International Review of Economics and Finance 22 (2012) 230–253

Contents lists available at SciVerse ScienceDirect

International Review of Economics and Finance

journal homepage: www.elsevier.com/locate/iref

Firm Market Performance and Volatility in a National Real Estate Sector

Marcelo Bianconi [a,*], Joe A. Yoshino [b,1]

[a] Tufts University, Department of Economics, 111 Braker Hall, Medford, MA 02155, USA
[b] FEA, University of Sao Paulo, Sao Paulo, 05508-900, Brazil

ARTICLE INFO

Article history:
Received 15 October 2010
Received in revised form 2 November 2011
Accepted 3 November 2011
Available online 11 November 2011

JEL Classification Codes:
G10
G14
O54
R30

Keywords:
Risk-return tradeoff
National real estate market
Momentum
Reversal

ABSTRACT

We present empirical evidence using daily data for stock prices for 17 real estate companies traded in the Sao Paulo, Brazil stock exchange, from August 26, 2006 to March 31, 2010. We use the U.S. house price bubble, financial crisis and risk measures to instrument for momentums and reversals in the domestic real estate sector. We find evidence of conditional premium persistence and conditional volatility persistence in the market. We find that the conditional risk-return relationship in the sector is consistent with the prospect theory of risk attitudes in this period. Certain companies seem to be operating on a perceived potential industry return above the target, while most others are below the target, and the whole sector is below target on average.

1. Introduction

The real estate market in the U.S. has passed through a transformation in the last 30 years that made it one of the culprits of the recent financial crisis. In contrast, the real estate market of the country of Brazil has been booming in the last few years, most prominently recently, but at the same time has been very volatile. Thus, the financial crisis in the U.S. provides a fertile natural experiment to understand the economic influence of the U.S. in Brazil, in particular in the Brazilian real estate sector. Fig. 1 shows the daily evolution of several sector indices of the main Brazilian stock market in the period 2008–2010.[2] The U.S. financial crisis has impacted all reported sector indices negatively with most bottoming around November 2008, at the height of the crisis. In particular, the real estate sector index was the hardest hit loosing almost 80% of its value between May and December 2008.

A key question we are interested in is what shapes the market performance of firms in the real estate sector in Brazil.[3] In order to answer this question we start with the standard Fama-French multi-factor model to explain the daily variation of firm market

* Corresponding author. Tel.: +1 617 627 2677; fax: +1 617 627 3917.
E-mail addresses: marcelo.bianconi@tufts.edu (M. Bianconi), pyoshino@usp.br (J.A. Yoshino).
URL's: http://www.tufts.edu/~mbiancon (M. Bianconi), http://www.econ.fea.usp.br/joe/ (J.A. Yoshino).
[1] Tel.: +55 11 30 91 58 26; fax: +55 11 30 91 60 13.
[2] The performance of the indices is comparable through normalization where all are equal to 100 in January 2, 2008.
[3] The market capitalization of the real estate sector in Brazil is relatively new. Until 2005, most companies were local, but from 2005 and on through active merger and acquisition activity they become national. Also, starting roughly in 2007, they seek more funds in the capital market through IPOs. The standards of operation change as well with more short term goals and more speculative behavior in fixed assets. In contrast, market capitalization of the real estate sector in the US is well developed; see for example Wu and Huang (2011) for an analysis of REITs.

1059-0560/$ – see front matter
doi:10.1016/j.iref.2011.11.002

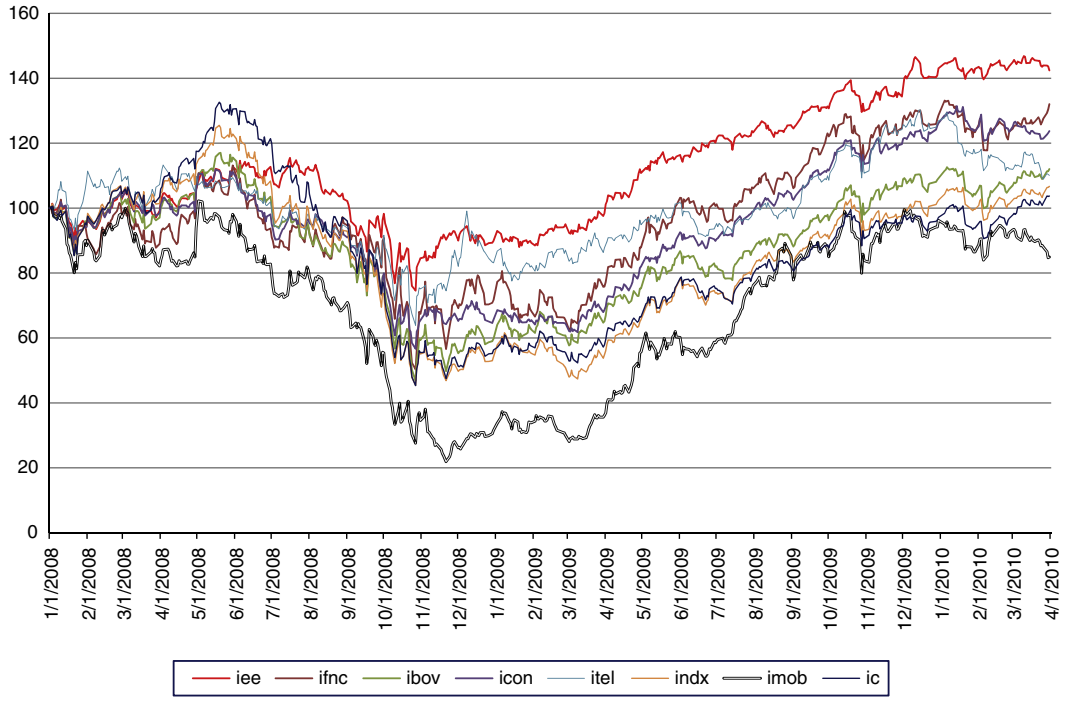


Fig. 1. Sectoral Market Indices in Brazil – 2008–2010, Daily Obs. Legend: Iee – Electric Power Index. Ifnc – Financial Index. Ibov – Bovespa Index. Icon – Consumption Index. Itel – Telecommunications Sector Index. Indx – Industrial Sector Index. Imob – Real Estate Index. Ic – Commodities Index.

premiums in the Brazilian real estate sector. We expand the factor space to include momentum and reversals in the daily market variation. Firm financial multiples and other domestic factors have a potential influence in the firm market premium, and we include them as well.

The novelty here is to condition the likelihood of momentums and reversals on U.S. risk factors and on the recent U.S. subprime lending and financial crisis. Our estimation of momentum, or boom probabilities; and reversals, or crash probabilities with U.S. risk, political and economic factors shows that many of those factors can significantly identify momentums and reversals in the Brazilian real estate sector. We find that conditional momentums and conditional reversals probabilities are significantly negatively correlated. The momentums are declining and flat during and after the U.S. crisis, while the reversals tend to increase after the U.S. crisis. We take those results as evidence that the U.S. factors provide a plausible exogenous identification of momentums and reversals in the daily variation of the real estate sector in the Brazilian capital market. In addition, we find that instrumented momentums are not correlated with the market premium, but reversals are. Hence, while downside risk from the U.S. in the real estate sector is part of the systematic risk of the market, upside risk is not in this period.[4]

We estimate several versions of the CAPM model with instrumented momentums and reversals. All specifications report the problem of potential strong persistence of premiums, and other unobservables captured by trend effects, which indicates that in the real estate sector in Brazil, the daily variation in premium is persistent and the potential for mispricing and opportunities for short term arbitrage are present. Momentums and reversals have a robust effect on the premium and the magnitudes of the β's are large, of an order of close to nine indicating the aggressiveness and risky behavior of the real estate sector in Brazil in this period.

We also estimate conditional volatility of daily returns and find that distributed lagged volatility is positive and significant in predicting current volatility, and there are significant trend effects in volatility capturing unobservables. Overall, we find a significant amount of conditional heteroskedasticity in this market.

