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Research article

Relative mispricing and takeover likelihood

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Abstract: This paper examines the effect of acquirer likelihood on future stock returns. In sharp contrast to prior findings, acquirer likelihood is a strong and negative predictor of cross-sectional future returns after controlling for target likelihood. If takeover exposure represents a risk premium, the effect on stock valuation should only present in either likelihood measure (acquirer or target likelihood). This evidence casts doubt on the rational risk explanation, but is consistent with a relative mispricing story. Investors take positions accordingly to explore profits from takeovers. Profits from trading strategy based on takeover probability are concentrated in stocks with high misvaluation characteristics, including small size, value, high momentum, high investment, and low turnover firms, as well as both high and low issuance (or accrual) firms.

Keywords: acquisition; merger; takeover; firm efficiency; mispricing; corporate control; corporate governance; portfolio choice

JEL Codes: G1; G11; G34

1. Introduction

Does takeover exposure represent mispricing or risk in the cross-sectional stock returns? Recent paper by Cremers et al. (2009) documents a positive relationship between target likelihood and future stock returns and argues that it is consistent with a risk-based explanation. Target firms are exposed to cash flows shocks or discount rate risk because acquirers have more free cash, or lower required rates of return. Difference in takeover exposure means difference in exposure to asset pricing state variables.

Takeover markets offer a unique testing ground for the risk-based hypothesis. In prefect capital markets, higher returns (or low returns) for high target likelihood firms (or high acquirer likelihood firms) would reflect compensation for higher (or lower) systematic risk. If the link between takeover probabilities

and cross-sectional stock returns can be attributed to risk (Cremers et al., 2009), then target likelihood and acquirer likelihood should capture the same risk exposure. This indicates that acquirer likelihood, the likelihood of being an acquiring firm, should have no incremental effect on the cross-sectional stock return beyond target likelihood, the likelihood of being a target firm.

In this paper, we find that stocks with high acquirer likelihood earn significantly lower future returns than similar stocks in both portfolio and regression settings after controlling for target probability. In independent-sorting portfolios on acquirer and target probability, strategies that go long on the lowest acquirer probability portfolio and short the highest acquirer probability portfolio earn significantly positive future returns in all target probability quintiles. The acquirer effect is more pronounced for longer holding periods, and the results are robust to various risk-adjustment techniques. Based on the results in Fama-MacBeth regressions, a one percent increase in acquirer likelihood corresponds to a four percent decline in future one-month stock returns. This is inconsistent with the interpretation of takeover exposure as a proxy for risk.

Alternatively, the evidence in this paper supports the relative mispricing hypothesis. Misvaluation is an important factor in takeover market (Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004). Bidder and target overvaluations reflect expropriation opportunities, information asymmetries and managerial incentives. Bidders profit from purchasing less overvalued (or undervalued) assets using relatively cheap currency (equity). Over-optimistic investment opportunities can induce managers to acquire firms to confirm investor expectations (Polk and Sapienza, 2009).

Under the behavioral approach, market valuation is a determining factor in takeovers. We hypothesize that takeover likelihood can be viewed as a measure of relative overvaluation. Markets are consisting of different scales of misvaluation firms, including overvalued, fair-valued and undervalued firms[1]. Shleifer and Vishny (2003) argue that overvalued firms are motivated to acquire fair-valued and undervalued firms to capture real assets[2]. For fair-valued firms, mangers acquire undervalued firms to survive competition or avoid losing private benefits and controls in the acquisition process (Gorton et al., 2009). Morck et al. (1988) find that target managers are likely to be replaced or play subordinate roles in the new firms after being acquired. Potential acquirers tend to be overvalued and potential targets tend to be undervalued stocks, but fair-valued firms may be either.

Overvaluation determines the potential acquirer and potential target between two firms. Furthermore, a firm is facing an entire market of potential acquirers. If takeover likelihood corresponds to relative mispricing, acquirer probability and target probability should have different influences on future stock returns. Probable investors are likely to short probable acquirers even if these firms do not engage in M&A activities. Investor should go long on probable targets. Several studies find evidence of abnormal volume and price increases during periods of known insider trading (Cornell and Sirri, 1992; Meulbroek, 1992; Meulbroek and Hart, 1997; Chakravarty and McConnell, 1997; 1999; Fishe and Robe, 2004). By examining trading in target firms prior to M&A announcements, other studies (Jarrell and Poulsen, 1989; Gao and Oler, 2012) conclude that the observed abnormal trading activities and the resulting price run-ups are consistent with market anticipation of a takeover announcement. Probable acquirers become less overvalued and probable targets become more overvalued (or less undervalued).

[1]The implication does not change if these firms are changed to more overvalued, median overvalued, and less overvalued firms.

[2]To capture the benefits of overvaluation from M&A, acquirers are not restricted to use stock as the method of payment. Issuing equity prior to M&A and make cash offers, acquirers also benefit from their overvalued equity as stock acquisition.

We examine trading strategies based on takeover probability in different mispricing subsets as a further test of the mispricing hypothesis. We find that the takeover effect concentrated in small size, value, high momentum, high investment, and low turnover firms, as well as both high and low net issuance (or accrual) firms. These characteristics are associated with firms that are expensive for investors to arbitrage and are likely to be mispriced[3]. This evidence supports the relative mispricing hypothesis.

The rest of the paper is organized as follows. Section we discuss the sample data, summary statistics, and adjustment for outliers and other data problems. In section II, we construct a dynamic logit model of target probability and another to estimate acquirer probability. In section III, we conduct portfolio analyses based on these likelihoods. Section IV, we test the takeover effects on different firm characteristics. Section V reports my conclusions.

2. Data and Estimation

Acquirers and targets are identified from the Securities Data Corporation (SDC), which compiles a database with a broad range of M&A activities between January 1981 and December 2009. After filtering the sample (see section C), we obtain 22,008 acquirer observations and 6922 target observations. Table 1 provides summary of the takeover activities over the sample period. There is an obvious increasing pattern before year 2000 for both acquirers and targets. In fact, the number of acquirers (target) is 2477 (1844) in the 80s, but the number becomes 9105 (3127) in the 90s[4]. Takeover activities subsequently stabilize.

The dataset also provides information on whether the acquisition is successful, the mode of payment, announcement date, completion date, transaction value, and industry SIC code. We consider all announced deals (both complete and not) since this paper studies the expected level of takeovers. We create two dummy dependent variables. For each month, we assign a value 1 to the acquirer dummy (AC) if a firm announces to acquire another firm and 0 otherwise. At the same time we assign a value 1 to the target dummy (TA) for the corresponding target firm and 0 otherwise.

We obtain daily and monthly stock returns, prices, and trading volumes from CRSP monthly and daily data. Annual accounting data are from COMPUSTAT annual file. IBES covers analyst data, which contains analyst earnings forecasts, long term growth estimates, and recommendations[5]. To align firms with different fiscal year-ends in calendar month, we match fiscal year t-1 accounting data to the monthly market data from May of year t to April of year t+1 based on the assumption that accounting data of fiscal year t-1 is available to all investors on April of year t. Then we match prior quarter analyst data to current month securities data.

[3]See, for example, Ritter (1991), Loughran and Ritter (1995), Stein (1996), Sloan (1996), Teoh et al. (1998b, 1998a), Teoh et al. (1998), Baker and Wurgler (2000), Lee and Swaminathan (2000), Jegadeesh and Titman (2001), Bakeret et al. (2003), Titman et al. (2004), Zhang (2006), Henderson et al. (2006) and Dong et al. (2007).

[4]The huge unbalance between the number of acquirer and that of target is due to the fact that many targets are privately owned firms, which do not appear in our sample. The empirical results are robust to eliminating non-public target observations.

[5]We also use EXECUCOMP database and RiskMetrics database in the robustness check section.

Table 1. Number of acquirers and targets by year.

