Market Exuberance and M&A Activity: The Impact of Investor Sentiment on Aggregate M&A Activity in the US The Empirical Evidence

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Abstract

This paper aims to examine the empirical relationship between investor sentiment and aggregate M&A activity from three different perspectives. I explore the general incidence of investor sentiment and M&A activity with respect to frequency of mergers and transaction volume transferred between firms in M&A transactions. Secondly, I examine the relationship of investor sentiment with respect to the method of payment used in mergers. Lastly, I examine cross-sectional differences in M&A activity in reaction to sentiment. I find that sentiment is positively related to frequency of stock financed mergers and is positively related to transaction volume transferred between companies in M&A activity. Second, I find that increase in investor sentiment increases the probability of using stock as method of payment on statistically reliable level. Lastly, I find empirical evidence that when the sentiment is higher, firms tend to bet on and pay significantly more for targets that are less stable, have greater propensity to speculate and are more problematic and subjective to value due greater growth opportunities.

Keywords: merger activity, investor sentiment, M&A waves, mispricing, overvaluation, market exuberance, behavioral finance

Table of Contents

Introduction

The topic of merger waves and merger clustering has been discussed in great depth in past literature, yet, there are still fundamental disagreements in this area of finance. Are there any market forces that could cause systematic increase in the occurrence of mergers? From number of past studies, it is commonly acknowledged that high merger intensity is correlated with high stock market valuations. However, whether it is a simple correlation or whether high stock valuation and mispricing could cause mergers to be occurring in greater intensity is still topic that various literature disagrees upon. Number of academic research papers had attempted to explain the pattern of merger waves by the Neoclassical theory. The neoclassical theory of merger waves states that the external shocks to the industry cause the industry to re-structuralize and the increased mergers activity is due to abundance of liquidity in the market. A substantial part of literature focuses on the behavioral explanation for this phenomena outside of the market mispricing. Large stream of existing research examines the market timing hypothesis whilst other part of literature focuses on CEO characteristics and its ability to act upon biases into execution of M&A activity. Acknowledging that there are many empirical ways to approach merger waves, the aim of this paper is to investigate the patterns in aggregate M&A and its relationship to market exuberance in the market proxied by the investor sentiment.

In this paper, I investigate the relationship between investor sentiment and aggregate M&A activity from number of different perspectives. This means that the assumption set for the framework of this paper is that investors can be irrational whilst the managers of the companies involved in mergers are fully rational. I proxy the market exuberance by investor sentiment index of Baker & Wurgler (2006) in means of quantifying the underlying feeling of optimism and pessimism among the investors by stock market data. Baker and Wurgler (2006) define the sentiment as propensity to speculate and the feeling of optimism and pessimism in general. Sentiment comes from the idea that investment behaviour does not conform to rational decision-making, and is subject to irrational optimism or pessimism about investment prospects (McLean & Zhao, 2014). Investor sentiment (or also consumer sentiment) has been widely investigated since the dawn of finance as well as economic research. Even though the fundamental idea of classical finance developed in 1970s leaves no room for a concept of sentiment in the financial markets, the underlying debate on sentiment existed before and after.

One of the landmarks of academic research in classical finance was when Fama developed the efficient market hypothesis, stating that stock prices always fully reflect all available information. Yet, already in 1936 J. Keynes stated that 'market is subject to waves of optimistic and pessimistic sentiment, which are unreasoning and yet in a sense legitimate where no solid basis exists for a sound calculation'. Other very early contributions to sentiment include Smidt (1968) who argues that market is prone to aggregate sentiment and may give rise to speculative bubbles and random walk in prices and Zweigh (1973) develops a proxy based on closed-end fund premiums to measure sentiment from

the market movements. In late 1990s, the topic of sentiment becomes very relevant after US experienced the famous dot.com bubble where the growth of internet stocks escalated to values which are difficult to explain from the perspective of rational theory and which is subsequently followed by the familiar crash of early 2000s. The most recent financial crisis presents us with evidence that inefficient and irrational financial markets do have enormous impact on the real economy and understanding the forces outside of classical finance is fundamental for long term functioning of the society. In this paper I ask, what is the relationship of sentiment to M&A activity? Does sentiment matter in the frequency of different methods of payment for acquisitions? Does sentiment effect all deals or only specific cross section of targets?

The results presented in this paper support the view that there is a relationship between sentiment and M&A activity. I find that sentiment alone cannot predict the aggregate M&A activity but has strong relation with M&A activity financed by stocks alone. Taking into consideration the number of mergers successfully executed per month, sentiment is only empirically related to stock financed merger activity, excluding cash financed activities. This is in perfect agreement with empirical findings of past literature as well as with theory of market overvaluation and market timing. Rhodes-Kropf, Robinson, & Viswanathan (2005) find that whilst the sector wide misvaluation have high impact on stock financed mergers, the effect is significantly less strong with cash financed mergers on both targets and acquirers. When both types of transactions are examined together, the sector wide investor sentiment is less prominent and less significant than when only stock mergers are taken into consideration in the sample. In my second hypothesis, the empirical results of the logit model confirms that for mergers that are executed during periods of high sentiment, the probability that they use stock as a method of payment is significantly higher. This captures the idea that when the overall market is optimistic and 'over-heated', this changes managers' perspective on the optimal method of payment to be used for the underlying mergers.

Lastly, I find that there are significant differences in the effect of sentiment on the deal value throughout the cross section of firms. In the intuition of Baker and Wurgler (2006), certain cross-section of firms is more susceptible to sentiment than others. These are firms that have particularly large propensity to be speculated upon, such as unprofitable firms, firms with low B/M ratio, smaller firms, non-dividend paying, high growth and high R&D firms. I hypothesize that given that these firms are indeed more prone to sentiment, this will be reflected in the deal value for the transaction of these firms and on average, transactions will be higher during the periods of positive sentiment and lower during the negative sentiment. Larger, more stable, profitable firms in the cross-section do not exhibit this trend according to this theory and thus their transaction values should not be affected by changing sentiment in the market. I indeed find that firms that are less profitable, non-dividend paying, high growth, high R&D, firms that exhibit high growth opportunities and have low B/M ratio are significantly more sensitive to sentiment in terms of the deal value. This means that during the periods

of high sentiment, acquirers pay significantly more on these type of companies than when the sentiment is low. At the same time, the targets that are stable, profitable, dividend paying, low growth, low R&D and do not exhibit high growth opportunities do not experience significant differences in the deal value between periods of high and low sentiment. This is an evidence that sentiment has significant real impact not only on the volume of investment but also on the type of investment that is being carried out by firms. The theory of cross section variation in M&A activity is in agreement with the empirical findings of Baker and Wurgler (2006) who investigate the cross section patterns in sentiment. They find that sentiment has significant effect on the stock returns of small, young, highly volatile, unprofitable, non-dividend paying, extreme growth and distressed companies.

All my results suggest that sentiment among investors does have real economic impact on the transactions carried out amongst firms. As predicted by the hypotheses, when the sentiment is higher, not only firms carry out more stock financed mergers, but also they tend to bet on and pay significantly more for targets that are less stable, have greater propensity to speculate and are more problematic and subjective to value due greater growth opportunities. Having said that however, there still more areas of research that would complement these findings. I have examined the effect of sentiment on firms from the perspective of the target companies due to limited data on the acquirers. I have strong belief that it would be valuable to examine the effect of sentiment on merger activity from the perspective of acquirers as this would additionally approximate the firms' behavior during high sentiment, especially in the cross section examination. It would show not only which firms are being bought more expensively during period of high sentiment but also which companies are making the purchases.

I organize this research in following way: After this introduction, in section I. I present a detailed analysis of existing literature that helped me build up intuition and framework for this research. Section II. builds up structured methodology a hypothesis development that this research follows. Section III. provides descriptive statistics of the data use to build empirical model and test the above-mentioned hypotheses, after which follows section IV. Elaborating on results from the formal tests of the hypotheses and testing their robustness in section V. I conclude all my findings with limitations and suggestions for further research in section V. which concludes on the research, summarizes limitations and explores areas for future research in this field.

I. Theoretical Background and Literature review

A. Valuation Waves and aggregate mispricing

There are number of alternative views to the coincidence of highly exuberant markets and high M&A activity and why they relate. Shleifer & Vishny (2003) is one of the early studies which is concerned with market misvaluation and aggregate merger activity. The authors observe that when clustering in merger activity occurs, substantial portion of these mergers is driven by stock market mispricing. They further argue that the key factor in merger waves is the relative valuations of merging firms and *market's perception* of the synergies from the merger of the two respective firms. They state that valuation of the acquirer and the target is not efficient but rather reflect *investor sentiment* about them and that this investor sentiment can but not need to be idiosyncratic: it may reflect over- or undervaluation of the entire sector, industry or market. Second explanation, in the view of Rhodes-Kropf and Viswanathan (2004) differs from the one of Shleifer & Vishny in that managers rationally accept overvalued equity markets because of imperfect information about the degree of synergies. However, both views are grouped as behavioral hypotheses regarding the merger clustering as they both incorporate market misvaluation as underlying explanatory phenomena. In the third view, Smit and Moraitis (2015) offer alternative explanation, stating that overexuberant stock process can influence companies' valuation analyses, when the reference point is made from familiar position that executives observe in current markets. This may become the anchor of relative valuation benchmark. This view is similar to one of the empirical predictions of Rhodes-Kropf et al., that is "increasing sector misvaluation increases mergers activity, and the use of stock as method of payment". Baker and Wurgler (2012), creators of the well-known sentiment index, comply with this argument, as they state that parties appear to use peaks of overexuberant stock prices as a reference point to simplify complex tasks of valuation and negotiation in order to pursue deals.

To closer elaborate on the proposed theory of Shleifer and Vishny (2003), these authors develop a theory of irrational markets and self-interested managers who rationally take advantage of their mistakenly overvalued companies in the pursuit of maximizing their short run gain. The theoretical predictions of Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004), which will be elaborated in further details bellow, are one of the earliest literatures concerning the phenomenon of merger clustering and common market misvaluation. The two studies have similar elements in explaining the underlying characteristics of this phenomenon. The two research papers agree that the source of the merger is mispricing of the two individual combining companies, yet if there is aggregate mispricing in the respective market, this will lead to higher merger activity in one period than in the other. However, whilst Rhodes-Kropf and Viswanathan (2004) argue that it is the managers of the target company who overestimate the synergies due to the high sentiment in the market and agree to the deal, Shleifer and Vishny (2003) argue that it is the *market's perception of the synergies from the combination*. Shleifer and Vishny (2003) do acknowledge that there is some truth to

the neoclassical explanation of merger activity, yet it does not complete the entire story of the occurrence of this phenomena. It explains industry specific shocks but it fails to explain the aggregate merger waves, unless of course, these industry specific shocks happen all at the same time. It does not explain the systematic pattern in why in some periods, stock-financed deals are more frequent than in other periods but perhaps even more importantly, why do merger waves occur specifically during periods of highly overvalued markets in such great intensity. With these remarks, their proposed theory does not entirely reject the neoclassical explanation of merger activity, but offers additional explanation to the incomplete areas of what is observed in the market.

In this theory, the transactions between companies are driven by stock market valuations of the merging companies, with the fundamental assumption pointing at inefficient financial markets, where firms are valued incorrectly. The degree of the mispricing may differ in different periods. As with all other studies I mention in support of my hypotheses, managers are fully rational and are aware of equity market inefficiencies. This contrast the opposing theory, where irrational managers make decisions regarding mergers and acquisitions in fully efficient markets. Under this assumption, the authors construct a model consisting of two firms, 0 and 1 with capital stocks, K and K_1 and market valuation of the capital per unit Q and Q_1. Q and Q_1 are not efficient in accordance with fundamentals but rather reflect investor sentiment about them. The investor sentiment may but not necessarily be idiosyncratic, it may be partially due to their firm specific mispricing, but may be part of the mispricing of the sector, industry or even market. It also hold that firm with similar characteristics such as technology companies, or all US or European companies may be under the influence of *common sentiment*. The combined equity and value of the newly created entity is denoted with S a V and is expressed as $V = S(K + K_1)$, where is perceived synergy rather than ex-post synergy derived from fundamental values. Shleifer and Vishny (2003) define this variable as "*market consensus* holds about the benefits of the merger" and describe it as facilitator of merger activity, but in reality it may not have causal power of aggregate merger activity. The immediate effect (also short run gains) from the two firms merging is given by:

$$S(K + K_1) - KQ - K_1Q_1, \tag{1}$$

and we can observe synergies when the difference between these variables is greater than 0. The immediate effect on the short run value of the target:

$$(P + Q)K \tag{2}$$

And on the bidder's value:

$$(S - P)K + (S - Q_1)K_1 \tag{3}$$

When P=Q, target does not benefit from this merger, when P=S, they gain proportionately to the increase of the capital. Authors' second proposition is that the long run effect of cash acquisitions on the merged firms equals zero, the effect on the target and the bidder is $K(P-q)$ and $K(q-P)$ respectively. In case of stock financed acquisition, the target owns x amount of stocks:

$$x = PK/[S(K + K_1)] \tag{4}$$

These stocks are consequently worth:

$$xp(K + K_1) = q\left(\frac{P}{S}\right)K \tag{5}$$

Based on this, authors propose third proposition, the long-term gain to the shareholders of the target firm from being acquired is:

$$q\left(\frac{P}{S}\right)K - qK = qK\left(\frac{P}{S} - 1\right) \tag{6}$$

In the long run, the acquirer gain only if P < S, that is when the target is acquired at better terms than the market's assessment of perceived synergies between the two considered companies. Authors do however posit that within this model, manager fail to look after the long-run wellbeing of existing shareholders. Instead, they seek to maximize their short run gain where the acquirer is might still be better off undergoing acquisition in the short run as long as S is high enough and therefore management gets rewarded. Acquisition is preferred by the managers as long as S>P, intuitively, as long as the perceived synergies are higher than the price paid for the acquisition, the short run pay off will be higher if the acquisition is executed. It then follows that the occurrence of mergers will be clustered in period of high sentiment, where the short run gain is maximized. This benefits gain of the managers, as long as the shareholders perceive the synergies from the acquisition to be valuable.

