regression model (1) an interaction variable of *NEG_E* with *BV* to inquire whether the coefficient on the book value of equity is different for loss firm-years. We find that the coefficient on the interaction variable in statistically insignificant with the other coefficients in the model similar to those reported in our tables.

Table 6
Price regressions analysis.

	Pre	Bubble	Bursting	Post
Panel A				
Intercept	0.891	2.070	1.223	0.514
	(0.000)	(0.000)	(0.000)	(0.000)
1/BV	3.864	11.452	1.429	0.405
	(0.000)	(0.000)	(0.000)	(0.000)
E/BV	5.420	0.174	0.036	5.233
	(0.000)	(0.218)	(0.581)	(0.011)
Neg_E/BV	−5.511	−0.007	−0.012	−5.001
	(0.055)	(0.429)	(0.309)	(0.038)
Sales Ch/BV	0.048	0.562	0.182	0.080
	(0.399)	(0.000)	(0.007)	(0.241)
R&D/BV	0.095	1.259	0.801	0.123
	(0.574)	(0.023)	(0.052)	(0.309)
Adj.R^2	0.142	0.153	0.113	0.115
F-Value	32.854	30.197	29.379	28.096
Sig.	(0.000)	(0.000)	(0.000)	(0.000)
# obs.	1,580	1,174	901	511
Panel B				
Variable				
Intercept	0.739	2.813	1.047	0.201
	(0.000)	(0.000)	(0.000)	(0.000)
1/BV	3.447	5.578	2.554	0.870
	(0.000)	(0.000)	(0.000)	(0.000)
TotalAcc/BV	5.133	2.406	−0.366	5.013
	(0.000)	(0.000)	(0.125)	(0.021)
CFO/BV	5.165	0.388	0.433	6.114
	(0.000)	(0.253)	(0.006)	(0.003)
(Loss × TotalAcc)/BV	−5.005	0.009	0.014	−5.011
	(0.000)	(0.489)	(0.224)	(0.055)
(Loss × CFO)/BV	−5.013	0.003	0.006	−6.016
	(0.000)	(0.632)	(0.088)	(0.019)
Sales Ch/BV	0.041	0.670	0.194	0.053
	(0.415)	(0.000)	(0.004)	(0.434)
R&D/BV	0.098	1.652	1.066	0.143
	(0.483)	(0.000)	(0.025)	(0.112)
Adj.R^2	0.138	0.180	0.121	0.127
F-Value	11.427	14.459	10.851	10.186
Sig.	(0.000)	(0.000)	(0.000)	(0.000)
# obs.	1,580	1,174	901	511
Panel C				
Variable				
Intercept	0.366	2.422	0.618	0.130
	(0.000)	(0.000)	(0.000)	(0.000)
1/BV	0.023	6.491	1.520	0.064
	(0.914)	(0.000)	(0.000)	(0.973)
ExpAcc/BV	7.288	0.363	1.980	5.055
	(0.009)	(0.218)	(0.070)	(0.007)
AbnAcc/BV	5.854	4.462	−1.834	0.620
	(0.089)	(0.017)	(0.023)	(0.390)
CFO/BV	5.426	0.346	0.407	6.074
	(0.000)	(0.345)	(0.023)	(0.009)
(Loss × ExpAcc)/BV	−8.057	0.345	−1.837	−6.624
	(0.002)	(0.133)	(0.013)	(0.023)
(Loss × AbnAcc)/BV	−6.953	−8.843	−0.879	−0.090
	(0.036)	(0.000)	(0.013)	(0.927)
(Loss × CFO)/BV	−5.004	0.000	0.001	−6.004
	(0.689)	(0.926)	(0.142)	(0.596)
Sales Ch/BV	0.290	1.437	1.007	0.452
	(0.141)	(0.000)	(0.009)	(0.710)
R&D/BV	0.065	1.724	2.483	0.760
	(0.624)	(0.000)	(0.000)	(0.101)
Adj.R^2	0.258	0.203	0.206	0.232
F-Value	18.749	13.463	11.530	9.088
Sig.	(0.000)	(0.000)	(0.000)	(0.000)
# obs.	1,580	1,174	901	511

This table panel A presents the results of the following regression model:
$P_{it}/BV_{it} = \beta_0 1/BV_{it} + \beta_1 + \beta_2 E_{it}/BV_{it} + \beta_3 Neg\_E_{it}/BV + \beta_4 R\&D_{it}/BV_{it} + \beta_5 SalesCh_{it}/BV_{it} + \varepsilon_{it}$.
P is the sale price of the firm's equity; *BV* is the book value of equity; *E* represents earnings before extraordinary items; *Neg_E* is negative earnings before extraordinary items, 0 otherwise; *R&D* is research & development expense; and *SalesCh* is the annual change in sales. In panel B, the earnings are disaggregated into accrual and non-accrual components. *Loss* is a dummy variable that equals 1 if earnings before extraordinary items are negative, zero otherwise. We interact the indicator *Loss* variable with the decomposed-earnings variables, total accruals (*TotalAcc*) and cash flows from operation (*CFO*). In panel C, we further differentiate between expected and unexpected accruals. We identify unexpected – abnormal – accruals using the widely applied modified Jones (1991) model. *P*-Values of the coefficients are presented in parentheses.