Year	N	Acquirer	Acquirer-ME	Target	Target-ME
1981	13,321	125	1,067.85	76	264.67
1982	13.849	169	1174.82	81	341.19
1983	14,604	229	1131.56	151	488.97
1984	16,043	335	1,237.44	293	714.12
1985	16,171	221	1,986.01	193	643.65
1986	16,958	337	1,636.14	201	622.84
1987	17,030	312	2,581.08	261	1,465.17
1988	17,021	325	2,382.43	278	828.95
1989	18,212	424	2,995.64	310	1,143.56
1990	18,445	457	1,634.70	212	752.63
1991	18,688	431	1,799.96	168	521.77
1992	19,254	560	1,287.56	159	650.72
1993	20,705	625	1,524.67	188	1,150.66
1994	22,847	831	1,940.84	334	595.18
1995	24,910	891	2,692.63	390	1,003.30
1996	27,584	1,109	2,804.02	407	1003.71
1997	29,960	1,294	4,026.65	391	872.34
1998	32,790	1,476	4,177.35	431	1,297.02
1999	33,882	1,431	6,633.69	447	1,755.96
2000	31,611	1,197	7,392.50	374	1,478.79
2001	29,253	979	7,174.56	182	942.52
2002	28,252	954	6,837.95	119	1,216.65
2003	29,038	946	7,550.69	150	865.57
2004	29,937	1,077	9,549.23	137	2,032.08
2005	30,584	1,157	12,202.49	194	2,531.67
2006	31,485	1,207	12,744.90	206	3,384.11
2007	31,971	1,163	17,082.51	264	3,239.13
2008	31,798	975	15,742.08	199	2,854.87
2009	32,069	771	14,505.16	126	2,424.64
1981–1989	129,374	2,477	1,799.22	1,844	3,635.05
1990–1999	249,065	9,105	2,852.21	3,127	960.33
2000–2010	305,998	10,426	11,078.21	1,951	2,097.00

Note: This table reports the numbers of acquirers and targets per year and their market capitalization in our sample data. Table also reports the average number of observations in our whole sample per year (N). ME is the market capitalization in millions. The sample period ranges from January 1981 to April 2010.

Prior literature applies the market-to-book ratio (or analogous variables such as Tobin's Q) to capture the valuation effect on takeover. Motivated by Rhodes-Kropf et al. (2005), we decompose the market to book ratio because market value is a noise measure of fundamental value. Market value reflects both overvaluation and information on future earnings growth prospects. Between observed market price and fundamental value, there is a mispricing componentwhich the literature generally

attributes to behavioral causes[6]. Mispricing significantly affects finance decisions (Dong et al., 2012), predicts future abnormal returns (Frankel and Lee, 1998; Lee et al.,1999), and predicts takeover-related activities (Dong et al., 2006). The estimate of residual income value (V) contains forward-looking information, which filters firm characteristics other than misvaluation, such as earnings growth prospects, risk, and managerial problems. We adopt methodology similar to Dong et al. (2006) and Dong et al. (2012).

2.1. Mispricing measure

We follow the approach of Dong et al. (2006) and Dong et al. (2012) who use Ohlson's (1995) residual income model. There are two obvious advantages of using the residual income model. First, the "clean surplus" calculation allows different accounting treatments and the results are unaffected (Ohlson, 1995). Second it contains forward-looking information from analyst forecasts of future earnings and filters growth expectations not related to misvaluation[7].

Under the "clean surplus" calculation, increases (or decreases) in book value of equity are equal to earnings minus dividends. The intrinsic value (V_t) includes both book value of equity and an additional component to reflect the firm's forecast excess income, which is measured by analysts' earnings forecasts. To measure fundamental value for each stock in month t, we measure the residual income model as follows:

$$V_t = B_t + \sum_{\tau=1}^{\infty} \frac{E_t[(ROE_{t+\tau} - r_t^e)B_{t+\tau-1}]}{(1+r_t^e)^{\tau}} \tag{1}$$

where E_t is the conditional expectation operator, B_t is the book value of equity at time t, $ROE_{t+\tau}$ is the return on equity for period $t+\tau$, r^e_t is the firm's annualized cost of equity.

To implement estimation, we replace equity (1) to a finite series of T-1 periods and a terminal value. The terminal value is equal to the present value of perpetual of residual income (Dong et al., 2006; Dong et al. (2012). Since the estimated fundamental value is not sensitive to the choice of the forecast period beyond three years (Lee et al., 1999), we use a three-period horizon to estimate the residual income valuation:

$$V_t = B_t + \frac{[f(ROE_{t+1}) - r_t^e]\,B_t}{1+r_t^e} + \frac{[f(ROE_{t+2}) - r_t^e]\,B_{t+1}}{(1+r_t^e)^2} + \frac{[f(ROE_{t+3}) - r_t^e]\,B_{t+2}}{(1+r_t^e)^2 r_t^e} \tag{2}$$

where $f(ROE_{t+i})$ is the forecasted return on equity for period t+i. Forecasted ROE is:

$$f(ROE_{t+i}) = \frac{f(EPS_{t+i})}{\bar{B}(t+i-1)} \tag{3}$$

[6]See Modigliani and Cohn (1979), Shiller (1981), Shleifer and Vishny (1997), Scheinkman and Xiong (2003), Brunnermeier and Julliard (2008), and Chen, Lung, and Wang (2009). Behavioral models imply that B/P is correlated with misvaluation, and therefore is a predictor of abnormal returns (e.g., Barberis and Huang 2001; Daniel, Hirshleifer, and Subrahmanyam 2001).

[7]Sell-side analyst forecasts are well-known with their biases due to either strategic actions from analysts or common psychological biases. These biases can only weaken the results of this paper. If that is the case, the results should be interpreted as a conservative version of the results using true misvlauation.

where

$$\bar{B}(t+i-1) = \frac{B(t+i-1) + B(t+i-2)}{2} \tag{4}$$

and where

$$B(t+i) = B(t+i-1) + (1-payout) f(EPS_{t+i}) \tag{5}$$

where $f(EPS_{t+i})$ is the forecast EPS for period t+i. *payout* is the dividend payout ratio and is equal to dividends divided by earnings[8]. If the EPS forecast for any horizon is missing, we replace it with the EPS forecast for the previous horizon. We restrict each of f(ROE)s to be less than one.

For the annualized cost of equity, r^e_t, we consider the CAPM and the Fama-French three-factor model. In the tables, we report results based on the CAPM but findings based on the Fama-French three-factor model remain qualitatively the same. Following Fama and French (1992), for each month of each firm, the beta of time t is estimated on the prior 24 to 60 monthly returns (as available). The market risk premium and risk free rate are obtained from Professor French's website. To reduce outlier problems in the beta estimation, we winsorize the annualized cost of equity into the range of 5% to 25%. Following Dong et al. (2006) and Dong et al. (2012), we use V/P, fundamental value (Equation 2) divided by price per share, as a misvaluation proxy.

2.2. Earnings growth prospects

Past literature documents that B/P, book value per share divided by price per share, is a robust and positive predictor of the cross-section returns. While risk models argue that B/P is correlated with growth, behavior models claim that B/P is related to misvaluation (Daniel et al., 2001). This implies that B/P is likely to be a noisy proxy of firm characteristics, such as earnings growth expectations. By replacing market value with the residual income measure of fundament value, B/V can capture earnings growth prospects better than B/P in filtering out misvaluation. We calculate B/V as a ratio of book equity to fundamental value, which is measured by the residual income model. In the final sample, the correlation of V/B with V/P is fairly low, 0.068, so they may offer useful independent information about growth or misvaluation.

2.3. Data filtering, outliners, and adjustments

In the raw data, there are serious negative book value of equity problems and outlier problems. Following Cohen et al. (2003), the book value of equity is adjusted by adding 10% of the difference between the market value and the book value of equity. After these changes, we still find less than 1% of sample firms have negative book values of equity. We replace the negative adjusted book values of equity with values of $1. Similar adjustments are made to the book value of assets.

For the outlier problem in our sample, we winsorize all variables at the 1 and 99 percent levels for the entire sample. We implement some additional filtering criteria and adjustments as follow:

1. The observation date is between January 1981 and December 2009. This means the sample for mergers and acquisitions should also fall within these periods

[8]Following Lee et al. (1999), we replace negative payout ratio (due to negative EPS) to the ratio of dividends over 6% of total assets. We also delete observations with payout ratio greater than one.