It is important to note that whilst both Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) deal with the way investor sentiment influences the perception of synergies in perspective deals, they do not model the same source of misvaluation. Critical part about my research and any of the literatures used to support my research is that mispricing is present in the market due to irrational investors and limits to arbitrage and in some periods this phenomenon is more pronounced than in others. Yet, the effect on corporate finance is worthwhile examining only if firms respond to this mispricing. The papers of Shleifer and Vishny (2003) and Rhodes-Kropf and Viswanathan (2004) suggest different ways that the firms respond to this misvaluation with similar end results. Shleifer and Vishny (2003) propose that the merger activity reacts to investor sentiment due to incentivized manager acting in their own self-interest. Since the market sentiment influences also their own shareholders, they take advantage of their biased perception of the synergies of the perspective

merger and execute mergers to maximize short run gain. Rhodes-Kropf and Viswanathan (2004) base the proposed theory on correlated misinformation and valuation of potential acquisition synergies being correlated with overall valuation error in the market. They point out that the behavioral explanation behind merger clustering is that acquirers use their inflated stocks to acquire relatively undervalued stocks cheaply is rather naïve.

It leaves us with question; why would the targets rationally accept the overvalued stock? Rhodes-Kropf and Viswanathan (2004) develop a model where stock purchases can be rationally driven in overvalued due to existence of private information on both sides of the underlying merger. In accordance to this theory, it then follows that this private information correlates with the market valuation and whilst the managers of the target companies have private information about the value of their company, bidder has information not only their stand-alone value of their company but also the potential value after merging with the target company. Yet, the private information of acquirer and target is subjected to possible misvaluation and may not necessarily the true value of the respective companies. In their model, the target is less able to assess the publicly known information when determining the possible synergies. Rhodes-Kropf and Viswanathan (2004) divide the misvaluation of the two distinct companies into two components - a firm specific component and market-wide component - the first component captures the idiosyncratic misvaluation of specific company whilst the latter captures misvaluation what is common in the market.

The critical part in this paper is that the target has the knowledge and ability to determine whether their firm is currently overvalued or undervalued, however they cannot distinguish the source of this misvaluation - whether the source of this misvaluation is from the market (sector) and is therefore aggregate and shared with the acquirer, or whether it is firm specific misvaluation. The target therefore evaluates the prospects of the perspective merger on the assessment of possible synergies. Thus their decision regarding the acceptance of the bid lies in the assessment of the private information of their own company and the synergies perceived by target's management. Not being able to distinguish between market wide and firm specific misvaluation, this poses great difficulty to approach this assessment rationally. Rhodes-Kropf and Viswanathan (2004) predicted that when market-wide overvaluation is high, the estimation error associated with the synergies between the two respective companies is high as well. Since target's private information and the acquirer's bid are positively correlated with market sentiment, this leads to higher likelihood that the target accepts the bid and that merger activity intensifies in the underlying overvalued market (sectors):

"When the market is overvalued, then target is more likely to overestimate the synergies even though he can see that his own price is affected by the same overvaluation because he still underestimates the shared component of the misvaluation." - (Rhodes-Kropf and Viswanathan, 2004)

It is important to emphasise that the target is not irrational in this case, but simply does not poses

enough information to assess the situation most optimally due to the overvalued markets. The prediction follows that we could observe the opposite effect when the target is overvalued due to firm specific component. The more overvalued it is, the more the target anticipates the market misvaluation and effectively filters it out from decision making. This will make the underlying bid appear too low and the likelihood of the target agreeing to the merger decreases. It then comes to the formal hypothesis of the paper the target will perceive the bid to be high when the perceived strategies are high and that occurs when the acquirer is overvalued or when the target is *relatively* undervalued. This phenomenon does not appear automatically during every boom and therefore the periods of market overvaluation should not be confused with periods of high growth or used interchangeably. Rhodes-Kropf and Viswanathan (2004) offer formal explanation to merger clustering in the intuition of correlated synergies in the market. In the rational and fully efficient markets, each successfully executed merger will lead to the market to update the prices on the next perspective mergers. It will also lower the probability of the next merger occurring due to part of synergistic opportunities already exploited in the first merger. This would then subsequently continue until there are no more synergies and ending the clustered merger activity. In the overvalued and exuberant markets however, each new merger increases the expectations regarding possible synergies, thus the waves will occur during the periods of high over valuation in the market and will end only when investors and firm entities learn information that will lead to doubt the possible gains from the synergies and ultimately ending each respective merger wave with a crash.

The theoretical model Rhodes-Kropf and Viswanathan (2004) consists of a bidding firm i, that has private value of Vi for firm T. Vi would be the true value of firm T, multiplied by the the perceived synergy by factor $(1 + s_i)$: where $s_i > -1$. It then implies that merger can be both value creating ($s_i > 0$) and value destroying ($s_i < 0$). The bidding firm i however does not know the exact true value XT or the value of synergies s_i but only knows the value of the firm as a potential merger partner V_i. The factor $(1 + s_i)$ includes a firm specific and common component as follows $(1 + s_i) = (1 + \lambda)(1 + \omega_i)$. The market value of MT may not however equal the Xi because of the possible underlying misvaluation in the market. As previously elaborated, Rhodes-Kropf and Viswanathan (2004) assumed two types of mispricing - the market wide and shared mispricing and firm-specific mispricing for the acquirer:

$$X_i = M_i(1 + \rho)(1 + \varepsilon_i) \quad (7)$$

and for target:

$$X_T = M_T(1 + \rho)(1 + \varepsilon_T) \quad (8)$$

Where ρ is the common component of the sentiment in the market and that affect both acquirer and target in the same manner. One may think of ρ as a mispricing factor or as in this paper, an *investor sentiment*, which is shared in the market (or sector). In order to clarify the opportunities of riskless

arbitrage, no entity in the market is aware of what value ρ and ε_i take and thus cannot trade the firm's stock in order to pursue these.

The Model of Rhodes-Kropf and Viswanathan (2004)

Information known Only to bidders	Unknown Variables	Information known to bidder, target & market	Unknown variables	Information known only to target

$$\underbrace{X_i}_{\text{Firm Value}} = \underbrace{(1+\varepsilon_i)}_{\text{Firm Specific Error}} \times \underbrace{(1+\rho)}_{\text{Market wide Error}} \times \underbrace{M_i}_{\text{Market Price}} \times \underbrace{\alpha_i}_{\text{Bid}} \underbrace{M_T}_{\text{Market Price}} \times \underbrace{(1+\rho)}_{\text{Market Wide Error}} \times \underbrace{(1+\varepsilon_T)}_{\text{Firm Specific Error}} = \underbrace{X_T}_{\text{Stand-alone Value}}$$

Same effect
Investor sentiment

Rhodes-Kropf and Viswanathan (2004) derived simple following rule regarding target's willingness to accept the bid. Since the value of target without undergoing merger is X_T, the target will not be willing to merge unless acquirer's offer delivers value that is greater than X_T. Target will therefore accept any offer that satisfies following rule:

$$E\left[V_i \mid \alpha_i, M_i, \phi_T\right] > X_T \tag{9}$$

which includes the market misvaluation M_i, α_i is the fraction that the acquirer bids, and ϕ_T, representing target's private information set, this expression can be conveniently decomposed to:

$$E\left[(1+s_i)\left|\frac{(1+s_i)}{(1-\varepsilon_i)(1-\rho)}, \frac{(1+s_i)(1-\varepsilon_j)}{(1+\varepsilon_i)(1+s_j)} \forall j \neq i, \frac{(1+s_i)(1-\varepsilon_T)}{(1+\varepsilon_i)}\right.\right] \tag{10}$$

Where the first component $\frac{(1+s_i)}{(1-\varepsilon_i)(1-\rho)}$ is dependent in the market misvaluation since ρ is common market component shared between the firms, carrying the element of investor's sentiment. This expression delivers the phenomenon that as the investor's sentiment increases, so will the likelihood that the target accepts the offer. *Since this component is common between firms in the market, the likelihood of mergers increases on aggregate level, leading to the initiation of a merger wave.* This is due to the fact that the target is likely to overestimate the synergies from the potential merger, even though the target acknowledges the overvaluation of its own stock price. Vice versa, in undervalued markets, this model predicts lower merger activity.

In support of this theoretical model, the authors test their empirical predictions in M. Rhodes-Kropf, T. Robinson, S. Viswanathan (2005), which were in agreement with the above-discussed theory. Unlike in their theoretical model however, in order to empirically test for the above-discussed theory, they disintegrate the firm-level market-to-book ratio of firms, which were involved in merger activity, into three components instead of two. Whilst the sector wide investor sentiment component remains in the market to book ratio, they disintegrated the firm specific component into short run deviations firms' long-run pricing and long run pricing to book. As in the initially discussed paper, they focus on rational managers with asymmetric private information where synergies are systematically overestimated and correlated with the overvalued markets and where managers have the fiduciary responsibility to accept any offer higher than the standalone value of the target firm. Along with their own proposed theory regarding merger waves and mispricing, they contrasted the opposing theory of neoclassical view, where assets are being transferred to firm entities that are able to employ them into more productive uses following certain shocks in the sector or industry.

Interesting intuition that the authors present is that although in the last 125 years, the merger clustering was coinciding with high M/B ratios and stock financed deals, M/B alone has *no effect on the probability* of the merger taking once year fixed effect panel structure is in place. And thus empirically, M/B alone cannot explain the phenomena of merger intensity in certain times. The fact that all recognized merger waves had ended with a stock market crash or substantial decline in equity prices would intuitively lead us to the opinion that at least to some extend, merger activity is driven by the misvaluation in the market. Rhodes-Kropf et al. (2005) find empirical evidence that misvaluation indeed drives the aggregate activity as well as other complementary findings regarding understanding of determination of acquirer and target and method of payment.

The authors disintegrate the M/B ratio to empirically in order to test for underlying misvaluation:

$$\frac{M}{B} = Market\ to\ value\ \times\ Value\ to\ book = \frac{M}{V} \times \frac{V}{B}$$

Taking the logarithm and abbreviating this expression into:

$$\log\left(\frac{M}{B}\right) = \log\left(\frac{M}{V} \times \frac{V}{B}\right) \qquad (11)$$

$$\therefore\ m - b = (m - v) + (v - b)$$

where lower case letters express values in logs. The first of expression $(m - v)$ measures the discrepancy between the price in the market and true value of the firm, which arises due to mispricing in the market and asymmetric information between acquirer, target and the rest of the market. The second expression is the true value to book ratio, which in theory measures firm's not yet realized growth options, which are not incorporated in firm's book value. The expression is then further decomposed to three components: firm-specific error, time series sector error and long run value to book. As in the model of Rhodes-Kropf and Viswanathan (2004), firm specific error attempt to capture

the idiosyncratic mispricing that relates to the firm, but is not shared in the market whilst the time series error arises from deviation from long term valuation multiples of the firm and captures the current exuberance in the market that is common among the firms in the particular market or sector. Although target correctly adjusts for potential overvaluation, it also puts some weights on synergies, which in line with theory of Rhodes-Kropf and Viswanathan (2004). Synergies are systematically overestimated in overvalued markets as a result of high estimation error in mispriced markets whilst at the same time, target is unable to distinguish between whether the misvaluation is firm specific or sentiment in the market.

Their estimation of true value conceptually involves expressing value v as a linear function of firm specific accounting information at a given time. The equation 11 can be further decomposed into:

$$m - b = (m - v) + (v - b)$$

$$\therefore\ m_{it} - b_{it} = \underbrace{m_{it} - v(\theta_{it};\ \alpha_{it})}_{\text{Firm Specific Error}} + \underbrace{v(\theta_{it};\ \alpha_{it}) - v(\theta_{it};\ \alpha_j)}_{\text{Sector Wide Error (Investor Sentiment)}} + \underbrace{v(\theta_{it};\ \alpha_j) - b_{it}}_{\text{Long run Value-to-Book}} \qquad (12)$$

The sector-wide time series error expresses the difference between multiples at time t which are accounted in a vector of conditional accounting multiples α_{jt} whilst α_j depicts long-run multiples which stay constant over time. Authors describe this component as crucial for capturing the mispricing in the respective market that the firm *j* operates in. When markets are overvalued, this will be captured in vector α_{jt}. Intuitively, when the difference between these two values is high, the aggregate merger activity approaches its peak. Vice versa, the first component captures idiosyncratic valuation of the company and to isolate it from the effects of market common investor sentiment, the authors deduct the fundamental firm value $v(\theta_{it};\ \alpha_{it})$ at time *t*. The last component expresses the difference that is attributable the long-term value and book value of firm *j,* capturing the growth options of the standalone firm.

Rhodes-Kropf et al. (2005) developed three main models to examine the relationship between merger intensity across time, firm fundamentals and underlying sentiment in the market, which would directly affect the mispricing. The first model (1) depict a simple time series regression of market equity to book equity:

$$M_t = \alpha_{0t} + \alpha_{1t} B_t \qquad (13)$$

Where α_{0t} and α_{1t} would take a value of 0 and 1 respectively under the assumption of perfect competition forces and the firm's equity equal to its opportunity cost at all points in time. Authors examined the above stated regression in logs to account for right-skewness in the accounting data.

None of the three models can be interpreted as asset pricing regression, as they do not model expected returns incorporating risk and other factors. The authors however do emphasize that the multiples move in the same directions as the discount rates as they are embedded in the multiples. Although not explicitly, one may still interpret the α_{0t} as the average risk characteristic in the industry.

In the second model (2), the authors added net income to the first model (1):

$$M_t = \alpha_0 + \alpha_{1t} B_t + \alpha_2 NI_t \tag{14}$$

Expressed in logs:

$$\therefore m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt} \ln(NI)^+_{it} + \alpha_{3jt} I_{(<0)} \ln(NI)^+_{it} + \varepsilon_{it}$$

Thanks to implementation of the model by adding net income, this allows to relax stringent assumption applied to model (1).