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earnings into accruals and operating cash flows. If buyers are aware of accrual manipulation, then the coefficient on accruals should be lower than the coefficient on cash flows, throughout the sample period. We estimate:

$$\frac{P_{it}}{BV_{it}} = \beta_0 \frac{1}{BV_{it}} + \beta_1 + \beta_2 \frac{TotalAcc_{it}}{BV_{it}} + \beta_3 \frac{CFO_{it}}{BV_{it}} + \beta_4 \frac{(Loss \times TotalAcc)_{it}}{BV_{it}} + \beta_5 \frac{(Loss \times OCF)_{it}}{BV_{it}} + \beta_6 \frac{R\&D_{it}}{BV_{it}} + \beta_7 \frac{SalesCh_{it}}{BV_{it}} + \varepsilon_{it} \quad (4)$$

Loss is a dummy variable that equals 1 if earnings before extraordinary items are negative, zero otherwise. We interact the indicator *Loss* variable with the decomposed-earnings variables, total accruals (*TotalAcc*) and cash flows from operation (*CFO*). This allows us to isolate the coefficient on accruals versus operating cash flows for profit firm-years from loss years. Additionally, estimation of Eq. (4) for each sub-period separately allows us to explore changes in the weight that bidders place on operating cash flows versus accruals across the sub-periods.

Table 6, panel B contains the results of estimating Eq. (4). We first compare the coefficient on accruals and the coefficient on operating cash flows. In the pre-bubble sub-period, the coefficient on accruals and operating cash flows for profit firm-years is 5.133 and 5.165, respectively. The difference in these coefficients is not statistically significant. Thus, it seems that prior to the bubble, bidders placed similar weight on accruals and on operating cash flows. During the bubble, the coefficient on accruals is lower (2.406), however remains highly significant. In contrast, the coefficient on operating cash flows (0.388) becomes insignificant. In essence, investors seem to attach higher value to the accrual component of earnings, which may be subjected to manipulation by management, than to cash. This result is consistent with the euphoria – and hence to less rationalism in investors' decision making – that characterized this sub-period, which is expressed in reduced awareness of investors to the risk of lower earnings quality for target firms prior to the sale transaction. Interestingly, the opposite result is obtained for the bubble bursting sub-period. While the coefficient on accruals changes its sign (−0.366) and loses its significance, the coefficient on cash flows (0.433) becomes significant at the 1% level. This finding implies that investors undergo a learning process in terms of the type of variables preferred, and in our case, appear to be more cautious and suspicious with regards to earnings reported prior to the transaction. In the post-bursting sub-period, the coefficient on accruals and operating cash flows for profit firm-years is 5.013 and 6.114, respectively. The difference in these coefficients is statistically significant, implying that in post-bursting years, bidders place a higher weight on operating cash flows than on accruals.

For loss firms, the results indicate that, prior to the bubble as well as in post-bursing years, the coefficients on accruals and operating cash flows are not significantly different from zero, consistent with the findings for negative earnings in Eq. (3). During the bubble, we do not find a difference between the coefficients on accruals and operating cash flows in profit versus loss firms. That is, the coefficient on accruals (cash flows) is (in)significantly positive for loss firms as it is for profit firms. In contrast, during the bursting of the bubble, the coefficient on operating cash flows in loss firms is significantly higher than that in profit firms, possibly due to the transitory nature of losses.

Note that the coefficients on the accrual and cash flow components of earnings are lower across the drastic bubble and bursting sub-periods in comparison to the pre- and post-bursting sub-periods. In all, it seems that the use investors make of accounting variables in valuations of target firms is a dynamic process which changes over time.

We now move to differentiate between expected and unexpected accruals. We identify unexpected – abnormal – accruals using the widely applied modified Jones (1991) model. Kothari, Leone, and Wasley (2005) explain that earnings management is related to firm performance (i.e., firms with extreme financial performance are likely to engage in earnings management) and thus the impact of performance on accruals should be accounted for when estimating abnormal accruals. In keeping with Kothari et al., and consistent with prior studies (e.g. Raman & Shahrur, 2008), we include a proxy for performance – return on assets (*ROA*) – as an independent variable in the modified Jones model.[18] Prior research also suggests that firms with higher growth opportunities tend to have higher accruals (e.g., Cohen, Dey, & Lys, 2008; McNichols, 2002). We thus control for growth options in the modified Jones model by including the book-to-market ratio (see also Raman & Shahrur, 2008).