2. Both the acquirer and the target are public and trade in NYSE, AMEX, or Nasdaq
3. Firms are required to have earnings forecast data in IBES
4. Firms are required to have valid information on total assets, the book value of shareholder's equity, the book value of total liability, sales, cash and short-term investment, operating income, market capitalization, and total outstanding shares
5. Observations with negative value in capital expenditure, sales, cash and short-term investment, inventory, capital expenditure, plant, property, and equipment, and price per share are discarded.
6. We replace missing values in plant, property, and equipment with zero
7. V/P and B/V are not missing in the data sample
8. Financial firms (with one-digit SIC of 6) and utility firms (with two-digit SIC of 49) are eliminated.

Next, we explore the summary statistics and characteristics of the filtered and adjusted variables

2.4. Summary Statistics

Table 2. Summary statistics of firm characteristics.

VARIABLES	N	MEAN	STD	25%	MEDIAN	75%
Panel A: All Firms						
MB	699,877	3.421	5.081	1.235	2.043	3.590
PPE	699,877	0.607	0.439	0.268	0.516	0.868
CASH	699,877	0.164	0.200	0.022	0.078	0.231
SIZE	699,877	5.842	1.913	4.447	5.696	7.077
LEV	699,877	0.491	0.213	0.316	0.491	0.638
ROA	699,877	0.031	0.129	0.014	0.049	0.089
VP	699,877	0.675	0.913	0.154	0.371	0.983
VB	699,877	1.860	3.343	0.301	0.803	2.191
AC	699,877	0.032	0.175	0.000	0.000	0.000
TA	699,877	0.010	0.097	0.000	0.000	0.000
Panel B: Acquirers and Target						
	Acquirer			Target		
MB	22,118	4.201	2.702	6,686	3.420	2.061
PPE	22,118	0.569	0.471	6,686	0.595	0.503
CASH	22,118	0.148	0.074	6,686	0.162	0.074
SIZE	22,118	6.686	6.559	6,686	5.545	5.388
LEV	22,118	0.498	0.511	6,686	0.492	0.507
ROA	22,118	0.044	0.054	6,686	0.015	0.040
VP	22,118	0.640	0.356	6,686	0.616	0.323
VB	22,118	2.130	0.994	6,686	1.736	0.755

Note: This table reports the summary statistics of firm characteristics. The sample period ranges from January 1981 to December 2009. The log value of market to book ratios (MB) is defined as the ratio of the total market value of equity (ME) over the book value of equity (BE). Fixed asset ratio (PPE) is defined as the property, plant and equipment to the book value

of total asset. Firm liquidity ratio (CASH) is the cash and short-term investment to the book value of total asset. Firm size (SIZE) is the log value of total capitalization at the end of fiscal year. Firm leverage (LEV) is the total liability to the book value of total asset. Firm profitability (ROA) is the net income to the book value of total asset. We add an extra variable (BLOCK) to capture firm's corporate government as Cremers et al. (2009). BLOCK is a dummy variable equal to 1 if one or more than one institutional investor holds more than 5% of the company's stock and 0 otherwise. Mispricing measure (V/P) is the ratio of fundamental value over market value, where fundamental value is estimated through a residual income model as Dong et al. (2006) and Dong et al. (2012). Growth (VB) is the ratio of fundamental value over book value. AC is a dummy variable equal to 1 if a firm announces to acquire another firm and 0 otherwise. TA a dummy variable equal to 1 if a firm is being acquired and 0 otherwise. All variables are winsorized at the 1 percent and 99 percent level expect for TA, and AC.

Table 2 shows the summary statistics of filtered and adjusted variables. There are 684,437 firm-month observations with complete data available. Panel A of Table 2 reports the distributions of the independent variables for the basic models for all firms. Panel B of Table 2 describes the variables for acquirer and target firms. All variables are free from the outlier problem as the table indicates. Using Panel A as a benchmark, targets and acquirers are distinct from each other and average firms. Acquirers have much higher market-to-book ratio compared to average firms, but targets' market to book ratio is similar to average firms. This indicates that the market to book ratio might not be a good indicator in identifying targets. Of all accounting variables, size stands out as an apparent identifier for acquirers and targets. The average size for acquirers is 6.686 and for target is 5.545, but the average size of sample firms is 5.842. This evidence is consistent with the "eat or be eaten" theory, where size is important factor in determining acquirers or targets.

In Panel B, the mispricing measure (V/P) in acquirers and targets are significantly lower than average firms, which indicates that these firms are overvalued relative to average firms. More importantly, acquirers are growth firms with higher V/B and targets are value firms with lower V/B compared to average firms. For example, average V/B of average firm is 1.86, where that of acquirer is 2.13 and that of target is 1.74. For the entire sample, there are 3% acquirer observations and 1% target observations.

3. The logistic models of takeovers

3.1. Acquirer and target models

For each sample month, we estimate (separately) logistic regressions of the likelihood of acquirer and target on various independent variables as appropriate. The basic assumption is that the probability of a firm to be an acquirer or target in the next month is logistically distributed. The logistic model can be represented as follows:

$$P_{t-1}\left(Y_t^i = 1\right) = \frac{1}{1 + e^{(-z_{t-1}^i)}} \tag{6}$$

where $z_t^i = \alpha + \beta x_t^i$, P is the probability measure, Y is either the acquirer dummy (AC) or the target dummy (TA), α is the constants term, β is a vector of coefficients, and x is a vector of independent variables. The larger is the value of z, the higher is the likelihood that a firm will be an acquirer or target.

We construct the dummy variable, BLOCK, which is equals to 1 if one or at least one blockholder with more than 5% ownership at the end of previous year and 0 otherwise. Thompson/CDA spectrum

provides data on institutional share holdings on quarterly basis from SEC 13f filings. Industry dummy variable is SIC 4 digits code to capture the clustering of takeover activity with industry. The time dummy variable is constructed using a combination of year and month.

Table 3. Dynamic logistic models of acquirer/target.

	Acquirer		Target	
	Model 1	Model 2	Model 3	Model 4
MB	0.022***		0.007***	
	(20.61)		(3.33)	
V/P		–0.018****		–0.006
		(–6.85)		(–1.22)
V/B		–0.006**		–0.005*
		(2.48)		(–1.87)
PPE	–0.320***	–0.319***	–0.042	–0.043
	(–17.45)	(–17.39)	(–1.36)	(–1.35)
CASH	–0.656***	–0.455***	0.077	0.131
	(–13.66)	(–17.39)	(0.94)	(1.64)
LEV	–0.181***	–0.056	0.310***	0.349***
	(–4.64)	(–1.43)	(4.39)	(4.99)
ROA	0.314***	0.331***	–0.999***	–1.028***
	(5.18)	(5.03)	(–11.22)	(–11.47)
SIZE	0.220***	0.228***	–0.043***	–0.040***
	(53.24)	(55.55)	(–5.97)	(–5.57)
BLOCK	1.154***	1.143***	1.473***	1.469***
	(34.93)	(34.47)	(24.93)	(24.82)
Constant	–5.406***	–5.459***	–4.654***	–4.669***
	(–121.97)	(–122.77)	(–62.01)	(–62.23)
ID	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes
PSEUDO R^2	0.03	0.03	0.02	0.02

Note: This table reports logistic regression results on the likelihoods of being an acquirer and being a target. The sample period ranges from January 1981 to December 2009. The dependent variable is either the acquirer dummy (AC) or the target dummy (TA). The independent variables include the market to book ratios (MB), fixed asset ratio (PPE), firm liquidity ratio (CASH), firm size (SIZE), firm leverage (LEV) firm profitability (ROA), Block holder (BLOCK) mispricing measure (V/P), growth measure (V/B), and the industry dummy (ID), the year-month dummy (Time Dummy). All variables are winsorized at the 1 percent and 99 percent level expect for TA and AC. The value of t-statistics is in parentheses. * denotes 10% significant level, ** denotes 5% significant level, and *** denotes 1% significant level.

Table 3 describes the results of logistic regressions. The first and the second columns are for the acquirer model and the last two columns are for the target model. We present a version of the basic model as Model 1 for acquirer and Model 3 for target with independent variables used in prior

literature[9]. In Model 1, all explanatory variables are significant predictors on the likelihood of being an acquirer. Acquirers have less fixed asset, cash, leverage and have higher market-to-book ratio and profitability than the average firm. They also tend to be large firms with large blockholders, where the coefficient of size is 0.22 in 1% significant level. Model 1 has Pseudo R^2 of 0.03.