In the third model (3), the authors added leverage to the model to account for the possibility that the leverage may differ between the industries and it may possibly have an impact on the firm specific mispricing and fundamental long run value of the firm as the cost of capital varies depending on the leverage of the particular company. They allowed model (2) and (3) to vary cross-sectionally and over time to allow the leverage and net income to fluctuate over time and vary between the companies within each sector. Model 3 is expressed as follows:

$$\therefore m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt} \ln(NI)^+_{it} + \alpha_{3jt} I_{(<0)} \ln(NI)^+_{it} + \alpha_{4jt} LEV_{it} + \varepsilon_{it} \tag{15}$$

Rhodes-Kropf, T. Robinson, S. Viswanathan (2005) find support of multiple of prediction as well as some unexpected findings. Although in wide it is hypothesized literature that high market to book companies tend to acquire low market to book companies, in this dataset, both the acquirer and the target have high market to book ratio relatively to group of deals with cash financed acquisitions. That said, although both high, the difference in market to book ratio of target and acquirer was still significant on deal-level. This intuitively leads the authors to the conclusion that firm specific error $m_{it} - v(\theta_{it};\ \alpha_{it})$ should be lower for targets than for acquirers, yet both are higher than the market to book ratio of firms not participated in mergers and acquisition activity.

What is more related to the topic of my paper is their formal test on misvaluation and merger intensity – does valuation levels increase merger activity? They examine this question in two tests. One is a probit regression, examining the probability of being involved on a firm level and second, they relate the aggregate merger activity and overall valuation error within sector. The first model examines the likelihood of being involved in a merger activity based on firm level valuation characteristics, where the dependent variable in the probit model takes value of 1 if particular firm was involved in a merger activity and 0 otherwise. They find empirical support in the argument that

firms are more likely to be involved in merger when the M/B is high, however, this effect disappears both statistically and economically once they control for year fixed effects. Once they decomposed the M/B ratio, they find that year fixed effect eliminate the statistical significance of sector-wide error. This indicates that on firm-level, M/B is picking up mostly the time-varying trends, but not the differences across firms that would increase the probability of a merger. In the second model of this subsection, the authors regress panel data of merger activity in sector *j* in year *t* on variety of aggregate measures. The panel regression is constructed as follows:

$$Number\ of\ mergers_{it} = \alpha_{0jt} + \alpha_{1jt}\left[\bar{v}(\alpha_{ij}) - \bar{v}(\bar{\alpha}_j)\right] + \alpha_{2t}\left[\bar{v}(\bar{\alpha}_j) - \bar{b}_t\right] + \varepsilon_{it} \qquad (16)$$

They find that after decomposing the M/B ratio to sector wide and long run value, they find that increasing sector wide valuation error lead to increases in merger activity even after inclusion of sector and year fixed effects. On average, one unit increase in the sector-wide M/B component $\left[\bar{v}(\alpha_{ij}) - \bar{v}(\bar{\alpha}_j)\right]$ results in 39 more mergers executed per given year, controlling for year and fixed effects and is statistically reliable at 1% significance level. In short summary, the authors finds empirical evidence that all parties participating in clustered merger activity have high time-series sector error and share a common mispricing component as a result of influence of investor sentiment in the market. The ultimate conclusion is that misvaluation matters, and that overvalued firm's buy relatively less overvalued firms that are in sectors in which equity is aggregately mispriced.

B. Corporate finance and market-driven stock prices

Whilst the research of Rhodes-Kropf and Viswanathan (2004) and Shleifer and Vishny (2004) focused on misvaluation driven corporate finance and incorporated common sentiment as a component of the underlying misvaluation, a smaller stream of empirical corporate finance on supply side for forms of capital. Baker (2009), the co-author of the investor sentiment index, summarized the broad findings on investor sentiment and corporate finance and argues that stock prices influence corporate investment because of mispricing through supply effects. The supply effects can arise from combination of three factors – investor tastes, limited intermediation and corporate opportunism (Baker M., 2009). Investor tastes is a broader definition of investor sentiment, in which investor's preferences shift over time in a way that is unrelated to corporate fundamentals and cannot be justified by models of classical corporate finance. The first two factors interact with one another – a slump in confidence of investors will not only drive away the investors willingness to invest but also would cause a panic among depositors and thus affecting prices of loans.

Although in accordance with classical finances, institutional investors are rational and should stop investor tastes from bringing the prices away from the fundamental value, a broad empirical evidence suggests that rational investors do not always succeed in doing so due to limits on arbitrage or simply

because doing so it is not profitable enough and arbitrageurs decide to take a role of rational speculator instead (Griffin, Harris, Shu, & and Topaloglu, 2011). Therefore until now, one could observe many occasions in which combination of limited intermediation and investor tastes led to non-fundamental movement in asset prices and interest rates. The final factor is the one that responds to the first two and subsequently incorporates the mispricing into corporate finance. Corporate opportunism is the extent to which firms respond to non-fundamental investor demand, thus to investor changes and shocks to intermediary capital. Stein (1996) and Baker et al. (2003b) develop framework to model supply side of capital, incorporating the above-mentioned supply side effect:

$$Q^S = (\phi - P)K + [(\phi + \delta) - P]k \qquad (17)$$

And managerial objectives stating the demand for capital:

$$Q^D = a + b(P - \phi) + c\phi \qquad (18)$$

Where in supply equation 17 K denotes intermediary capital, k denotes capital that is subject to investor sentiment δ and $\phi - P$ denotes the difference between fundamental value ϕ and price. Thus according to Stein (2009) and Baker et al. (2003b), the supply of capital from investors stems from two distinct sources, yet the traditional finance posits the view that the intermediate capital is much larger than relative to the latter one. In another words, in the traditional rational view, the investor sentiment would be close to zero and the arbitrage forces would drive the prices in the direction of fundamental value and corporate finance could at last ignore the asset pricing. In the more realistic case however, knowing that markets do not always work efficiently, the investor sentiment $\delta > 0$ and and limited arbitrage forces may cause the price to deviate from fundamental value and supply is not perfectly elastic:

$$P = \phi + \frac{k}{K+k}\delta - \frac{k}{K+k}Q^s \qquad (19)$$

where supply of capital to corporate finance is influenced through limited intermediation $\frac{k}{K+k}$, investor tastes δ. Based on this mispricing, the managers may then make opportunistic decision regarding buying other or its own equity which is conceptually similar to the paper of Shleifer and Vishny (2003)

C. Investor sentiment

The literature previously elaborated was concerning the market mispricing and aggregate merger activity, yet the concept of the (investor) sentiment and the way it is measured is equally as important for the purposes of my research. The early concepts and ideas of the common sentiment between agents were mentioned as early as 1930's, John M. Keynes wrote that the "market is subject to waves of optimistic and pessimistic sentiment, which are unreasoning and yet in a sense legitimate where no solid basis exists for sound calculation". In early periods, sentiment was mostly linked to the

speculative bubbles and noise in the market that could not be explained by fundamental analyses and presented a significant challenge to the supporters of efficient market hypothesis. Today, after the major breakthrough of behavioral finance in the 1990s, we acknowledge the presence of sentiment in many areas of finance. For instance, the waves of optimistic and pessimistic sentiment that hit the market and influence the efficient pricing of assets. As John Keynes already pointed, a difficulty comes with measuring the underlying feeling of optimism and pessimism. There are two main methods that attempt to proxy the aggregate investor mood of optimism or pessimism in the market – the survey based and secondly, sentiment derived from the stock and financial markets activity. Among the first attempt to quantify the mood of the market was the one of R. Shiller (2000) who measured bubble expectation and consumer confidence through examination of number of stock indices, indicators and economic variables.

For the purpose of this research, I will use Baker and Wurgler's Investor sentiment index and the consumer index of University of Michigan. The first index takes six components taken from various stock market data whilst the latter is polled regularly by U.S. households.

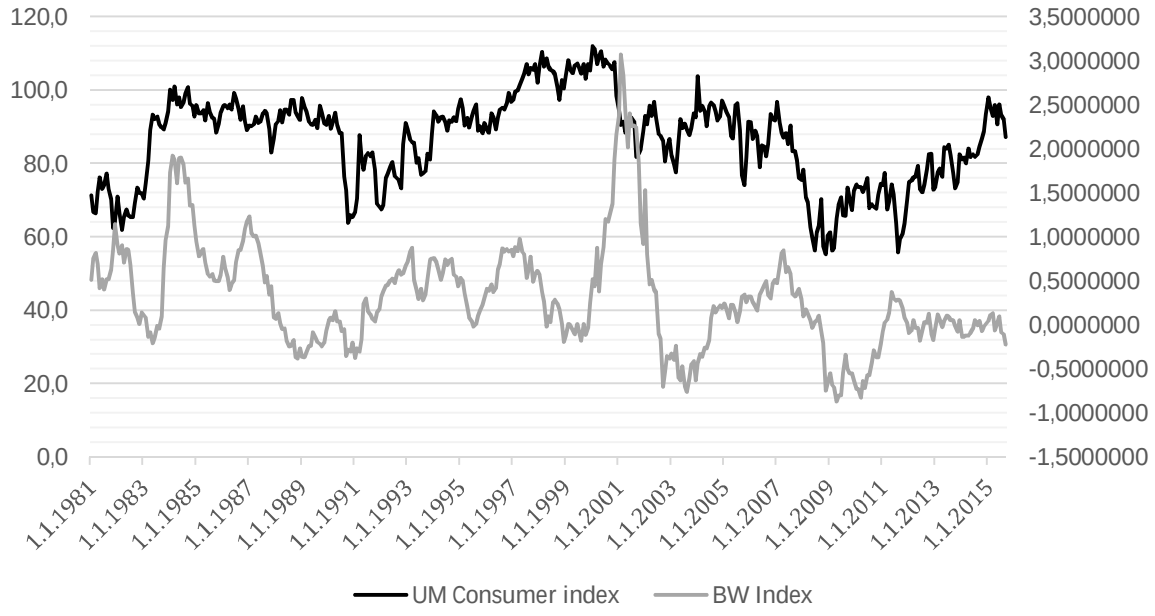

Figure 1. BW Investor sentiment index vs UM Consumer Sentiment Index

On figure 1, I plot the time series of the two indices from 1981 to 2015 as the intended sample period. Although the first glance comparison from these two indices may be troublesome due to different scales and measures, the trends suggest there still may be some tenuous relationship. Considering some of the major bubbles and consecutive crashes, we can observe increase in sentiment in the beginning to mid-1980s, where U.S. went through series of optimistic periods in Ronald Reagan era, with the subsequent infamous Black Monday Crash in 1987. The "biotech" and "dot-com" bubble also appears prominently on the chart, with one of the biggest rise and decline in consumer and investor sentiment. The U.S. bear market of 2007-2009 is very clearly identifiable due to the severity of

subprime mortgage crisis and its effect on aggregate confidence of the market. The two trends exhibit similar pattern as a result of reaction to the same events, albeit it appears that there is a different lag due to polling intervals of sentiment index carried out by University of Michigan.

D. Investor Sentiment Index of Baker & Wurgler

In the work of M. Baker and J. Wurgler (2006) regarding the examination of the influence of market sentiment and cross-sectional differences between firms, authors developed investor sentiment index derived from stock market data using time-series conditioning variables. In the original version of this research paper, the authors formed a composite index that is collected from six proxies, which were in past examined to exhibit patterns in reaction to optimism and pessimism in the market. Since the index is being used until today, the authors regularly update this index based on more recent findings and developments. The original parsimonious index consisted of common variation in six proxies: Closed-end fund discount, NYSE share turnover, number of IPO per given month and average first day return on IPOs, the equity share in new issues and the dividend premium. The most recently updating version of this index omitted NYSE share turnover as one of the indicators for sentiment. Nevertheless, in the next section, I describe all six proxies of the original index and its relation with market's sentiment.

The closed-End Fund Discount is defined the average difference between the net asset value of closed end stock fund shares and their current market prices (Baker & Wurgler, 2006). This proxy relates to closed end-premium puzzle. Past empirical finding delivers evidence that the shares of the closed-end fund do not trade at the market value of the assets that the fund holds at given moment. This phenomenon typically occurs within 3 months since beginning trading. If this has been established fact, it is in question why do investors still invest in these funds at premium at the issue. This lead to the intuition that irrational investors invest in closed-end funds, and thus, closed end funds are offered when retail investors are particularly optimistic. Closed-end funds trade at a discount and the noise trader risk is systematic. Prior literature suggests that this discount is inversely related to sentiment. If the premium increases, there is greater optimism amongst retail investors, and vice versa, presence of discount on close end funds indicates lower or negative sentiment in the market. Lee et al. (1991) investigate the phenomena of closed end fund discount and proposes that the puzzling fluctuations in the closed-end fund discount over time is caused by changes in the investor sentiment and delivers empirical evidence to support this proposition. Since investor sentiment was empirically evaluated as a driver of closed-end fund discount, it then intuitively follows that there must be a common variation between these two variables and that closed-end fund discount should serve as a proxy of investor's mood. Baker and Wurgler (2006) take the value-weighted average discount on closed-end fund discount as one of the component of the sentiment index for the period of 1962-2015.

The second component of the original sentiment index is the NYSE share turnover, although as previously mentioned, this component was dropped in the updated version of the index in 2015. New York Stock Exchange share turnover is a ratio of share volume to averages listed from NYSE *Fact Book*. Baker and Stein (2004) examined the relationship of general market liquidity, represented by NYSE share volume to average shares listed, and stock returns in CRSP value-weighted and equal weighted portfolios. They show evidence that increases in liquidity lower returns in firm-level and aggregate data. The intuition behind the link to sentiment is the fact that retail investors are constrained on short selling, and thus their impact on stock prices is predominantly noticeable when they are optimistic and are taking long position in stocks listed in NYSE and thus increasing liquidity. Consequently, the hypothesis is that in the periods of optimism, the market is flooded with irrational investors and is overvalued, with liquidity being one of the symptoms which is distinguishable from general efficient activity from the side of arbitrageurs. The changes in turnover may therefore proxy the sentiment of irrational investors in the market. This component was taken out from the original index by the authors in 2015, due to strong believe of fundamental change in this variable over time. Turnover does not carry the information about the underlying feeling of the market as it once did due to large volume of institutional high frequency trading and the migration of trading to a variety of venues (Wurgler, 2015). Baker and Wurgler did not publish the updated equation, therefore for the purposes of this research, the bellow stated parsimonious index relates to the original published version in 2006, yet the data used to constitute the models is the updated on the five-proxy index, omitting NYSE share turnover.

