

Misvaluation and Mergers Waves: Evidence from Australia

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Abstract—This paper attempts to investigate whether stock market misvaluation has been a driver force in merger and acquisition activities during 2000-2007 in Australia. Our findings indicate that, more overvalued firms use stocks to buy less overvalued firms, overvalued firms pay cash to buy undervalued firms, and higher bidder overvaluation relative to target overvaluation decreases the combativeness of the deals. Our findings provide a behavioral explanation of the Australian takeover activities that has been traditionally viewed from the neoclassical perspectives premised upon the efficient market hypothesis.

Index Terms—Misvaluation hypothesis, Australian merger and acquisition, market efficiency.

I. INTRODUCTION

Recent studies have documented evidence of waves in mergers and acquisitions activity; most notably the large wave experienced by the U.S. and world economies in the late 1990s. This phenomenon is open to two interpretations; neoclassical theories and behavioural theories. Neoclassical theories posit that firms redeploy assets towards more productive uses due to factors such as market shocks, with the aim to improve market efficiency or maximise shareholders wealth. Behavioural or non-neoclassical theories drop efficiency improvement or wealth maximization assumptions and propose alternative factors, including stock market misvaluations, as the principal explanation for mergers.

Evidence of the ongoing debate on takeover activities and merger waves have mostly stemmed from U.S data and research. This paper aims to test whether there is a systematic relationship between firms' misvaluation and takeover activities in Australian in recent years, using a sample of capital market data during the 2000-2007 period. Our findings provide support for misvaluation hypothesis which is founded on the premise that the market values firms incorrectly while managers have complete information [2], [3], resulting in the correlation of market misvaluation and merger activities. A motivation to conduct this research is the fact that earlier studies on Australia mergers and acquisitions are largely based on the neoclassical paradigm. However, neoclassical theories, have not been very successful in explaining recent merger waves in US and in Australia, while

support is found for behavioural theories.

Traditional neoclassical theory views mergers as an efficiency-improving response to economic, regulatory and industrial shocks [1]. The rationale behind mergers allows firms to smoothly transit into a new competitive environment, increase their profitability, and value of their shares. However evidence found in supporting new classical views are not conclusive. The apparent trends found in the data for the methods of payment to target shareholders also challenges new classical views.

The new behavioral theories present a sharp challenge to the traditional views, trying to link takeover activity with stock market performance¹. Along these lines, Shleifer and Vishny (S&V) [2] and Rhodes-Kropf and Viswanathan (RK&V) [3] developed models which suggest that stock market misvaluations drive merger activity. One of the fundamental assumptions that are relaxed in these models is the efficiency of financial markets. This creates an environment for firms being misvalued alongside rational managers who understand this inefficiency and take advantage of time acquisitions with the purpose of making a profit. This theory however is in contradiction to Roll's hubris hypothesis [4] relating to takeovers, in which financial markets are rational, but corporate managers are not.

The behavioural model suggested by RK&V, hypothesis that rational targets have imperfect information and would accept a larger number of offers from overvalued bidders during hot markets because they overestimate potential synergies of the merger. This compares differently to S&V model in which target management is not only self-concerned, but hold imperfect information about the value of synergies. Imperfect information can affect the type of firms acquired since managers may, like investors during hot markets, overestimate the synergies that result from a merger and make poor acquisitions during hot markets.

The method of payment is a significant source of information to the market in a takeover and this can take the form of cash, stock, or a combination of both. The central prediction of misvaluation theory is that bidders profit by buying undervalued targets for cash, at a price below fundamental value. Alternatively, the bidders profit by paying stock for overvalued target firms, when they are overvalued at a lesser extent than the bidders' firms. Further, firms should use only cash to buy an undervalued firm because there is no role for true synergies in the model of S&V. RK&V [3] suggest cash targets should be less overvalued than stock targets, but may still be overvalued if

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¹Jovanovic and Rousseau [1] found high merger activity is correlated with high stock market valuations.

high synergies outweigh the overvaluation. Hansen [5] documented that the bidder prefers cash when they believe the target shares are undervalued, implying that the means of payment proposed by the acquiring company will indicate the perceived value of the target company. Overall, the theories suggest that cash mergers are driven by undervaluation or synergies or both, while stock mergers are driven by overvaluation. This argument provides background for proposing a second question: Do overvalued firm will pay cash to buy the undervalued firm?