Model 2 replaces the market-to-book ratio with the mispricing measure (V/P) and growth measure (V/B). The coefficient of –0.018 (t = –6.85) on V/P is a significantly negative predictor in the acquirer model, which indicates that greater mispricing leads to higher acquirer likelihood. This is consistent with the overvaluation hypothesis of Dong et al (2006). In addition, V/B has negative predictive power on the likelihood of being an acquirer. The coefficient of V/B is –0.006 with t-statistics of –2.48, indicating that acquirers tend to have lower earnings growth prospects than average firms. All other variables have similar coefficients with similar significant levels relative to Model 1 except for leverage. The Pseudo R^2 of Model 2 (0.03) is similar to Model 1.

Model 3 of Table 3 is the target basic model. The market-to-book ratio has significant and positive power in predicting the likelihood of being a target unlike Cremers et al. (2009). This is puzzling under the normal theory of takeovers because the market-to-book ratio has been claimed to be a measure of productivity or growth opportunities[10]. However, it is consistent with the misvaluation theory of Dong et al. (2006). Target firms can be overvalued firms, but less overvalued than acquirer (the coefficient of MB on Model 1 and that of Model 3). Targets tend to have higher cash, leverage, lower fixed assets, and ROA. They are also likely to be small firms with large blockholders. This is consistent with the "eat or be eaten" theory, which states that small firms are vulnerable to takeovers. Model 3 has Pseudo R^2 of 0.02, which is similar to prior literature.

The decomposition of MB in model 4 confirms the results from the basic model. The mispricing measure (V/P) is a negative but insignificant predictor of target likelihood. Consistent with the misvaluation theory, targets are less overvalued than acquiring firms[11]. On the contrary, the coefficient of V/B is –0.005 (t = –1.87), indicating that targets are low growth firms (or firms with management problems) and disciplinary actions will initiate in financial markets. The Pseudo R^2 is 0.02. All other variables have similar coefficients with similar significant levels relative to Model 3. The Pseudo R^2 of Model 2 (0.02) is similar to Model 3.

Figure 1 shows monthly aggregate measures of realized and predicted takeover percentages. The model of acquirer likelihood captures the majority of variation in realized acquirer percentage, with some minor errors. The gradual increment in the percentage of acquirer from 1981 to 2000 and the gradual decline from 2000 to 2005, and in 2010, are well captured by the model. However, it slightly overpredicts the likelihood of being an acquirer during the period 2000–2009.

It is clear that aggregate realized target percentage varies and is mean-revering. Our model of target likelihood has not performed as well as our model of the acquirer likelihood, but it does capture the trend of aggregate realized target percentage. The lack of fit may be due to a number of factors.

[9]See, for example, Hasbrouck (1985), Palepu (1986), Ambrose and Meggison (1992), and Cremers et al. (2009).

[10]Discussion about the market-to-book ratio can be found in Hasbrouck (1985). Cremers et al. (2009) and Bates et al. (2008) find a significant relation between Q and takeover targets but Palepu (1986) and Ambrose and Megginson (1992) uncover no link. Also see the work on Tobin's Q and takeovers of Lang et al. (1991), Servas (1991), Martin (1996), and Jovanovic and Rousseau (2002).

[11]Target shareholders choose to be taken over by overvalued firms because either target managers want to cash out from their current holdings (Shleifer and Vishny, 2003) or asymmetrical information sets between bidders and targets (Rhodes-Kropf and Viswanathan, 2004).

First, targets may be private firms, for which data are not available. Second, the likelihood of being a target is more idiosyncratic than the likelihood of being an acquirer. Finally, the aggregate measure may not represent targets well since targets tend to disappear from the sample after the acquisition.

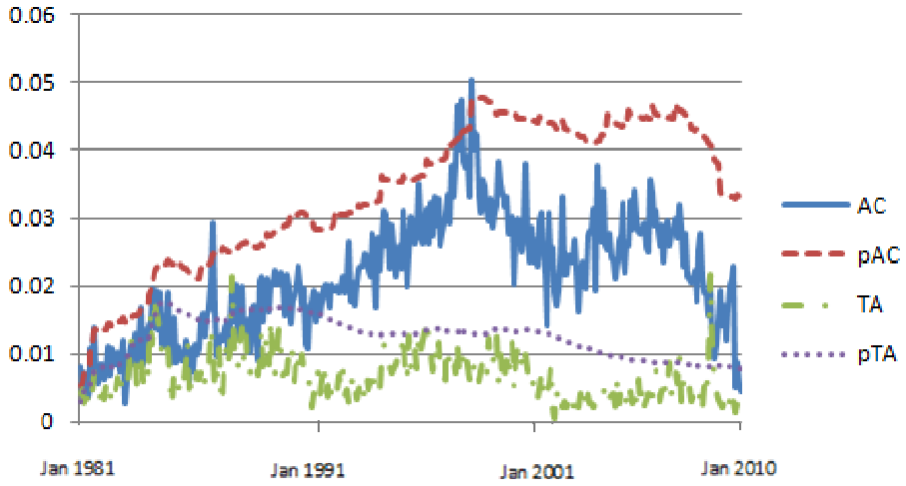

Figure 1. Predicted and Realized Takeovers. This figure plots predicted and realized probabilities of being an acquirer and being a target. The data ranges from January 1981 to April 2010. The realized acquirer probability (AC) is defined as the percentage of acquirer and the realized target probability (TA) is the percentage of target for all firms with available data. Predicted acquirer probability (pAC) is calculated using Model 3 and predicted target probability (pTA) is calculated using Model 6 from table 4.

3.2. Robustness check and alternative specifications

Following the corporate governance literature on merger and acquisition, we run a critical robustness check on the sample with alternative specifications. Masulis et al. (2007) find that corporate governance mechanisms affect the profitability of firm acquisitions. Moreover, Cramers et al. (2009) demonstrate that corporate governance has a significant effect on predicting target likelihood.

Following their research, we test two models on both acquirer and target with different corporate governance variables, including a complement of G-index (EXT), and an interaction variable of BLOCK and EXT (EXT_BLK). Similar to Cramers et al. (2009), the corporate governance index (G-index), incorporating 24 different provisions (Gompers et al. 2003), is taken from the Risk Metrics-Governance Legacy Data, formerly known as the Investor Research Responsibility Center (IRRC). The dataset used to construct the indices are available from 1990 through 2006. The index EXT is a complement index to the G-index, which is equal to 24 minus G-index. A higher value of EXT represents a greater shareholder rights. The second corporate governance proxy is a dummy variable for the present of an external blockholder. As Cremer and Nair (2005) point out, corporate governance can be divided further into internal governance and external government. The effect of corporate control on equity value is amplified when internal and external governance mechanisms interact. We obtain the equity percentage for outside blockholders from the Blockholders database, which contains blockholder data on 1,913 companies for the period 1996–2001. We use a data cleaning procedure

following Dlugosz et al. (2006). We construct a dummy variable (BLOCK) that is equal to one if a firm has outside blockholders who own more than 5% of equity shares.

Table 4. Robustness check: logistic models of acquirer/target.