The third and fourth components of the sentiment index were directly related to the IPOs, as the IPO activity is linked to being sensitive to sentiment among individual investors. The optimistic investors exhibit enthusiasm over new companies with high level in uncertainty in form of high first day return on the stocks offered. This may also be linked to the concept of market timing with companies being selective about the time to go public for the first time. The number of IPOs executed monthly is therefore another proxy for which companies exploit the common enthusiasm in the market and decide to go public during period's of high sentiment. Ritter (1991) documented the "hot issue" relation of underperformance and IPO issuance during periods of high sentiment and appears to be highly cyclical phenomenon with some periods of high sentiment lasting months at a time. These "hot issue" companies however subsequently underperform relatively to companies of similar size and industry, which has not undergone IPO for the next three years. This suggest that the type of investors who initially buys these hot stocks are individual investors who are prone to the media hype of the IPO rather than arbitrageurs who would recognize high fundamental value in these stocks. The number of executed IPOs and first day return on IPO is denoted by *NIPO* and *RIPO* respectively.

The share of equity issues in total of equity and debt issues is a financing proxy that may exhibit sensitivity to investor sentiment in the market. Baker and Wurgler (2000) investigated this variable in

a separate research to determine the predictive power over market reurns. In the view of classical finance, the financing decision of companies should not have any effect on the performance of the respective company, in line with the intuition of the well-known hypothesis of Modigliani and Miller (1958). The main finding of Baker and Wurgler (2000) which has strong implication on the perception of financing activity we observe daily is the fact that companies prefer to finance their activities with equity issue before periods of low returns and vice versa, they tend to prefer debt issues before the periods of high returns. In this intuition, the equity issue is a strong reliable predictor of market returns in upcoming year. This phenomenon cannot be explained by any rational mechanisms in the efficient markets, instead, it may identify behavioral phenomenons and inefficiencies such as market timing. This variable is created by taking gross issuance of common equity over the sum of gross equity and gross long-term debt and is denoted by *S*.

Last component is the dividend yield premium P^{D-ND}, which is the log difference of the average market to book ratios of dividend payers and non-payers. The intuition behind using this proxy is the observed behavior of higher demand for non-dividend paying stocks during period of high sentiment. In this period, retail investors are keen to purchase growth stocks which promise large capital gain in short span of time rather and thus this component will be negative in periods of high sentiment and thus inversely related to sentiment index. On the other hand, during the periods of low sentiment and high volatility, investors demand stable stocks with lower growth opportunities that are paying dividends on their investment. The authors take the common component of the six proxies and isolate it from the non-common idiosyncratic parts which are unrelated to sentiment. They additionally investigate the lead-lag relationship of the variables in order to determine if some components take longer to react to the same sentiment than others, and lag each variable respectively to whichever has higher correlation with the first stage index (Baker and Wurgler 2006). Finally, they rescale the coefficients so that the index has unit variance and composed following index:

$$Sentiment_t = -0.241CEFD_t + 0.242TURN_{t-1} + 0.253NIPO_t + 0.257RIPO_{t-1} + 0.112S_t - 0.283P_{t-1}^{D-ND} \quad (20)$$

One of the main objections that one may have against this index is that these proxies may simply capture only the common component of the business cycle rather than the underlying feeling of optimism and pessimism amongst investors. The objective of constructing such index was to identify periods in time when the above-mentioned phenomena occur for no rational reason. For instance, why do systematically high returns on first day of IPO occur– this cannot be explained by the common business cycle. It is expected that some part of these proxies can explained rationally with the moving business cycle, but to isolate these from the part that cannot be explained by any rational reasons, the authors create a second investor sentiment index with orthogonalized proxies that explicitly remove

the common business cycle variation. This means that they regress each of these proxies on growth in production index, consumption of durables, non-durables and service and a dummy variable for NBER recession. The residual from these regressions may represent a better proxy of aggregate sentiment with control of common business cycle variation. Following the same methodology as with index (20) the authors constructed following index:

$$SENTIMENT_t^{\perp} = -0.198CEFD_t^{\perp} + 0.225TURN_{t-1}^{\perp} + 0.234NIPO_t^{\perp} \quad (21)$$
$$+0263RIPO_{t-1}^{\perp} + 0.211S_t^{\perp} - 0.2432P_{t-1}^{D-ND,\perp}$$

Examination of the two indices shows that controlling for macroeconomic conditions is not an issue and the indices are not qualitatively affected by doing so. The orthogonalized variables are slightly more correlated with each other than the proxies in equation 20, one would expected the opposite if the raw were driven by macroeconomic condition rather than the investor sentiment. The first principal component explains 53% of the sample variation and in coincides with the anecdotal accounts of high periods of bubbles. This index is positive in years of 1968-1970, 1972, 1979-1987, 1996-1997 and 1999-2001, in years which exhibit bubbles in the market. The correspondence of positive index of sentiment and bubbles together with the greater correlation after including macroeconomic variables shows evidence of robustness of this index.

II. Methodology and hypotheses development

Given that the intuition of the theoretical and empirical findings are correct, it may therefore be possible to find significant relationship between aggregate merger activity and market sentiment or even predict the likelihood of start of the M&A wave with data on market sentiment. The fundamental research question of this study therefore is:

What is the relationship between investor sentiment and aggregate merger activity?

It is important to note that vast majority of existing literature regarding debates about the cause of merger waves and its correlation to high stock market valuation dates back to early 2000's. Shleifer and Vishny (2003) stated that they will not explicitly model the sources of market inefficiency and investor sentiment, but will rely on growing empirical literature describing the circumstances under which security prices deviate from fundamental values. This creates an opportunity to explore this area of research, which had been previously discussed but not thoroughly examined with specific set of data. Baker and Wurgler created their sentiment index in 2006, with the monthly data of this index being published in 2007. My motivation behind this study is to see whether market sentiment is indeed correlated to aggregate merger activity, and whether sentiment have predictive power on

merger clustering and in the methodology of this research, use the sentiment index that previously did not exist. I will additionally provide the analysis with substitution of the investor sentiment with the consumer confidence index of University of Michigan as a robustness check. The fist hypothesis aims to examine general relationship between sentiment and aggregate M&A activity in a monthly time series. I examine the time series with respect to number of deals executed per month and the levels of aggregate deal value per month as dependent variable. Shleifer and Vishny (2003), Baker (2009), (Rhodes-Kropf, Robinson, & Viswanathan, 2005) keep the executives fully rational but take mispricing as given. In this intuition, acquisitions are stock market-driven and it is plausible that merger clustering do specifically happen in period of overvalued markets and sentiment may have certain predictive power over merger waves. The first empirical prediction therefore is:

Hypothesis 1: Increasing sentiment in market increases aggregate merger activity.

Before I formally test the relationship between aggregate merger activity I create a univariate time series model with number of executed mergers (both stock and cash-method of payment and separately) in a month and sentiment index as an independent variable of interest, with different lags being investigated. In the original study of the investor sentiment in Baker and Wurgler (2006), the authors use one year lag to investigate pattern in annual frequency of stock returns following a year of positive and negative sentiment. Given the nature of monthly time series however, it may make more sense to use monthly lag or none at all, if managers react to execute planned merger with immediate effects. The variable of sentiment is rather volatile throughout the months using a lag of full year as in Baker and Wurgler (2006) may have very little causal power over mergers that happen in 12 months in future. I use both the original sentiment index and the orthogonalized index in order to distinguish between a common sentiment component and a common business cycle component (Baker & Wurgler, 2006). Whilst I realize that the univariate model will be a subject to omitted variable bias, the purpose of this hypothesis is to examine whether even statistically reliable relationship exists between these two variables - control variables will be added to the univariate regression in the following models.

$$number\ of\ deals\ executed_t = \alpha + \beta_1\ Sentiment_{t-1} + \beta'_2 \boldsymbol{x_t} + u_t \quad (22)$$

$$number\ of\ deals\ announced_t = \alpha + \beta_1\ Sentiment_{t-1} + \beta'_2 \boldsymbol{x_t} + u_t \quad (23)$$

$$number\ of\ stock\ financed\ deals_{\ t} = \alpha + \beta_1\ Sentiment_{t-1} + \beta'_2 \boldsymbol{x_t} + u_t \quad (24)$$

$$deal\ value_t = \alpha + \beta_1\ Sentiment_{t-1} + \beta'_2 \boldsymbol{x_t} + u_t \quad (25)$$

Where x is a vector of macroeconomic characteristics, β_1 picks up the effect of sentiment and β'_2 picks

up the generic effect of macroeconomic characteristic – these control variables are macro economic indicators that would isolate the sentiment effect further from omitted variable bias correlated with business cycle. These include inflation, industrial production, liquidity index, dummy variable for recession.

Second hypothesis examines the relationship of aggregate merger activity with sentiment when controlling for the method payment. According to Harford (2005), under the behavioral hypothesis, there is no other underlying reason for a merger wave to occur more likely other than the desire of managers to use overvalued stock in order to acquire more assets in form of other firm. As oppose to the neoclassical hypothesis, where it follows that not all transactions will use stock as a method of payment but also will use cash, as the underlying reason of merger clustering is reallocation of assets to more productive firms following an industry shock. The if the behavioral explanation holds, the second hypothesis therefore follows:

Hypothesis 2: In periods of high sentiment and high market mispricing, the probability that the method of payment in a merger is stock increases.

Given the nature of the test for sentiment and merger activity in terms of probabilities, the appropriate method to be used to test for this hypothesis is the logit model. Logit is a non-linear model that optimally transform the regression model so that the fitted valued yield dependent variable which in a interval of (0,1). The relationship is examined in its univariate form and multivariate form; however opposite to the prior models of hypothesis 1, the sample data of hypothesis 2 includes both macro environment and firm specific control variables to prevent omitted variable bias.

$$P(Stock\ payment)_i = \alpha + \beta_1\, Sentiment_i + \beta'_2 \boldsymbol{x_i} + \beta'_3\, \boldsymbol{y_i} + u_i \qquad (26)$$

Where β_1 indicates the effect the sentiment has on the probability of the firm using stock, β'_2 picks up the generic effect of the vector macroeconomic control variable and β'_3 capture the effect of firm specific controls. Hypothesis 2 predicts that the higher the sentiment in the market in the period that the merger is executed, the higher probability that the company uses stock as a method of financing the merger, thus a positive and significant coefficient of sentiment β_1. This intuition is in agreement with the theory and empirical findings of Rhodes-Kropf, Robinson, & Viswanathan (2005) and other above mentioned empirical findings.

Since in the original study on sentiment of Baker and Wurgler (2006) the authors examine the effect of the investor sentiment index on the cross section of the stock return, it is also my motivation to do so to see whether investor sentiment effects the M&A activity throughout the cross section in a similar way. Baker and Wurgler (2006) provide evidence that sentiment has substially larger effect on securities whose valuations are highly subjective and difficult to arbitrage. My motivation is, that

sentiment may have larger effect on the transaction values ont he targets whose valuation is also more problematic and subjective.The author sexamine the effect of sentiment on cross section of stock return conditional on size (market capitalization), age of the firm, total risk, earnings, dividends, tangibility of assets, R&D expenditure, market to book ratio, external finance and sales growth. They find that sentiment has significant effect on the cross section conditional on size, age, total risk, earnings and dividends, meaning that when the proxy for sentiment is negative or low, the returns are also low on small stock, young stocks, high volatility stocks, unprofitable stocks, non-dividend paying stocks, extreme growth stocks and distressed stocks (Baker & Wurgler, 2006). In this study, I examine the cross section of public firms involved in M&A activity and the effect of the sentiment on the deal value condititional to specific firm characteristic of the target. The hypothesis for the analysis of the cross section therefore is:

Hypothesis 3: The effect of sentiment on the deal value is different throughout the cross section of target firms. The effect of sentiment is greater, positive and significant for targets that are small, unprofitable, non-dividend paying, have low tangibility of assets, high R&D expenditure, low book-to-market ratio, high level of external finances and high sales growth.

Due to availability of data, I omitted the examination of cross section conditional on total risk of firms (stock price volatility) and age of the firms. Whilst it would be meaningful to examine cross section of firms with respect to acquirer as well, Thomson Reuters unfortunately offers very limited data on the acquirer parties of the deals with the exception of data on PPE, net income and net debt which is also used as firm specific control variables in hypothesis 2. Examining the sentiment effect on cross section of acquirers would nevertheless be an interesting subject for future research given more favourable the availability of data.