When we relate the predicted premium and volatility from our estimates, both linearly and nonlinearly, we find a negative relationship between them in this market in this period. Thus, it reinforces the case that on a daily basis the market, on average, has opportunities for short term arbitrage. The introduction of domestic additional real estate multiples and domestic risk factors mildly mitigate the negative slopes, but does not revert it. A potential theory that explains this phenomenon is based on Kahneman and Tversky's (1979) prospect theory. In our sample of all real estate sector firms, the below target firms dominate the sector and the overall evidence is that the sector is below the perceived potential industry returns. On a company by company

[4] Our evidence shows that the US financial crisis had an important effect in the sector in Brazil, but this sector and all others have shown solid gains since February 2009. In particular, the Real Estate sector has been very volatile (and bullish) ever since.

basis, certain companies seem to be operating on a perceived potential industry return above the target, while most others are below the target.

The rest of the paper is organized as follows. In the next section we discuss some basic theoretical models and empirical evidence of relevance. Section 3 presents preliminary data. Section 4 is the core of the paper with estimates and results. Section 5 concludes and appendices provide data description and sources, and a description of each company in the sample.

2. Models and literature review

At the theoretical level, the Sharpe-Lintner capital asset pricing model (CAPM) of Sharpe (1964), Lintner (1965) is related to short term investment strategies of maximizing return and minimizing risk through diversification, and is based on linear pricing and thus no-arbitrage opportunities. Those models assert a positive relationship between the expected return and some measure of risk. The Fama-French extension, Fama and French (1992, 1993), adds two factors to the standard CAPM, and is consistent with the efficient markets hypothesis, thus consistent with no-arbitrage opportunities. In this framework, the total volatility of premiums is decomposed into systematic, or market related volatility and non systematic volatility.

On the other hand, a market that is experiencing large movements on a daily basis is prone to have several different types of participants and have potential limits to arbitrage. The model of De Long et al. (1990) provides a sensible theoretical framework where sophisticated and noise traders co-exist and some equity holders demand a risk premium based not only on risk aversion, but also on market conditions emanating from behavioral attitudes of noise traders. The volatility of premiums is also related to those behavioral attitudes, and mispricing of assets becomes apparent.

At the empirical level, the simplicity of the Sharpe-Lintner capital asset pricing model (CAPM) lends itself appropriately to the data at hand. In this framework, the premium of a stock over the risk free return is linearly related to the premium of the market over the risk-free return. Fama and French add two factors to the standard CAPM, one related to firm size and the other to firm growth opportunities. A potential 4th factor, initially proposed by Jegaeesh and Titman (1993) and Carhart (1997), is the momentum of a stock. Cochrane (2005) discusses momentums and reversals at length. Here, we include an alternative measure of momentums and reversals in our empirical models and ultimately identify those momentums and reversals with U.S. risk factors and the recent U.S. subprime lending and financial crisis.

Our main hypothesis is that the U.S. provides a benchmark for other markets in other countries, in general, and in Brazil in particular. In effect, the housing bubble and financial crisis in the U.S. in the second half of the decade of the new millennium provide a fertile natural experiment to measure U.S. benchmarks.[5]

Our empirical evidence of the basic CAPM models is mixed. Because our data are daily and the real estate market in Brazil in the sample period has been subject to several sources of risk, it is natural that arbitrage opportunities, mispricing and potential negative risk-return tradeoffs emerge. Recently, Brennan and Wang (2006) show that when stock prices are subject to stochastic mispricing errors, expected rates of return may depend not only upon the fundamental risk, but also on the type and degree of asset mispricing. Empirically, they show that the mispricing induced return premium is shown to be correlated with realized risk adjusted returns. Chou et al. (2009) revisit the potential negative risk-return tradeoff based upon the prospect theory of Kahneman and Tversky (1979), predicting that agents have different risk attitudes towards gains and losses, measured with respect to a certain reference point.

Our paper relates to this literature. We find empirical evidence of persistence in premiums thus lending support to the hypothesis that some mispricing has occurred. In addition, we find evidence of negative conditional risk-return tradeoffs indicating further potential for arbitrage opportunities and support of the prospect theory view of risk attitudes.[6]

3. Data preliminaries

We have daily data for stock prices for 17 real estate companies traded in the Sao Paulo stock exchange, Bovespa, from August 26, 2006 to March 31, 2010. This period encompasses the main events in the U.S. regarding the housing market bubble and the financial crises that followed. First, we compute the premium of company i in day t, denoted Premium_{it}, as the daily rate of return minus the risk free daily rate of return, the Over Selic interest rate in Brazil. The market premium is similarly computed as the premium of the return of the market index Bovespa minus the risk free daily rate of return, the Over Selic rate, denoted PreMkt_t. Table 1 shows the summary statistics of those variables. Fig. 2a shows a plot of those variables over the time period and Fig. 2b shows company premium and market premium, by company, in our sample of 17 companies.[7]

[5] Solnik (1974) is an early empirical attempt to determine the international market structure of asset returns in the CAPM framework. More recently, Xu and Yang (2009) present related empirical analysis of the effects of U.S. monetary policy on real estate public companies for a sample of countries; and Cheng and Wu (2010) present a recent application of momentums for the case of the Hong Kong market. Schindler (2010) studies market efficiency in real estate public companies in emerging markets. However, none of those above include real estate companies of Brazil, which is a relatively new sector in the market. See also Bianconi and Yoshino (2010) for an empirical analysis of U.S. benchmarking on firm valuation in a panel of 29 countries.

[6] There is an important recent debate on the relationship between house prices and the current account deficit in the U.S. Aizenman and Jinjarak (2009) find a robust and strong positive association between current account deficits and the appreciation of the real estate prices; and Laibson and Mollerstrom (2010) provide theoretical foundations for this evidence. Our focus here is different and on the behavior of the market returns of firms in the real estate sector.

[7] The appendix describes data by companies, the companies themselves and data sources in detail.

Table 1

Table 1a. Company Premium and Market Premium.

	Obs	Mean	Std. Dev.	Min	Max
Premium (i,t)	14,597	.0615795	3.818762	−24.82275	40.16022
PreMkt (t)	14,733	−.0079815	.0594198	−.457405	.6708202

Table 1b: Company Codes

Cod_entity==1 ABYA Former Abyara, now: AGRE (BM&F Bovespa: AGEI3)
Cod_entity==2 AGEI AGRE – Not included.
Cod_entity==3 BISA Brookfield Incorporated
Cod_entity==4 BRML BRMALLS\
Cod_entity==5 CCIM Camargo Correa Real Estate Development
Cod_entity==6 CYRE Cyrela Brazil Realty
Cod_entity==7 EVEN Even
Cod_entity==8 EZTC EZTEC
Cod_entity==9 GFSA Gafisa
Cod_entity==10 IGTA Iguatemi
Cod_entity==11 INPR TCI Inpar
Cod_entity==12 JHFS JHSF Participações S.A.
Cod_entity==13 LPSB Lopes Consultoria de Imóveis
Cod_entity==14 MRVE
Cod_entity==15 MULT Multiplan
Cod_entity==16 PDGR PDG Realty
Cod_entity==17 RSID Rossi Residencial
Cod_entity==18 TCSA Tecnisa

This is a period where the real estate sector is very volatile relative to the market; on average the daily standard deviation of the company premium is about 64 times larger than the standard deviation of the market. We want to explain the variation of the premium and the volatility of the real estate market with an array of risk measures, controlling for macroeconomic factors and other risk sources. Company by company variation reveals that companies 5, 8 and 13 have had relatively less variability in their premium, and particularly, company 10 has been smoother than all others. Companies 1, 6, 9, 11, 14, and 17 are particularly more volatile.[8]

4. Econometric models, data and empirical results

Our empirical models identify the effects of several factors on market premium and return volatility. We have an unbalanced dynamic panel and we use a multi-factor framework for the determination of the premium and return volatility, basically starting with the CAPM model and extending this framework in several directions, see e.g. Fama and MacBeth (1973), Fama and French (1992, 1993), Cochrane (2005).[9]

4.1. Premium

Our starting formulation for the premium is the simple Fama-French factors model where

$$premium_{it} = \alpha_0 + \beta\, premkt_t + \gamma' \mathbf{X}_{it} + a_t + \varepsilon_{it} \tag{1}$$

where i indexes the company and t indexes the day and $\boldsymbol{X}_{it}$ is a vector of factors. The coefficient on the market premium is the usual beta of the stock. The Fama-French factors include: i. The market capitalization of firms, as price times quantity of outstanding shares. A low (high) market capitalization indicates that a company might be undervalued (overvalued); and the main assumption is that the small firm has higher returns; ii. The book-to-market value. A low (high) ratio indicates that the company is facing low (high) financial distress. Hence, when the market capitalization is low or the book-to-market ratio is high, we expect that the premium is high, reflecting that small size and high financial distress stocks have sizable return premiums due to added non-diversifiable risk. Another explanation is that a firm with potential good projects invests in fixed assets and if the project is successful, it will reflect later in a larger stock return. Thus, in the beginning, the higher book-to-market value would be a signal for potential higher returns. Those are the so-called growth stocks.