	Acquirer		Target	
	Model 5	Model 6	Model 7	Model 8
V/P	–0.055***	–0.055***	0.002	0.002
	(–3.35)	(–3.34)	(0.08)	(0.08)
V/B	–0.003	–0.004	–0.019	–0.019
	(–0.52)	(–0.50)	(–1.60)	(–1.60)
PPE	–0.569***	–0.569***	–0.026	–0.026
	(–16.19)	(–16.19)	(–0.29)	(–0.29)
CASH	–0.644***	–0.646***	0.463*	0.463*
	(–7.10)	(–7.12)	(1.93)	(1.93)
LEV	–0.464***	–0.470***	0.625***	0.626***
	(–6.25)	(-6.32)	(3.05)	(3.04)
ROA	0.425***	0.425***	–1.289***	–1.290***
	(2.70)	(2.70)	(–4.19)	(4.18)
SIZE	0.265***	0.265***	–0.126***	–0.126***
	(28.97)	(28.96)	(–4.90)	(–4.91)
BLOCK	0.007	1.282*	0.022	–0.096
	(0.06)	(1.72)	(0.07)	(–0.04)
EXT	–0.016***	0.069	0.018	0.010
	(–3.56)	(1.42)	(1.34)	(0.07)
EXT_BLOCK		–0.086*		0.008
		(–1.76)		(0.07)
Constant	–3.547***	–4.807***	–2.953***	–2.836
	(–18.70)	(–6.40)	(–5.43)	(–1.15)
ID	Yes	Yes	Yes	Yes
Time Dummy	Yes	Yes	Yes	Yes
N	140,445	140,445	140,445	140,445
PSEUDO R^2	0.02	0.02	0.01	0.01

Note: This table reports alterative logistic regression results on the likelihoods of being an acquirer and being a target. The sample period ranges from January 1981 to December 2009. The dependent variable is either the acquirer dummy (AC) or the target dummy (TA). The independent variables include the market to book ratios (MB), fixed asset ratio (PPE), firm liquidity ratio (CASH), firm size (SIZE), firm leverage (LEV) firm profitability (ROA), Block holder (BLOCK) mispricing measure (V/P), growth measure (V/B), and the industry dummy (ID), the year-month dummy (Time Dummy) as defined as Table 2 EXT is equal to (24-Gindex), where G-index is Gompers et al. (2003) corporate government index. EXT and BLOCK is the interaction term of EXT and a dummy variable of external blockholder, which equal to one if external blockholder own more than 5% of the total share outstanding and zero otherwise. All variables are winsorized at the 1 percent and 99 percent level expect for TA and AC. The value of t-statistics is in parentheses. * denotes 10% significant level, ** denotes 5% significant level, and *** denotes 1% significant level.

Table 4 presents alternative model estimates controlling for the corporate governance effect. Models 5 and 6 are acquirer models and Models 7 and 8 are target models. Following Cremers and Nair (2005) and Cremer et al. (2009), we use EXT and the interaction term of EXT and BLOCK. In all models, sample size reduces significantly to 140,445, compared to 684,437 in previous models. Models 5 and 6 show that EXT and EXT_BLK have significantly negative effects on the acquirer likelihood, indicating that the empire-building agency problem of the acquiring firms motivates managers engaging in acquisitions. In contrast, these variables do not affect the target likelihood[12]. Acquirers tend to have overvalued equity, but targets tend to be like average firms.

The goodness of fit of alternative models is marginal. For acquirers, alternative models have lower pseudo R^2 (0.02) than the original models in Table 3. For targets, the alternative models slightly decrease the pseudo R^2 to 0.01. However, total observations decrease substantially after we include corporate governance proxies due to data availability. Considering all of the alterative models, we find qualitatively similar results.

In the next section, we use Model 2 to estimate acquirer likelihood and Model 4 to estimate target likelihood and then sort firms into portfolios. To remove look-ahead bias, we use only historical data in estimating both likelihoods, which guarantees all likelihoods are based on past information. In a robustness check, we also estimate models using 10-year rolling windows or the entire sample. Then, we construct portfolios by these likelihoods and analyze these portfolio returns, finding consistent results.

4. Acquirer Likelihood and Equity Returns

4.1. Portfolios based on acquirer likelihood

We first present results on univariate sorting. Each month from January 1981 to December 2009, firms are grouped into quintile portfolios based on acquirer likelihood. To indentify the cross-sectional effect, acquirer portfolios are constructed each month. This guarantees that any effect here is not caused by time-series variations in equity returns. The average value of each portfolio is calculated for each month. Then, the time-series mean of equity returns is computed for each portfolio.

In this section, we test whether acquirer likelihood affects equity returns based on univariate sorting and double sorting of the firm's takeover measures. We also present multivariate regression tests. We focus on equal-weighted portfolios, but results of value-weighted portfolios show similar patterns with slightly lower magnitude.

Table 5 reports results of quintile portfolios based on acquirer likelihood (acquirer portfolio) from Model 2 and the model is re-estimated using historical data for each month. Each row represents each portfolio mean as well as the difference between top and bottom acquirer likelihood firms. There are remarkable patterns in characteristics and risk loadings across acquirer portfolios. In Panel A of Table 5, firms with high acquirer likelihood tend to be large, high growth, and high momentum firms. These stocks also have high market beta loadings and lower loadings on HML and SMB betas, indicating that low acquirer likelihood stocks have lower HML and SMB risks. The results raise concerns that these return differentials are driven by characteristics or risk loadings. To address these concerns, we perform both risk adjustments, and characteristic adjustments on equity returns.

[12]The difference in the results between ours and Cremer et al. (2009) is caused by different database for outside blockholders. Cremer et al. (2009) use data on institutional share holdings from Thompson/CDA Spectrum.

Table 5. Portfolio characteristics, risks, and abnormal returns on acquirer likelihood.

Acquirer Portfolio	Characteristics			Risk Loadings		
	Size	BM	Mom	Market	HML	SMB
Panel A: Characteristics and Risk Loading						
1 (Low)	3.925	1.059	0.032	0.853	0.738	0.554
2	4.687	0.769	0.078	0.847	0.582	0.521
3	5.428	0.640	0.118	0.934	0.548	0.517
4	6.303	0.569	0.130	1.015	0.411	0.461
5 (High)	7.979	0.482	0.122	1.080	0.067	0.328
Acquirer Portfolio	Excess Returns	CAPM Alpha	3-factor Alpha	4-factor Alpha	5-factor Alpha	Char-adjusted Returns
Panel B: Future t+1 Returns						
1 (Low)	1.236	0.824	0.468	0.645	0.650	0.540
2	0.913	0.508	0.179	0.274	0.302	0.350
3	0.798	0.350	0.025	0.125	0.161	0.257
4	0.786	0.298	0.013	0.102	0.125	0.220
5 (High)	0.724	0.213	0.022	0.094	0.101	0.208
1–5	0.512***	0.612***	0.445***	0.551***	0.549***	0.332**
1–10	0.663***	0.759***	0.527***	0.657***	0.667***	0.360*
Panel C: Future t+3 Returns						
1 (Low)	3.705	2.107	1.052	1.534	1.595	1.465
2	2.686	1.250	0.301	0.540	0.666	0.891
3	2.350	0.876	–0.019	0.256	0.344	0.641
4	2.311	0.751	–0.023	0.295	0.352	0.511
5 (High)	2.152	0.560	–0.017	0.327	0.324	0.535
1–5	1.552***	1.548***	1.068***	1.207***	1.271***	0.929***
1–10	2.000***	1.926***	1.222***	1.470***	1.560***	0.973***
Panel D: Future t+6 Returns						
1 (Low)	7.625	4.015	1.922	2.962	3.031	2.983
2	5.431	2.391	0.476	0.866	1.005	1.741
3	4.700	1.687	–0.183	0.183	0.272	1.224
4	4.582	1.427	–0.233	0.265	0.378	0.893
5 (High)	4.325	1.074	–0.148	0.430	0.455	0.981
1–5	3.300***	2.940***	2.070***	2.532***	2.576***	2.002***
1–10	4.360***	3.760***	2.496***	3.165***	3.300***	2.231***
Panel E: Future t+12 Returns						
1 (Low)	16.664	8.791	3.504	5.241	5.191	6.492
2	11.656	5.064	0.054	0.114	–0.018	3.540
3	9.973	3.798	–0.839	–0.767	–0.834	2.445
4	9.610	3.055	–1.123	–0.604	–0.427	1.621
5 (High)	9.250	2.508	–0.215	0.400	0.353	1.996
1–5	7.414***	6.283***	3.718***	4.841***	4.838***	4.496***
1–10	10.311***	8.603***	4.908***	6.698***	7.194***	5.521***

Note: This table presents the average value of characteristics, risk loadings, abnormal returns relative to risk free rate, the

CAPM model, the Fama and French (1993) 3-factor model, the Carhart (1997) 4-factor model, the Pastor and Stambaugh (2003) 5-factor model, and the DGTW's (Danel et al., 1997) characteristic-adjusted returns on portfolio formed by acquirer likelihood. The sample period ranges from January 1981 to December 2009. Panel A reports characteristics and risk-loadings on quintile portfolio. Panel B–D report results from future t+1 to t+12 month returns. Table also reports strategy returns of buying low acquirer likelihood portfolios and selling high acquirer likelihood portfolio. * denotes 10%, ** denotes 5%, and *** denote 1% significant level.

