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Introduction

In neoclassical finance theory, there is no role for investor sentiment in valuation, markets are efficient and all movements in stock prices rationally reflect changes in cash flows or discount rates. In sharp contrast, the behavioural finance literature posits that investor sentiment and limits to arbitrage play a role in the determination of asset prices which is independent of market fundamentals. More specifically, the noise trader approach (De Long, Shleifer, Summers and Waldmann 1990) hypothesizes that the presence of noise traders in capital markets can cause prices to diverge from fundamental value even in the absence of fundamental risk. The existence of the noise traders provides an extra noise trader risk (De Long, Shleifer, Summers and Waldmann 1990). When asset prices are forced above the level warranted by fundamentals because of irrational sentiment; mispricing will not be fully arbitraged away by rational investors, because rational investors have finite investment horizon and noise traders' sentiment is both stochastic and systematic. Therefore, the noise trader model predicts that security prices diverge from fundamental values in the short-run, as well as that securities will be priced below fundamental values in the long-run due to the additional required return of informed traders to bear noise trader risk.

Empirical evidence indicates that investor sentiment does affect prices as found in the literature on closed end fund discounts, mutual fund flows and equity offerings (IPOs and SEOs). In the cross-section, Kumar and Lee (2006) find supportive evidence for investor sentiment in the formation of stock returns. Lamont and Stein (2006) argue that corporate timing decisions reflect market inefficiency at an aggregate level.

Lamont and Stein (2006) look at the role for investor sentiment in the dynamic formation of prices.

Real Estate Investment Trusts (REITs) are company that own and operates income-producing real estate assets. The REIT investment vehicle was created by Congress in 1960 through legislation called the Real Estate Investment Trust Act, with the main objective of offering to all the investors a liquid way to invest in a diversified portfolio of commercial properties (Geltner, Miller, Clayton, Eichholtz 2006). For this reason, REITs are unique in that the pricing of the asset class parallels two markets. Specifically, a dual asset market situation exist for trading real estate assets in the private real estate market, trading properties directly, and the public real estate market for trading REIT shares that provides ownership of underlying properties indirectly. The performance of real estate in private market has been recognized as the underlying fundamental value of real estate stocks. REIT's value is fundamentally linked to the performance of private real estate market in the long-run and both markets are apparently dominated by a common real estate cycle. Consequently, REITs are an interesting laboratory to test the influence of sentiment in the pricing dynamics.

Moreover, using property stocks it can be possible to disentangle the driving forces leading to sentiment in REITs as rational related to fundamental changes or irrational stock market sentiment as well as explore the transmission mechanism of sentiment in the price formation.

Empirical evidences for the US real estate market point out the relevance of investor sentiment in explaining price dynamic of in both real estate private and public market. Ling, Naranjo and Scheick (2014) find evidence of a positive relation between investor sentiment and subsequent quarter returns in both public and private real estate markets. The magnitude of the short-run effect is larger in the public than in the private real estate market, which is consistent with the hypothesis that private market investors are better informed and more sophisticated. On the other hand, in public real estate markets, periods of sentiment-induced mispricing are followed by quicker price reversals, whereas, in private real estate markets are more susceptible

to prolonged periods of sentiment-induced mispricing. These results support the hypothesis that limits to arbitrage and delays in price revelation play important roles in determining the time it takes for prices to revert to fundamental values.

To this regard, the aim of this research work is twofold. First, it provides a detailed analysis of the investor sentiment literature in the finance and real estate field, with a focus on the methodologies used to construct sentiment indices. Secondly, this research work aims to provide evidence of the role of investor sentiment with respect to specific REITs characteristics. To this extend, a measure of the individual REITs sensitivity to the sentiment index is constructed (sentiment beta) in order to test the Hard-to-Arbitrage, Difficult-to-Value Hypothesis.

As sentiment has played a significant role in past bubbles, it might have played a role in the 2007-2008 financial crisis, therefore measuring and understanding the dynamics of investor sentiment is necessary in order to answer the question of whether is possible to identify and manage bubbles. The analysis of the role played by both the stock market and the real estate sentiment is crucial to address policy questions.

The remainder of this work is structured as follow. Chapter 1 analyses the investor sentiment literature in the finance and real estate field. Subsequently, I discuss the construction of the sentiment indices in Chapter 2. Chapter 3 focuses on the development of the sentiment beta to test the Hard-to-Arbitrage, Difficult-to-Value Hypothesis. My conclusions are presented in the final section.

Chapter 1

Investor sentiment in financial and real estate markets

Behavioural Finance relies on two main building blocks: (i) incorporation of cognitive psychology into finance and (ii) limit to arbitrage that explain why psychological factors are important in the same market.

Behavioural Finance uses model in which some agents are assumed to be not fully rational. Deviations from rationality are due to individuals' actual preferences and beliefs. Indeed, rational investors have two main characteristics: (i) they update their beliefs when new information arrive using Bayes' Law and (ii) they make choice using their beliefs that maximize their expected utility. Expected utility theory has dominated the analysis of decision making under risk and it has been generally accepted as a normative model of rational choice (Keeney, Raiffa 1976; until Kahneman, Tversky 1979) developed an alternative model called Prospect Theory. They point out that in choosing among risky prospects individuals exhibit several persistent effects that are inconsistent with utility theory. Moreover, irrational behaviour does not necessary lead to mispricing, which rather depends upon the rational traders' action of offsetting mispricing.

1.1 *Investor Sentiment in Financial Market*

Sentiment is the irrational component of investor expectations. Efficient financial markets assume that security prices reflect available public information and that assets are fairly valued by rational investors (Fama 1979).

On the other hand, sentiment reflects investors' belief about future market movement, which is different from the investors' risk aversion, which measures their taste for risky assets over risk-free assets. Nevertheless, these two measures are highly correlated. Indeed, when investor sentiment is low, investors may save more in preparation for upcoming bad times, and hence raise the risk premium.

Baker and Wurgler (2007) find that the price of stable stocks to be lower in high sentiment periods. According to Chen (2008), it is likely that the effect of sentiment on beliefs is swamped by the effect of sentiment on risk preferences for stable stocks. In another study, Mian and Sankaraguruswamy (2007) find that investors in low sentiment states have larger responses to bad news compared with their response in high sentiment states. However, they rule out the possibility that investors' risk preferences could have explained their results because during low sentiment times, investors increased risk aversion pushes up the discount rate.

The standard finance model, in which unemotional investors always force capital market prices to equal the rational present value of expected future cash flows, has considerable difficulty fitting price patterns. Researchers in behavioural finance have therefore been working to augment the standard model with an alternative model built on two basic assumptions. The first assumption, laid out in Delong, Shleifer, Summers, and Waldmann (1990), is that investors are subject to sentiment. Investor sentiment, defined broadly, is a belief about future cash flows and investment risks that is not justified by the facts at hand (and therefore irrational). The second assumption, emphasized by Shleifer and Vishny (1997), is that betting against sentimental investors is costly and risky.

According to Shleifer and Vishny (1997), in a market with a very large number of tiny arbitrageurs, each taking an infinitesimal position against the mispricing in a variety of markets, since their positions are so small, capital constraints are not binding and arbitrageurs are effectively risk neutral toward each trade. Their collective actions, however, drive prices toward fundamental values. This, essentially, is the model of arbitrage im-

plicit in Fama's (1965) classic analysis of efficient markets and in models such as CAPM (Sharpe 1964) and APT (Ross 1976). The trouble with this approach is that little traders are typically not the ones who have the knowledge and information to engage in arbitrage. More commonly, arbitrage is conducted by relatively few professional, highly specialized investors who combine their knowledge with resources of outside investors to take large positions. The fundamental feature of such arbitrage is that brains and resources are separated by an agency relationship. That is, the money comes from wealthy individuals, banks, endowments, and other investors with only a limited knowledge of individual markets, and is invested by arbitrageurs with highly specialized knowledge of these markets.

Shleifer and Vishny (1997) describe the workings of markets in which specialized arbitrageurs invest the capital of outside investors, and where investors use arbitrageurs' performance to ascertain their ability to invest profitably. They show that such specialized performance-based arbitrage may not be fully effective in bringing security prices to fundamental values, especially in extreme circumstances. More generally, specialized, professional arbitrageurs may avoid extremely volatile arbitrage positions. Although such positions offer attractive average returns, the volatility also exposes arbitrageurs to risk of losses and the need to liquidate the portfolio under pressure from the investors in the fund. The avoidance of volatility by arbitrageurs also suggests a different approach to understanding persistent excess returns in security prices. Specifically, Shleifer and Vishny (1997) argue that anomalies reflect not some exposure of securities to difficult-to-measure macroeconomic risks, but rather, high idiosyncratic return volatility of arbitrage trades needed to eliminate the anomalies. This more realistic view of arbitrage can shed light on a variety of observations in securities markets that are difficult to understand in more conventional models.

The behavioural theory of DeLong, Shleifer, Summers, and Waldmann (1990) predicts that noise trader sentiment can persist in financial markets. They argue that changes in noise trader sentiment must be difficult to predict to avoid arbitrage. Assets that are disproportionally exposed to noise trader risk are

both riskier and have to offer an extra return premium. In sum, the theory predicts that sentiment can influence security pricing under two necessary conditions: (i) the assets are held predominantly by sentiment (noise) traders, and (ii) transaction costs are high enough to prevent systematic arbitrage by arbitrageurs.

In many behavioural models of securities markets inspired by DeLong, Shleifer, Summers, and Waldmann (1990), investors are of two types: rational arbitrageurs, who are sentiment-free, and irrational traders prone to exogenous sentiment. They compete in the market and set prices and expected returns, but rational arbitrageurs are limited in various ways. These limits come from short time horizons or from costs and risks of trading and short selling. As a result, prices are not always at their fundamental values. In such models, mispricing arises out of the combination of two factors: a change in sentiment on the part of the irrational traders and a limit to arbitrage from the rational ones.

This raises two questions: (i) whether investor sentiment affects stock prices and (ii) how to measure investor sentiment and quantify its effects. To address those two questions, this Chapter aims to focus on the first one whereas Chapter 2 will investigate how to measure investor sentiment.