Since both the theories from S&V and RK&V demonstrate misvaluation can cause a divergence between market value and firm fundamental value, the predictions from the theory. should also be stated in terms of how overvalued and undervalued firms take advantage of the scenario. For the theory to have empirical relevance, increase in valuation errors should affect the combativeness of the deal. Intuitively, the greater a firm's overvaluation, the more likely it is to win the bidding for a target and if this target is also (relatively less) overvalued, then the bidder also faces less combativeness to their offer. As a result, the last question posed in this study is to find out whether higher bidder overvaluation relative to target overvaluation does decrease (doesn't change) the combativeness of the deal.

II. DATA AND METHODOLOGY

This paper examines 284 takeovers from 2000 to 2007 by Australian companies listed on the Australian Stock Exchange (ASX). The takeover sample is from Zephyr Mergers & Acquisition database. Because our sample includes only publicly traded firms, this excludes transactions such as leverage buyouts (LBOs) and management buyouts (MBOs). We then match these data with fiscal year-end accounting data from Aspect/Huntley DatAnalysis database and stock price data from the Bloomberg to obtain a final sample. Earnings forecast needed for calculating the residual income intrinsic values are obtained from the Institutional Brokers Estimate System (I/B/E/S). Our final sample comprises 230 successful and 64 unsuccessful acquisition bids. All variables have been winsorised at the 1st and 99th percentiles to mitigate the impact of extreme observations by assigning the cut-off value to values beyond the cut-off point.

Following Ohlson, [6] and Baker, Stein, and Wurgler [7], we propose two proxies for misvaluation or the non-fundamental component of firm market price; price-to-book value of equity (P/B) and price-to-residual income value (P/RIV)². As P/B contains both fundamental and non-fundamental components, we need to control for the former as our interest is in the latter. Information content literature shows that accounting numbers used in fundamental valuations explain a significant part of contemporaneous and future stock return.

Prior literature considers P/B as a proxy for information about the ability of the firm to generate high returns on its

investments. Market value reflects mispricing and risk, whereas a book value reflects the fundamental value and filters our scale differences, thus P/B can provide a less noisy measure of mispricing [8]. However, it is debatable as to whether P/B return predictions reflect mispricing or risk premium. A further source of noise in P/B is that book value, the denominator of P/B, which is influenced by firm and industry differences in accounting methods.

We calculate P/B as a ratio of equity rather than total asset values, because it is equity rather than total asset misvaluation that is likely to matter for takeover decisions; a similar rationale applies to P/RIV. In our procedure, the P/B proxy is a ratio of the market value of equity to book value of equity. Following Baker and Wurgler (2002), for each stock the book value of equity is measured at the end of the prior fiscal year. The market value of equity is measured three days prior to the announcement. The firm's book value of equity determines the misvaluation, as the positive book value of equity indicates P/B is a positive measure of valuation. In contrast, negative book value of equity means P/B is negative and decreasing, and hence an inverse measure of valuation. Firms with a negative book value of equity (and positive market value of equity) indicate a high valuation, hence we classified these firms with the maximum value of P/B.

According to the recent theories [6], RIV expresses the intrinsic value of the firm's equity as the current book value of equity plus the present value of an infinite series of expected residual income, where the residual income is the difference between the reported income and the cost of equity capital multiplied by the reported book value at the beginning of the period. In practice, we apply a finite series of expected residual income, as Frankel and Lee [9] show. A naive model that uses current earnings performs as well to models using three or more forecasting periods when explaining future stock prices. The residual income model is derived from the discounted dividend valuation model and the assumption of clean-surplus accounting. The application of residual income valuation requires estimates of future income (or return on equity), cost of capital, and dividend payout rates, as well as an assumption about terminal value at the end of the forecasting horizon [10]. Following [9] model, we derive RIV with a three-period forecast horizon³.

$$RIV_t = B_t + \frac{B_t(FROE_{t+1} - r_e)}{1 + r_e} + \frac{B_{t+1}(FROE_{t+2} - r_e)}{(1 + r_e)^2} + \frac{B_{t+2}(FROE_{t+3} - r_e)}{(1 + r_e)^3} \quad (1)$$

where $FROE_t$ is the forecasted return on equity in year t , B_t is the estimated book value of common stockholders' equity at the end of the year t , and r_e is the estimated cost of capital. We estimate $FROE_t$, $FROE_{t+1}$, $FROE_{t+2}$ from I/B/E/S consensus forecasted earnings per share (FEPS), actual book value (B_{t-2} and B_{t-1}) from Aspect Huntley, and estimated future book values (B_t and B_{t+1}):

$$FROE_{t+1} = \frac{FEPS_1}{[(B_{t-1} + B_{t-2}) \div 2]} \quad (2)$$

³In the takeover context, Dong, Hirshleifer, Richardson, and Teoh [11] report the residual-income-value-to-price ratio helps explain long-run underperformance experiences by bidder firms in takeover situations better than the book-to-price ratio.