We estimate the following cross-sectional regression for each two-digit SIC industry and year:

$$\frac{TotalAcc_t}{TA_{t-1}} = \beta_0 \frac{1}{TA_{t-1}} + \beta_1 \left(\frac{\Delta REV_t}{TA_{t-1}} - \frac{\Delta AR_t}{TA_{t-1}} \right) + \beta_2 \frac{GPPE_t}{TA_{t-1}} + \beta_3 ROA_t + \beta_4 BM_t + \varepsilon_t \quad (5)$$

where *TA* is total assets, ΔREV is the change in revenues from the previous year, ΔAR is the change in accounts receivable, *GPPE* is gross fixed assets, *ROA* is net income before extraordinary items scaled by lagged total assets and *BM* is the ratio of total assets to total assets minus book value of equity plus market value of equity. Consistent with prior research, total accruals are net income minus cash flows from operations. The residual in the regression model (ε) is the measure of unexpected – discretionary – accruals. These accruals indicate the extent to which a firm manages its earnings (Dechow & Skinner, 2000).

Table 6, panel C contains the results of estimating Eq. (4) with total accruals decomposed into expected and unexpected accruals. For pre-bubble years, we find that the coefficient on expected accruals (7.228) is significantly higher than the coefficients on unexpected accruals and operating cash flows (5.854 and 5.426, respectively). During the bubble, the coefficient on unexpected accruals is significantly positive (4.462) while the coefficients on expected accruals and operating cash flows (0.363 and 0.346, respectively) are insignificantly different from zero, implying that acquisitions during the time of the bubble were affected by the noisy, less persistent component of earnings. Markedly, this has changed when the bubble burst, as reflected in a significantly *negative* coefficient on unexpected accruals (−1.834) versus a significantly positive coefficient on expected accruals and on cash flows (1.980 and 0.407, respectively). In effect, the significantly negative coefficient on unexpected accruals implies that during the bursting of the bubble, investors discounted the price they were willing to pay once detecting upward earnings manipulation. This further demonstrates the process of learning that investors undergo in concomitance to processes in the market. In post-bursting years, the coefficient on unexpected accruals is insignificant, implying that investors remain cautious (in the pre-bubble and during the bubble, this coefficient was significantly positive). The coefficients on expected accruals and cash flows are significant (5.055 and 6.074, respectively).

[18] Kothari et al. (2005) show that matching based on current *ROA* performs better than matching based on prior year's *ROA*. The performance-matching approach distinguishes between 'normal' and 'abnormal' EM.

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5. Summary and conclusion

We document a considerable increase in the prevalence of M&A transactions during the bubble for all sectors, followed by a reduction to pre-bubble levels at the bursting of the bubble, and further reduction in subsequent post-bursting years, despite recovery in the capital markets during that time. Although the frequency of M&A increased during the bubble, the pricing of M&A did not change. In contrast, the bursting of the bubble seems to have led to further cautiousness by these investors, which extended through post-bursting years, even when prices on the exchange rebounded. While we do not find robust evidence for changes in price multiples outside the exchange in concomitance with the changes on the exchange, we document changes in the information used by investors to value their targets. Specifically, during the bubble and the bursting of the bubble, investor valuations tended to rely on expectations for the future rather than on the current performance of the target firm, and vice versa for the pre-bubble and the post-bursting sub-periods. Additionally, our evidence suggests that during the euphoric bubble sub-period, investors outside the exchange did take more risks, relying on the noisy, less persistent component of earnings – unexpected accruals – rather than on expected accruals and cash flows. However, these investors seem to have undergone a learning process, appearing to be more cautious since the bursting of the bubble with regards to the quality of earnings reported prior to the transaction. Hence, this process of learning that investors outside the exchange undergo in concomitance to processes in the market results in these investors being less affected by periodical or cyclical sentiments of euphoria and depression in the capital market.

An important implication of the findings of this study is that, although the pricing of a target firm in an acquisition outside the exchange is intended mainly to the investors involved in the transaction,[19] it in effect provides outside investors with a good firm value indicator. Namely, the multiple derived from the transaction may serve as a good benchmark multiple for investment decision making, one to be compared with the industry multiple – which is derived from stock exchange prices of the firms in the industry – or from target prices published by sell-side analysts. Notably, an M&A multiple may provide a moderate benchmark which is less affected by the "mood" of the market.

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[19] See Elnathan et al. (2009).

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