There are empirical evidences in support of behavioural finance, in particular concerning the significant role of sentiment in the valuation of assets in public stock market[1]. Brown and Cliff (2004), Lemmon and Portnaiguina (2006), Qiu and Welch (2004) have investigated the role of investor sentiment in US stock market returns. Yu and Yuan (2009) argue that sentiment has major effects on the mean-variance relationship in the stock market, with the trade-off between risk and expected return emerging only in low sentiment periods. Baker and Wurgler (2008) investigate how it affects, and connects, the cross-section of stock returns and government bond returns while Bekart, Baele and Inghelbrecht (2008) discuss sentiment and the time-series relationships between government bond and stock market returns. Baker and Wurgler (2000) regard sentiment as affecting aggregate pricing patterns. How to measure investor sentiment

[1] Among others, Welch 1992; Froot, Scharfstein, Stein 1992.

and quantify its effects is the interesting issue to address. Baker and Wurgler (2007) apply an approach they called top down – as opposed to the bottom up approach. The top down approach focuses on the measurement of the reduced-form, aggregate sentiment and traces its effects to market returns and individual stocks. Precisely, it focuses on explain which stocks are likely to be most affected by sentiment building its conclusion on both sentiment and limits to arbitrage arguments. The big contribution of Baker and Wurgler (2007) is to explicitly measure investor sentiment, which allows «…to encompass bubbles, crashes, and more everyday patterns in stock prices in a simple, intuitive and comprehensive way»[2].

On the other hand, the bottom up approach uses biases in individual investor psychology (overconfidence, representativeness, and conservatism) to explain how individual investors underreact or overreact to past returns or fundamentals Barberis, Shleifer,Vishny, Daniel, Hirshleifer and Subrahmanyam (1998).

Although behavioural theory does not deliver clear aggregate predictions on the impact of sentiment on returns, cross-sectional predictions about the effects of sentiment seem to be clear. In particular, in the risk-based asset pricing models, such as the capital-asset pricing model, a stock's expected return depends on its risk exposure, measured by market beta, times the market risk premium, which is the expected return on the stock market as a whole. Furthermore, since investors are rational and risk averse in these models, the market risk premium is always positive, though it may change over time[3]. Precisely, classical models predict that securities that have higher market betas always have higher expected returns than bond-like stocks. However, recent research work seems to show empirical evidence of negative risk premium.

1.2 *Investor Sentiment and Equity Risk Premium*

Irrational investor sentiment plays little role in the standard risk-based asset pricing literature. The issue of investors'

[2] Baker, Wurgler 2007, p. 131.
[3] See Fama, French 2004; Perold 2004.

irrationality is ignored due to the central role of rational arbitrageurs who trade against noise traders and bring stock price close to its fundamental value. However, numerous recent studies have countered this argument and suggested that arbitrage is limited and that stock prices can deviate from the fundamental value because of the unpredictability in irrational sentiment. The theoretical framework describing the role of sentiment in asset pricing is provided by previous works as Black (1986), DeLong, Shleifer, Summers and Waldman (DSSW) (1990, 1991), Shleifer and Summers (1990), Lakonishok *et al.* (1991), Shefrin and Statman (1994). As Mehra and Prescott (1985) pointed out the historical U.S. equity premium (the return earned by a risky security in excess of that earned by a relatively risk free U.S. T-bill) is an order of magnitude greater than can be rationalized in the context of the standard neoclassical paradigm of financial economics. Mehra (2003) provides a discussion about the equity premium puzzle that is the inability of standard intertemporal economic models to rationalize the statistics that have characterized the financial markets over the past century.

The link between the fluctuations in market price for risk and the behavioural aspects of investors stems from the presence of heterogeneity in sentiment of market participants (in the presence of the market imperfections). Investor's heterogeneity in beliefs leads to an additional factor implying that standard asset pricing models overestimates/underestimates the equity risk premium depending on investor's relative optimism/pessimism. Recent studies (Buraschi and Jiltsov 2002), (Pavlova and Rigobon, 2003) strongly support the notion that difference of opinion among market participants plays an important role in asset pricing. Moreover, Basak (2005) suggests risk is transferred from the more pessimistic to more optimistic investor when sentiment is heterogeneous across the market. This transfer of risk is proportional to the degree of difference of opinion which brings another factor in the investors' perceived market risk premium. Taking into consideration the risk premium and risk-free rate puzzles, Mehra and Prescott (1985) and Weil (1989), Jouini and Napp (2005) show that when investors are pessimistic, there is indeed a bias towards a higher market risk premium as well as a

lower risk-free rate than in the normal setting. There is a higher market risk premium when risk tolerance and investors' pessimism are (positively) correlated. The reason that lead investors' pessimism to increase the objective expectation of market risk premium, according to Jouini and Napp (2005), is that, although the investor requires the same market risk premium, his pessimism leads him to underestimate the average return such that the perceived market risk premium is greater than the normal market risk premium.

Yu and Yuan (2005) demonstrate that market's reaction to volatility is not homogenous through time but depends on irrational sentiment because, in the absence of irrationality, market risk premium is positive and constant, whereas, when this assumption is relaxed (irrational traders considered), market risk premium become a decreasing function of irrational sentiment. That is the price of risk is inversely related to irrational sentiment.

Abel (2002) proves that investors' pessimism increases the risk premium when agents have power utility functions. Garrett *et al.* (2005) suggest that fluctuations in investors' beliefs may be due to the changes in risk aversion over time. Therefore, market risk premium can be interpreted as a weighted average of investors' coefficient of relative risk aversion, the weights being investors' proportion of wealth. Several studies have documented the effect of heterogeneous beliefs of investors on market risk premium through its effect on the risk premium. For example, Giordani and Soderlind (2003), incorporate heterogeneous beliefs in the study of pessimism and doubt provide evidence on the role of investors' pessimism in explaining the risk premium. Cecchetti *et al.* (2000) study a standard model with distorted subjective beliefs of investors and show that pessimistic sentiment can better match first and second moments of the equity premium and risk free rate than a rational expectation model.

Li and Zhong (2005) find that the predictability of returns from many developed countries' equity markets is explained in part by time varying market price of risk associated with consumption relative to habit at the world as well as at local levels. Similarly, Soydemir (2005) links the increase in the price of covariance risk following the first quarter of 2000, to the

bearish investor attitudes and economic slowdown of the U.S. Girard *et al. (*2003) argue that since markets are never fully integrated with the world, and their level of integration with the world portfolio changes over time, the market risk premium always includes both components: reward to local variance and reward to world variance. They show that market risk premium is negative in pessimistic market while positive in optimistic market. Following the predictions of the behavioural model, several empirical tests have analysed if investor sentiment play a significant role in asset pricing, effect either used indirect measures or direct measures of investor sentiment. Studies using indirect measure (Baker, Wurgler 2006; Brown, Cliff 2004 and 2005, Chen *et al.* 1993, Clarke, Statman 1998; DeBondt 1993; Elton *et al.* 1998; Fisher, Statman 2000; Gemmill, Thomas 2002; Lee *et al.* 1991 and 2002, Neal, Wheatley 1998; Sias *et al.* 2001; Swaminathan 1996). provide powerful and consistent empirical support for the hypothesis that stock prices are affected by individual and institutional investor sentiment.

Recent behavioral asset pricing models predict linkages between irrational sentiment and the market price of risk (Abel 2002; Basak 2005; Cecchetti *et al.* 2000; Garrett *et al.* 2005; Girard *et al.* 2003; Jouini, Napp 2005; Li, Zhong 2005; Yu, Yuan 2005)[4]. Overall, these theoretical studies suggest that irrational investors and rational arbitrageurs hold opposite beliefs (i.e., when noise traders are pessimistic, rational arbitrageurs are optimistic). In such scenario, the compensation for bearing risk should be higher to attract more wealth from rational arbitrageurs, thus adjusting market price of risk upwards. Conversely, when irrational investors are optimistic, market price of risk should be lower to deter rational investors from making investments.

Verma and Soydemir (2009) using data of investor sentiment at the individual and institutional level focus on both rational

[4] It has long been recognized among practitioners that investor sentiment affects bond yields. In fact, Barron's constructs its investor confidence index by dividing the average yield on high-grade bonds by the average yield on intermediate-grade bonds. The discrepancy between the yields is indicative of investor confidence (Tang, Yan 2008).

and irrational components of investor sentiment and investigate their relationship with market price of risk derived from the S&P 500 returns. Unlike the previous studies which treat sentiment as fully irrational, Verma and Soydemir (2009) focus on both rational and irrational components of investor sentiment and explore how fundamental and noise trading may affect the market price of risk. They also investigate the effects of the individual and institutional investor sentiment on the market price of risk instead of treat the two classes of investor sentiment in isolation. Shocks originating from sentiment of one class of investors not considered might mistakenly be perceived as a disturbance originating from a class of sentiment considered in the analysis. Unlike previous studies, which capture only the anticipated changes in sentiment, we examine the unanticipated component of sentiment on the market price of risk.

Their results reveal that, consistent with Yu and Yuan (2005), irrational optimism leads to a significant downward revision in the market price of risk perhaps due to the excess volatility generated. Second, rational investor sentiment have an insignificant effect on the market price of risk suggesting that rational optimism backed by strong economic fundamentals cause the changes in the market price of risk to stay statistically insignificant. This is consistent with Merton's ICAPM which shows that when investors happen to have correct beliefs, the return adjusted for risk does not respond significantly meaning the resulting changes in the market price of risk are not significant enough to generate any meaningful response. Consistent with Solt and Statman (1988), rational investors are bullish (bearish) when noise traders are bearish (bullish) reflecting the contrarian investment strategies. Fourth, there are insignificant responses of irrational optimism and pessimism to rational investor sentiment suggesting that irrationality in the market is not likely to be driven by risk factors. The empirical results are consistent with the notion that market's reaction to volatility is non-homogenous in time depending on different kinds of investor sentiment being generated.

To conclude, recent asset pricing models recent predict investors' irrationality to market price for risk and arbitrage.

When irrational investors are optimistic, the stock prices are overvalued but irrational investors believe that prices are undervalued. In such case market price for risk is lower since mean of returns is damped down and the prices are pushed up. Due to lower compensation for bearing risk, in such scenario, the incentive to carry out arbitrage is less for rational traders. However, when irrational investors are pessimistic, there is an increase in market price for risk which attracts greater wealth of rational arbitrageurs in the market.

1.3 *Investor Sentiment in Real Estate*

Barkham and Ward (1999) follow noise trader theory to explain time-varying nature of discount to NAV in real estate stocks[5]. They document common REIT sector effect in the pricing of individual REITs relative to their NAVs, and suggest that investor sentiment is the major cause of discounts to NAV. Clayton and McKinnon (2000) find the similar results. They also shed light on changes in liquidity (proxy of transaction cost) to determine whether noise traders or rational investors dominate the public real estate market. Intuitionally, if the transaction cost decreases (meaning liquidity increases), the discount to NAV increases, because more noise traders enter into market than rational investors. It implies that there is positive relationship between liquidity and existence of noise traders. Their results are consistent with noise trader theory, but liquidity just partially explains a common element in REIT discounts. Furthermore, they also find the impact of noise trade is more pronounced in down market. In short, the results suggest changes in discount to NAV are related to fun-

[5] Generally, there are two approaches to investigating the discount to NAV from REIT: the rational approach and the noise trader approach. The rational approach hypothesizes the discount to net asset value as being the result of rational or firm-specific factors (e.g. management quality, firm size, expense ratio). But these rational factors alone or together do not successfully and fully explain the variance in contemporaneous REIT discounts without some common factors. In addition, another weakness of rational approach is that it could not explain the time-varying nature of discount of the share (Adams, Venmore-Rowland 1989; Capoozza, Lee 1996; Barkham, Ward 1999; Brounen, Ter Laak 2005.

damentals at turning points of real estate cycle, but the magnitude of the swings is exacerbated by noise traders.