I examine the cross sectional effects using cross section regression subsample analysis of the deals, dividing the sample in three cohorts conditional on specific target firm characteristic. Taking profitability into consideration for instance; I take the third of the lowest profitable targets, middle third of the profitable targets and third with the most profitable targets and run the cross section regression to examine the sentiment effect on deal value on these subsamples separately in following way:

$$Deal\ value\_lowest\ cohort_i = \alpha + \beta_1\ Sentiment_i + \beta'_2 \boldsymbol{x_i} + \beta'_3\ \boldsymbol{y_i} + u_i \quad (27)$$

$$Deal\ value\_medium\ cohort_i = \alpha + \beta_1\ Sentiment_i + \beta'_2 \boldsymbol{x_i} + \beta'_3\ \boldsymbol{y_i} + u_i \quad (28)$$

$$Deal\ value\_highest\ cohort_i = \alpha + \beta_1\ Sentiment_i + \beta'_2 \boldsymbol{x_i} + \beta'_3\ \boldsymbol{y_i} + u_i \quad (29)$$

The hypothesis 3 states that there will be differences of the effect of sentiment on the cross section of

target firms, meaning that the coefficients of sentiment β_1 differs in sign, magnitude and statistical and economical significance. As in previous hypotheses, β'_2 picks up the generic effect of the vector of macroeconomic control variables $\boldsymbol{x_i}$ and β'_3 captures the effect of firm specific controls $\boldsymbol{y_i}$. Taking the profitability as an example, in this study the profitability is measured in net income (E) scaled by book value of equity [E/BE]. In the intuition of Baker and Wurgler (2006), the lowest cohort should have the highest and most significant coefficient and therefore deal value of low profitable targets should be the most sensitive to sentiment in the cross section. Smaller firms, measured in market capitalization, are expected to be more sensitive to sentiment than larger firm and therefore the coefficient of sentiment β_1 of the lower cohort be more economically and statistically significant than in the medium and highest cohort.

Tangibility is measured in two ways, first – the amount of fixed assets scaled by total assets [PPE/TA] and the amount of R&D expenditure scaled by total assets. The hypothesis states that firms that have lower tangibility and do not own substantial amount of fixed assets in scale of total assets will be more susceptible to sentiment and therefore the coefficient of sentiment in the low cohort is expected to be greater and more significant. R&D also proxies for growth opportunities for firms in future; these are accompanied by significant amount of uncertainty, one is very subjective and difficult to arbitrage. One may therefore expect, that firms will substantial R&D expenditure and larger growth opportunities will be the ones whose value is will be very susceptible to sentiment in comparison to value firms will low growth opportunities and low or none R&D expenditure. Baker & Wurgler (2006) in their anecdotal accounts on investor sentiment that during periods of low or negative sentiment, investors rather opt for firms that actually do pay dividends rather than firms that are promising overnight wealth. And vice versa, when the period is particularly optimistic, we can observe that many investors enthusiastically invest into innovative and hi-tech and dividend payment becomes less important. Dividend payment of firms therefore becomes quite an important characteristic of firms when it comes to changing sentiment. I test whether the non-dividend paying targets are acquired for greater value during period of high sentiment than the one who are more stable and actually do pay dividends regularly. Majority of firms Due to smaller number of observation R&D and dividend payment characteristics are subdivided into cohorts instead of three – one where R&D > 0 and dividend payment > 0 and otherwise.

Since periods of high sentiment are also associated with periods of overvaluation and significantly high book-to-market ratio, therefore I also test whether it is also associated with higher deal value. I predict that the deal values of targets with the lowest B/M ratio are most sensitive to sentiment. Lastly I also run cross section subsample analysis with respect to sales growth to examine extreme growth companies and external finance to examine highly distressed and indebted companies.

III. Data

As the investor sentiment index of Baker & Wurgler (2006) solely focuses on optimism of investors within the US economy, it naturally narrows down the country of the research to the US only. I start with the examination of the mergers or the tender-offer bids that are recorded by the Securities Data Company (SDC) with the effective date between 1981 and September 2015. The start of this period is identical to the one of Harford (2005) and coincides with the start of fourth merger wave that I intend to include it in this analysis. The end of the sample period is linked to the end of the constructed investor sentiment index. The analysis of this paper focuses on two distinguish set of data to examine the relationship of sentiment and merger activity. The first set of data includes mergers for aggregate time series analysis where the I examine the changing intensity of monthly M&A activity in terms of number of mergers completed (or withdrawn) on monthly basis and aggregate deal value. In this analysis I use all mergers between the above mention period with the deal value above $10 million to exclude minor transaction, identically to the data selection of Harford (2005). This adds to the sample with 200,300 mergers to be examined in the monthly analysis of hypothesis 1 which can be in more details seen in table 1.

Descriptive Statistics for Hypothesis **1**

Table 1 includes descriptive statistics regarding annual aggregate merger activity. N (total) is the total number of all mergers successfully executed between US acquirer and US target between 01/01/1981 and 30 /09/2015. Total Volume of transactions and mean value per transaction are in millions of dollars, and the stock – number of deals, stock – deal value and successful are the percentage. Source: Security data Company via Thomson One.

Year	*N* (total)	Total Volume Of transactions ($mil)	Stock – number of deals (%)	Stock – deal value (%)	Mean value Per transaction ($mil)	Successful (%)
1981	824	59,679.61	53.88	88.47	72.427	82.55
1982	1,525	60,994.88	40.13	83.33	39.997	78.96
1983	2,407	73,665.21	34.57	72.12	30.605	77.22
1984	2,748	140,254.74	40.14	69.70	51.039	77.03
1985	1,780	142,050.28	37.30	67.35	79.804	70.74
1986	2,438	206,430.69	27.73	62.83	84.672	78.90
1987	2,490	179,601.21	32.01	63.78	72.129	80.40
1988	2,882	252,913.12	33.66	64.57	87.756	74.41
1989	3,644	261,883.86	31.28	68.23	71.867	72.65
1990	4,080	149,652.71	24.98	58.33	36.680	78.14
1991	3,717	102,156.53	18.19	50.32	27.484	77.39
1992	4,117	106,574.28	19.46	48.89	25.886	79.88
1993	4,744	165,244.98	20.15	52.28	34.832	78.73
1994	5,730	244,545.28	21.33	61.66	42.678	81.86
1995	6,873	351,342.72	19.12	56.32	51.119	80.08
1996	7,979	540,584.18	17.42	64.91	67.751	82.05
1997	8,679	623,964.49	12.37	63.80	71.894	82.91
1998	9,861	1,115,654.47	10.97	69.62	113.138	82.78
1999	8,535	1,030,296.11	11.60	69.93	120.714	83.78
2000	8,529	1,420,419.15	11.04	73.70	166.540	85.66
2001	6,085	941,194.11	10.98	75.34	154.674	86.58
2002	5,680	486,714.79	8.77	44.26	85.689	87.29
2003	6,229	397,673.7	7.66	45.00	63.842	89.14
2004	7,205	699,585.22	6.13	60.90	97.097	90.06
2005	7,744	780,672.29	6.11	59.73	100.810	91.01
2006	8,519	1,121,142.49	5.78	62.53	131.605	89.92
2007	9,086	1,344,932.87	6.80	66.87	148.023	89.98
2008	7,537	653,183.18	7.59	59.58	86.664	88.76
2009	5,975	609,738.62	8.45	56.54	102.048	89.26
2010	6,481	594,620.93	5.42	46.91	91.748	91.15
2011	6,710	638,605.7	5.16	50.02	95.172	92.89
2012	7,069	729,149.57	4.50	50.30	103.147	92.89
2013	7,429	718,842.88	4.12	48.60	96.762	92.49
2014	8,054	912,930.05	3.66	35.35	113.351	92.60
2015	6,482	914,778.82	3.81	64.50	141.126	90.81
Total/ average	200,300	18,771,673.70	12.63	60.80	72.427	85.38

Table 2 – Descriptive statistics for the sentiment measures used. Observations refers to number of months in the time series. The table shows mean, standard deviation and min and max for the respective measure.

	bservations	Mean (m)	Std. Dev. (s)	Min	Max
Investor Sentiment Index	417	0. 277	0.689	-0.932	2.837
Investor Sentiment Orthogonalized	417	0.315	0.616	-0.866	3.076
Consumer Sentiment Index	417	86.603	12.297	55.3	112

Table 2 provides summary statistics for the sentiment measures used in this paper. The investor sentiment of Baker and Wurgler (2006) takes negative values when there is underlying feeling of pessimism among the investors in the market and vice versa, is positive when market is feeling optimistic. This is different from the consumer sentiment index of UM that takes values between 55.3 and 112 and the value of optimism is a relative measure. From table 2, one can see that the orthogonalized sentiment index has slightly higher mean than the original index and takes slightly higher values with lower standard deviation. Whilst this should not present any problem to the time series analysis, it is problematic for the two-way sorts, since more values are positive than negative. I obtained the BW investor sentiment index from Jeffrey Wurgler website and the Michigan consumer sentiment index (MCSI) from the website of University of Michigan. Both allow the indices to be publicly available for research.

Table 3 – Summary statistics for macroeconomic control variables for hypothesis 1

	bservations	Mean (m)	td. Dev. (s)	Min	Max
US Federal interest	417	0. 048	0.039	0.001	0.191
US Inflation	417	0.002	0.003	-0.866	0.013
US Industrial Production index	417	80.994	18.469	48.695	106.687
US Liquidity index	417	-0.023	0.064	-0.461	0.201

Table 3 provides summary statistics for the macro environment control variables that are used in hypothesis 1. The effective federal interest rate and inflation is from Federal Reserves Bank Reports obtained via Compustat North America. The US industrial production index serves as an economic indicator that measures real output for all the facilities located in US and are manufactured in US. Thus

if the change in merger activity was due to increased industrial production and reallocation of assets to more productive firms due to higher demand, this index controls for this relationship. It also includes mining, electric and gas utilities. The source of the US Industrial Production index is the Board of Governors of the Federal Reserve System (US). The US Liquidity index is Pastor and Stambaugh (2003), which is a standard liquidity measure used in empirical asset pricing and captures fluctuations in aggregate liquidity in US. Whilst liquidity is a broad concept and can be interpreted and proxied in any different ways, in this index it captures the aspect of liquidity associated with temporary asset prices fluctuations induced by order flow. In this analysis it serves as an important control variable.

It is problematic to investigate the merger activity not only in terms of number of deals successfully completed per month but also in terms of deal value transferred with the current sample. This relationship has to be investigated on companies with public status, otherwise the deal value and the accounting measure to be used to scale the deal value may not be publicly known and therefore cannot be used. This may yield biased results if in one year, more public companies were acquired over the other, the value of total money being transferred in M&A activity would be inflated regardless of high or low sentiment. Therefore, the last part of hypothesis 1 investigating the total M&A value uses the data sample of the following hypotheses which is subject to public companies only. The second set of data consists of firm specific data with deals dating between 1981 and September 2015 between US companies. As stated, all companies were public at the time of the acquisition and include only deals with transaction value above $10 million. This creates a sample of 6,791 deals, however, due to some accounting variables missing, the final analysis consisted of 5,572 deals. I winsorise all the accounting data at 1% and 99% confidence level in order to preserve remaining observations as oppose to dropping them from the sample. In order to test for the probability that the acquirer uses stock as a method of payment, I use number of control variables to preserve exogeneity. The descriptive statistics of these can be found in table 4. Along with the macroeconomic variables already described above, I use accounting variables of the acquirer to control for firm specific characteristics that could influence the decision of whether to use stock or not. These are the amount of fixed assets, the profitability and indebtedness of the acquirer in the last 12 months' prior the acquisition.

Table 4 – Summary statistics for accounting control variables of the acquirers for hypothesis 2

	Observations	Mean (μ)	Std. Dev. (σ)	Min	Max
Ln(PPE) (LTM)	5,572	19.113	2.338	7.601	24.005
Net Profit/PPE	5,572	7.629	291.703	0.002	16546
Net Debt/PPE	5,572	14.815	267.565	0	18683.5

Unfortunately, the SDC did not provide the information on Total Assets for the acquirer of the deal, only the information on fixed assets. Thus I scale the net profit and net debt by the fixed assets.

Data for hypothesis 3 consist of deal specific observation of public companies involved in M&A activity between 01/01/1981 and 31/09/2015. It includes deal specific as well as firm specific information about both target and acquirer at time of the acquisition or last twelve months prior the acquisition. Hypothesis 3 consists of subsample analysis of cross section conditional on number of firm characteristics. I follow the approaches of Baker and Wurgler (2006), Baker, Stein and Wurgler (2003) and McLean and Zhao (2014) and I winsorise all accounting variables on 1% and 99% confidence interval. The variable of interest is non-orthogonalized version of investor sentiment (descriptive statistics in table 2) and the dependent variable to be examine in hypothesis 3 is the deal transaction value scaled by total assets $\frac{\text{Transaction value}}{\text{Total Assets}}$.

Table 5 - Summary statistics for accounting control variables of the targets for hypothesis 3

	Observations	Mean (μ)	Std. Dev. (σ)	Min	Max
Ln(Total assets) (LTM)	6,552	19.366	1.885	15.078	24.427
Net Profit/Total assets	5,690	0.436	4.712	.0001	354.810
Net Debt/Total Assets	6,475	0.131	0.832	.00004	59.830

Table 5 depicts the descriptive statistic for winsorised accounting variables that are used as controls in hypothesis 3. Unlike in hypothesis 2, these are related to the targets of the acquisition as they are related to the deal value of the transaction in the acquisition, not the method of payment as investigated in hypothesis 2. Of course, most important data in hypothesis is the firm characteristics for the analysis of the cross section. Table 6 summarizes the descriptive statistics for the firm characteristics with respect to which the cross section is divided. I analyze the cross section with respect to 8 variables instead of the original 10 in Baker and Wurgler (2006); I omit age and volatility as these variables are unavailable in Thomson Reuters.

Table 6 – Summary statistics for firm characteristics of cross section analysis for hypothesis 3. Profit/BE is the net profit of the target scaled by book value of equity in the last twelve months. ME is the market capitalization of the target at the time of acquisition (share price x number of shares outstanding). PPE/Assets is the fixed assets of the target scaled by total assets in the last twelve months. BE/ME is the book-to-market ratio of the target at the time of the acquisition. Sales growth is the growth in revenue from t-1 to t where t is the year of the acquisition. External finance is the net debt/total assets. All variables are winsorised at 1% and 99% level.