Panel B of Table 5 reports results of 1-month holding period abnormal returns relative to the risk free rate, 3-factor model (Fama and French, 1993), 4-factor model (Carhart, 1997), 5-factor model (Pastor and Stambaugh, 2003), and characteristics-adjusted returns[13] (Daniel et al., 1997). There is a clear pattern on abnormal returns among different acquirer portfolios. High acquirer likelihood portfolios generally earn lower abnormal returns compared to low acquirer likelihood portfolios. The average excess returns over risk free rate of quintile 5 are 0.72% per month, where quintile 1 earns 1.24% per month average excess returns. This pattern is monotonically declining and is not caused either by traditional risks or common characteristics. The long-short strategy which buys the lowest acquirer portfolio and sells the highest acquirer portfolio has average excess returns of 0.51% per month. Decile portfolios also show similar results. The long-short strategy earns 0.66% per month in excess returns.

Panels C to E of Table 6 confirm the patterns among acquirer portfolios. For example, for a 12-month holding period, the average excess returns over risk free rate is 16.66% per year in portfolio 1 where portfolio 5 earns 9.25% excess returns per year. The long-short quintile portfolio earns average returns of 7.41% per year and the long-short decile portfolio earns average returns of 10.31% per year.

Overall, the evidence from the univariate sorts indicates that acquirer likelihood is negatively related to equity returns. Consistent with the relative mispricing hypothesis, investors anticipate a takeover and they position themselves to capture these premiums.

4.2. Portfolios based on acquirer likelihood and target likelihood

The previous section showed how acquirer likelihood affects equity returns. To study whether takeover probability is driven by risk, we test whether acquirer likelihood has predictive power over target likelihood. For each month, firms are sorted into quintile portfolios independently based on the two likelihood measures. This procedure creates total 25 portfolios with 94 stocks on average. The mean value of excess returns over the risk free rate is computed each month for each portfolio. Then the time-series mean for each portfolio is calculated.

Table 6 shows the time-series average of double sorting. For brevity, we report only excess returns over the risk free rate of quintile portfolios, but all other abnormal returns with respect to risks and characteristics of quintile portfolios or decile portfolios have qualitatively similar results. We also report the interquintile return difference along high takeover likelihoods. Table 6 confirms that acquirer likelihood is a negative and significant predictor on stock returns even after controlling for target likelihood. The long-short strategy of buying the lowest acquirer portfolio and selling highest acquirer portfolios earns 0.34% excess returns per month at target portfolio 1, and a similar strategy at target portfolio 5 earns 0.40% per month. We also construct a strategy that buys the lowest acquirer likelihood

[13]All factors and risk free rates are available at Professor Kenneth R. French's website. The DGTW's (1997) benchmark portfolio cutoffs and returns are available at Russ Wermers' website. Definition of firm Characteristics is similar to DGTW (1997).

and the highest target likelihood portfolio and sells the highest acquirer likelihood and the lowest target likelihood portfolio. This strategy earns 0.59% per month, 1.64% per quarter, 3.68% per semi-annual, and 8.55% per year in excess returns. These returns are statistically significant.

Table 6. Portfolio characteristics, risks, and abnormal returns on acquirer likelihood and target likelihood.

Acquirer	Target	Characteristics			Risk Loadings			t+1	t+3	t+6	t+12
Portfolio	Portfolio	Size	BM	Mom	Market	HML	SMB	month	month	month	month
1	1	4.521	0.880	0.074	0.903	0.489	0.504	0.996	3.233	6.956	16.073
	2	3.696	1.175	–0.016	0.822	0.475	0.667	1.119	3.363	6.995	15.517
	3	3.554	1.302	–0.021	0.834	0.531	0.735	1.253	3.723	7.473	15.575
	4	3.486	1.378	–0.017	0.919	0.691	0.803	1.486	4.463	8.845	19.224
	5	3.497	0.996	0.043	0.861	0.622	0.840	1.254	3.649	7.839	17.600
2	1	5.717	0.576	0.070	0.865	0.405	0.484	0.849	2.417	5.104	11.252
	2	4.625	0.725	0.061	0.886	0.457	0.618	0.936	2.765	5.474	12.195
	3	4.492	0.841	0.065	0.953	0.629	0.691	0.992	2.900	5.844	12.429
	4	4.379	0.905	0.071	0.817	0.548	0.553	0.874	2.560	5.168	11.291
	5	4.326	0.831	0.116	0.813	0.665	0.663	0.965	2.876	5.893	11.175
3	1	6.183	0.460	0.104	0.893	0.271	0.452	0.663	1.979	4.132	9.248
	2	5.493	0.561	0.101	0.914	0.437	0.572	0.749	2.162	4.213	9.296
	3	5.347	0.661	0.109	0.957	0.554	0.590	0.796	2.343	4.834	10.066
	4	5.218	0.750	0.120	0.918	0.645	0.567	0.815	2.472	4.896	10.287
	5	5.092	0.741	0.162	1.029	0.790	0.551	1.076	2.992	5.750	11.487
4	1	6.743	0.348	0.137	0.999	0.274	0.350	0.644	1.958	3.932	8.704
	2	6.438	0.462	0.125	0.986	0.426	0.397	0.787	2.175	4.290	9.368
	3	6.333	0.546	0.124	1.003	0.512	0.434	0.732	2.341	4.768	9.809
	4	6.174	0.637	0.125	0.999	0.577	0.450	0.945	2.608	5.143	10.131
	5	6.011	0.648	0.160	1.130	0.750	0.442	0.961	2.963	5.720	11.150
5	1	8.087	0.289	0.162	1.093	0.231	0.153	0.661	2.013	4.162	9.052
	2	7.867	0.375	0.135	1.044	0.252	0.082	0.652	2.046	4.533	9.789
	3	7.808	0.435	0.116	1.026	0.330	0.102	0.755	2.196	4.199	8.852
	4	7.805	0.491	0.126	1.054	0.363	0.076	0.728	2.172	4.267	9.156
	5	7.798	0.511	0.144	1.117	0.502	0.017	0.851	2.546	4.919	10.333
1–5	1							0.335*	1.221***	2.795***	7.020***
1–5	5							0.402	1.103***	2.920***	7.268***
1	5–1							0.258	0.416	0.883	1.528
5	5–1							0.191	0.533***	0.758***	1.281***
1,5–5,1								0.593**	1.636***	3.678***	8.548***

Note: This table presents the average value of characteristics, risk loadings, and abnormal returns relative to risk free rate on portfolio formed by acquirer likelihood and target likelihood. The sample period ranges from January 1981 to April

2010. Table also reports results of strategy returns of buying low acquirer likelihood portfolios and selling high acquirer likelihood portfolio on extreme target portfolios, strategy returns of buying high target likelihood portfolios and selling low target likelihood portfolio on extreme acquirer portfolios, strategy returns of buying high target likelihood portfolios and selling high target likelihood portfolio. * denotes 10%, ** denotes 5%, and *** denote 1% significant level.

In summary, Table 6 confirms the findings for the one-way sorts by acquirer likelihood. It documents that acquirer likelihood has predictive power on equity returns beyond target likelihood. For given target likelihood, higher acquirer likelihood firms earn lower future stock returns. The evidence contradicts the risk-based hypothesis (Cremers et al., 2009) on the relationship between takeover probability and equity returns.

4.3. Predictive ability in cross-sectional stock returns

The prior two tests uncover the predictive power of acquirer likelihood and the results raise doubt on the interpretation that takeover exposure is a risk. To test whether these results are driven by uncontrolled effects from growth, risk, or other factors, we employ Fama-MacBeth regressions, where standard errors are adjusted using the Newey-West Methodology. Four return holding periods are considered, including 1-month, 3-month, 6-month, and 12-month.

This test relies on implementing the correct functional form of expected returns. Since the correct specification is not known in the finance literature, we employ several independent variables including firm size (SIZE), the book-to-market ratio (BM), momentum (MOM), investment (IV), asset growth (AG), turnover (TO), issuance (IS), and accruals (AU). MOM is defined as prior 12 month returns (Jegadeesh and Titman, 1993). IV is the sum of changes in property, plant, and equipment and changes in inventory from the prior year relative to total assets (Titman et al., 2004). AG is the percentage change in total assets from the prior year (Cooper et al., 2008). TO is trading volume for the previous 3-months, relative to total shares outstanding (Scheinkman and Xiong, 2003). IS is the log value of shares outstanding less the log value of the prior year's shares outstanding (Pontiff and Woodgate, 2008). AU is the change in current assets less the sum of changes in cash and short term investment, changes in long-term debt, and changes in depreciation, depletion, and amortization from the prior year relative to total assets (Sloan, 1996).