Thus noise trader risk or investor sentiment appears to be the major determinant of REIT and stock pricing, with evidence from discount to NAV, and further REIT mutual fund flows[6] and IPO activities[7]. Subsequently, Clayton, Ling, and Naranjo (2009) corroborate the existence of private real estate sentiment. However, more research work is needed in order to address the question of whether REITs suffer from stock market sentiment, following the presence of noise traders in the stock market, or is real market sentiment the most important force in REIT pricing?

In order to address those issues the following paragraphs provide a literature review of the main puzzle in real estate pricing in order to identify the main reasons why the real estate sector is an interesting laboratory where to investigate the role of the investor sentiment.

In particular, the empirical literature on sentiment and asset pricing in equity market has focused on public stock markets. This focus is understandable given the difficulties associated with obtaining return information on private equity investments since private equity has historically been exempt from public disclosure requirements (Kaplan, Schoar 2005).

As pointed out by Ling, Scheick and Naranjo (2014), there are several reasons that make the commercial real estate market to be an appealing area to examine.

[6] Kallberg, Liu, Trzcinka (2000) report that there was 1 REIT mutual fund in 1989, grew to 67 at end of 1997. Assets managed grew from $1 billion in 1992 to $13.25 billion by the end of 1997. At the end of 1997 REIT mutual funds held about 10% of the REIT market cap. Their results indicate a strong correlation between investor sentiment and REIT mutual funds flows.

[7] Lowry, Schwert (2000) conclude that the two most important determinants of IPO volume are private firms' demand for capital and investor sentiment in stock market. Pagano, Panetta, Zinglaes (1998) document firm's growth opportunities or attempts by firms going public to time the market are the reason of IPO in Italian stock market. They emphasize the latter one. As noted before, REIT industry witnessed IPO boom and surge in SEOs during 1990s. Barkham, Ward (1999) suggest that IPO are somewhat correlated with period of investor sentiment. These findings suggest that the timing of REIT IPOs and SEOs over the past decade is consistent with sentiment-based explanation.

First of all, relative to more liquid public markets, private investment markets exhibit significant information asymmetries and illiquidity. Moreover, the lack of continuous price revelation in private markets suggests that the potential impact of investor sentiment on market values may be revealed with significant lags. Indeed, the authors analyse the impact on the market value of private/public real estate in short and long run and the role of investor sentiment to predict the time series of market returns. They find a positive relation between investor sentiment and subsequent quarter returns in both public and private real estate market. More precisely, the short run effect is larger in the public real estate market, which is consistent with private market investors being better informed and more sophisticated.

On the other hand, long run results provide evidences of price reversals in public real estate market. Private real estate markets are more susceptible to prolonged periods of sentiment (induced mispricing). Their results support the hypothesis that limits to arbitrage and delay in price revelation play important roles in determining the time it takes for prices to revert to fundamental values.

Recent work (Ling, Porras, Brounen 2013) examine the price to net asset value (NAV) of Real Estate Investment Trusts (REITs) to directly test Miller's overvaluation hypothesis in how short sales influence the deviation from fundamental value of a security in the presence of differences of opinions. Precisely, they relate the cross sectional variation in premiums to NAV to differences in short sales while controlling for firm-specific NAV determinants, sentiment and known mispricing patterns. They argue that both the magnitude and constraints in short sales affect the valuation of stocks. Short sales alleviate overvaluation above and beyond rational and sentimental drivers of deviations from fundamental value. In the cross-section, REITs with prior short sales trade closer to fundamental value. Contemporaneously, high short sale activity increases the difficulty to short at the margin and as such increases the overvaluation. Their evidences indicate that short sales do not depress prices, there is no greater short sale demand for undervalued stocks, nor they observe that short sales further reduce valuation levels. The existence

of adverse opinions affects market valuation of a stock in those evaluations are likely to diverge, nonetheless it is the short sale limitation that drives overvaluation. The authors examine various short constraint specifications and find that REITs that are hardest to arbitrage trade further from fundamental.

1.4 *Pricing issues in Real Estate*

1.4.1 *CAPM and Real Estate*

There are several reasons the analysis of the role of behavioural finance in the real estate market is an interesting topic to further investigate. This is due mainly to the evidences that rational pricing models applied to real estate sector fail to explain ex-post and ex-ante returns. The risk-based models, like the traditional CAPM, seem not work well for private real estate also when using stock market as proxy for returns on the market, since private real estate returns are not highly correlated with general stock market. This gives real estate a low market beta when measured with respect to stock market, however private real estate is generally viewed as a risky investment getting a substantial ex ante risk premium. According to CAPM theory, market portfolio should include all assets in economy (on a value-weighted basis). Therefore, market portfolio should include, in addition to stocks and bonds, real estate as well as other assets.

To solve the puzzle, possible approaches have been applied. Geltner and Miller (2006) find that by un-smoothing the real estate total return index and define risk (beta) with respect to national wealth portfolio[8] solve the puzzle and explain the differences in realized returns across asset classes.

Evidences about applying basic CAPM across asset classes seems to confirm that it works. However, without additional risk factors (e.g., Fama-French factors), a single-factor model (i.e. CAPM) is a pretty incomplete model of returns within an asset class, and it does not work properly within stock mar-

[8] It is defined as a portfolio that has allocation equal to: 1/3 stocks, 1/3 bonds, 1/3 Real Estate.

ket. Multi-factor models, such as Fama and French (1993) three factors model or the Charter (2000) four factor model that include momentum as additional factor, show evidences that they provide better prediction of both public and private real estate returns. In general, REITs are low-beta stocks, and many REITs are small stocks, so CAPM tends to under-predict average returns to low-beta stocks and small stocks, including REITs.

However, it is important to clarify that the CAPM model is a normative model whereas a multi-factors model is a positive model. As a consequence, to test for market efficiency a normative model must be used as a benchmark since the use of a positive model allows testing whether any patterns that exist are being captured by other known patterns, such as size and market-to-book value (Loughran and Ritter 2000). Abnormal returns should be considered as deviations between actual returns and benchmark returns, where the benchmark is empirically-based (such as size and book-to-market adjustments) rather than theoretically motivated (CAPM).

In the same way, within the private real estate asset class, beta (as well as simple volatility) does not explain dispersion in ex post long-run average total returns. Inability to explain dispersion in average long-run ex post total returns explains why we see little variation in ex ante returns. Ex ante returns are smaller than the realized returns. Within the private Real Estate asset class, CAPM is not very effective at distinguishing among relative levels of risk of real estate market segments. This holds implications for tactical portfolio investment policy within the private real estate asset class[9].

In particular, to test for returns predictability factors models imply that stocks always have higher returns than bond-like stocks and so it is the case for speculative and hard-to-arbitrage securities. On the other hand, sentiment models might predict future returns for stock that are speculative and hard-to-arbitrage that are lower than bond-like stocks (Baker, Wurgler

[9] That is, it limits the ability to search for market segments with a combination of high cap rates & high rental growth opportunities such apparent bargains present favourable risk-adjusted ex ante returns.

2006). This is one main reason to investigate the role of investor sentiment in real estate.

Investors are extremely unwilling to accept variations in stock returns without, on average, earning a high premium (Mehra, Prescott 1985). The risk premium on real estate is too high to be explained by models of illiquidity in which investors accommodate large transaction costs by drastically reducing the frequency and volume of trade. In these kinds of models, a small liquidity premium is generally sufficient to compensate an investor for any lack of liquidity (Constantinides 1986).

1.4.2 *Rational Expectation in Real Estate*

Rational expectations theory is a forward-looking model of expectations, concerned with whether people optimally use all information they have when forecasting the future. The theory is appealing for several reasons. First, if expectations are rational, then, in the aggregate, anticipations are unbiased estimates of actual realizations. Further, if expectations are rational, then it is consistent with investors gathering and using all useful information efficiently. The evidence for rational expectations is mixed, however. Some authors find considerable evidence of rational expectations, while others reject it.

In the real estate market, several empirical results tend to suggest that investors are not able to respond efficiently to market information, which reject the hypothesis that anticipations are unbiased expectations of actual realizations. The reasons include, for example, herding and crowding, information cascades and trend-chasing behaviour (Conlisk 1980; Banerjee 1989; Bikchandani, Hirshlefer, Welch 1992), and reputation-preserving behavior (Scharfstein, Stein 1990). For example, Hendershott and MacGregor (2005) and Sivitanides, Southard, Torto and Wheaton (2001) found evidence that US real estate investors are irrational when they found negative relationship between capitalization rate and rental growth. Shilling (2003) then questioned whether US real estate investors are overly risk averse after observing large deviations between the historical ex-ante and ex-post rates of return in real estate. Shilling and Sing

(2007) separate the forward returns into a rational and irrational components and test their first and second moment relationships with the realized returns. Their results imply that the risk averse behaviour of US investors as found by Shilling (2003) does have significant effects on the first and second moments of price changes in real estate. Shilling and Sing (2007) shows that irrational return component, which is represented by the deviation of investors' expected return in Korpacz survey from the realized returns, has negative effects on the realized returns one period ahead. That is, when investors' expectation is not in line with the realized return, the market is expected to react in the next period return through a downward adjustment to the return. Similarly, innovations in irrational returns contribute significantly to the variance in the realized returns, which is market has sensitive response to the change in investors' behaviour in the expectation formation processes.

Chapter 2

Measuring investor sentiment

Measuring investor sentiment is not an easy task. Brown and Cliff (2002) state: "The existence of systematic mispricing in the market remains contentious because of the difficulty of examining the issue empirically. The absence of precise valuation model for the stock markets makes difficult to measure deviation from its theoretical prices. Similar problem arise from the difficulty in measuring investor sentiment".

Previous research with the exception of Baker and Wurgler (2006), Brown and Cliff (2005) and Glushkov (2006) predominantly used proxies of aggregate investors sentiment based on one time series that captured different dimensions of variation in unobserved sentiment factor. In the analysis of the role of investor sentiment (and then in the real estate market more specifically) is necessary to distinguish among: 1) Sentiment indicator of economic prospective, 2) Sentiment indicator for the stock market, 3) Sentiment indicator for the private real estate sector and 4) Sentiment indicator for the public real estate sector.

2.1 *Economic Sentiment Indicators*

Among several available measures of investor sentiment used in empirical works there are, among others, the Michigan Consumer Confidence Index, the UBS/GALLUP Index of Investor Optimism and Conference Board Consumer Confidence Index.