	Observations	Mean (μ)	Std. Dev. (σ)	Min	Max
Profit/BE	6,421	0.421	1.953	0.0001	90.774
ME	6,791	1.08×10^9	2.99×10^9	5995000	2.14×10^{10}
PPE/Assets	5,554	0.258	2.786	0.000	1
BE/ME	6,476	.676	4.281475	0.000	299.468
Sales Growth	6,153	0.348	4.324	-0.993	299.398
External Finance	6,462	0.421	4.413	.0001	353.74
R&D	6,791	6415519	2.39×10^7	0	1.80×10^8
Common Dividend	6,791	11.402	45.674	0	347.567

IV. Results

A. Results for hypothesis 1

As described in the introduction and the methodology of this paper, I start with the examination of sentiment with the monthly time series analysis of the aggregate merger activity. I examine the average number of deals executed for months of negative and positive sentiment respectively.

Table 7 – average number of deals executed during months of positive sentiment and months of negative sentiment.

	positive sentiment	negative sentiment
Average number of deals (all)	250.9	228.9
Average number of deals (stock financed)	41.8	22.6
Paired t-test (all)	0.857	
Paired t-test (stock)	5.678	

For the interpretation of table 7, on average, there has been 250.9 deals executed during months of positive sentiment. That is, on average, 22 deals more than during the months when investor sentiment is negative, thus when the investors are rather pessimistic. As seen in table 4, the difference is much larger in case of stock financed deals. In order to determine whether there is statistically reliable difference, I used paired t-test to examine the two means. If we consider all the mergers in the sample period, I do not find a statistically significant difference between number of mergers executed during the month of positive sentiment and months of negative sentiment. On the other hand, when only stock financed deals are considered, the t statistics is 5.678, meaning that the means are statistically different from each other at any level (Pr (T>t) = 0.000).

As described in the methodology section, to formally test the underlying relationship between investor sentiment and aggregate merger activity, I run a series of univariate and multivariate tests to examine the two variables. Regression (1), (2) and (3) in table 8 have dependent variable the number of *all mergers that have been successfully* executed during a given month, regressions (4), (5) and (6) have dependent variable of all mergers announced during a given month, including those who have been withdrawn while the dependent variable of regression (7), (8) and (9) is the number of successfully executed mergers which were financed via stock method of payment. What is slightly surprising at first glance is the negative coefficient of sentiment of regression (1) which is significant both statistically and economically. The hypothesis 1 predicts that there is positive correlation between sentiment and aggregate merger activity, yet the coefficient of univariate regression is significantly negative. The negative sign of the coefficient disappears once macroeconomic control variables are added in regression (2) and (3); however, the coefficient still remains insignificant. This is the case also in regression (4), (5) and (6).

Although this result was not anticipated when forming the theoretical background and hypotheses, it does not necessarily disagree against the theoretical argument. All mergers included in the monthly dependent variable include both stock and cash financed acquisitions – although stock financed acquisitions are predicted to move along in the direction of positive, one may argue that cash acquisitions move in the inverse direction from the sentiment. The common market misvaluation

component of market-to-book ratio is much lower for companies that were involved in cash financed merger than for the companies that were in stock financed merger and this is the case for both target and acquirer. Additionally, by looking and descriptive statistics for hypothesis 1 in table 1, it is clear that in this hypothesis, there were substantially more mergers financed by cash than by stock method. That being said, the regressions (7), (8) and (9) capture the effect of sentiment on aggregate activity of stock financed mergers only. The univariate regression (7) has positive and strongly statistically and economically reliable coefficient of sentiment, indicating that the higher sentiment in each given month, the higher number of mergers successfully executed per month on 1% confidence level.

In order to ensure exogeneity and minimize omitted variable bias, I add macro economic variables to regression (8) and (9) which were taken from previous literatures as being correlated with merger activity. Regression (8) captures the effect of the original investor sentiment index whilst regression (9) examines the orthogonalized version of investor sentiment. Both coefficients are positive remained positive and significant at 5% confidence level after controlling for macroeconomic environment.

Results for Hypothesis **1** – Monthly Merger Intensity and the Sentiment Effect

*Table 8 – Regressions (1)-(9) capture the relationship between investor sentiment and aggregate merger intensity in terms of number of mergers completed on monthly basis. The dependent variable of regressions (1) -(3) is the monthly number of mergers that have been announced and successfully executed. The dependent variable of regressions (4) – (6) is the monthly number of announced mergers that have been successfully completed and also withdrawn. The dependent variable of regressions (7) -(9) is the monthly number of mergers that have been successfully completed and used stock as a method of payment. Regression (1), (4) and (7) are univariate regressions showing relationship between the respective dependent variable and non-orthogonalized investor sentiment index. Sentiment is a first principal component of the six sentiment proxies discussed in theoretical framework of sentiment. Sentiment orthogonalized is the named investor sentiment of orthogonalized proxies. The rest of the regression include appropriate control variables as described in the above section. The model used is time-series with Newey-West standard error and therefore the statistics is robust to heteroskedasticity and autocorrelation. Superscripts *, **, *** denote statistical significance at 1%, 5% and 10% significance level, respectively.*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sentiment	-92.681***	13.749		-91.353***	14.389		11.826***	5.262**	
	(-6.11)	(1.38)		(-5.73)	(1.24)		(5.77)	(2.41)	
Sentiment			11.91			13.730			7.151***
Orthogonalized			(1.14)			(1.12)			(3.14)
Interest		748.035***	767.694***		800.391**	811.122***		113.907**	101.236*
		(2.86)	(2.93)		(2.60)	(2.64)		(1.98)	(1.77)
Inflation		-41.433**	-42.907**		-32.645	-34.122		-12.375***	-12.802***
		(-2.19)	(-2.27)		(-1.47)	(-1.54)		(-2.97)	(-3.10)
Liquidity		19.932	16.378		59.777	55.560		-29.441	-31.822
		(0.21)	(0.18)		(0.55)	(0.51)		(-1.44)	(-1.56)
Industrial		11.128***	11.048***		11.012***	10.923		-0.474***	-0.515***
Production		(22.24)	(22.00)		(18.72)	(18.51)		(-4.31)	(-4.69)
Recession		-78.868***	-75.962***		-110.08***	-106.992***		-15.269***	-14.057***
dummy		(-4.27)	(-4.13)		(-5.07)	(-4.95)		(-3.76)	(-3.49)
Constant	504.93***	-441.740***	-436.239***	-593.807***	-343.232***	-336.999***	57.429***	96.348***	99.429***
	(44.88)	(-8.84)	(-8.70)	(50.19)	(-5.84)	(-5.72)	(37.78)	(8.76)	(9.06)
R-squared	0.083	0.711	0.711	0.073	0.635	0.635	0.074	0.226	0.234
N	417	417	417	417	417	417	417	417	417

I run the regression diagnostics to determine whether the residuals of this model are subject to serial autocorrelation. This is important to determine as it is likely to create problem by posing a bias to the standard errors of the coefficient estimators. I use Breusch-Godfrey test for autocorrelation for weakly exogenous regressors. This test is slightly more flexible for the assumption of normally distributed residuals that, for example, Durbin-Watson test for autocorrelation requires. Breusch-Godfrey test also allows to test for serial correlation through more lags beyond lag 1. The Pr > chi2 is 0.000, hence rejecting the null hypothesis of no serial correlation. In order to correct for the autocorrelation, I use the regression model in this table is the time series model with Newey-West standard error that is robust to heteroskedasticity and autocorrelation. I used STATA user generated function ivreg2 to generate a model and calculate the optimal lag in Newey-West regression. The most appropriate bandwidth to use with this model is 28. I additionally test the model for the presence of unit root using augmented Dickey-Fuller (ADF) method for unit root. In all models, I reject the null hypothesis of the ADF test that states non-stationarity of the model, therefore there is no presence of random walk in this model and the variables are stationary.

To perform a check for the robustness of this model, I additionally regress the same time series model with the consumer confidence index as the independent variable of interest. Table 9 shows the results of the regression model capturing the effect of sentiment via consumer sentiment index on M&A activity. Similarly to previous models, regression result (10) shows the effect of consumer sentiment on all successfully executed mergers, while the dependent variable of regression (11) is all mergers announced per given month, including those who were later on withdrawn and regression (12) shows the effect of consumer confidence index on all successfully completed mergers which were financed via stock. Opposite to the previous model capturing the effect of investor sentiment, all coefficients of consumer sentiment show positive and strongly significant effect of consumer confidence index. As discussed in the theory section of investor sentiment of this paper, whilst these two indices attempt to capture similar economic phenomenon, they are not equivalent and may show the reaction of the market to same events with different lag. As discussed in greater details, the investor sentiment of Baker and Wurgler (2006) captures the sentiment from different stock and financial market variables with almost immediate effect whilst the effect of different economic events may take longer to be prominently visible on the consumer confidence index which is a survey based proxy of aggregate confidence. All regressions in table 6 include macroeconomic control variables as in regression models in table 5.

Hypothesis **1** – Robustness check Aggregate Merger Activity and the consumer sentiment

*Table 9 – Regression (10), (11) and (12) depict relationship between aggregate merger activity and consumer confidence index of university of Michigan. Similarly, to models showed in table 5, regression (10) shows consumer confidence effect on monthly number of successfully completed mergers, the dependent variable of regression (11) includes monthly number of all announced mergers, including completed and withdrawn and the dependent variable of regression (12) includes monthly number of succefully completed mergers which were stock financed. All regressions include macroeconomic control variables identically to models in table 5. UM Consumer Confidence index is a survey based indicator designed to measure consumer confidence as a degree of optimism about the general economic events. The model used is time-series with Newey-West standard error and therefore the statistics is robust to heteroskedasticity and autocorrelation with measured appropriate optimal lag. Superscripts *, **, *** denote statistical significance at 1%, 5% and 10% significance level, respectively.*

	(10)	(11)	(12)
UM Consumer Confidence index	4.382*** (7.95)	6.182*** (9.89)	1.208*** (10.38)
Macroeconomic Controls	Y	Y	Y
Constant	-728.589	-748.273	17.354
R-squared	0.749	0.704	0.379
N	417	417	417

To investigate all aspects of hypothesis 1, the last outcome is to examine the relationship between the effect of sentiment and aggregate merger activity in terms of the aggregate deal value being transferred monthly between the firms involved in merger activity. As outlined in the methodology section, in order to investigate the relationship of aggregate deal value and sentiment, the sample consists only of public companies. The dependent variable to all regressions in table 10 is the monthly average transaction value scaled by total assets $\frac{Transaction\ value}{Total\ assets}$. Table 7 shows that in both cases of the investor sentiment index and its orthogonalized version, there is a strong effect of sentiment on the investment involved within M&A activity after being scaled for assets. This is also strongly economically significant, the mean of $\frac{Transaction\ value}{Total\ assets}$ is 1.313 and 1 unit increase in investor sentiment index estimates an increase in the average transaction value scaled by assets by 0.245. This strongly supports the hypothesis 1 stating that increase in sentiment increases the aggregate M&A activity in terms of deal value or the investment involved in M&A activity.

Results for Hypothesis **1** – Aggregate Merger Activity and the Sentiment Effect

*Table 10 – Time series regression show the relationship between investor sentiment (and consumer confidence) and aggregate merger activity in terms of the total deal value being transferred in M&A activity. The sample includes total transaction value between public companies between 1985-2015. Investor Sentiment is a first principal component of the six sentiment proxies discussed in theoretical framework of sentiment. Investor Sentiment orthogonalized is the named investor sentiment of orthogonalized proxies. UM Consumer Confidence index is a survey based indicator designed to measure consumer confidence as a degree of optimism about the general economic events. All regression include appropriate control variables as described in the above section. The model used is time-series with Newey-West standard error and therefore the statistics is robust to heteroskedasticity and autocorrelation. First number indicates the coefficient of the respective variable whilst number in brackets indicates the t-value of the coefficient. Superscripts *, **, *** denote statistical significance at 1%, 5% and 10% significance level, respectively.*

	(13)	(14)	(15)
Investor sentiment $_t$	0.247***		
	(4.61)		
Investor sentiment		0.241***	
Orthogonalized $_t$		(4.30)	
UM Consumer			0.006*
Confidence index $_t$			(1.72)
Macroeconomic	Y	Y	Y
Controls $_t$			
Constant	-2.093***	-2.026***	-2.489***
	(-7.88)	(-7.56)	(-7.55)
R-squared	0.370	0.365	0.338
N	369	369	369

The hypothesis 2 predicts that in the period of high sentiment and high market mispricing, the probability that firm opts for stock as method of payment increases. Since I deal with probabilities in this framework, I use a logit model to estimate a probability of the company using stock. Large part of literature specifies the periods of high market-to-book value as of market timing opportunism, or taking advantage of highly overvalued stock acquiring targets cheaply. Since it is firm specific examination, I include firm specific control variables which provide information on the characteristic of the acquirer in the last twelve months' prior the acquisition. Although the sample includes 6,791 mergers, substantial number of observations had to be dropped due to missing firm specific variable. This left the analysis with a sample of 5,572 observations, which is still very large number which may yield robust results and therefore the tradeoff for having firm specific control variables is rather small as it provides more exogeneous results. As described in the Data section of this paper, all firm specific data are winsorised at 1% and 99%.