²See Frankel and Lee [9], who proposed a finite solution to Ohlson's model.

$$FROE_{t+2} = \frac{FEPS_2}{[(B_t + B_{t-1}) \div 2]} \quad (3)$$

$$FROE_{t+3} = \frac{FEPS_3}{[(B_{t+1} + B_t) \div 2]} \quad (4)$$

where future book value is estimated as:

$$B_t = B_{t-1} + FEPS_1 - DIV_t \quad (5)$$

$$B_{t+1} = B_t + FEPS_2 - DIV_t \quad (6)$$

DIV_t are calculated based on the dividend payout ratio in the most recent year. The last available closing price before the announcement date is divided by RIV, to obtain the P/RIV ratio.

III. EMPIRICIAL FINDINGS

In this section, we report the robust findings of our results. Table I presents mean acquirer and target valuation ratios by mode of offer and payment methods. The means of P/B and P/RIV, and their differences between acquiring and target firms, are reported in both the overall sample across modes of acquisition (tender offers versus merger offers) and methods of payment (cash, stock and mixed).

Panel A shows the overall sample against methods of payment, with bidding firms on average displaying higher valuation ratios than their targets. For a bidder, the average P/B and P/RIV ratio is 3.053 and 2.720 respectively, whereas for their targets it is 1.861 and 2.176 respectively. For our complete sample, there is a significant difference between bidder and target P/B of 1.192, highly significant at the 0.01 level. The P/RIV bidder and target differential is 0.544, and significant at the 0.05 level.

Examining the method of payment as a separate subsample, enables us to test the misvaluation claim that cash mergers are driven by undervaluation or synergies or both, while stock mergers are driven by market overvaluation. From Panel A for both cash and stock payment methods, the bidder valuation ratio exceeds the target ratio. Among the 49 cash subsample offers, the bidder-target P/B differential is 1.363 and the bidder-target P/RIV differential is 0.795. Among the 174 stock subsample offers, the bidder-target P/B differential is 0.934 and the bidder-target P/RIV differential is 0.705. All of these differentials are significant at the conventional statistical levels. Under mixed measurement sample, the overall mean valuation differential between bidder and target is also statistically significant.

Further evidence in Panel A suggests that target valuations of cash offers are significantly lower than target valuations of stock offers. Specifically, target stock P/B is 2.679 compared to cash P/B of 1.871, whereas target stock P/RIV is 2.423 compared to target cash P/RIV of 2.123. Both of these coefficients are highly significant. Similarly with bidder and valuations, where stock bidders on average have higher valuation compare to cash bidders; the stock-cash bidder difference is 0.379 for P/B and 0.210 for P/RIV and significant at conventional statistical levels.

From Panel B and C under both valuation measures, the bidder-target differential is statistically significant. For

instance, in Panel C, we find for 182 merged deals the differential between bidder and target P/V and P/RIV is 0.149 (marginally significant at the 0.10 level) and 0.538 (significant at the 0.05 level). With respect to cash versus stock offer, differentials from the tender and merged offer subsets are also positive and statistically significant.

Table II presents mean valuation ratios (P/B and P/RIV) ranked into quintiles. For each month, acquirer and target firms are assigned a rank between 1 to 5, where 5 is the top valuation quintile with the highest bidder or target P/B or P/V. The difference across the top and bottom quintile is reported to display the relationship between higher market valuation and transaction characteristics. The valuation ratios is then broken down into target and bidder and examined across a wide range of transactions characteristics. Panels A and B report the effects of target valuation on takeover characteristics. Panels C and D report the effects of acquirer valuation on takeover characteristics. By ranking bidders and targets based on their valuation ratios, we avoid time series swings. We also ensure that any effects we identify in the valuation and takeover characteristics are purely cross-sectional.

Comparing target stock valuations to target cash valuations at each quintile, we see that the higher target valuation is associated with greater use of equity compared to cash as the method of payment. Panels A and B show that stock is more likely to be used as the method of payment when the target has a higher valuation as the difference between the highest quintile and lowest quintile with P/B is 13.9% (with P/RIV being 9.6%) which are both highly significant. This is the converse for cash; as the higher the target valuation ratio, the lower the probability that cash will be used as the method of payment. The quintile difference for cash payments is -13.2% for P/B and -10.0% for P/RIV, again both are highly significant.