The University of Michigan Consumer Sentiment Index Thomson Reuters/University of Michigan Surveys of Consumers is a consumer confidence index published monthly by the

University of Michigan and Thomson Reuters and its calculation is derived from a survey on expectation about the future financial and economic conditions[10]. Another survey-based sentiment index is the Conference Board Consumer Confidence Index, which survey is based on representative sample of 5,000 U.S. households.

Concerning the European Market, the European Commission provides an Economic Sentiment Indicator (ESI) as composite indicator of opinion and expectations of participants of economic environment and opinions and postures of consumers. It is aggregated from results of processing of business tendency survey in industry, construction, retail trade and from results of processing of opinion of consumers on current economic situation[11].

Qiu and Welch (2004) show that survey-based sentiment measures are superior to other constructed measures. The authors examine two potential proxies for investor sentiment: the closed end fund discount and consumer confidence and they find that only consumer confidence but not the closed-end fund discount plays a robust role in financial market pricing. Changes in consumer confidence can explain the excess returns on small deciles stocks.

Customer Confidence Indexes relies on direct survey questions and they seem to be a concept similar to investor sentiment. Many investors are likely to be bullish about the economy when they are bullish about the stock market and vice-versa. To qualify as a proxy for investor sentiment, consumer confidence and investor sentiment must be positively correlated.

In the context of DeLong, Shleifer, Summers, and Waldmann (1990), the consumer confidence measure further requires an identification of consumers as the individual retail investors

[10] For an extensive analysis of the methodology used the reader may refer to the Survey Information Report available on the University of Michigan website <http://www.sca.isr.umich.edu/main.php>.

[11] Economic Sentiment Indicator is calculated as weighted arithmetic mean of four partial components-confidence indicators in industry, construction, retail trade and consumers. (European Commission. Joint Research Center, Composite indicators for the euro area economic activity (Rua 2002).

that are the relevant noise traders or, more accurately, that the important marginal sentiment noise investors feel and act like the sampled consumers. To this extent, Qiu and Welch (2004) also pointed out that the survey-based consumer confidence index is not without drawbacks as an investor sentiment measure since it does rely on auxiliary hypotheses.

2.2 *Sentiment proxies for the Stock Market*

Following the predictions of the behavioural model, several empirical tests have analysed if investor sentiment play a significant role in asset pricing, effect either used indirect measures or direct measures of investor sentiment. Studies using indirect measures are: Baker and Wurgler (2006), Brown and Cliff (2004, 2005), Chen *et al.* (1993), Clarke and Statman (1998), DeBondt (1993), Elton *et al.* (1998), Fisher and Statman (2000), Gemmill and Thomas (2002), Lee *et al.* (1991, 2002), Neal and Wheatley (1998), Sias *et al.* (2001) and Swaminathan (1996).

A description of the main proxies of the investment sentiment that have been identified by the literature follows:

- Investors Surveys ask directly to investor how optimistic they are in order to have insight into their irrational behavior. The main reason a survey is considered to be useful to this extend it that an exogenous shock in investor sentiment can lead to a chain of events, and the shock itself could in principle be observed at any or every part of this chain. Indeed, it might show up first in investor beliefs, which could be surveyed Baker and Wurgler (2006). However, surveys are treated with some degree of suspicion, because of the potential gap between how people respond to a survey and how they actually behave Qui and Welch (2005). Several surveys are conducted with respect to the stock market. Among others, UBS/Gallup surveys randomly selected investor households and Investor Intelligence surveys financial newsletter writers. In particular, Qiu and Welch (2005) provide a comparison of several direct survey-based measures of investor sentiment, showing that consumer confidence measure correlate

especially with small stock returns and returns of firms held mainly by retail investors.

- Retail Investor trading activity is considered to be a proxy of sentiment because of retail (individual) investors are more likely than professional to be subject to sentiment. In particular, empirical evidence shows that retail investor tend to sell and buy stock in concert and this is consistent with the presence of a systematic component of sentiment. However, recent research work, and the empirical evidences of this PhD thesis as well, provide evidences that also institutional investor may trade based on their emotion and therefore be subject to sentiment (Glushkov 2006).
- Mutual funds flows. Brown, Goetzmann, Hiraki, Shiraishi and Watanabe (2002) propose and measure of market sentiment based on how fund investors are moving across fund categories. Brown *et al.* (2002) and Frazzini and Lamont (2008), which suggest that flows into and out of mutual funds proxy for investor sentiment.
- Liquidity can be viewed as an investor sentiment index. For instance, Baker and Stein (2004) show that if short-selling is costlier than opening and closing long positions irrational investors are more likely to trade (increasing liquidity) when they are optimistic and betting on rising stocks rather than when they are pessimistic and betting on falling stocks. In Scheinkman and Xiong (2003), volume reveals underlying differences of opinion, which are in turn related to valuation levels when short selling is difficult. Baker and Wurgler (2006, 2007) measured this variable in term of market turnover, which is the ratio of trading volume to the number of shares listed on the New York Stock Exchange. Precisely, Baker and Stein (2004) explain why time-variation (increases) in liquidity predicts lower subsequent stock returns. Traditional explanations focus on transactions costs Amihud and Mendelson (1986) and Vayanos (1998) and empirical evidence focus on which cross-firm differences in liquidity are associated with cross-firm differences in returns whereas investor sentiment explanation focuses on time series analysis. In presence of market frictions (like short sales constraints)

investor behaviour tends to be irrational. Overconfident investors overestimate private signals leading to sentiment shocks and underreact to observed trading decisions. As a result, the price impact of trades is lower (i.e. market liquidity increases). Therefore, in Baker and Stein (2004) model market liquidity serve as indicator of positive sentiment of irrational investors assuming short sales constraints.

- Dividend Premium and Volatility premium. Stocks that pay constant dividends overtime are generally view as safer (bond-like stock). Therefore, we can expect investors to pay a premium for dividend-pay stocks versus non dividend-paying stocks. To the extent that dividend-paying stocks are viewed as safer, the premium should be inversely related to sentiment. Baker and Wurgler (2004) define dividend premium as the difference between the average market-to-book value ratios of dividend payers and non-payers. Baker, Wurgler and Yuan (2012) compute this variable as the year-end log of the ratio of the value-weighted average market-to-book ratio of high volatility stocks to that of low volatility stocks.
- Closed-end discount. The misalignment between market prices and NAVs (as premium or discount) is a debated issue in financial literature and often called closed-end fund discount puzzle Lee, Shleifer, Thaler (1991), Malkiel (1995), Dimson, Minio-Kozershi (1999). Those authors argued that if closed-end funds are mainly hold by individual investors than it may be a proxy for sentiment, which is an increase of the discount will be experienced when retail investors are bearish. REITs' shares that trade at premium on NAV are considered to have greater growth potential than those trading at lower premium or at discount on their NAV (Young 1999). Moreover, a persistent NAV discount (i.e. market prices significantly and constantly below net asset values) negatively affects REITs' capability of raising new equity and, more generally, might impair initial public offerings. The market price subsequent to the initial public offering that is characteristics of REITs may be explained by an information asymmetry between issuer and underwriters (Ling and Ryngaert 1997). Capozza and Lee (1995) pointed out the relevance of firm-specific

characteristics, like leverage and size, in explaining the level and dynamic of this phenomenon over time. Other authors (Clayton, MacKinnon 2001) identified also the liquidity, in addition to size and leverage, as explanatory variable by stressing the short-term misalignment between market prices and NAVs because of irrational behaviour of the investors. Other studies (Barkham, Ward 1999) examined the UK property sector following both an economic (or rational) and a sentiment (or irrational) approach; they stated the relevance of the market sentiment as a determinant of property companies' NAV discount path and showed the minor significance of other firm-specific variables like the asset under management as explanatory factors. Lee, Shleifer, Thaler (1991); Malkiel (1995) and Dimson, Minio-Kozershi (1999) provide a complete review of the possible explanations (both rational and irrational) of the misalignment between market prices and NAVs in the financial literature, often called closed-end fund discount puzzle.

- Underpricing (IPO first day returns). The main explanation for the existence and the level of underpricing as well as its change overtime has studied by numerous authors. In particular, Benveniste (1984) first point out the winner course problem. Ritter (1995) explained the level of underpricing is due to the risk associated with the IPO (as proxied by the number of uses foreseen in the contract). The issuer wants to maximize his utility function. Although, it is well documented that the issuer wants to maximize the issue proceeds and therefore to reduce the level of underpricing, Ritter and Lounghran (2007) show a change overtime of the issuer objective function, introducing the analyst's lust and the spinning hypotheses. Although the sentiment main not play a fundamental role in explaining the underpricing, it can capture some of its variation. Indeed, it is difficult to find an explanation of remarkable first day returns on IPOs that does not involve investor optimism or pessimism.
- Equity financing activity. Equity financing offering (activity) that considers total volume of IPOs or both IPOs and SEO (seasonal equity offering) over total new issues experience

wild fluctuations due to market timing consideration linked to the relative cost of equity versus debt and it is often viewed as sensitive to investor sentiment.

2.3 *Baker and Wurgler Investor Sentiment Model*

Baker and Wurgler (2007) investigate how to measure the investment sentiment in the U.S. stock market and the follow a top down approach as opposite to the bottom up approach. The top-down approach focuses on the measurement of reduced-form, aggregate sentiment and traces its effects to market returns and individual stocks. The top-down approach explains which stocks are likely to be most affected by sentiment, rather than pointing out that the level of stock prices in the aggregate depends on sentiment. The aggregate risk aversion is one-dimensional variable that will affect all stocks to some degree but will also affect some more than others. The main contribution of their paper is that it shows how to measure investor sentiment explicitly and to use the sentiment measures to validate the key predictions of the top-down approach. As the authors state, the advantage of the top-down approach is its potential to encompass bubbles, crashes, and more everyday patterns in stock prices in a simple, intuitive, and comprehensive way. The advantage of the bottom-up model is in providing micro-foundations for the variation in investor sentiment that the top-down model takes as exogenous.

The predictions of the model are that stocks of low capitalization, younger, unprofitable, high-volatility, non-dividend paying, growth companies or stocks of firms in financial distress are likely to be disproportionately sensitive to broad waves of investor sentiment. Theoretically, it follows because these categories of stocks tend to be harder to arbitrage (for example, they have higher transaction costs) and they are more difficult to value, making biases more insidious and valuation mistakes more likely.