We also introduce macroeconomic factors represented by monthly rate of change of real GDP_t and monthly rate of change of the general price index (GPI_t) in Brazil. In addition, for each company we compute a distributed lag of the company premium based on several statistical information criteria to control for lagged dependent variable effects, the variable $PreLag_t$; and we compute the distributed lag of the return variance for each company as well, $PreVarLag_t$ to control for volatility effects; similarly the

[8] Information from the appendix shows that companies with less variability are some that have been in the market for longer periods, and particularly company 10, which operates in the construction of shopping malls. The more volatile companies are generally newer and niche oriented with higher upside potential.

[9] A table of descriptive statistics of the factors by company is provided in the appendix. We also performed all the analysis in this paper using the portfolios of Fama-French, Small-minus-Big and High-minus-Low; those results are quite similar to the ones obtained in this paper and are available upon request.

return variance for each company is $RetVar_t$.[10] Finally, we introduce a time trend to capture any other possible unobservable effects. Table 2 gives the summary statistics of the variables described above.

A potential fourth factor in this framework is the short term tendency of stocks to persist when performance is high (momentum) or low (reversal). We construct dummy variables referring to momentum and reversal when the daily return of a company stock is outside the bounds of one and two standard deviations of a 50 day past moving average of daily returns. Those variables provide unconditional probabilities of a momentum (boom) or reversal (crash) in a given day for any firm. Table 3 presents the summary statistics of momentums and reversals. We note that in this sample period, on average, the unconditional probability of a one standard deviation momentum, denoted Momentum1, in any given day for any given firm, is about 24%, while a two standard deviation momentum probability is about 14%, denoted Momentum2. The reversal probabilities are about 12% and 2% respectively, much lower than momentums, thus characterizing this period as bullish in the real estate sector.

Table 4a shows the results of the panel estimation of the four models described above. We use a fixed effects estimation procedure with clusters by firm.[11]

The first column, (1) shows the traditional CAPM. First, α is significantly different than zero indicating that the expected rate of return of a stock premium in this sector is too high, given its level of risk. This is also a first indication of failure of CAPM because the constant should be zero, according to Lintner (1965). The β is of an order of magnitude of 10 indicating that the stock in the real estate sector is very aggressive with a large exposure to local market risks in this period. Column 2 is a version of the Fama and French (1992, 1993) three-factor model. The results are mixed. The market capitalization, while having the right sign is not significant while a low Book-to-Market ratio leads to a higher premium in this sector. On the other hand, α is not significantly different than zero in this case.

Columns 3 and 4 are most revealing. When momentums and reversals are included, the Fama-French factors, the macroeconomic factors and α all become irrelevant; while β reduces to about one-half of its previous magnitude. Specifications 3 and 4 show that when momentum above one standard deviation occurs the premium increases, but declines as momentum above two standard deviations occurs. Our interpretation is that, for momentums above one standard deviation, market participants may take additional risks on average; but for momentums above two standard deviations individuals retreat from additional risk. On the other hand reversals uniformly increase the premium.[12]

In the next table, Table 4b we estimate the models of Table 4a, but controlling for the lagged premium, the lagged volatility of the returns, and the time trend; results are similar to Table 4a except that in column 4a, the constant is statistically significant; and in column 5a the time trend is positive and statistically significant. All specifications report the problem of potential strong persistence of premiums in the CAPM and Fama-French models given the significance of the coefficient of dependent distributed lagged variable (PreLag) and time trend. Brennan and Wang (2006) report results of identification of persistence in premiums with mispricing of stocks. In the real estate sector in Brazil in this period, the daily variation is persistent indicating the potential for mispricing. Furthermore, in columns 3a and 4a, when volatility (risk) increases, the stock premium increases. This is an expected stylized fact. But, in the first two columns, this effect is insignificant and the sign is opposite; and when the time trend is included in column 5a, the effect is also insignificant. Overall, the results of Table 4a are robust to lagged premium, lagged volatility and time trend controls.

The success of short term and persistent strategies such as momentums and reversals in explaining the excess returns of stocks has been well documented in the finance literature, e.g. Cochrane (2005). However, there is a fair amount of endogeneity driving our results above. When a stock has a momentum or a reversal, it is by definition above or below the expected return thus generating a disproportionate premium or discount in that period. Our main hypothesis in this paper is that several risk and other factors in the U.S. are important exogenous factors that generate the momentums and reversals in the real estate sector of Brazil in this sample period. In particular, the housing bubble and financial crisis in the U.S. provide a fertile natural experiment to test for the economic effects of the U.S. on the Brazilian economy, and on the daily variation of the market performance of the real estate sector.

Thus, in our view, momentums and reversals can be instrumented by U.S. risk and other factors, thus providing a plausible identification of the effects of momentums and reversals generated by factors external to the Brazilian economy, specifically the U.S. influence in this sample period. We use a simple score method to estimate the probability of a momentum or reversal conditional on U.S. risk and other factors; and use the predicted probability of momentums/reversals as an instrument for momentums/reversals in the premium models. The models are basically given by the following equations:

$$Prob\left(Y_{it} > 0 | \mathbf{Z}_{it}\right) = \Phi\left(\pi_0 + \pi' \mathbf{Z}_{it}\right) \tag{2a}$$

$$premium_{it} = \alpha_0 + \beta\, premkt_t + \mathbf{y}' \mathbf{X}''_{it} + a_t + \varepsilon_{it} \tag{2b}$$

where in (2a), Y_{it} is the momentum or reversal for a company on a given day, that is the unobserved latent variable, Φ is the standard normal cumulative density function in the probit model and $\boldsymbol{Z}_{it}$ are controls from the U.S. economy. Expression (2b) is the premium valuation equation and $\boldsymbol{X''}_{it}$ include factors from the Brazilian economy and the predicted momentums/reversals from expression (2a).

We provide a description of the variables included on the vector $\boldsymbol{Z}_{it}$ which includes the following external factors. First, Table 5 presents a series of event dummies of the unraveling of the financial crisis in the U.S. in this sample period.

[10] The usual information criteria give distributed lags of 12 days, so they include a 12 day memory for the predicted lagged values. The return volatility is computed as the square root of the daily return squared.

[11] When a lagged dependent variable is included, the autoregressive coefficient suffers from the Nickell bias. However, the bias is of the order T^{-1} and our T is large, greater than 690 (see Table A1), so the bias is small. Hence, we use fixed effects as well in this case.

[12] Note that the qualitative sign is reversed since the reversal state indicates a decline in returns.