B. Results hypothesis 2

Results for Hypothesis **2** – Effect of Sentiment on the Probability of Stock Financed Merger

*Table 11 – Logit models (1)-(6) capture the relationship between investor sentiment (and consumer confidence) and the probability that the merger is financed via stock. The dependent variable of regressions is a binary variable with value of 1.0 in case of merger being fully financed with stock and 0.0 if otherwise (including hybrid payments). Regression (1) and (4) are univariate regressions showing relationship between the binary dependent variable and orthogonalized investor sentiment index and consumer confidence index. Sentiment orthogonalized is the named investor sentiment of orthogonalized proxies. UM Consumer Confidence index is a survey based indicator designed to measure consumer confidence as a degree of optimism about the general economic events. The regressions (2) and (5) include appropriate firm specific control variable related to the acquirer of the merger and regression (3) and (6) also include controls for macroeconomic environment. Superscripts *, **, *** denote statistical significance at 1%, 5% and 10% significance level, respectively.*

	(1)	(2)	(3)	(4)	(5)	(6)
Investor Sentiment	0.114*** (3.04)	0.138*** (3.29)	0.182*** (3.86)			
UM Consumer Confidence index				0.018*** (8.70)	0.018*** (7.55)	0.028*** (8.26)
Ln(Total Assets)		-0.156*** (12.50)	-0.159*** (12.61)		-0.152*** (-12.09)	-0.154*** (-12.15)
Net profit/TA		0.000 (-0.18)	0.000 (-0.06)		0.000 (-0.03)	0.000 (-.11)
Net debt/TA		0.003** (2.08)	0.002** (2.30)		0.003** (2.45)	-0.003** (2.47)
Interest			0.01 (0.01)			-7.280*** (3.97)
Inflation			-0.332*** (-2.60)			-0.132 (-1.01)
Liquidity			-0.357 (-0.68)			-0.504 (-0.96)
Industrial Production			0.013*** (5.13)			0.004 (1.57)
Recession dummy			-0.188* (-1.65)			-0.364*** (-3.01)
Constant	0.142*** (5.27)	3.182*** (13.01)	2.211*** (6.30)		1.513*** (4.57)	0.597 (1.52)
R-squared	0.001	0.027	0.034	0.008	0.033	0.041
N	6,791	5,572	5,572	6,791	5,572	5,572

Table 11 shows results of estimating logistic models of the probability of stock financed merger. The dependent variable in the logit model of hypothesis 2 is a binary variable with value of 1.0 in case of stock financed merger and 0.0 if otherwise. In case of hybrid securities such as convertible securities, it is also 0.0. Table 2 shows results on non-orthogonalized version of the sentiment index and the consumer confidence index as a robustness check. The orthogonalized version of the index exhibits

identical results to its non-orthogonalized version and therefore I omit this from the body of the paper and can be found in appendix 1. Both respective sentiment proxies yield strongly statistical and economically significant and robust results in the direction predicted by the hypothesis. The univariate regression of the sentiment in logistic regression (1) shows that sentiment by itself has some ability to predict the likelihood of company using stock as a method of payment to financed the perspective merger. This ability remains and even increases in magnitude after control variables are added to the model in logistic regression (2) after adding firm specific variables of the acquirer and logistic regression (3) after adding macroeconomic variables. The coefficient of investor sentiment in logit regression (3) is interpreted as each additional unit of sentiment increases the probability of financing merger by stock by 18.2% all else being equal. The results of the consumer confidence index of UM are very similar to the investor sentiment index and therefore this model may be robust to the variable of sentiment.

C. Results for hypothesis 3

Hypothesis 3 states that cross sectional differences exist in the way companies reacts to underlying sentiment in the M&A activity. In the intuition of Baker and Wurgler (2006), this means that sentiment has greater effect on M&A activity among smaller, less profitable, non-dividend paying, high growth and distressed companies. As firms of this nature are more prone to speculation as a result of greater subjectivity in evaluating future performance of these firms, they exhibit greater sensitivity to high sentiment and changes in sentiment. I look at categorical variables across several characteristics of the target in order to examine the cross-sectional effects. The conditional variables of the target I examine are size – in terms of market capitalization, asset tangibility in terms of proportion of fixed assets over total assets, book to market ratio, sales growth and the amount of external financed used. I sort the sample of deals into three cohorts conditional on each of the characteristic in the respective analysis. In the last two analyses, I sort the deals into two subsamples with respect to R&D expenses in the last twelve months (R&D expenses above zero and otherwise) and whether they pay dividends or not. Whilst Baker and Wurgler (2006) investigate the effect of sentiment on cross section of stock returns, I place the value of transaction scaled by total assets of the target as a dependent variable of this analysis.

As outlined in the methodology section in the intuition of Baker and Wurgler (2006), target companies with lower profitability should be more susceptible to sentiment than more profitable targets. Table 12 depicts results on the subsample analysis of sentiment on transaction value conditional on profitability of the target. The profitability is expressed as net income in the last twelve months prior to the effective date of the transaction divided by book value of equity $\frac{Net\ income}{BE}$.

Results for Hypothesis **3** - Subsample analysis **1** conditional on Target's Profitability

*Table 12 – The subsample analysis shows the relationship between investor sentiment and aggregate merger activity conditional on profitability of the target. The dependent variable of all three regressions is the transaction value of the deal scaled by total assets of the target. The sample is divided into three cohorts, conditional on profitability (net income LTM scaled by book value of equity). Regression (1) includes deals with targets of the lowest profitability whilst regression (2) includes deals with targets of medium profitability and regression (3) includes subsample analysis of deals with highly profitable targets. Investor Sentiment is a first principal component of the six sentiment proxies discussed in theoretical framework of sentiment. All regression include appropriate control variables as described in the above section. First number indicates the coefficient of the respective variable whilst number in brackets indicates the t-value of the coefficient. Superscripts *, **, *** denote statistical significance at 1%, 5% and 10% significance level, respectively.*

	(1)	(2)	(3)
Investor Sentiment	0.337*** (4.37)	0.295*** (2.99)	0.179 (0.77)
Ln(Total Assets)	-0.092*** (-2.74)	-0.218*** (-5.88)	-0.620*** (12.61)
Net profit/TA	30.604*** (10.99)	17.977*** (12.19)	0.326 (1.27)
Net debt/TA	-0.702*** (-4.77)	-0.674*** (-3.55)	-4.833*** (-104.65)
Interest	6.063** (2.41)	7.513** (2.29)	27.183*** (3.42)
Inflation	0.278 (1.29)	-0.620** (2.29)	1.864** (2.84)
Liquidity	0.789 (0.93)	2.497** (2.28)	-0.230 (-0.09)
Industrial Production	0.020*** (4.74)	0.030*** (5.71)	0.090*** (6.72)
Recession dummy	-0.446** (-2.44)	-0.299 (-1.14)	-1.113* (-1.95)
Constant	0.139 (0.19)	2.097** (2.35)	2.695 (1.46)
R-squared	0.130	0.172	0.977
N	1858	1894	1848

I find that as predicted, targets in the lowest profitability cohorts are most sensitive to sentiment than targets of higher profitability. This means that as sentiment increases, the prices of targets with lower profitability increases more than for the ones in the medium profitability cohort. I also find no such significant relationship for the cohort of targets with high profitability as depicted in table 10 in the regression (1), (2) and (3). Regression (1) consist of subsample of targets with lowest profitability

12 months prior the deal; the coefficient of this regression can be interpreted as 1 unit of investor sentiment increases the dependent variable transaction value/total assets by 0.337 which both economically and statistically strongly significant at 0.1%. Regression (2) contains subsample of targets with medium profitability where coefficient of sentiment 0.295, which also statistically significant at 1% significance level, although as expected, slightly lower than the subsample in the low profitability cohort. Last regression (3) does not exhibit statistically reliable relationship at any level, thus indicating that sentiment does not affect the purchase of targets with high profitability. This result is consistent with the general intuition of Baker and Wurgler (2006), where they also find that higher sentiment severely effects stocks of low profitability and distressed firms.

I run the same subsample analysis with sample divided in three cohorts conditional on book-to-market (B/M) ratio and as with profitability. The prediction is that the cohort of the lowest B/M ratio should be most susceptible to sentiment as it represents growth stock with high growth options in the future rather than high current book value. Table 13 shows that as predicted, the bottom cohort of firms with lowest market to book ratio is highly sensitive to sentiment where an increase in sentiment by 1 unit means an increase in investment into these companies as the variable transaction value/total assets by 0.834, which is again, economically and statistically strongly reliable. The remaining two cohorts do not to show such relationship, creating discrepancies in the effects that sentiment has on the cross-section of companies. This is a highly predictable result which is in agreement with all previously elaborated literature defending the behavioral views on merger waves including the proposed theory of Shleifer & Vishny (2003), empirical evidence of Rhodes-Kropf & Viswanathan (2004) and Baker (2009). It is the overvalued firms who are most susceptible to sentiment and this is reflected in the level of transaction value in these deals.

Table 14 provides evidence on the effect of sentiment on cross-section of firms conditional on dividend payment and R&D expenditure. As shown in regression (1) and (2) of table 12, sentiment has much larger effect on the deal value of non-dividend paying companies than companies that do have dividends > 0. This is consistent with finding of Baker & Wurgler (2006) who provide evidence that non-dividend paying companies are significantly more susceptible to sentiment in terms of stock returns than dividend paying. The dependent variable of this analysis is identical the all previous subsample analyses, thus $\frac{Transaction\ value}{Total\ assets}$. On average, non-dividend paying target will be acquired more expensively during period of high sentiment than during the period of negative sentiment. This means, an increase of sentiment means 0.486 increase in the dependent variable for non-dividend paying companies. As denoted by the superscripts, this result is significant on 1% significant level as the t-statistics is 2.74. The subsample with dividend paying companies does not exhibit statistically reliable coefficient of sentiment, thus indicating that the dividend paying targets are not susceptible or more attractive during the period of high sentiment. Once again, this is consistent with the findings of Baker & Wurgler (2006).

Results for Hypothesis **3 -** Subsample analysis **2** conditional on Target's Book-to-Market Ratio

*Table 13 – The subsample analysis shows the relationship between investor sentiment and aggregate merger activity conditional on B/M ratio of the target. The dependent variable of all three regressions is the transaction value of the deal scaled by total assets of the target. The sample is divided into three cohorts, conditional on profitability (net income LTM scaled by book value of equity). Regression (1) includes deals with targets of the lowest B/M ratio whilst regression (2) includes deals with targets of medium B/M ratio and regression (3) includes subsample analysis of deals with highly B/M ratios. Investor Sentiment is a first principal component of the six sentiment proxies discussed in theoretical framework of sentiment. All regression include appropriate control variables as described in the above section. First number indicates the coefficient of the respective variable whilst number in brackets indicates the t-value of the coefficient. Superscripts *, **, *** denote statistical significance at 1%, 5% and 10% significance level, respectively.*

	(1)	(2)	(3)
Investor Sentiment	0.834*** (2.92)	0.010 (0.28)	-0.179 (0.77)
Ln(Total Assets)	-0.867*** (-9.88)	-0.058*** (-4.97)	-0.070*** (-10.76)
Net profit/TA	0.603* (1.93)	4.560*** (41.44)	0.458*** (11.66)
Net debt/TA	4.783*** (86.26)	-0.022*** (-0.35)	-0.082*** (-3.07)
Interest	30.960*** (2.46)	-0.561 (-0.49)	1.696*** (3.05)
Inflation	1.822** (2.46)	0.007 (0.07)	-0.027 (-0.53)
Liquidity	3.836 (1.26)	-0.296** (-0.82)	-0.180 (-0.87)
Industrial Production	0.113*** (7.34)	0.004** (2.19)	0.006*** (6.48)
Recession dummy	-2.176*** (-3.10)	-0.092 (-1.00)	-0.032 (-0.83)
Constant	6.016*** (2.82)	1.384*** (5.04)	1.175*** (7.25)
R-squared	0.974	0.528	0.168
N	1729	1925	1946

Results for Hypothesis **3** - Subsample analysis **3** conditional on dividend payment and R&D

*Table 14 – The subsample analysis (1)-(4) shows the relationship between investor sentiment and aggregate merger activity conditional on dividend payment (1)-(2) and R&D (3)-(4) . The dependent variable of all three regressions is the transaction value of the deal scaled by total assets of the target. In the sample condition on dividend payment, the sample is divided into 2 groups – regression (1) includes deals where target does not pay dividends and regression (2) consists of deals with dividend paying targets. In case of regression (3) and (4), the total sample is divided into deals where target has no R&D expenses (3) and deals where R&D expenses are at least above zero (4). The variable of interest – investor sentiment, is a first principal component of the six sentiment proxies discussed in theoretical framework of sentiment. All regression include appropriate control variables as described in the above section. The analysis is accompanied with appropriate control variables in order to ensure exogeneity of the model. First number indicates the coefficient of the respective variable whilst number in brackets indicates the t-value of the coefficient. Superscripts *, **, *** denote statistical significance at 1%, 5% and 10% significance level, respectively.*

	Dividends		R&D	
	(1)	(2)	(3)	(4)
	no dividends	dividend payers	No R&D	R&D > 0
Investor Sentiment	0.473*** (2.74)	0.028 (0.97)	0.059 (0.78)	0.998*** (2.73)
Ln(Total Assets)	-0.641*** (-11.17)	-0.083*** (-7.63)	-0.295*** (-11.00)	-0.549*** (-5.11)
Net profit/TA	0.783*** (3.84)	0.456*** (7.43)	2.314*** (13.48)	1.074*** (2.89)
Net debt/TA	4.744*** (125.82)	5.297*** (17.62)	4.495*** (149.65)	-0.153 (-0.28)
Interest	20.621*** (4.11)	1.106 (1.12)	9.359*** (3.58)	34.960*** (3.52)
Inflation	1.186*** (2.76)	-0.122 (-1.44)	0.092 (0.40)	1.081 (1.36)
Liquidity	1.120 (0.66)	0.468 (1.37)	0.552 (0.62)	2.318 (0.67)
Industrial Production	0.092*** (10.94)	0.006*** (3.76)	0.045*** (10.47)	0.113*** (6.86)
Recession dummy	-1.245*** (-3.31)	-0.097 (-1.35)	-0.315 (-1.61)	-1.464** (-1.99)
Constant	2.955** (2.22)	1.798*** (6.63)	0.558 (0.86)	1.248 (0.49)
R-squared	0.969	0.192	0.986	0.084
N	3398	2244	4434	1208

Regression (3) and (4) in table 12 denotes results of subsample analysis conditional on R&D expenses where regression (3) includes deals of target with no R&D expenditure in the last 12 months and regression (4) includes deals of targets with R&D expenditure above zero. The theoretical prediction is that R&D is one of the tangibility measures along with the PPE/A measure but also it proxies growth opportunities of the targets in future and since these are not as stable as predictable as profitable firms who do not rely on R&D research, the firms with positive R&D research should be more susceptible to be bough during periods of high sentiment. Regression (4) shows positive and strongly significant coefficient of sentiment on deals with companies with positive R&D expenses in last twelve months, and on the other hand, there is no significant relationship between sentiment and transaction value for firm with zero R&D expenses. This is what is expected by the proposed theory of cross-sectional differences. The coefficient of sentiment in regression (4) is 0.998, meaning that for companies with R&D expenses above 0, on average the deal value scaled by total assets increases by 0.998 as the aggregate investor sentiment increases by 1 unit. This is significant at 1% significance level as the t-statistic is 2.73.