The reason is that is more difficult and subjective to determine the true value of those stocks. Therefore, when the propensity to speculate is high, the price (and the realized returns) will

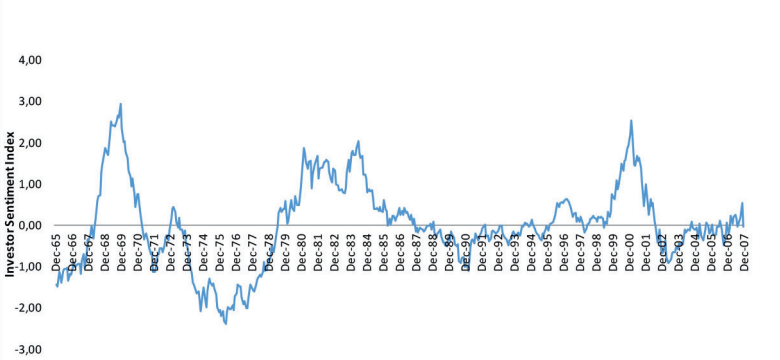
be higher. This intuition also imply then that the value of a firm with a long earnings history, tangible assets, and stable dividends is much less subjective, and thus its stock is likely to be less sensitive to sentiment. The key point is that in practice, the same securities that are difficult to value also tend to be difficult to arbitrage. Therefore, according with Baker and Wurgler (2006) the stocks most sensitive to investor sentiment will be those of companies that are younger, smaller, more volatile, unprofitable, non-dividend paying, distressed, or with extreme growth potential (or companies having analogous characteristics). Conversely, bond-like stocks will be less driven by sentiment. This assessment does not depend on specifying a fine definition of investor sentiment or rely on just one arbitrage mechanism such as short-sales constraints. This model will therefore predict that REITs are not very sensitive to sentiment as compared to common stocks. This model allow to test whether more speculative and harder-to-arbitrage stocks are indeed more sensitive to sentiment, in the sense that their prices co-move more with an index of sentiment changes (higher sentiment betas) and whether bond-like stocks have negative sentiment betas, that is, their returns are negatively related to changes in sentiment.

This Sentiment Model argues that investor beliefs might then translate to observable patterns of securities trades, which are recorded. Also, limited arbitrage implies that demand pressures might cause some mispricing, which might be observed using benchmarks for fundamental value like the book-to-market ratio. These mispricing might engender an informed response by insiders, such as corporate executives, who may have both the superior information and the incentive to take advantage of it, and the patterns of firms choosing to adjust their balance of equity or debt could be observed. This implies that some corporate structure adjustments are due to a response to sentiment.

Baker and Wurgler (2006, 2007) model allows constructing a sentiment index and to this extent they utilize principal component analysis to develop an indirect measure of investor sentiment from multiple indirect proxies. The use of the principal component analysis (PCA) is that it cannot be argued that a perfect proxy for investor sentiment exist, however it is likely that

investor sentiment is reflected to some degree in each several imperfect proxies and it therefore can be extracted analysing the it as the common variation of the identified imperfect proxies. In fact, each sentiment proxy is likely to include a sentiment component as well as an idiosyncratic non-sentiment-related component, however the principal components analysis isolate the common component. More precisely, Baker and Wurgler (2006) provide an index based on six proxies of sentiment and Figure 1 shows their sentiment indexes. The variables that are positively associated with sentiment levels include share turnover, IPO volume, IPO first-day returns, and the equity share in new issues, and those negatively associated are the closed-end fund discount and the dividend premium.

Figure 1. Baker and Wurgler Sentiment Index



Source: elaboration by the authors using the monthly available at <http://pages.stern.nyu.edu/ jwurgler/> and the methodology described in Baker and Wurgler (2007).

Data displayed in Figure 1 have been obtained using the methodology described in Baker and Wurgler (2007). The methodology consists in first estimating the first principal component of the proxies and their lags to obtain a first-stage index with 12 loadings, one for each of the current and lagged proxies. Then, the correlations between the first-stage index and the current and

lagged values of each of the proxies are computed. Finally, the investor sentiment is defined as the first principal component of the correlation matrix of six variables-each respective proxy's lead or lag, whichever has higher correlation with the first-stage index-rescaling the coefficients so that the index has unit variance.

In the Baker and Wurgler (2006, 2007) Sentiment Index each individual proxy enters with the expected sign and timing. Since the principal components analysis cannot distinguish between a common sentiment component and a common business cycle component, the sentiment index is constructed so that it explicitly removes business cycle variation from each of the proxies prior to the principal components analysis. To this extend, the model uses a regression of each of the six raw proxies on growth in the industrial production index, growth in consumer durables, nondurables, and services and a dummy variable for NBER recessions. The residuals from the regression model are better proxies for investor sentiment; therefore the sentiment index is constructed using the orthogonalized proxies following the same procedure as before.

Baker, Wurgler and Yuan (2012) construct indexes of investor sentiment for six major markets (France, Germany, Japan, Canada, UK and US) and decompose them into one global and six local indexes. They find that when sentiment from either global or local sources is high, future returns are low on various categories of difficult to arbitrage and difficult to value stocks. Sentiment appears to be contagious across markets based on tests involving capital flows, and this presumably contributes to the global component of sentiment.

The general approach of the model used to construct investor sentiment index for a single country takes as given that there is no perfect index of investor sentiment. Instead, there are a number of available, imperfect sentiment proxies that are likely to contain some component of investor sentiment along with a degree of non-sentiment, idiosyncratic variation. The common sentiment component is then estimated as the first principal component of the proxies. The authors use the same set of proxies of sentiment for all markets reducing to four the number

of proxies (volatility premium, IPO Volume, underpricing and market turnover).

2.4. *Investor Sentiment proxies in the Real Estate Market*

2.4.1 *Private Real Estate Market*

Despite lack of research in investor sentiment indicators with respect to the private real estate sector there two main measures that have been proposed by the literature by Clayton, Ling and Naranjo (2009) and Ling, Naranjo and Scheick (2014).

Clayton, Ling and Naranjo (2009) were the first to construct an index of investor sentiment towards commercial real estate investment based on the common variation in a number of proxies for sentiment. The overall market sentiment measure they propose is extracted from the following five sentiment-related proxies:

1. Commercial mortgage flows (as a percentage of GDP) are widely viewed by industry participants as a barometer of market investment sentiment, in part because of the association between past real estate cycles and excessive mortgage flows in periods of underpricing of default risk.
2. The percentage of properties sold from the National Council of Real Estate Investment Fiduciaries (NCREIF) Property Index (NPI) and.
3. The ratio of the transaction based and constant liquidity[12] version of the National Council of Real Estate Investment Fiduciaries (NCREIF) Property Index (NPI) value index are related to transaction activity or market turnover, that is market liquidity proxies Baker and Stein (2004).
4. The National Council of Real Estate Investment Fiduciaries (NCREIF)Property Index (NPI) total return13 and (5) the quarterly TBI total returns are current property returns derived

[12] The constant liquidity value Index is derived under the assumption that all asset market adjustment takes place through price change and that there is no change in the level of market liquidity (expected time to sale). For more detail regarding commercial real estate indexes the reader may refer to Clayton (2007).

[13] This proxy is considered over the past four quarters.

from appraisal-based and transaction-based indices used by institutional investors to track investment performance.

The methodology used by the authors is similar to that used by Baker and Wurgler (2006, 2007) and it can be summarized in two steps. First, the authors use a regression model where each of the five sentiment proxies is expressed as function of some macro-economic variables, such as the three-month Treasury yield, the ten-year less three-month Treasury yield, and a measure of economy-wide default risk (the Baa corporate bond yield less the AAA bond yield), in order to ensure that their real estate sentiment measure is not an index of common business cycle risk factors. Then, they construct a real estate sentiment index as the first principal component of the five residual series using quarterly observations.

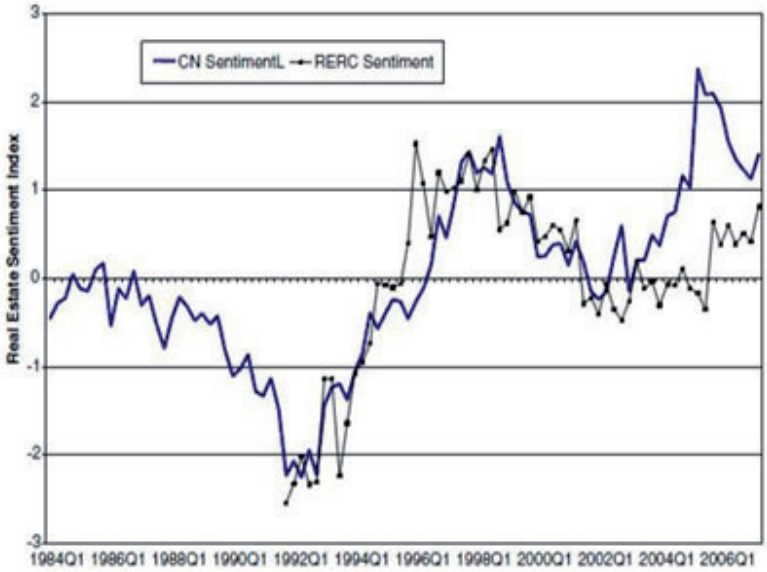
Clayton, Ling and Naranjo (2009) paper investigates the role of fundamentals and investor sentiment in commercial real estate valuation. In real estate markets, heterogeneous properties trade in illiquid, highly segmented and informationally inefficient local markets. Moreover, the inability to short sell private real estate restricts the ability of sophisticated traders to enter the market and eliminate mispricing. These characteristics would seem to render private real estate markets highly susceptible to sentiment-induced mispricing. They find evidence that investor sentiment impacts commercial real estate pricing.

Ling, Naranjo and Scheick (2014) create a direct measure of sentiment using the first principal component extracted from quarterly Real Estate Research Corporation (RERC) investment condition survey responses pertaining to the RERC property types (e.g. apartment, hotel, industrial research and development, industrial warehouse, central business district (CBD) office, suburban office, neighbourhood retail, power shopping centres, and regional malls).

RERC surveys institutional real estate investors, appraisers, lenders, and managers throughout the United States to gather information on current investment criteria, such as required rates of return on equity, expected rental growth rates, and current investment conditions, the latter of which is the variable of interest in their study. RERC survey respondents are asked to rank

current investment conditions for multiple property types, both nationally and by metropolitan area, on a scale of 1 to 10, with 1 indicating poor investment conditions and 10 indicating excellent conditions for investing. This sentiment measure is similar in spirit to a bull-bear spread in that it captures movements in the proportion of participants in commercial real estate markets who are bullish relative to those less optimistic about current investment opportunities.

Figure 2. Real estate investment sentiment indice



Source: Clayton, Ling, Naranjo (2009).

Figure 2 displays the Clayton, Ling and Naranjo (2009) sentiment index (CNL) and the RERC survey data, which show substantial co-movement[14]. In order to compare the RERC survey data, Clayton, Ling and Naranjo (2009) constructed an index called RERC Sentiment[15].