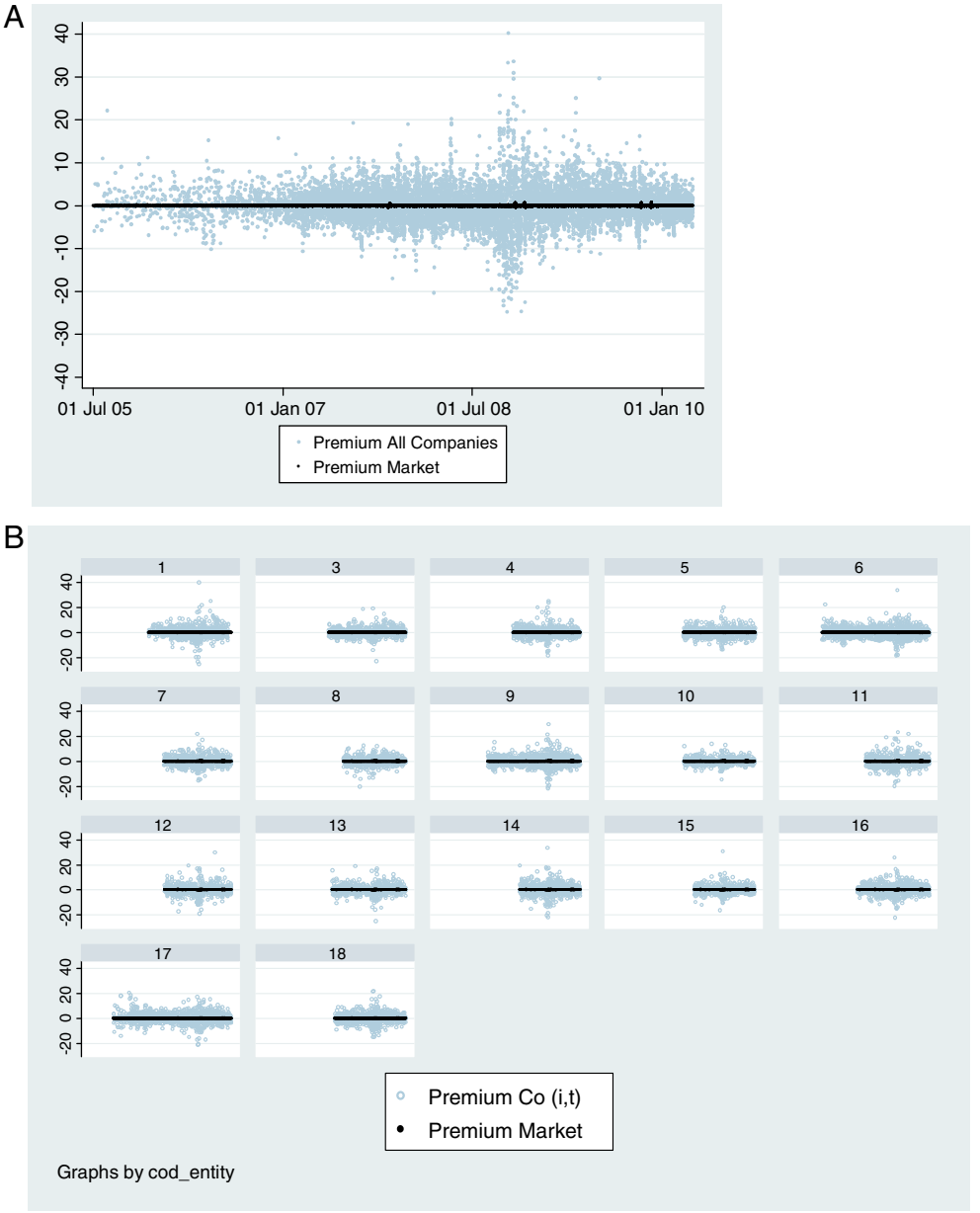


Fig. 2. A: Real Estate Premiums and Market Premiums. B: Company Premium, Market Premium by Company. Cod_entity==1 ABYA Former Abyara, now: AGRE (BM&F Bovespa: AGEI3). Cod_entity==3 BISA Brookfield Incorporated. Cod_entity==4 BRML BRMALLS. Cod_entity==5 CCIM Camargo Correa Real Estate Development. Cod_entity==6 CYRE Cyrela Brazil Realty. Cod_entity==7 EVEN Even. Cod_entity==8 EZTC EZTEC. Cod_entity==9 GFSA Gafisa. Cod_entity==10 IGTA Iguatemi. Cod_entity==11 INPR TCI Inpar. Cod_entity==12 JHFS JHSF Participações S.A.. Cod_entity==13 LPSB Lopes Consultoria de Imóveis. Cod_entity==14 MRVE. Cod_entity==15 MULT Multiplan. Cod_entity==16 PDGR PDG Realty. Cod_entity==17 RSID Rossi Residencial. Cod_entity==18 TCSA Tecnisa.

Next, we have several factors including risk factors of the U.S. First, in order to capture the exposure of the company to foreign capital movements, we include the company debt in foreign currency, DebtForCurr_{it}. The motivation for this variable is that, before the financial crisis, Brazilian real estate companies have focused on expensive three and four bedrooms apartments funded by foreign capital through IPOs, and a large share of the IPOs were absorbed by overseas financing. As a measure of health of the U.S. banking system, we include the one month, three month and six month TED spread; the spreads between Libor and the OIS overnight indexed swap rate; the spread between the two rates is a measure of health of the banking system and is therefore a measure of how likely borrowing banks will default; Spread1m_t, Spread3m_t, Spread6m_t. We include the six month and one year credit default swap spreads, CDS, of Citi Group and Ford Motor Co. to control for counterparty risk in the U.S., Cds_citi_6_t, Cds_citi_1_t, Cds_Ford_6_t, Cds_Ford_1_t respectively. We include Sharpe ratios of the major stock exchanges and of the federal

Table 2
Fama-French factors, macroeconomic factors and persistence factors.

Variable	Obs	Mean	Std. Dev.	Min	Max
MktCap (log)	14,740	14.29268	.9327446	10.83667	16.1994
BookTOmarket	14,740	.0252111	.032682	.000319	.4365497
GDP	14,750	.0043915	.0200912	−.0465047	.0502543
GPI	14,751	.4520487	.6638373	−.74	1.98
Prelag	13,531	.0688641	.7328246	−7.77107	6.372596
Retvar	14,613	2.537998	2.851334	0	40.17094

Notes: MktCap = Market capitalization in logarithm; BookToMarket = Book to market ratio; GDP = Monthly rate of change of real GDP/Brazil; GPI = Monthly rate of change of general price index/Brazil (IGPM); Prelag = Prediction of distributed lag of company premium; Retvar = Volatility of company returns.

Table 3
Unconditional momentums and reversals.

Variable	Obs	Mean	Std. Dev.	Min	Max
Momentum1	14,751	.2355772	.4243734	0	1
Momentum2	14,751	.1431089	.3501958	0	1
Reversal1	14,751	.1188394	.3236104	0	1
Reversal2	14,751	.0203376	.1411571	0	1

Table 4a
CAPM – Fama-French, macroeconomic factors, unconditional momentums and reversals – all 17 firms in the sample.

	(1)	(2)	(3)	(4)
Dep Vble: Premium				
Premkt	10.06***	10.07***	4.890***	4.919***
MktCap		−0.0220	0.0885	
BookTOmarket		−3.026*	3.720	
GDP			−2.194	
GPI			−0.0897	
Momentum1			4.906***	4.896***
Momentum2			−2.550***	−2.582***
Reversal1			−4.622***	−4.636***
Reversal2			−4.532***	−4.523***
_cons	0.142***	0.533	−1.354	−0.0370
N	14,601	14,601	14,601	14,601
AR-sq	0.024	0.025	0.488	0.487

Standard errors in parentheses.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Notes: Premium = Company premium; Premkt = Premium of Bovespa index (market); MktCap = Market capitalization in logarithm; BookToMarket = Book to market ratio; GDP = Monthly rate of change of real GDP/Brazil; GPI = Monthly rate of change of general price index/Brazil (IGPM); Momentums and Reversals as defined in text.

funds interest rate in the U.S. to account for volatility and risk, $SharpeSP500_t$, $SharpeNasdaq_t$, $SharpeDowJones_t$, $SharpeFedFunds_t$. We also include the 3-Month U.S. treasury bill interest rate, $TBR\text{-}3m_t$ and a version of the Sharpe ratio of the T-Bill return, $SharpeTBR\text{-}3m_t$; the spread of the bank prime loan rate to the 1 month certificate of deposit, $SpreadPrime1_t$; the 1-month, 3-month and 6-month spread between the U.S. certificate of deposit rate and the federal funds rate, Cd_1_t, Cd_3_t, Cd_6_t and the Sharpe ratio of the 6-month U.S. certificate, $SharpeCd\_6_t$. Finally, we include a U.S. house price index to control for the U.S. housing market bubble effect using the Case-Shiller repeated sales measure, $CaseShiller_t$. Table 6 presents the summary statistics of those variables.