I run subsample analysis on other firm characteristic which are summarized in the last result table 13. These are the sales growth, tangibility (PPE/TA), market capitalization, and amount of external finance used scaled by total assets. The table presents the coefficient b of sentiment in each cohort. Although not shown, each subsample analysis includes control variables as in the previous analyses of hypothesis 3. Turns out that the subsample analysis conditional sales growth $[(g_t - g_{t-1})/g_{t-1}]$ exhibit expected results whilst the rest of the remaining firm characteristics do not show any predicted or significant relationship. As far as the sales growth is concerned, Baker and Wurgler (2006) have predicted that the extreme growth companies are the ones who are the most sensitive to sentiment as one may hypothesize that these are the ones which are bought during a period of aggregate optimism in the market. Panel A of table 13 provides evidence that sentiment has statistically significant effect also on the transaction value of extreme growth companies thus during the period of high sentiment – an increase in investor sentiment by 1 unit increases the transaction value of extreme growth companies by 0.160. This is statistically significant at 1% significance level. Tangibility expressed in terms of PPE/TA, size of the the firms expressed by total market capitalization or indebtedness of the firms do not exhibit any differences in relation to sentiment across the cross-section.

Remaining results for subsample analysis

*Table 15 – Last table of subsample analysis shows remaining results on cross-sectional differences in the effect of sentiment on deal value. The model in this table is identical to subsample analysis 1 and 2 with same firm specific and macroeconomic control variables, only differing in the arrangement of cohorts which is accordingly to specific firm characteristic. Similarly to subsample analysis 1 and 2, each analysis is divided into three cohort conditional on specific variable. Panel A shows the effect of sentiment on deal value conditional on sales growth, panel B show the effect of sentiment on deal value conditional on tangibility, panel C shows the effect of sentiment on deal value conditional size and panel D on external finance. Column sentiment b indicates the coefficient of the respective variable in each cohort whilst number in brackets indicates the t-value of the coefficient. Superscripts *, **, *** denote statistical significance at 1%, 5% and 10% significance level, respectively.*

Cohort:	(1)		(2)		(3)	
	Sentiment b	t-statistic	Sentiment b	t-statistic	Sentiment b	t-statistic
Panel A: Sales Growth						
$(g_t - g_{t-1}) / g_{t-1}$	0.240	(1.12)	0.034	(0.43)	0.160***	(2.61)
Panel B: Tangibility						
PPE/TA	0.162	(1.43)	0.548**	(2.14)	0.099	(0.69)
Panel C: Size						
Market Capitalization	0.009	(0.25)	0.107	(1.49)	0.478**	(2.21)
Panel D: External Finance						
Net Debt/Total Assets	0.241	(1.20)	0.450***	(4.53)	-0.147	(-0.90)

V. Robustness Check – time series

Throughout this study, I use the consumer sentiment index of University of Michigan in order to periodically check for the robustness of each the model in all three hypotheses. Although when using this intuition to check for robustness, models in all three hypotheses appear to be robust and significant and statistically reliable, I use an additional robustness check for the time series regression in hypothesis 1. The robustness check of the results is conducted to guard against the possibility of endogeneity of the models, but more importantly also against the threat of serial correlation and heterogeneity of the data. To perform additional check for robustness of the time series, I regress the models in hypothesis 1 with dependent and independent variable expressed in changes. Since the time series model testing the relationship between the aggregate M&A activity in terms of number of successfully executed mergers and investor sentiment turned out to be insignificant I will no longer test for robustness. I only test for the regression which showed statistically significant relationships in support of the hypothesis. Regression (7) shows statistically significant positive relationship between investor sentiment and M&A activity in terms of number of successfully executed mergers financed stock and regression (13) which shows statistically significant and positive relationship between investor sentiment and M&A activity expressed as average monthly transaction value scaled by total assets of respective firm. The results of the robustness check are in table 16 bellow. Regression (7R) and (13R) shows robustness check for regression (7) and (13) respectively.

Robustness Check for Hypothesis **1** – Aggregate Merger Activity and the Sentiment Effect

*Table 16 – The results bellow show robustness of the models used in this study. Regression (7R) captures the relationship between investor sentiment and aggregate merger activity in terms of number of successfully executed mergers financed stock. Both dependent variable and variable of interest investor sentiment are expressed in changes from previous lag. Regression (13R) captures the relationship between investor sentiment and M&A activity expressed as average monthly transaction value scaled by total assets of respective firm. The sample includes total transaction value between public companies between 1985-2015. Investor Sentiment is a first principal component of the six sentiment proxies discussed in theoretical framework of sentiment. Investor Sentiment orthogonalized is the named investor sentiment of orthogonalized proxies. All regression include appropriate macroeconomic control variables as in the original models. First number indicates the coefficient of the respective variable whilst number in brackets indicates the t-value of the coefficient. Superscripts *, **, *** denote statistical significance at 1%, 5% and 10% significance level, respectively.*

	(7R)	(13R)
Investor sentiment $_t$	0.00015	0.00102**
	(0.21)	(1.97)
Macroeconomic Controls $_t$	Y	Y
Constant	0.139	0.971***
	(0.96)	(3.31)
N	368	368

As can be seen in table 16, although I have previously found that statistically significant result in regression (7) which would be in agreement with my hypothesis, it appears that this model may not be robust in its entirety after performing additional robustness check. The variable of interest Sentiment in regression (7R) which examines the relationship of regression (7) when variables are expressed in changes shows statistically insignificant coefficient. On the other hand, regression (13R), which captures robustness of regression (13) show positive and statistically significant relationship at 5% significance level. This shows that this finding is robust as far as this robustness test concerns.

VI. *Conclusion and suggestions for future research*

In classical finance, concept such as investor sentiment should have no lasting impact on fundamental functioning of financial markets. The theory of classical finance does not explicitly reject the idea of its presence, but it explains that the rational agents, who operate in substantially larger nominal volumes, correct the distortion created by the retail investors. Thus there should be no long term impact of retail investors on prices or market trends. Number of past research papers find evidence in favor that investor sentiment does create distortions in the market in terms of stock prices, realized returns and expected returns and affects the financial market condition that have impact on real economy. In this paper, the main research question aims to examine the relationship between the investor sentiment and aggregate M&A activity from number of different perspectives. The research question of this paper is formulated as follows:

What is the relationship between investor sentiment and aggregate merger activity?

Using supply side approach to corporate finance, I set the assumption of irrational investors as oppose to the view of rational investors and irrational managers, which large stream of literature focuses on. In order to answer the research question, I develop three separate hypotheses which aim to explore the aggregate M&A activity and investor sentiment to create more elaborated hypothesis and examine the topic from different angles.

The first hypothesis aims to explore the general incidence of investor sentiment and merger activity in terms of the frequency of mergers announced, frequency of mergers successfully executed and transaction volume transferred between firms in M&A transactions. It states that the *increasing sentiment in the market increases the aggregate merger activity* (H1). This paper finds evidence that investor sentiment does not have significant effect on aggregate M&A activity when all mergers are included in the sample. However, the sentiment has statistically and economically significant effect on stock-financed M&A activity alone, excluding cash financed mergers. The effect remains strongly significant after adding macroeconomic and firms specific variables of the acquirer. This means that when the investor sentiment is high, the occurrence of stock finance merger significantly increases. This is perfectly sound with evidence from the existing literature elaborated in this paper. On the other hand however, after performing additional testing, this result failed to be robust. The index of

University of Michigan showed statistically significant relationship. Whilst the two indices attempt to capture the same economic phenomenon, they are not equivalent in its entirety. The investor sentiment index of BW captures the mood of the market directly from stock market data whilst the consumer index is survey based index. The two indices may have different lags in reaction to same economic events. This may be area of research that would be worthwhile examining in future research. To complete answers to hypothesis 1, I investigated the relationship between the sentiment and aggregate merger activity in terms of the aggregate deal value being transferred between firms in M&A transactions. I find positive and statistically significant relationship between transaction value scaled by assets and all the proxies of sentiment. This means that when the sentiment is high, the firms are willing to pay more in the M&A transaction than when the sentiment is lower and vice versa. The robustness of this model is supported by two additional checks for robustness. The hypothesis 1 is therefore true only when volume in M&A activity is considered.

Hypothesis 2 of this research paper aims to examine the relationship between investor sentiment and method of payment. I examine the likelihood of stocks being used in M&A transaction in periods of high sentiment as opposed periods of lower sentiment. Hypothesis 2 states that (H2) *in periods of high sentiment and high market mispricing, the probability that the method of payment in a merger is stock increases.* Using logistic regression, I provide statistically reliable evidence that high investor sentiment increases the probability of acquirers using stock as a method to finance the underlying mergers. The effect remains significant even after adding macroeconomic and relevant firm-specific variables. The coefficient of sentiment in this model is significant in all cases of sentiment proxies. After including all the control variables, the probability of using stock to finance merger increases by 18.2% with each increasing unit of sentiment, all else being equal. Hypothesis 2 is therefore true as the probability of using stock as method payment is higher when the sentiment is increases.

Hypothesis 3 aims to examine the relationship of sentiment and the cross section of target firms. It states that (H3) *the effect of sentiment on the deal value is different throughout the cross section of target firms. The effect of sentiment is greater, positive and significant for targets that are small, unprofitable, non-dividend paying, have low tangibility of assets, high R&D expenditure, low book-to-market ratio, high level of external finances and high sales growth.* I examine the cross section of target firms using the subsample analysis conditional on target's firm characteristic. I find statistically reliable evidence that there are cross sectional differences in the transaction volume conditional on number of characteristics. I find that the deal value of firms that are in the lower and middle cohort of profitability are much more sensitive to sentiment. This means that acquirer pay significantly more for these firms when the sentiment is high and vice versa, pay significantly lower when the sentiment is low. I do not observe this phenomenon with the profitable firms, meaning that acquirers are not influenced by sentiment when intending to merge with profitable company on statistically significant

level. This is in perfect agreement with the cross-sectional analysis of Baker and Wurgler (2006). The effect became even more prominent in the analysis of cross-section conditional on book-to-market ratio. The transaction value of the target in the lower cohort with the lowest B/M ratio exhibits the highest sensitivity to sentiment, meaning that when the sentiment is high, acquirer's tend to pay higher for these targets than when the sentiment is low. I provide additional evidence that there are cross sectional differences in sensitivity of transaction value to sentiment conditional on dividend payment, R&D expenditure and sales growth. This provides evidence that indeed, as predicted by the hypotheses, when the sentiment is higher, firms tend to bet on and pay significantly more for targets that are less stable, have greater propensity to speculate and are more problematic and subjective to value due greater growth opportunities.

All in all, I provide evidence that systematic relationship exists between the sentiment in the market and aggregate M&A activity, however I am fully of the understanding that there are many more areas to be explored in this topic. This research would be complimented by additional cross-sectional analysis conditional on firm characteristics of acquirers if the data is available. I am of the opinion that the cross-sectional differences may be prominent not only on what kind of firms are being purchased more expensively during the periods of high sentiment but also what kind of firms make the investments during the period of high and low sentiment. Additionally, one of the limitations to this research is that different industries tend to go through different M&A waves. Large M&A wave in individual industries very often tend to create big wave for the entire market such as it was the case during the dot.com bubble and therefore the research presented in this paper is still sound. However, to create greater understanding of the M&A activity and the exuberance of the market, it would be worthwhile examining the sentiment effect separately in different industries with each sentiment index specific to the industry. Of course, this would involve creating new sentiment indices specific to each respective industry which was beyond the scope of this research. I additionally think that this research would benefit from further distinguishing between firm specific and aggregate mispricing which is another limitation to this research. I considered mispricing as common factor between firms and controlled for book-to-market ratio on firm specific level but the study would be more exogenous with additional analysis of the effect of firm specific and market sentiment such as the methodology used in Rhodes-Kropf, Robinson, & Viswanathan (2005). Having said that, this research provides clear evidence that there is existing relationship between sentiment and M&A activity and may serve as an introduction to an area of research that may still have more aspects to be explored.

Appendices

Further Robust Results for Hypothesis **2** –

Effect of Orthogonalized Sentiment on the Probability of Stock Financed Merger

*Logit models (1) - (3) capture the relationship between investor sentiment and the probability that the merger is financed via stock. The dependent variable of regressions is a binary variable with value of 1.0 in case of merger being fully financed with stock and 0.0 if otherwise (including hybrid payments). Regression (1) and (4) are univariate regressions showing relationship between the binary dependent variable and orthogonalized investor sentiment index and consumer confidence index. Sentiment orthogonalized is the named investor sentiment of orthogonalized proxies. The rest of the regression include appropriate control variables as described in the above section. Superscripts *, **, *** denote statistical significance at 1%, 5% and 10% significance level, respectively.*

	(1)	(2)	(3)
Orthogonalized Investor Sentiment	0.135*** (3.45)	0.126*** (2.90)	0.141*** (2.95)
Ln(Total Assets)		-0.156*** (12.52)	-0.159*** (-12.62)
Net profit/TA		0.000 (-0.17)	0.000 (-0.07)
Net debt/TA		0.003** (2.10)	0.003** (2.35)
Interest			-3.980 (-3.23)
Inflation			-0.318 *** (-2.60)
Liquidity			0.510 (1.02)
Industrial Production			0.013*** (5.13)
Recession dummy			-0.188* (-1.65)
Constant	0.142*** (5.27)	3.182*** (13.01)	2.211*** (6.30)
R-squared	0.001	0.027	0.033
N	6,791	5,572	5,572

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