Table 7 shows the results of panel regressions. Four holding periods are under consideration, where Panel A reports results t+1 month ahead, Panel B reports results t+3 months ahead, Panel C reports results t+6 months ahead, and Panel D reports results t+12 months ahead, each with excess returns as the dependent variable. Five specifications allow comparison by considering:

1. univariate model (acquire likelihood, pAC)
2. multivariate model with takeover proxies (acquire likelihood, pAC, and target likelihood, pTA)
3. multivariate model with takeover proxies and common risk (or characteristic) proxies
4. multivariate model with takeover proxies and anomalies
5. multivariate model with takeover proxies and all other proxies

Table 7. Fama-MacBeth Cross-Sectional Regression of returns on acquirer/target likelihood.

Cons	pAC	pTA	SIZE	BM	MOM	IV	AG	TO	IS	AU	Avg R^2
Panel A: Future t+1 Month											
1.911***	–8.353**										0.78%
(4.79)	(–2.28)										
1.571**	–10.008**	32.279**									1.10%
(2.31)	(–2.56)	(2.59)									
0.788**	–3.436*	24.806**	–0.013	0.759***	1.345***						3.11%
(1.99)	(–1.97)	(2.18)	(–0.27)	(8.17)	(6.22)						
1.750***	–10.085***	2.757**				–0.464**	–0.449***	0.771	–0.068	–0.337***	2.60%
(5.74)	(–2.61)	(2.26)				(–2.17)	(–3.40)	(0.61)	(–1.33)	(–3.17)	
10.353***	–2.183***	19.869*	–0.034	0.721***	1.347***	–0.336	–0.295**	0.460	–0.024	–0.253**	4.38%
(2.83)	(–2.67)	(1.81)	(–0.75)	(7.95)	(6.57)	(–1.64)	(–2.43)	(0.38)	(–0.50)	(–2.46)	
Panel B: Future t+3 Month											
5.323***	–18.658***										1.03%
(6.86)	(–2.67)										
4.695***	–20.955***	62.148***									1.40%
(6.63)	(–2.87)	(2.76)									
2.704**	–8.540**	45.878**	–0.014	1.822***	3.269***						3.80%
(2.34)	(–2.34)	(–2.28)	(–0.17)	(11.09)	(8.40)						
5.153***	–20.566***	51.774**				–0.905**	–1.218***	0.434	–0.221**	0.713***	2.98%
(8.09)	(–2.86)	(2.36)				(–2.43)	(–5.53)	(0.21)	(–2.50)	(–4.02)	
3.414***	–4.355*	31.357	–0.070	1.702***	3.229***	–0.609*	–0.863***	–0.191	–0.119	–0.518	5.14%
(4.45)	(–1.75)	(1.61)	(–0.87)	(10.82)	(8.62)	(1.70)	(–4.23)	(–0.10)	(–1.40)	(–3.01)	
Panel C: Future t+6 Month											
9.83***	–29.202***										1.03%
(9.26)	(–2.97)										

Continued on next page

Cons	pAC	pTA	SIZE	BM	MOM	IV	AG	TO	IS	AU	Avg R^2
9.389***	–29.415***	47.291***									1.39%
(9.07)	(–2.89)	(3.64)									
5.625***	–5.158***	9.029***	–0.013	3.459***	4.925**						4.12%
(4.76)	(–2.54)	(3.70)	(–0.11)	(15.75)	(8.49)						
10.384***	–29.261***	27.545				–1.399***	–2.006***	–4.677	–0.428****	–1.035***	2.95%
(10.91)	(–2.90)	(0.97)				(–2.70)	(–7.44)	(–1.62)	(–3.26)	(–4.39)	
7.113***	–2.586**	17.947	–0.119***	3.217***	4.822***	–0.891*	–1.457***	–5.436**	–0.254**	–0.753***	5.39%
(6.30)	(–2.30)	(0.76)	(–1.06)	(15.15)	(8.69)	(1.76)	(–5.93)	(–2.06)	(–2.03)	(–3.40)	
Panel D: Future t+12 Month											
18.648***	–46.646***										0.94%
(14.14)	(–3.40)										
18.933***	–41.213***	–15.394									1.30%
(13.37)	(–2.95)	(–0.37)									
12.203***	–3.297**	–61.274***	0.120	6.111***	3.585***						3.96%
(7.56)	(–2.21)	(–2.76)	(0.74)	(24.08)	(4.57)						
20.834***	–41.944***	–51.753				–2.091***	–3.266***	–12.036***	–0.512**	–1.146***	2.87%
(16.10)	(–3.00)	(–1.28)				(–2.76)	(–8.57)	(–3.02)	(–2.33)	(–3.15)	
14.750***	–12.173***	17.161***	–0.105	5.708***	3.523***	–1.377*	–2.531***	–9.034**	–0.277	–0.587*	5.19%
(9.44)	(–2.87)	(3.08)	(–0.70)	(23.53)	(4.77)	(–1.82)	(–7.33)	(–2.45)	(–1.33)	(–1.67)	

Note: This table reports Fama-MacBeth regression results. The sample period ranges from January 1981 to April 2010. The dependent variable is excess returns over risk-free rate. The independent variables include acquirer likelihood (pAC), target likelihood (pTA), pTA/pAC, firm size (SIZE), the book-to-market ratio (BM), momentum (MOM), investment (IV), asset growth (AG), turnover (TO), issuance (IS), and accruals (AU). Size is the log value of market capitalization. BM is the book-to-market ratio. MOM is defined as the average monthly returns of prior 12 month. IV is the sum of changes in property, plant, and equipment and changes in inventory from prior year over total asset. AG is the percentage changes in total asset from prior year. TO is trading volume of prior 3-month over total share outstanding. IS is the log value of share outstanding minus the log value of prior year's share outstanding. AU is changes in current asset minus the sum of changes in cash and short term investment, changes in long-term debt, and changes in depreciation, depletion, and amortization from prior year over total asset. Panel A reports results on future t+1 month. Panel B reports results on future t+3 month. Panel C reports results on future t+6 month. Panel D reports results on future t+12 month. The value of t-statistics is in parentheses statistics adjusted for autocorrelation using Newey-West (1987) method with one lag. * denotes 10% significant level, ** denotes 5% significant level, and *** denotes 1% significant level.

The coefficient on pAC measure in the first specification is negative, which is statistically and economically significant for all holding periods. For example, in model (1) of Panel A, a one percent increase in pAC will lead to a 0.08% decrease in monthly cross-sectional returns with a t-statistic of –2.28. Average adjusted–R^2 ranges from 0.78% to 1.03%. When considering a specification that includes both takeover measures simultaneously, pAC remains negative and statistically significant. In addition, pAC in other specifications exhibits consistent results.

In the third specification, which controls for common risks and characteristics, the sign of the slope coefficients on SIZE, BM, and MOM is consistent with prior literature[14]. The coefficient on SIZE is negative but not significant. Although the estimate of the slope coefficient is similar to Fama and French (1992), the effect of SIZE can be captured by pAC. The slopes on BM and MOM are positive and significant.

The fourth specification consists of multivariate models with additional variables, which control for other empirical anomalies, including investment (IV), asset growth (AG), turnover (TO), issuance (IS), and accruals (AU). Results of Model 4 show that all variables of interest are aligned with prior literature. When all independent variables are considered simultaneously, the coefficient on pAC is less pronounced, yet significant. For example, model 5 of Panel D shows that a one percent increase in pAC is associated with a 0.12% increase in stock returns per year with a t-statistic of –2.87.

Overall, acquirer likelihood predicts stock returns better than target likelihood. We interpret these results as evidence against the risk-based explanation of takeover probability. The longer the holding period, the better is the predictability of pAC measure. All results in this section are consistent with analyses from previous sections.