We estimate the probability of momentums/reversals as in expression (2a). Table 7a presents probit model estimates for momentums and reversals as a function of the set of external factors with focus on the U.S. factors. In columns 1 and 2 we note that momentum is sensitive to several U.S. factors including all spreads of the health of the banking system, the TED spreads. The election of President Barack Obama, which is an important political economy factor, and the Economic Stimulus Act of 2008 both have a significant negative effects on the probability of momentums, as well as the 3-month certificate of deposit spread and the prime rate spread. In addition, the Sharpe ratios of Nasdaq, of Federal Funds rate and of the 3-month T-Bill rate have significant positive effects on the probability of momentums as well as TARP (Troubled Asset Relief Program) and the 6 month certificate of deposit spread. Credit default swaps of Citi have alternative effects depending on the maturity: 6 months negative, one year positive; and the Case-Shiller house price index decreases the probability of momentums.

In columns 3 and 4 of Table 7a we note that reversals are less sensitive to the U.S. factors in this sample period. The political economy factor of the election of Obama has a positive effect on the probability of a one standard deviation reversal, but not a two

Table 4b
CAPM – Fama-French, macroeconomic factors, unconditional momentums and reversals and persistence factors – all 17 firms in the sample.

	(1a)	(2a)	(3a)	(4a)	(5a)
Dep. Vble: Premium					
PreMkt	9.970***	9.978***	4.839***	4.849***	4.595***
MktCap		−0.0561	0.0935		−0.282
BookTOmarket		−2.921*	1.727		−6.650*
GDP			−1.619		−3.124
GPI			−0.112		0.0815
Momentum1			4.757***	4.757***	4.775***
Momentum2			−2.240***	−2.253***	−1.700***
Reversal1			−4.553***	−4.566***	−4.550***
Reversal2			−4.437***	−4.443***	−4.394***
PreLag	1.000***	0.999***	0.537***	0.537***	0.527***
PreVarLag	−0.0388	−0.0275	0.136*	0.140**	0.0909
Trend					0.00182***
_cons	0.178	1.024	−1.732	−0.414**	2.172
(0.0957)	(1.228)	(2.920)	(0.109)	(2.184)	
N	13,344	13,344	13,344	13,344	13,340
AR-sq	0.061	0.061	0.509	0.509	0.520

Standard errors in parentheses.
* p<0.05, ** p<0.01, *** p<0.001.
Notes: Premium = Company premium; Premkt = Premium of Bovespa index (market); MktCap = Market capitalization in logarithm; BookToMarket = Book to market ratio; GDP = Monthly rate of change of real GDP/Brazil; GPI = Monthly rate of change of general price index/Brazil (IGPM); Prelag = Prediction of distributed lag of company premium; PreVarLag = Prediction of the distributed lag of the return volatility of company; Trend = Time trend; Momentums and Reversals as defined in text.

standard deviation reversal. The Bear Sterns event, Housing and Economic Recovery act of 2008, prime rate spread and 1-month certificate of deposit spread all have a negative effect, thus capturing the impact of the U.S. initial response to the housing price bubble. The Sharpe ratio of Nasdaq has a robust positive effect on the probability of reversals.

In Table 7b, we present the conditional predicted probabilities of models 1–4 in Table 7a. On average, the conditional and unconditional probabilities are similar, but the standard deviations of the conditional probabilities are much lower than the unconditional, as compared to Table 3.

Fig. 3a and b presents the conditional probabilities of Mom1Hat and Rev2Hat, and Mom2Hat and Rev2Hat by firm over the sample period, and Table 7c presents the unconditional correlations among conditional momentums and reversals. The results are very informative. Conditional momentums and reversal probabilities are significantly negatively correlated. The momentums are declining and flat during and after the U.S. crisis, while the reversals tend to increase after the U.S. crisis. Finally, in Table 7d we show the correlations between unconditional and conditional momentums and reversals with the market premium. The unconditional momentum correlations are significant, positive and small in magnitude; and the reversal correlations are significant, negative and still small, but an order of magnitude larger relative to the momentums. The instrumented momentums are not correlated with the market premium, but reversals are. Hence, while downside risk from the U.S. in the real estate sector is part of the systematic risk of the market, upside risk is not in this period.

We take those results as evidence that the U.S. factors provide a plausible exogenous identification of momentums and reversals (defined as boom and crash probabilities) in the daily variation of the real estate sector in the Brazilian capital market.

Table 5
U.S. financial crisis event descriptions.

Starting date of the week	Events	Event variable
08-Feb-08	Economic Stimulus Act of 2008	$EconStiAct_t$
14-Mar-08	Bear Stearns being acquired	$Bs1FF1_t$
	Reduce Federal Fund Rate	
11-Jul-08	Fannie Mae and Freddie Mac Bailout	$Fannie1_t$
25-Jul-08	Housing and Economic Recovery Act	$HouseRec_t$
15-Sep-08*	BoA acquired Merrill Lynch	$Lehman_t$
	Lehman Brother declared bankruptcy	
	AIG Bailout	
	Ban on short sales of bank stocks	
03-Oct-08	Passed the Emergency Economic Stabilization Act	FFR_t
	Reduce Federal Fund Rate	
10-Oct-08	Announce details of TARP	$TARP_t$
4-Nov-08	Obama became the president	$Obama_t$
13-Feb-09	American Recovery and Reinvestment Act of 2009	$ARecRAct_{it}$

(*) Week of September 15, 2008.

Table 6
U.S. financial and risk factors, and foreign factors.

Variable	Obs	Mean	Std. Dev.	Min	Max
DebtForCurr	14,692	24,259.57	75,848.46	0	414,845
Spread1m	14,126	2.144015	2.132841	0	5.82375
Spread3m	14,075	2.316916	2.092626	0	5.725
Spread6m	14,126	2.447095	2.010232	0	5.64
SharpeSP500	14,737	.0297172	.1857005	−.4769537	.6401283
SharpeNasdaq	14,737	.0636345	.1941541	−.558349	.6475728
SharpeDowJones	14,737	.0308622	.2025386	−.5206962	.6579434
Cds_Citi_6	14,737	67.80086	126.301	0	732.5
Cds_Citi_1	14,737	69.4589	128.6584	0	752.5
Cds_Ford_6	14,737	641.9139	1191.048	0	5850
Cds_Ford_1	14,737	662.0585	1178.052	0	5600
SharpeFedFunds	14,737	25.48508	31.25974	0	192.0611
TBR_3m	14,737	.0000733	.0000717	0	.0001955
SharpeTBR_3m	14,737	33.15155	57.40554	0	363.8166
SpreadPrime1	14,737	.000107	.0000203	−.0000251	.0001315
Cd_1	14,737	.0001008	.0000811	0	.0002253
Cd_3	14,737	.0001074	.0000783	0	.0002226
Cd_6	14,737	.0001131	.0000742	0	.0002159
SharpeCdfed_6	14,737	19.56167	17.6293	0	89.55462
CaseShiller	14,755	170.0116	23.61669	139.26	206.52

Notes: DebtForCurr = company debt in foreign currency; Spread1m, Spread3m, Spread6m = spreads between Libor and the OIS overnight indexed swap rate,1,3,6 months; Cds_citi_6, Cds_citi_1, Cds_Ford_6, Cds_Ford_1 = 1 month and 1 year credit default swap spreads, CDS, of Citi Group and Ford Motor Co.; SharpeSP500, SharpeNasdaq, SharpeDowJones, SharpeFedFunds = Sharpe ratios of S&P500, Nasdaq, Dow Jones, US Federal Funds rate; TBR-3 m, SharpeTBR-3 m = 3-Month U.S. treasury bill interest rate, and Sharpe ratio of the T-Bill return; SpreadPrime1 = the spread of the bank prime loan rate to the 1 month certificate of deposit; Cd_1, Cd_3, Cd_6 = 1, 3, 6-month spread between the U.S. certificate of deposit rate and the federal funds rate; SharpeCd_6 = Sharpe ratio of the 6-month U.S. certificate; CaseShiller = Case-Shiller repeated sales U.S. house price index.