2.4.2 *Public Real Estate Market*

Ling, Naranjo and Scheick (2014) construct an indirect quarterly sentiment index based on the common variation[16] of the following seven underlying proxies of investor sentiment in commercial real estate markets:

- The average REIT stock price premium/discount to net asset value (NAV). As discussed in par. 2.2 the literature (e.g. Lee, Shleifer, and Thaler 1991) suggest that closed-end fund discounts represent movements in stock prices away from fundamental values. In the same way, Real Estate Investment Trust price premiums relative to NAVs measure the difference between the market price of a REIT's shares and the estimated net asset values of the underlying properties that comprise the REIT portfolio. Stock price deviations from NAV may, at least in part, reflect the price impact of sentiment-based trading during periods of investor optimism or pessimism. One of the main issues in order to empirically use REIT NAVs data is that they are not publicly available. Among the data provider commonly used there are Green Street Advisors and SNL Financial. Precisely, US REITs are neither required by regulation to disclose the NAV nor to adopt common rule in the relative computation. As a consequence data on NAVs available are provided by the analysts that cover specific REITs and to this extent subject to similar but not explicitly known

[14] The correlation between them is 0.76 over the 1996:Q1 to 2007:Q2 period (Clayton, Ling, Naranjo 2009).

[15] For more detail the reader may refer to Clayton, Ling, Naranjo (2009).

[16] From an econometric point of view the model used is the Principal Component Analysis (PCA). That is the authors generate a composite indirect stock market sentiment index based on the first principal component of the contemporaneous levels or lags of each of the sentiment proxies they identified.

rules. According to Ling, Porras and Brounen (2013) a potential candidate to proxy for the dynamic of NAV discount/premium is the price to earnings ratio.

- The percentage of properties sold each quarter from the National Council of Real Estate Investment Fiduciaries (NCREIF) Property Index (NPI) as proxy of the aggregate the private commercial real estate market liquidity. Baker and Stein (2004) posit that aggregate market liquidity is a sentiment proxy as well. Indeed, irrational investors will participate in the market only when they are optimistic, and therefore liquidity will likely increase during periods of investor overconfidence.
- The number of REIT IPOs, the average first-day returns on REIT IPOs (underpricing) and the share of net REIT equity issues relative to total net REIT equity and debt issues (see par. 2.2) are measure of the market timing of IPOs and secondary equity offerings. In particular, the level of underpricing has been used to measure investor sentiment in the general stock market (Ritter 1991) and Baker and Wurgler (2000). The number of REIT IPOs, the average first-day returns on REIT IPOs, and the share of net REIT equity issues relative to the total capital raised by REITs may identify periods of sentiment-induced mispricing in commercial real estate markets.
- The net commercial mortgage flows (as a percentage of GDP). As described in par. 2.4., Clayton, Ling, and Naranjo (2009) argue that "net commercial mortgage flows are widely viewed by industry participants as a barometer of investment sentiment, because of the association between past real estate cycles and excessive mortgage flows during periods in which default risk may have been underpriced by lenders". As a result, periods of increased commercial mortgage flows may reflect the influence of investor sentiment.
- The net capital flows to dedicated REIT mutual funds[17], which may indicate periods of investor over- or under-

[17] NAREIT website <http://www.reit.org> provides a full list of those mutual funds. For more detail about the dedicated REIT Mutual Funds the reader may refer to Ling, Naranjo (2006).

confidence similarly to Brown *et al.* (2002) and Frazzini and Lamont (2008), which suggest that flows into and out of mutual funds proxy for investor sentiment. Ling, Porras and Brounen (2013) also suggest a measure of the REITs market capitalization with respect of the stock market capitalization in order to capture the investor expectation of the public real estate market with respect to the overall market. The higher the size of the public real estate market with respect to the overall market the higher is expected to be the level of sentiment. Similarly to the mutual fund flows, the relative size of REITs market versus the stock market is a measure of market sentiment based on how investors are moving across stock categories (real estate vs financial assets).

Chapter 3

Sentiment beta: the case of US REITs

3.1 *Introduction*

This chapter focuses on the cross section analysis of investor sentiment on the public real estate sector, which is represented by the Real Estate Investment Trusts (REITs). The objective is to investigate how REIT-specific characteristics are related with their sensitivity to investor sentiment.

Investor sentiment can affect the cross section of stock prices through two different channels: (i) sentimental (uninformed) demand shocks and (ii) limits to arbitrage. The analysis of the cross-sectional variation in sentiment answers the question of which stocks' characteristics make them more vulnerable to broad shift in the propensity to speculate. Stocks that are less affected by fluctuations in the propensity to speculate are expected to be those with tangible assets, that are older (i.e. longer earning history) and with stable dividends path. If investor sentiment is interpreted as optimism or pessimism about stock in general, we can analyse the difficulty to arbitrage across stocks. There are theoretical and empirical evidences that show how risky and costly can be arbitrage for young, small, unprofitable, growth and distressed stocks (Wurgler, Zhuravskaya 2002). Stocks that are hard to arbitrage tend to be the most difficult to valuate, that is both sentimental (uninformed) demand shocks and limits to arbitrage will result in mispricing, however, since to predict similar results, it is difficult to disentangle them from an empirical prospective.

Glushkov (2006) develops a measure sensitivity of stock returns to sentiment changes (sentiment beta). He finds that sentiment affects stocks of some firms more than others due to differences in firm characteristics. In particular, more sentiment sensitive stocks are smaller, younger, with greater short-sales constraints, higher idiosyncratic volatility and lower dividend yields. However, given size and volatility, high sentiment beta stocks have more of an analyst following, greater institutional ownership, and a higher likelihood of S&P500 membership, higher turnover and lower book-to-market ratios. Stocks with high exposure to sentiment deliver lower future returns inconsistent with the idea that noise trader risk is priced. Institutional investors stayed away from sentiment-sensitive stocks in the 1980's and held more of these stocks since the early 1990's. As Glushkov (2006) pointed out, this last result suggests that institutions may well have been exacerbating sentiment-driven mispricing instead of countering the actions of sentiment traders.

Stocks of some firms are more affected by shifts in investor sentiment than others due to the differences in firm characteristics. Specifically, smaller, younger, unprofitable, non-dividend or low-dividend-paying stocks with greater short sales constraints, shorter earnings histories and a presence of relatively high growth opportunities are predicted to be more prone to sentiment shifts because such characteristics make these stocks hard to value and difficult to arbitrage[18].

Stocks that are more vulnerable to sentiment changes are more likely to be held by retail investors, because their personal judgment is more likely to be affected by behavioral biases than that of institutions. To this extent, we would expect that REIT stocks are less affected by investor sentiments because of their specific characteristics that lead to consider them as bond-like stocks.

To proxy for sentiment at the individual stock level, Glushkov (2006) uses a composite aggregate measure of sentiment and he

[18] For example, there is evidence that individuals tend to be more overconfident in settings where more subjective judgment is needed to evaluate information, see Einhorn (1980), Daniel, Titman (1999), Chan *et al.* (1999), Klibanoff *et al.* (1999).

develops a meaningful stock-by-stock measure, the sentiment beta. Precisely, the sentiment beta is the coefficient in the time-series regression of an individual stock returns on sentiment factor, accounting for the risks associated with the market, size, book-to-market and it is a proxy for the relative proportion of uninformed sentiment traders. Glushkov (2006) provides evidences that, given size and volatility, high sentiment beta stocks have more of an analyst following, greater institutional ownership, and a higher likelihood of S&P500 membership, higher turnover and lower book-to-market ratios. In particular, stocks with high exposure to sentiment tend to underperform stocks with low exposure inconsistent with the idea that noise trader risk is priced.

Moreover, smaller, younger, unprofitable, non-dividend or low-dividend-paying, stocks with greater short sales constraints, shorter earnings histories and a presence of relatively high growth opportunities are predicted to be more prone to sentiment shifts because such characteristics make these stocks hard to value and difficult to arbitrage (Hard-to Value, Difficult-to-Arbitrage hypothesis).

Stocks that are more vulnerable to sentiment changes are more likely to be held by retail investors, because their personal judgment is more likely to be affected by behavioural biases than that of institutions.

Empirical evidence shows that age, firm's dividend policy and growth potential have power in explaining relative sentiment sensitivities beyond what is explained by size. Also, given size and volatility, growth stocks are more sensitive to sentiment than distressed stocks. In contrast to the Baker and Wurgler (2006) results that unprofitable stocks are more affected by sentiment, Glushkov (2006) finds that profitable and unprofitable stocks of similar size appear to have similar sentiment sensitivities (with profitable stocks being even more sensitive from 1989 to 2003).

3.2 *Sentiment Beta and REITs Characteristics*

As explained in Chapter 1 and 2, several variables have been identified by the literature as proxies of investor sentiment with

respect to both the stock market and the public real estate market. Therefore, following Glushkov (2006) and Baker and Wurgler (2006), I created an aggregate measure of investor sentiment (sentiment factor) constructed as the first principal component of several investor sentiment proxies[19], and then I used this index to investigate its role in explaining individual REITs excess returns.

In particular, the idea is that the relative proportion of sentiment traders can be proxied by the regression coefficient of individual REIT returns on the sentiment index.

The model that has been estimated is the following:

$$r_{i,t} - r_{ft} = \beta_{0} + \beta_1 (RMTK)\, \beta_2 (SMB) + \beta_3 (HML) + \beta_{sent} (REsent_t) + e_i \quad (1)$$

where the dependent variable$(r_{i,t} - r_{ft})$ is the excess return of the REIT *i* at time *t*; *RMTK* (excess return on the public stock market), *SMB* (Small-minus-Big) and *HML*(High-minus-Low) are the Fama-French three factors; and $REsent_t$ is the sentiment index for the public real estate market. Data are collected from CRSP Ziman REIT with respect to returns of US REITs during the period 1980:Q1 to 2008:Q2, whereas the Fama-French three factors data source is the Kenneth French's web site at Dartmouth.

Following Fama and French (1993), the model is estimated using a rolling analysis of the time series to assess the model's stability over time. Indeed, when analysing financial time series data using a statistical model, a key assumption is that the parameters of the model are constant over time. However, the economic environment often changes considerably, and it may not be reasonable to assume that a model's parameters are constant. A common technique to assess the constancy of a model's parameters is to compute parameter estimates over a rolling window of a fixed size through the sample, following Fama and French (1993), I used a rolling window of 36 months to obtain sentiment beta (β_{sent}) for individual REIT. If the parameters are truly constant over the entire sample, then the estimates over the rolling windows should not be too different.

[19] For more details please refer to Chapters 1 and 2.

If the parameters change at some point during the sample, then the rolling estimates should capture this instability.

The hypothesis is that more speculative and harder to arbitrage stocks have higher sentiment beta (β_{sent}). Although, this prediction is expected to be confirmed for the REIT market, their specific characteristics of bond like stocks should result in sentiment betas lower than those of non-bond like stock in absolute terms. On the other hand, since REITs are small cap stock we can expect an impact of sentiment stronger than for bigger stocks. Therefore, those two effects are in contrast.

This analysis contributes to the puzzling question of whether REITs returns are more like stock or real estate.