We also find that higher target valuations are associated with a greater chance of offer success and being a merger, whilst being less hostile. Therefore, these findings indicate that the transaction is less combative with higher target valuations. Specifically, the transaction is less likely to be hostile when the target has a higher valuation (for P/B, the quintile difference is -10.9% and for P/RIV it is -3.4% and are both significant). A transaction is more likely to take the form of a merger with higher target valuation of the quintile difference 15.6% (P/B) and 10.2% (P/RIV). The chance of the transaction being successful also increases with higher target valuation; significant for the quintile difference of 7.2% for P/B and insignificant for P/RIV of 1.8%.

Panels C and D displays the relationship between bidder valuations and takeover characteristics. Firstly, higher bidder valuation is associated with a greater use of equity and less use of cash as a means of payment. Bidders with higher valuations are more likely to use stock as the means of payment. The difference in probability of using stock between the top and bottom valuation quintiles is 10.6% for P/B and 17.5% for P/RIV. Conversely, high valuation acquirers are less likely to use cash as consideration. The difference in the probability of cash offers between the top and bottom valuation quintiles is -10.1% and -5.9% for P/B and P/RIV respectively.

TABLE I: MEAN CHARACTERISTICS OF ACQUIRER AND TARGET VALUATION RATIOS

Panel A: All

	N	Ratio	Bidder	Target	Bidder - Target	Bidder - Cash	Stock Target Stock - Cash
Cash	49	P/B	3.234	1.871	1.363***	0.379*	0.808**
		P/V	2.918	2.123	0.795**	0.210**	0.300*
Stock	174	P/B	3.613	2.679	0.934**		
		P/V	3.128	2.423	0.705**		
Mixed	61	P/B	2.312	1.032	1.280***		
		P/V	2.113	1.981	0.132*		
All	284	P/B	3.053	1.861	1.192***		
		P/V	2.720	2.176	0.544**		

Panel B: Tender Offers

	N	Ratio	Bidder	Target	Bidder - Target	Bidder Stock - Cash	Target Stock - Cash
Cash	21	P/B	3.121	2.131	0.990***	0.092	0.29*
		P/V	2.031	1.982	0.049	2.49***	0.03
Stock	58	P/B	3.213	2.421	0.792**		
		P/V	4.521	2.012	2.509***		
Mixed	23	P/B	2.506	2.321	0.185**		
		P/V	3.113	1.981	1.132**		
All	102	P/B	2.947	2.291	0.656**		
		P/V	3.222	1.992	1.230***		

Panel C: Merged Bids

	N	Ratio	Bidder	Target	Bidder - Target	Bidder - Cash	Stock Target Stock - Cash
Cash	28	P/B	3.183	2.941	0.242**	0.049	0.270*
		P/V	2.434	1.896	0.538**	0.52**	0.116*
Stock	116	P/B	3.232	3.211	0.021		
		P/V	2.954	2.012	0.942***		
Mixed	38	P/B	2.506	2.321	0.185*		
		P/V	2.115	1.981	0.134*		
All	182	P/B	2.974	2.8243333	0.149*		
		P/V	2.501	1.963	0.538*		

This table presents mean acquirer and target valuation ratios by the mode of the offer and payment method. The t-statistic of differences between acquirer and target, and between stock and cash offers are reported as (*, **, ***) characteristics which represents significant levels of 0.10, 0.05 and 0.01, respectively. P/B is the price-to-book ratio and P/RIV is the price-to-residual income value ratio.

It is also shown that higher bidder valuation increases the chance of a merger offer rather than a tender offer. High valuation bidders are less likely to use tender offers and more likely to use merger bids. In Panels C and D, the quintile difference of the probability of a tender offer is -8.0% and -4.3% for P/B and P/RIV respectively. Higher bidder P/B is associated with higher bid premia and higher target stock returns. Panel C shows high valuation bidders paying with stock also pay a higher bid premia. The quintile differential in premium paid is 1.7%, slightly significant at 10%. Panel D shows 2.1% difference in probability for P/RIV which is significant at the 5% level. In the entire sample, the P/B quintile difference in target announcement-period stock returns is 1.9%, slightly significant at 10%. Similarly, P/RIV has a target period stock returns differential of 2.6%. Higher bidder P/B and P/RIV is associated with lower bidder announcement-period returns.