Table 7a
Conditional momentum and reversal estimation.

Dep. Vble:	(1) Momentum1	(2) Momentum2	(3) Reversal1	(4) Reversal2
DebtForCurr	0.000000282	0.000000645**	0.000000142	−0.000000523
Spread1m	0.277*	0.665***	0.171	0.0488
Spread3m	−0.699**	−0.996**	−0.196	0.176
Spread6m	0.413**	0.330	0.101	−0.132
Obama	−0.968***	−1.600***	−0.691***	−0.565
FFR	0.339*	0.696***	0.156	−0.0241
Lehman	0.0864	0.0643	0.0387	−0.120
HouseRec	−0.287*	−0.172	0.397**	1.046**
CaseShiller	−0.00392**	−0.00739**	−0.000262	0.000688
SharpeSP500	−0.430*	−0.560*	−0.223	−1.306*
SharpeNasdaq	0.439***	0.506***	−0.957***	−1.029***
SharpeDowJones	0.520**	0.223	−0.288	−0.0421
EconStiAct	−0.744***	−1.293***	0.179	0.287
TARP	0.622**	0.643*	−0.207	0.0827
BS1FF1	−0.455***	−0.0573	0.489***	0.533*
FANNIE1	0.0485	0.0508	0.395**	−0.109
ARecRAct	−0.0951	−1.010***	0.328**	0.319
Cds_Citi-6	0.0421***	0.131***	0.0000935	0.0245
Cds_Citi-1	−0.0415***	−0.131***	0.000105	−0.0240
Cds_Ford-6	−0.000148	0.000791*	−0.000227	0.0000542
Cds_Ford-1	0.0000588	−0.00109**	0.000234	−0.0000875
SharpeFedFunds	0.00267*	0.00416***	−0.00285	−0.00664
TBR-3m	478.9	−2686.0	−4614.2**	−5106.9
SharpeTBR-3m	0.00237***	0.00296***	−0.000943*	−0.000103
SpreadPrime1	−7064.6**	−6950.2*	15,084.6***	13,558.3***
Cdfed1	7675.1	24,465.2***	15,728.8**	19,368.1*
Cdfed3	−33,136.1***	−71,210.6***	−7254.9	−9982.7
Cdfed6	22,925.5***	43,742.7***	257.7	781.8
SharpeFed	0.00183	0.000764	0.000891	0.00943*
_cons	1.479***	2.503***	−3.976***	−5.395***
R2 (pseudo)	0.1361	0.2786	0.0831	0.1912
LR chi2(30)	2115.25***	3296.74***	854.32***	547.35***
N	14,050	14,050	14,050	14,050

Standard errors in parentheses; * $p<0.05$, ** $p<0.01$, *** $p<0.001$.

Table 7b
Summary statistics — conditional momentums and reversals.

Variable	Obs	Mean	Std. Dev.	Min	Max
Mom1Hat	14,046	.2420455	.1686962	.0140756	.8313589
Mom2Hat	14,046	.1496621	.1782201	2.60e − 10	.8780795
Rev1Hat	14,046	.1196173	.0858073	.004777	.6002339
Rev2Hat	14,046	.0209648	.0375463	.0000292	.3453669

The premium is then explained using the instrumented momentums and reversals of Table 7a resulting in Table 8. Columns 3' and 4' are thus denoted to be compared with columns 3 and 4 of Table 4a; and columns 5, 6 and 7 control for the distributed lagged premium, volatility and time trend to be compared with columns 3a, 4a and 5a of Table 4b. When instrumented by U.S. factors, momentums and reversals continue to have a robust effect on the premium and the magnitude of the β's are large, of an order of close to 9 indicating the aggressiveness of the real estate sector. Also, the effects of the instrumented momentums and reversals are qualitatively the same, but higher in magnitude, except for the one standard deviation reversal that is not statistically significant in most cases.

The factors of Fama-French continue to be irrelevant, but the inflation macroeconomic factor has a significant negative impact on the premium. The inflation effect may be due to the immobilization in the real estate sector since higher inflation can lead individuals to seek fixed assets to protect their wealth (hedge against inflation), thus reducing the inflationary risk by investing in the real estate sector. Estimation in columns 5, 6 and 7 show that when controlling for distributed lagged premium, volatility and time trend, the effects described above are robust. In particular, the distributed lagged premium is positive and significant indicating some degree of mispricing. The distributed lagged volatility is also positive and significant, indicating a positive effect of past volatility on the current risk premium. In particular, the time trend is not significant in column 7 but the distributed lagged volatility is significant, a result that is the opposite of the one observed in column 5a of Table 4b where the momentums and reversals are not instrumented.

We consider now versions of models (2a-b) where the vector $\boldsymbol{X''}_{it}$ includes additional factors from the Brazilian economy. Variables included are firm multiples and risk factors and are organized according to their specific attribute. First, for the equity value multiple, we have the Price/EBTIDA $_{it}$, price to earnings before taxes, interest, depreciation and amortization, an accrual flow multiple. Then, as a book value multiple, PriceStock $_{it}$ is the price of the share divided by the book value per share, also an accrual flow multiple. As an entity value multiple, the enterprise value over earnings before interest, taxes, depreciation and amortization, $EV/EBITDA_{it}$ also an accrual flow multiple. For tangibility, we have $Tangibles_{it}$ defined as permanent assets divided by total assets. Debt measures include short term debt over total debt, $STDebt/TD_{it}$; and NetDebt/NetWorth $_{it}$ is the ratio of the company net debt to net worth. The company financial leverage, $FinLev_{it}$, and operational leverage, $OpLev_{it}$ are controls for leverage.

Growth effects are captured by $DirInvGDP_t$ and $ForDirInvGDP_t$, direct investment over GDP and foreign direct investment over GPD respectively, and $CurrTrGDP_t$ are current transactions over GDP accounted by the Central Bank of Brazil. Depth and liquidity are accounted for with a measure of depth (liquidity) of the market, defined as the daily volume over the return standard deviation, $Depth_{it}$, and credit to the private sector over GDP, $Credit/GDP_t$.[13] Size is controlled by total assets, in logarithms, $AssetTotal_{it}$. Specific real estate sector variables are $REFinTerm_t$, the maturity term for real estate financing in months; and $TaxSales_t$, the total value of taxes charged on sales of real estate.

Profitability of the company includes $ProfitNet_{it}$ as net profits, $ProfitPrice_{it}$ is the profit over price ratio, and profit per share is $ProfitShare_{it}$. Finally, the risk factors are the Sharpe ratio of the BOVESPA stock index, $SharpeBov_t$; the spread of the interest on the interbank certificates of deposits and the risk free interest (Over Selic rate) – this variable is similar to the US TED (libor – OIS) by measuring the bank intermediation risk, $SpreadCDC_t$; the spread between interest on mortgage financing and interest on saving for individuals, $MortgSavInd_t$; the spread between interest on mortgage financing and interest on saving for firms, $MortgSavCo_t$ and the $InterestLT_t$ is the long term monthly nominal interest rate.