5. Mispricing and takeover

We document that acquirer likelihood is a significant predictor of future stock returns over target likelihood, which is inconsistent with the risk-based explanation for takeover probability. Alternatively, previous results are consistent with the relative mispricing hypothesis. First, in the model construction (Table 3 and 4), the mispricing measure (V/P) is a significant predictor of takeover activities. The predictive value of takeover likelihood is likely to be associated with mispricing. Furthermore, if takeover likelihoods are proxies for the level of mispricing relative to the market, both acquirer likelihood and target likelihood may have predictive power on cross-sectional returns. Table 5–7 confirm this argument.

In this section, we investigate whether takeover likelihoods are related to mispricing by implementing trading strategies on different mispricing subsamples. If the relative mispricing hypothesis explains the relationship between takeover likelihoods and stock returns, trading strategies based on these likelihoods are concentrated in firms that are more sensitive to mispricing. For instance, small firms tend be mispriced because they are less diversified and have more severe information asymmetries. In this case, the takeover effect may be more prominent among small stocks.

To explore this argument, we form portfolios by first sorting stocks based on characteristics into 3 portfolios. Then for each characteristic portfolio we independently double-sort stocks based on

[14]Various studies have claimed the meaning of these factors. Fama and French (1992) argues that size and the book-to-market ratio capture unobserved state variable related to financial stress or marginal ability of surviving in market meltdowns. On the other hand, De Long et al. (1990), Hong and Stein (1999), Barberis and Shleifer (2003) claim that these factors are related to behavioral reasons, such as style investing.

acquirer likelihood and target likelihood into 3x3 portfolios. Finally, for each characteristic portfolio, we construct a strategy of buying the highest pTA and lowest pAC portfolio (1, 3) and selling the highest pAC and lowest pTA portfolio (3, 1). we consider firm size (SIZE), book-to-market ratio (BM), momentum (MOM), investment (IV), asset growth (AG), turnover (TO), issuance (IS), and accruals (AU), since these characteristics are associated with sensitivity to mispricing in the literature[15].

Table 8 presents the average value of trading strategy profits attributed to different firm characteristics. Five returns are considered: abnormal returns relative to risk free rate, the CAPM, the Fama and French (1993) 3-factor model, the Carhart (1997) 4-factor model, the Pastor and Stambaugh (2003) 5-factor model. We apply the above strategy on each characteristic portfolio. All returns are future one month returns with and without risk adjustment. Table 8 (top) reports results of the three most common characteristics from literature. It is consistent with the relative mispricing hypothesis that takeover effect appears only in small stocks and growth stocks. All MOM portfolios show significant returns based on the long-short strategy, but the magnitude is larger among high momentum firms. All risk adjustments reveal consistent results.

We extend the analysis to other firm characteristics. In the second and third rows of Table 8, we present the results for investment (IV), asset growth (AG), turnover (TO), issuance (IS), and accruals (AU). The long-short portfolio earns significant returns on all IV, IS, and AU portfolios, but more notably among High IV, low TO, and high IS. The evidence for IS portfolios is consistent with the literature, as prior studies propose that equity issuance is closely related to valuation-driven merger and acquisition[16]. More interestingly, the takeover effect seems to exist only on median and low TO portfolios. One possible explanation for this pattern is that high turnover stocks trade constantly and information can be instantaneously reflected in prices without obstacles. On the other hand, prices of low turnover stocks respond to news slowly. This indicates high sensitivity to mispricing in low TO firms.

Furthermore, both high and low AU portfolios reveal significant trading profits from the long-short strategy. This is consistent with Sloan's (1996) earnings fixation hypothesis, which indicates that high accrual and low cash flow firms tend to be overvalued, and low accrual and high cash flow firms tend to be undervalued. Overall, the evidence is consistent with the relative mispricing hypothesis.

[15]SIZE (Zhang, 2006), BM (Lakonishok et al., 1994), MOM (Jegadeesh and Titman, 1993), IV (Titman et al., 2004), AG (Cooper et al., 2008), TO (Scheinkman and Xiong, 2003), IS (Pontiff and Woodgate, 2008), and AU (Sloan, 1996).

[16]Pontiff and Woodgate (2008) are motivated by post-SEO and post-stock merger long-run returns and find significant relationship between equity insurance and stock returns.

Table 8. Firm characteristics and takeover effect.

Long-Short Strategy	Size			BM			MOM		
	Large	Median	Small	Value	Median	Growth	High	Median	Low
Excess Return	0.248	0.181	0.469**	0.190	0.189	0.671***	0.657***	0.465***	0.510**
CAPM Alpha	0.279	0.097	0.460**	0.310	0.294*	0.685***	0.781***	0.600***	0.646***
3-factor Alpha	–0.087	–0.155	0.249	–0.065	0.315*	0.675***	0.502***	0.483***	0.490**
4-factor Alpha	0.109	0.161	0.443**	0.056	0.384**	0.812***	0.633***	0.488***	0.451**
5-factor Alpha	0.117	0.143	0.474***	0.100	0.448***	0.858***	0.712***	0.504***	0.490**
	IV			AG			TO		
	High	Median	Low	High	Median	Low	High	Median	Low
Excess Return	0.628***	0.477**	0.429*	0.252	0.131	0.628***	0.427*	0.508**	0.729***
CAPM Alpha	0.736***	0.646***	0.519**	0.431***	0.250*	0.657***	0.401	0.484**	0.763***
3-factor Alpha	0.378**	0.453***	0.454**	0.258*	0.140	0.435**	–0.117	0.150	0.627***
4-factor Alpha	0.561***	0.516***	0.464**	0.235	0.187	0.592***	0.087	0.383**	0.801***
5-factor Alpha	0.576***	0.542***	0.526**	0.262*	0.235	0.646***	0.156	0.453**	0.854***
	IS			AU					
	High	Median	Low	High	Median	Low			
Excess Return	0.472**	0.522**	0.320*	0.765***	0.133	0.773***			
CAPM Alpha	0.633***	0.614***	0.398**	0.870***	0.320*	0.831***			
3-factor Alpha	0.398**	0.333*	0.264	0.511***	0.352*	0.454**			
4-factor Alpha	0.439***	0.496**	0.382**	0.664***	0.340*	0.620***			
5-factor Alpha	0.483***	0.550***	0.443**	0.702***	0.405**	0.683***			

Note: This table reports takeover effect on different characteristic-sort portfolios with and without risk adjustment. For each month, wefirst form three portfolios based on firm characteristics. Then for each characteristic portfolio, weindependently sort stocks based on acquirer likelihood and target likelihood into 3x3 portfolios. Finally, for each characteristic portfolio, weconstruct strategy of buying the highest pTA and lowest pAC portfolio (1,3) and selling the highest pAC and lowest pTA portfolio (3,1). This table presents the average value of abnormal returns relative to risk free rate, the CAPM model, the Fama and French's (1993) 3-factor model, the Carhart's (1997) 4-factor model, the Pastor and Stambaugh's (2003) 5-factor model by the above strategy on each characteristic portfolio. All returns are future t+1 month returns. The sample period ranges from January 1981 to April 2010. Firm characteristics under consideration are firm size (SIZE), the book-to-market ratio (BM), momentum (MOM), investment (IV), asset growth (AG), turnover (TO), issuance (IS), and accruals (AU). The value of t-statistics is in parentheses statistics. * denotes 10% significant level, ** denotes 5% significant level, and *** denotes 1% significant level.

5. Conclusions

Mergers and acquisitions have been viewed as the disciplinary action taken in the markets for corporate control to ensure proper management of corporate resources. Prior studies point out that acquirers generally lose and targets gain in M&A actions. However, the implication of takeovers on asset valuation has been largely ignored until recent article by Cremers et al. (2009). Whether takeover probability is a proxy for risk is still an open question.

In contrast to prior literature, this paper presents evidence that acquirer likelihood is a significant and negative predictor on future stock returns over target likelihood in both portfolios and regression settings. This is inconsistent with the risk-based explanation of Cremers et al. (2009) of takeover likelihood.

The results in this paper are consistent with the relative mispricing hypothesis. We find that trading strategy based on both acquirer likelihood and target likelihood is concentrated in firms that are more sensitive to mispricing. Specifically, profits are significantly higher in small, high growth, high momentum, high investment, high issuance, low turnover, as well as both high and low accrual firms.

Conflict of interest

The author declares no conflicts of interest in this paper.

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