In conclusion we confirm that misvaluation exist within the Australian market. They are also consistent with the hypotheses we developed and we have summarised them below.

High valuation bidders are more likely to use equity rather than cash as the sole consideration. Higher target valuations are associated with equity rather than cash as the sole means of payment. Higher valued bidders are more likely to pay a higher premium, more inclined to use a merger bid and earn lower announcement-period returns. Lower valued targets receive a higher premium relative to the market price. Lower valued targets are more likely to be hostile to the offer and more likely to receive tender offers. Lower valued targets have a lower probability of being successfully acquired and earn higher announcement-period returns. Acquiring firms are valued significantly higher than targets in the full sample.

TABLE II: MEAN ACQUISITION CHARACTERISTICS OF ACQUIRER AND TARGET VALUATION RATIO QUINTILES

Panel A: Acquisitions by Target P/B Ratio								
Target P/B rank	Target P/B	% of successful transactions	% of hostile transactions	% of tender offers	% of merger transactions	% of cash payment transactions	% of stock payment transactions	Bid Premium
1	1.3	74.1	13.3	36.4	63.6	34.5	45.7	28.8
2	1.6	74.3	12.5	34.9	65.1	29.5	50.5	25.6
3	1.9	75.6	9.7	30.2	69.8	28.4	52.6	25.8
4	2.51	78.1	2.7	29.8	70.2	25.2	58.2	26.3
5	2.9	81.3	2.4	20.8	79.2	21.3	59.6	22.6
Difference (5-1)	1.6***	7.2***	-10.9***	-15.6***	15.6**	-13.2***	13.9***	-6.2***
Panel B: Acquisitions by Target P/RIV Ratio								
Target P/B rank	Target P/B	% of successful transactions	% of hostile transactions	% of tender offers	% of merger transactions	% of cash payment transactions	% of stock payment transactions	Bid Premium
1	1.1	79.1	10.1	28.3	71.7	29.1	42.5	33.5
2	2.3	78.4	9.8	26.3	73.7	29.1	45.7	32.1
3	4.9	75.1	8.5	25.4	74.6	25.6	49.1	32.8
4	5.6	79.3	8.1	22.1	77.9	23.1	50.1	29.4
5	6.1	80.9	6.7	18.1	81.9	19.1	52.1	28.1
Difference (5-1)	5.0***	1.8	-3.4**	-10.2***	10.2**	-10.0***	9.6**	-5.4***
Panel C: Acquisitions by Bidder P/B Ratio								
Bidder P/RIV rank	Bidder P/RIV	% of successful transactions	% of hostile transactions	% of tender offers	% of merger transactions	% of cash payment transactions	% of stock payment transactions	Bid Premium
1	1.3	78.1	8.4	22.5	77.5	28.5	34.5	33.4
2	1.3	72.7	9.4	19.0	81.0	33.6	35.7	35.4
3	1.5	81.5	8.1	19.9	80.1	29.5	36.8	35.8
4	3.1	80.1	7.6	15.5	84.5	22.5	38.9	36.1
5	8.5	85.6	7.1	14.5	85.5	18.4	45.1	35.1
Difference (5-1)	7.2***	7.5***	-1.3**	-8.0***	8.0***	-10.1***	10.6**	1.7*
Panel D: Acquisitions by Bidder P/RIV Ratio								
Bidder P/RIV rank	Bidder P/RIV	% of successful transactions	% of hostile transactions	% of tender offers	% of merger transactions	% of cash payment transactions	% of stock payment transactions	Bid Premium
1	1.0	75.4	7.9	18.2	81.8	29.3	38.6	35.1
2	1.3	76.8	7.5	21.1	78.9	29.5	41.2	35.2
3	1.9	79.1	8.1	22.5	77.5	28.3	44.4	35.8
4	2.2	83.4	8.5	16.4	83.6	26.6	51.2	35.1
5	3.9	82.9	6.3	13.9	86.1	23.4	56.1	37.2

This table presents mean valuation ratios (P/B and P/RIV) ranked into quintiles, ranked between lowest 1 (most undervalued) to 5. P/B is the price-to-book ratio and P/RIV is the price-to-residual income value ratio. The mean acquisition characteristics for each of the quintiles is difference in means between ranks 1 and 5. Bid premium is the ratio of the bid offered by the acquirer to the target stock price 5 days prior to the announcement of the takeover bid. *, **, *** denote that the difference in means between ranks 1 and 5 is significant at the 10%, 5% and 1% level, respectively, based on the two sample t-test.

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