Table 9 presents the summary statistics of those data. The resulting estimates are presented in Table 10 where column 5' includes all controls, 6' adds the lagged premium control, and 7' adds the time trend. The results indicate that the company β and momentums and reversals instrumented by U.S. factors are robust to the additional domestic factors, and the α's remain insignificant. The Fama-French market capitalization factor is positive and significant. The macroeconomic factors are robust, GDP growth increases the premium and inflation decreases it. Of the multiples and risk factors included, the price-book value multiple, PriceStock $_{it}$ and the debt measure $NetDebt/NetWorth_{it}$ have robust positive effects on the risk premium of the company. Domestic direct investment has a positive effect and foreign direct investment a negative effect on the risk premium indicating that foreign savings signal lower risks in the market; a possible herd effect of market participants. Market depth has a significant negative effect on the risk premium and credit has the opposite effect. Both, firm net profits and the Bosvespa Sharpe ratio decrease the risk premium of companies in the sector. Finally, distributed lagged premium, distributed

[13] See, for example, Engle and Lange (2001) for an analysis of liquidity and market depth.

lagged volatility and time trend are positive and significant in predicting current premium indicating a significant amount of risk persistence in this market.

4.2. Daily Return Volatility

We use the same framework to estimate the volatility of daily returns as a function of risk and other factors. First, we estimate models without instrumentation of momentums/reversals analogous to model (1), with a linear skedastic function of the form:

$$RetVar_{it} = \alpha'_0 + \beta'_1 PreMkt_t + \beta'_2 PremVar_t + \gamma'' \mathbf{X}_{it} + a'_t + \varepsilon'_{it} \tag{1a}$$

where the variables on the right-hand-side are similar to the case of the premium and $PremVar_t$ is the volatility of the market premium.[14] In the case where momentums/reversals are instrumented by U.S. factors, model (2a) is similar and model (2b) gives the alternative linear skedastic function:

$$RetVar_{it} = \alpha'_0 + \beta'_1 PreMkt_t + \beta'_2 PremVar_t + \mathbf{y}'' \mathbf{X}''_{it} + a'_t + \varepsilon'_{it}. \tag{2b'}$$

Table 11 presents estimation results of the model in Eq. (1a) with fixed effects and firm clusters. Models 1 and 2 do not control for lagged premium, lagged volatility and time trend; while models 3, 4, and 5 do respectively. The effect of the volatility of the market premium on daily return volatility is positive and robust across all the five models, but the level of the premium has a marginal effect in specifications 3, 4 and 5 only. Book-to-market has a significant positive effect, but not robust to adding lagged premium, volatility and time trend. A potential important reason is that since the new IPOs in the sector in the period from the year 2005 to the recent financial crisis, the real estate companies started to play a role of hoarding land, becoming the so-called 'land banks,' besides investing and constructing buildings. Thus, the multiple book-to-market has become an important metric for the non-diversifiable corporate idiosyncratic risk in this sector. Macroeconomic factors do affect volatility. GDP growth decreases volatility across all specifications, and inflation increases volatility, except in column 3 when controls for lagged premium and volatility are included. The momentums/reversals are robust across almost all models. The one standard deviation momentum increases volatility but the two standard deviation momentum decreases volatility; with the exception of when a time trend is included and the two standard deviation momentum becomes insignificant. Reversals have a negative (minus the positive effect) effect on volatility at the two bounds across all specifications.

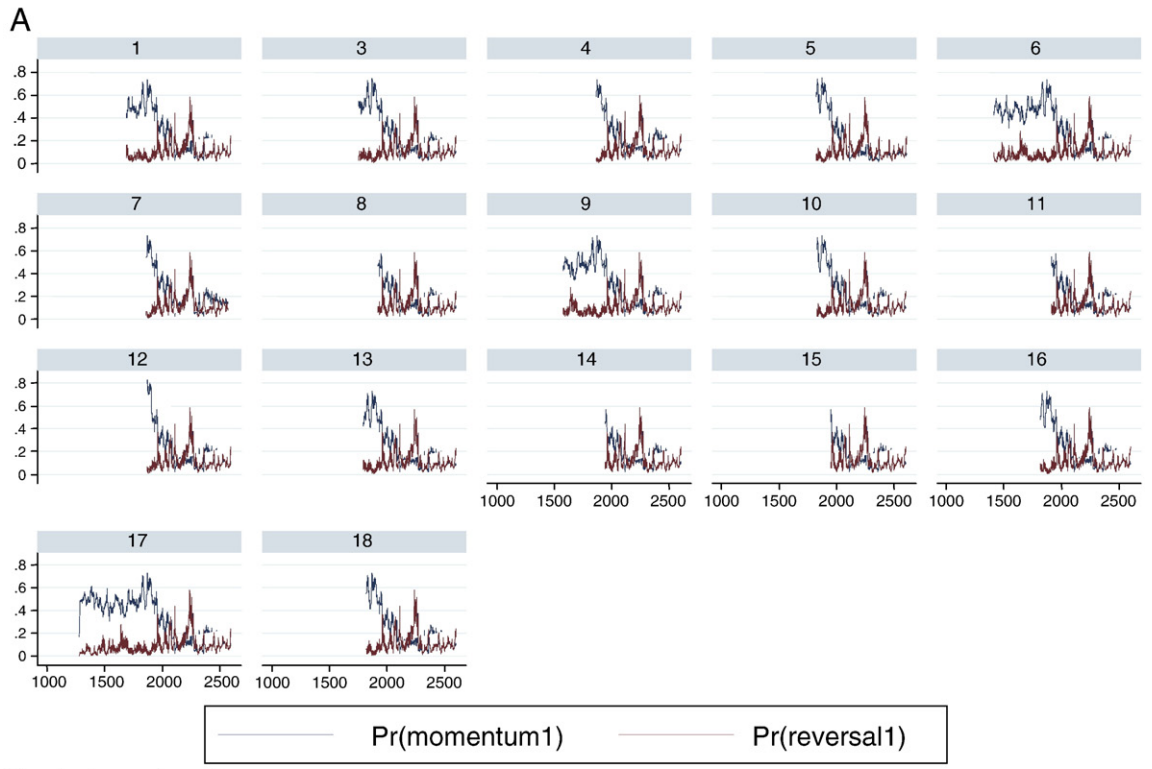
Overall, the sign of the coefficient of the 1st momentum is positive thus a mild boom makes the market more volatile, but, conditional on the 1st momentum, the 2nd momentum decreases volatility, providing some stability to the market. The sign of the reversals coefficients (1st and 2nd standard deviations) are both negative (minus the positive effect). When there is a small or a big crash, the volatility decreases. The variable PreVarLag shows a significant persistence of volatility in this period.

Table 12 presents the estimated models in Expression (2b') where momentums/reversals are instrumented by U.S. factors according to Table 7a. The effect of the volatility of the market premium on return volatility continues to be positive and robust across all the four models, but the market premium is insignificant. Market capitalization has a significant negative impact on volatility; and Book-to-Market continues to have a significant positive effect, but not robust to adding lagged premium, volatility and time trend. GDP growth decreases volatility only in column 1', but inflation increases volatility in columns 1' and 5' when controls for lagged premium, volatility and time trend are included. The instrumented momentums/reversals are robust across all models. The one standard deviation momentum increases volatility but two standard deviation momentum decreases volatility; however reversals have a negative (minus the positive effect) effect on volatility at the upper bound only, only big crashes matter in this case. The PreLagVar is positive and robust indicating the presence of time varying volatility; and column 5' shows a positive and significant time trend in volatility as well.

Next, we estimate volatility conditional on all factors of the Brazilian economy discussed in Section 4.1. Results are presented in Table 13. The results indicate again that the volatility of the market premium is robust to the additional domestic factors in determining volatility and the market premium is not significant. The Fama-French book-to-market factor is marginally significant and negative, except when a time trend is included. The macroeconomic factors have the right signs but become insignificant when lagged premium, volatility and time trends are included; except for inflation which is marginally significant in column 7. The instrumented momentums and reversals have mixed effects. The only robust effects are the one standard deviation predicted momentum, which increases volatility; and the two standard deviation reversal which decreases volatility across the three specifications.