The correlations among the factors for the entire period analysed (January 1981 – December 2008) are showed in Table 1. The correlation matrix suggests that multicollinearity is not a serious issue in sentiment beta estimation.

Table 1. Correlations matrix for the time period January 1980 - June 2008)

VARIABLE	RE SENT INDEX	RMKT	SMB	HML
RE SENT INDEX	1	-0.02	0.02	0.12
RMKT	-0.02	1	0.2	-0.49
SMB	0.02	0.2	1	-0.45
HML	0.12	-0.49	-0.45	1

Shefrin and Statman (1994) introduced first a theoretical idea similar to the sentiment beta. They develop a behavioural asset pricing theory where the expected returns of stocks are determined by behavioural beta (i.e. beta relative to the tangent mean-variance portfolios, which is not the market portfolios because irrational traders affect securities prices).

If noise trader risk is priced (De Long, J.B., Shleifer, A., Summers, L.H. and Waldmann, R.J. 1990) we should expect that portfolios with higher exposure to sentiment factor should

earn higher average returns in the future. In order to test this prediction, create three portfolios based on sentiment beta level and I measured equally-weighted for each portfolios over the period analysed.

To test the prediction of the Hard-to-Value, Difficult-to-Arbitrage hypothesis, firms characteristics has been matched with the sentiment beta stock-by-stock and form three portfolios on the basis of sentiment sensitivities.

First of all, Table 2 shows the summary statistics for time series averages of the three sentiment beta portfolio that were created. The results in Table 2 shows that there is quite a wide cross variation in REITs sensitivity to investor sentiment in support of the hypothesis that each firm's characteristics play a role in explain how their expected return are affected by investor sentiment overtime.

Table 2. Summary statistics for the sentiment beta portfolios

	Portfolio 1	Portfolio 2	Portfolio 3
Mean	-0.025	0.000	0.025
Stand. Dev.	0.027	0.010	0.03
Min	-0.322	-0.083	-0.023
Max	0.008	0.041	0.438
Observations	9,265	9,473	9,371

Portfolio 1 is composed by REITs that have on average negative sentiment beta (Negative SENT Beta Portfolio), Portfolio 2 is composed by REITs that have on average zero sentiment beta (Zero SENT Beta Portfolio), and lastly Portfolio 3 has a positive sentiment beta (Positive SENT Beta Portfolio).

When individual REIT's sentiment betas are compared to individual stock market sentiment betas (Glushkov 2006) and Baker and Wurgler (2007), we notice that unexpectedly REITs are at least as sensitive to investor sentiment as stock. During the same time period, I find results similar to Glushkov (2006) that analyses the US stocks market showing that on average sen-

timent betas are equal to 0.002 and are symmetrical distributed around zero. This indicates that the average impact of sentiment investors is the REITs market is non zero.

Despite the bond-like characteristics of REITs, at first glance they do not seems to be less sensitive to sentiment than stocks as we would expect and one possible explanation might be the size effect. REITs are small stocks, which tend to have greater sensitivity to sentiment.

Table 3 shows the characteristics of the three portfolios with respect to the following variables:

- *SIZE* is measure as the total value of assets in place;
- *M/B* is the measure of the market to book ratio;
- *Beta* CAPM is the measure of the systematic risk that is computed using rolling windows of 36 months;
- *Dividend Yield* is the ratio of the dividend paid per share dividend by the share market price;
- *ROA* is the Return on Asset;
- *Excess Return* is computed as the difference between the realized return and the 3 month T-bill rate;
- *Leverage ratio* is measured as the ratio of the total debt over total asset;
- *Age* is the number of months from the REIT IPO to the observed date;
- *Institutional Ownership* is the percentage of REIT shares owned by institutional investors.

Data for SIZE, Market-to-Book Value, ROA, Dividend yield and Leverage ratio are obtained from the COMPUSTAT database. The results over the all period analysed are showed in Table 3. Data for the Institutional ownership variable are available since 2000 and are retrieved from Thomson Reuters Institutional – Stock Holdings, which provide information about the compilation of the holding by the institutional investors from the 13-F fillings. The construction of the total institutional ownership requires matching each institutional investor number of shares hold for 13-F to each REIT and then the sum of the holdings are divided by the total share outstanding.

Table 3. Sentiment and REITs Characteristics 1981:Q1 -2008:Q4

Variable	Portfolio 1	Portfolio 2	Portfolio 3
Size (in $ml)	$1,979	$2,860	$1,781
M/B	1.63	1.7	2.24
Beta CAPM	0.533%	0.534%	0.54%
Div Yield	3.30	3.047	3.101
ROA	5.63%	6.81%	6.67%
Excess Return	0.26%	0.55%	0.76%
Leverage	64.02%	51.18%	63.61%
Age (months)	123	135	122
Institutional Ownership	62.94	63.52	56.52

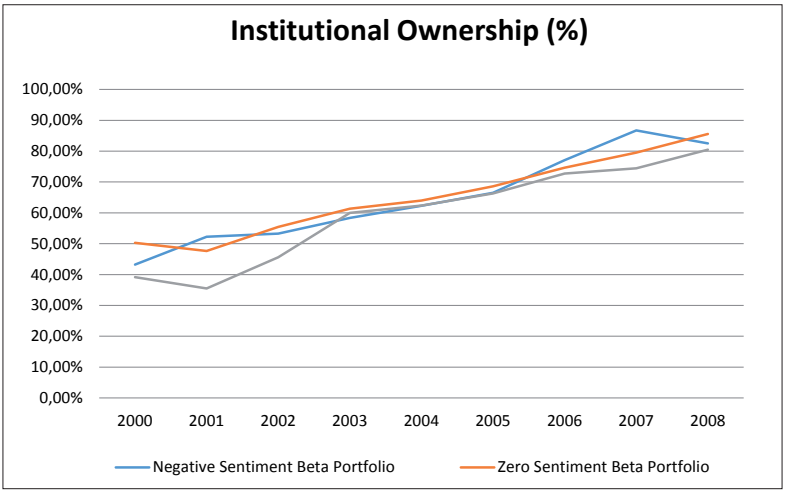
Data relative to the realized returns of individual REIT are obtained from CRSP/Ziman database. The analysis considers the population of US REIT from 1981:Q1 to 2008:Q4.

Stocks that covary positively with the investor sentiment index (Portfolio 3) are on average smaller than those in Portfolio 2 (zero-beta). This is consistent with the idea that small stocks are more sensitive to investor sentiment than large stocks. Table 3 does not show much cross variation with respect to the systematic risk (Beta CAPM); however, REITs that are positively correlated with the sentiment index are more profitable (ROA). Zero beta portfolios are slightly older but this evidence is not a strong support of the hypothesis that younger REITs are more affected by sentiment. Moreover, more sensitive REITs (both positive and negative sentiment portfolios) are more leveraged ant this is consistent with the expected increase in financial risk.

Two main results must be highlighted. First of all, only positive sentiment beta portfolios experienced higher excess returns whereas negative sentiment beta portfolios experienced small excess returns than zero sentiment beta portfolios. This seems to support the previous evidences that noise trader risk is not priced correctly. Otherwise both negative and positive sentiment beta portfolios should have higher excess return than zero sentiment beta portfolios.

On other unexpected result is that the percentage of institutional ownership is very similar for negative and zero sentiment beta portfolios. Prior literature suggests that individual investors' personal judgment appears to be relatively more prone to behavioural biases, this implies that stocks that are more sensitive to the sentiment changes will be predominantly held by not institutional investors. Therefore, we would expect lower institutional ownership in both negative and positive sentiment beta portfolios. To have a closer inspection of this phenomenon, Table 3 and Figure 3 show the variation over time of the institutional ownership with respect to each sentiment beta portfolio. Overall, we notice a continuous increase of the institutional investors' ownership overtime; however, portfolio that are sensitive to sentiment show a high percentage of institutional investors. This is not consistent with the notion that institutional investors do not trade on their emotions but provide information-gathering services. This evidence support the idea that not only individuals but also institutional exhibit significant degree of sentiment (institutional-oriented sentiment).

Figure 3. The variation over time of the institutional ownership



3.3 *Institutional Investors and Sentiment Beta*

Institutional investors' ownership of REIT shares is changed considerably overtime, as we can see from Table 4. Since the institutional investors represented a large fraction of equity ownership especially since 2005, so institutional can be likely to be price-setting marginal investors.

Over the last decade, institutional investors have increased considerably their ownership of U.S. Real Estate Investment Trust (REIT) shares. One possible reason for which the interest among retail investors is diminished can be due the reduction in dividend yields and the increase in share price volatility experienced by the REITs market.

Shareholder composition and its effects on stock prices have received increased attention in the finance literature in recent years (Dennis and Strickland 2002). To this extend the interesting question is which is the influence of shareholder composition on the performance of publicly traded real estate companies (i.e. REITs).

Potential agency problems arise in the context of dispersed ownership structure (Jensen and Meckling 1976). On the other hand, a large body of research focuses on the monitoring role of outside shareholders, such as institutional investors and blockholders. To this extend, it should be notice that the identity of shareholders can play an important role in agency conflicts between managers and shareholders. For instance, Demsetz and Villalonga (2001) address the simultaneity of the relationship between insider holdings and performance documenting quite insignificant results.

The hypothesis of efficient monitoring of institutional investors, which state that they are both more informed and able to monitor management at lower cost than retail shareholders (Brickley, Lease and Smith 1988). On the other hand, we find evidence of a strategic alignment hypothesis, which is based on the strategic cooperation between the firm and institutional investors, (Black 1992).

Overall, we cannot observe consistent finding with respect to the literature on the influence of institutional ownership on firm performance (Demsetz and Villalonga 2001). Holderness (2003) point out pronounced ownership concentrations can be motivated by both: (i) the shared benefits of control that accrue to all share-

holders and (ii) the private benefits that accrue solely to the block-holders.

Table 4. Institutional Investors in REITs Market

Full Sample

Year	Observations	Mean (%)	St.Dev(%)
2000	246	43.25	26.31
2001	1,610	46.02	25.30
2002	1,510	53.40	25.54
2003	1,119	57.09	28.45
2004	971	60.77	26.29
2005	1,417	65.49	25.62
2006	1,016	69.00	27.74
2007	1,067	72.57	28.15
2008	976	72.39	31.08
2009	1,310	73.97	27.42

Negative Sentiment Beta portfolio

Year	Institutional Ownership (%)
2000	43.20%
2001	52.28%
2002	53.29%
2003	58.37%
2004	62.32%
2005	66.47%
2006	77.12%
2007	86.74%
2008	82.53%

Zero Sentiment Beta portfolio

Year	Institutional Ownership (%)
2000	50.27%
2001	47.61%
2002	55.46%
2003	61.32%
2004	64.02%
2005	68.60%
2006	74.65%
2007	79.55%
2008	85.56%

Positive Sentiment Beta portfolio

Year	Institutional Ownership (%)
2000	39,18%
2001	35,50%
2002	45,63%
2003	60,00%
2004	62,37%
2005	66,28%
2006	72,73%
2007	74,47%
2008	80,48%

With respect to the U.S. REITs, the shareholder ownership structure is characterized by the strict legal constraints imposed on REITs their regulation. In fact, regulation foreseen a 5–50 rule, which states that the five largest shareholders can possess no more than 50 percent of the firm's shares; and also REITs must have at least 100 shareholders[20].

On the other hand, several factors might mitigate the need for external monitoring or inside incentive alignment. For example, in order to keep their tax-exempt status, REITs face an obligatory payout of ninety percent of the net taxable income. This requirement mitigates the free cash flow problem (Jensen 1986) and, in turn, it potentially reduces the necessity of shareholder activism and executive shareholdings. Moreover, REITs frequently have to return to the capital market to raise additional funds and this continuous process of raising capital (both equity and debt) provides to the external parties the opportunity to collect information important for the monitoring function (Gibson, Safieddine and Sonti 2004).

REIT management has restricted investment opportunities, which may reduce managerial empire building, over-diversification and other value-destructing behaviour. Precisely, seventy-five percent of gross income should be derived from real estate rents and seventy-five percent of the assets must be real estate-related (Geltner D. M., Miller N. G, Clayton J. and Eichholtz P. (2006).

However, hostile takeovers rarely occur (Campbell, Ghosh and Sirmans 2001; Eichholtz and Kok 2008) mitigating the market for corporate control function and rather acerbating the agency problems in the REIT sector. According to Han (2006) the competition in the labour market is also restricted since managers often are highly specialized, which in turn may encourage them to reduce the effort level.

Concerning the ability to actively pursue the monitoring activity by the institutional investors is reduced by the fragmented

[20] NAREIT, the National Association of Real Estate Investment Trusts (2005). Detailed information about REITs' regulation is provided by <www.nareit.com/reits>.

ownership dictated by the 5-50 and the presence of at least 100 shareholders rules.

Friday and Sirmans (1998) observe a positive relation between the real dollar values of director ownership and market-to-book ratios, thereby providing support for the convergence of interest hypothesis and the benefits that are connected to an increased level of insider stock ownership. Friday, Sirmans and Conover (1999) find that for high levels of ownership, firm performance is negatively related to block ownership. For institutional ownership, Friday and Sirmans (1998) find that the investment selection of REITs is more closely tied to Tobin's Q if institutions hold a larger percentage of the firm. This finding is consistent with the notion that institutional investors act as monitors, thereby carefully scrutinizing the management of the firm.

According to Glushkov (2006) sentiment beta is a proxy for the proportion of sentiment traders in a stock, therefore the investigation of the relation between sentiment beta and institutional ownership may give more insight in order to understand which role have been played by the institutional investors.

I use a panel regression model for the entire sample of REITs from 2000:Q1 to June 2008 (due to availability of ownership data starting from 2000) to estimate the following model:

$$InstOwn = \beta_0 + \beta_1 \left(\frac{M}{B} \right) + \beta_2 (Size) + \beta_3 (Age) + \beta_4 (DivYeld) + \beta_5 (Leverage) + \beta_6 (Ret) + \beta_7 (SentBeta) + e_i \quad (2)$$

- *Institutional Ownership* (*InstOwn*) is the percentage of REIT shares owned by institutional investors.
- *M/B* is the measure of the market to book ratio.
- *SIZE* is measure as the logarithm of total value of assets in place;
- *Age* is the number of months from the REIT IPO and the observed date.
- *DivYield* is the ratio of the dividend paid per share dividend by the share market price.

- *Leverage* is measured as the ratio of the total debt over total asset.
- *Ret* is the excess return computed as the difference between the realized return and the 3 month T-bill rate.
- *Sent Beta* is the coefficient of the time-series regression of an individual REIT return on sentiment factor, accounting for the Fama-French tree factors (Equation 1).

Table 5. Institutional Investors Panel Data Model

	Model (1) Full Sample	Model (2) 2000:Q1 2006:Q4	Model (3) 2007:Q1 2008:Q4
Variables	Institutional Ownership	Institutional Ownership	Institutional Ownership
M/B	0.0298**	0.015***	0.044**
	(1.98)	(2.95)	(2.04)
Size	7.328**	11.268***	9.199***
	(1.97)	(17.49)	(3.59)
Age	0.377***	0.327***	0.106***
	(9.23)	(9.42)	(3.34)
Div.Yield	-0.069*	-1.150***	0.005
	(-1.65)	(-11.99)	(0.59)
Leverage	-3.578***	-4.568***	-3.843***
	(-3.27)	(-2.140)	(-4.88)
Eccess Return	-2.201*	-4.580**	0.672
	(-1.75)	(1.68)	(0.30)
Sent Beta	-0.791*	-0.631***	0.223**
	(-1.71)	(-3.38)	(1.97)
Constant	-2.716	-4.410	1.605
	(-1.21)	(-1.64)	(0.82)
Observations	8,219	5,972	1,397
R-squared (within)	0.541	0.462	0.351
F(7,120) = 30.02 Prob > F = 0.000			
t-statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1 Standard Error Adj. for cluster			

Table 5 shows the results obtained using by a fixed effect estimator applied on the observations of the panel data. The panel fixed effects results pointed out that the model has some explanatory power and that R2 is about 54% (in the overall sample), 46.20% (in the 2001:Q1 – 2008:Q4 subsample) and 35.10% (in the 2007:Q1 – 2008:Q4 period).

With respect to the overall sample, the result tends to confirm previous finding. Similar to Friday and Sirmans (1998) we observe a positive relation between the institutional investors' ownership and market-to-book ratios. REITs' institutional ownership is negatively related to, their performance which is consistent with Friday, Sirmans and Conover (1999). Also, institutional investors tend to invest in bigger and older REIT with lower dividend yields.

With respect to the sentiment variable we notice that the effect of this variable change over time. Due to availability of data, I investigate only two sub-samples in order to look more in depth into the 2007-2008 Financial Crisis.

The overall sample show a result consistent with the hypothesis that individual investors ownership is higher in REIT that are more sensitive to sentiment ($\beta = -0.791$). On the other hand, during the 2007-2008 period the results show that indeed the institutional investors were irrational since the coefficient on the Sentiment Beta is positive and statistical significant ($\beta = 0.223$).

Again, this provides support to the notion that also institutional investors trade on their emotions although the evidence are not consistent overtime.

Conclusions

In neoclassical finance theory, there is no role for investor sentiment in valuation, markets are efficient and all movements in stock prices rationally reflect changes in cash flows or discount rates. In sharp contrast, the behavioural finance literature posits that investor sentiment and limits to arbitrage play a role in the determination of asset prices which is independent of market fundamentals. Indeed, investor sentiment has been one of the most interesting issued studied in the last 30 years and recent papers have focused mainly on how to measure investor sentiment indicators.

While the majority of researches in this field have focused on the stock markets, a few researches have addressed the role of the investor sentiment in the real estate public and private market. Ling, Naranjo and Scheick (2014) were the first to create an investor sentiment index for the U.S. REITs market and private real estate providing evidence of a relevant role of sentiment in the real estate market. Real Estate Investment Trusts (REITs) are unique in that the pricing of the asset class parallels two markets. Specifically, a dual asset market situation exist for trading real estate assets in the private real estate market, trading properties directly, and the public real estate market for trading REIT shares that provides ownership of underlying properties indirectly. The performance of real estate in private market has been recognized as the underlying fundamental value of real estate stocks. REIT's value is fundamentally linked to the performance of private real estate market in the long-run and both markets are apparently dominated by a common real estate cycle. Consequently, REITs are an interesting laboratory to test the influence of sentiment in the pricing dynamics. Moreover, using property stocks it can

be possible to disentangle the driving forces leading to sentiment in Real Estate Investment Trusts (REITs) as rational related to fundamental changes or irrational stock market sentiment as well as explore the transmission mechanism of sentiment in the price formation.

To this extent, this analysis investigated how REITs-specific characteristics are related to their sensitivity to investor sentiment. To this extend, a measure of the individual REITs sensitivity to the sentiment index is constructed (sentiment beta) in order to test the Hard-to-Arbitrage, Difficult-to-Value Hypothesis. With respect to the cross-sectional variation of the sensitivity to sentiment (sentiment beta), this analysis shows that there is quite a wide cross variation in REITs sensitivity to investor sentiment in support of the hypothesis that each REIT's characteristics play a role in explain how their return are affected by investor sentiment overtime. The results are also consistent with the idea that small, more profitable, more leveraged and younger stocks are more sensitive to investor sentiment. Zero beta portfolios are slightly older but this evidence is not a strong support of the hypothesis that younger REITs are more affected by sentiment. However, noise trader risk is not priced correctly since only positive sentiment beta portfolios experienced higher excess returns.

Last part of the analysis focus on the relation between institutional investors' ownership and sentiment beta showing that although the result for the overall sample are consistent with the hypothesis that individual investors ownership is higher in REIT that are more sensitive to sentiment, during the 2007-2008 period institutional investors traded on their emotions.

Investors' sentiment may be contagious across market (Baker, Wurgler and Yuan (2012), that is both in terms of different countries and in terms of financial market versus real estate market. To this extent, future development of this analysis will investigate the role of investor sentiment internationally. However, the lacks of literature on this topic and data availability for the some market (such as the European market) as compared to the US Market make the analysis more difficult and challenging at the same time. The main objective of future

research works will be to create a global dataset of data for the public and private real estate market in order to construct county-specific indexes of investor sentiment (local sentiment) and a global sentiment index.

Concerning the cross-sectional analysis, the analysis of the institutional investors' ownership can be improved looking into the identity of each institutional investors. That is the analysis should take into account the composition of the property ownership by type of institutional investors (for example banks, pension funds or hedge funds). The relation between institutional investors' ownership and sensitivity to sentiment can be different for each investors depending upon their investment horizon.

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The role of investor sentiment in the real estate market

In neoclassical finance theory, there is no role for investor sentiment in valuation, markets are efficient and all movements in stock prices rationally reflect changes in cash flows or discount rates. In contrast, the behavioural finance literature posits that investor sentiment and limits to arbitrage play a role in the determination of asset prices which is independent of market fundamentals. REITs are unique in that the pricing of the asset class parallels two markets: real estate assets trade in the private market and REIT shares, which provide indirect ownership of underlying properties, trade in the public market. The aim of this research work is twofold. First, it provides a detailed analysis of the investor sentiment literature in the finance and real estate field, with a focus on the methodologies used to construct sentiment indices. Secondly, this analysis is one of the first attempts to investigate how REIT-specific characteristics are related to their sensitivity to investor sentiment (sentiment beta).

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