Of the multiples and risk factors included, Price/EBITDA has a robust negative effect on volatility as well as the operational leverage of the firm. EV/EBITDA has a positive effect on volatility, but not robust. Total assets (size) have a robust positive effect on volatility, while financial and operational leverage both have a robust negative effect on volatility. Market depth and long term nominal interest rates have a significant and robust negative effect on volatility. Finally, distributed lagged volatility is positive and significant in predicting current volatility indicating a significant amount of conditional heteroskedasticity in this market; and the time trend is marginally significant and positive indicating rising volatility in the period.

[14] The market premium volatility is computed as the square root of the daily market premium squared; the summary statistics are in Table 9.


A
1
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
0
.2
.4
.6
.8
1000
1500
2000
2500
Pr(momentum1)
Pr(reversal1)
Graphs by cod_entity

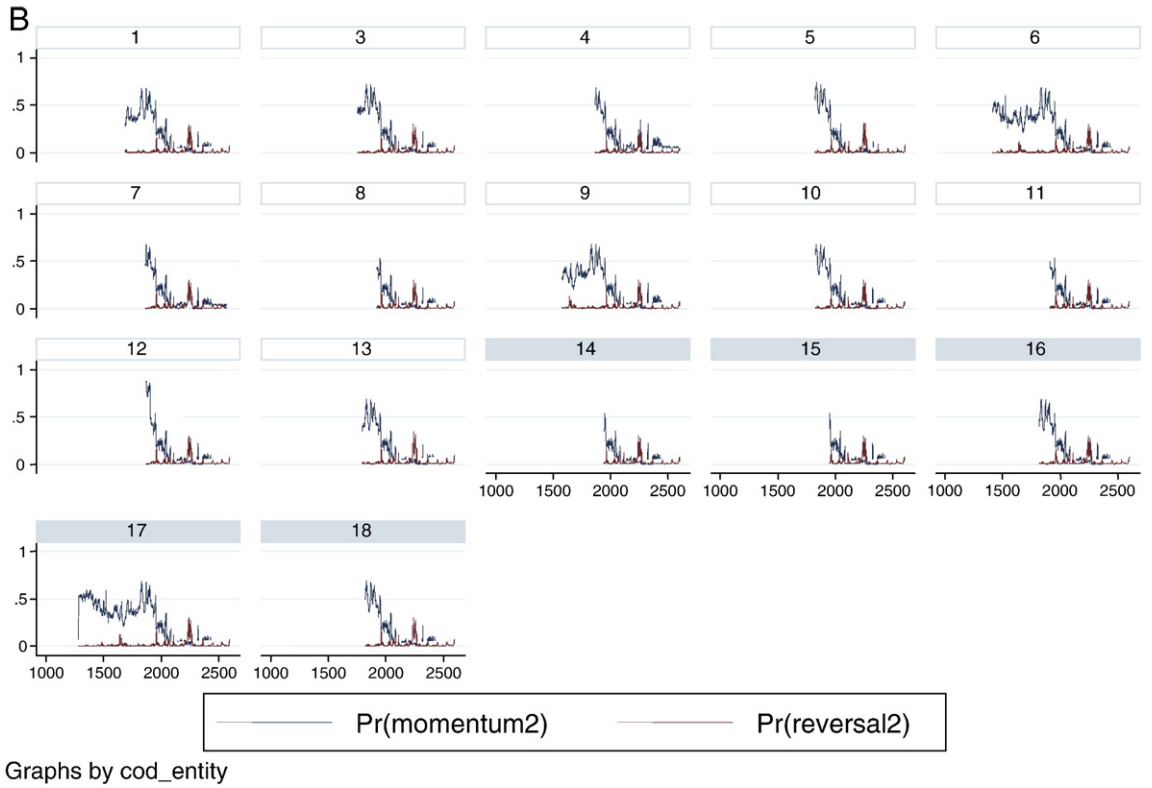

B
1
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
0
.5
1
1000
1500
2000
2500
Pr(momentum2)
Pr(reversal2)
Graphs by cod_entity

Table 7c
Correlations of conditional momentums and reversals.

	mom0111	mom0222
rev0111	−0.3479 (0.0000)	–
rev0222	–	−0.1276 (0.0000)

Pairwise correlation coefficients
Prob>|−r| under H0: Rho=0
Significance level in parentheses

Table 7d
Correlations of unconditional and conditional momentums and reversals with market premium.

	Momentum1	Momentum2	Reversal1	Reversal2	Mom1Hat	Mom2Hat	Rev1Hat	Rev2Hat
PremMkt	0.0660 (0.0000)	0.0281 (0.0008)	−0.0981 (0.0000)	−0.0735 (0.0000)	−0.0048 (0.5812)	−0.0082 (0.3431)	−0.0899 (0.0000)	−0.0974 (0.0000)

Pairwise correlation coefficients
Prob>|−r| under H0: Rho=0
Significance level in parentheses

Table 8
CAPM – Fama-French, macroeconomic factors, conditional momentums and reversals – all 17 firms in the sample.

	(3')	(4')	(5)	(6)	(7)
Dep. Vble: Premium					
PreMkt	8.932***	8.894***	8.842***	8.802***	8.847***
MktCap	−0.0147	−0.100	0.0167	−0.0878	0.0365
BookTOmarket	−0.427	−0.395	−2.656	−2.475*	−2.419
GDP	0.250		2.347*		2.342*
GPI	−0.225***		−0.258***		−0.273***
Mom1hat	6.754***	6.888***	5.716***	6.090***	5.700***
Mom2Hat	−6.120***	−6.248***	−5.139***	−5.466***	−5.270***
Rev1Hat	−1.753	−2.361	−1.920	−2.436*	−2.038
Rev2Hat	−14.18***	−13.45***	−13.89***	−13.16***	−13.68***
PreLag			0.906***	0.911***	0.907***
PreVarLag			0.189**	0.163*	0.191**
Trend					−0.0001
_cons	0.240	1.409	−0.571	0.893	−0.718
N	13946	13946	12746	12746	12746
AR-sq	0.066	0.065	0.100	0.098	0.100

Standard errors in parentheses.
* p<0.05, ** p<0.01, *** p<0.001.
Notes: Premium=Company premium; Premkt=Premium of Bovespa index (market); MktCap=Market capitalization in logarithm; BookToMarket=Book to market ratio; GDP=Monthly rate of change of real GDP/Brazil; GPI=Monthly rate of change of general price index/Brazil (IGPM); Prelag=Prediction of distributed lag of company premium; PreVarLag=Prediction of the distributed lag of the return volatility of company; Trend=Time trend; Momentums and Reversals as defined in text.

4.3. Conditional premium (Return) and conditional volatility (Risk)

When we compare the results of the determination of the premium in Table 10 and the determination of volatility in Table 13 we note that the common factors that influence both premium and volatility are few. The one standard deviation instrumented momentum increases both the premium and volatility while the two standard deviation reversal decreases the premium and

Fig. 3. A: Predicted Momentum and Reversal – One Standard Deviation. Cod_entity==1 ABYA Former Abyara, now: AGRE (BM&F Bovespa: AGEI3). Cod_entity==3 BISA Brookfield Incorporated. Cod_entity==4 BRML BRMALLS\. Cod_entity==5 CCIM Camargo Correa Real Estate Development. Cod_entity==6 CYRE Cyrela Brazil Realty. Cod_entity==7 EVEN Even. Cod_entity==8 EZTC EZTEC. Cod_entity==9 GFSA Gafisa. Cod_entity==10 IGTA Iguatemi. Cod_entity==11 INPR TCI Inpar. Cod_entity==12 JHFS JHSF Participações S.A. Cod_entity==13 LPSB Lopes Consultoria de Imóveis. Cod_entity==14 MRVE. Cod_entity==15 MULT Multiplan. Cod_entity==16 PDGR PDG Realty. Cod_entity==17 RSID Rossi Residencial. Cod_entity==18 TCSA Tecnisa. B: Predicted Momentums and Reversals – Two Standard Deviations. Cod_entity==1 ABYA Former Abyara, now: AGRE (BM&F Bovespa: AGEI3). Cod_entity==3 BISA Brookfield Incorporated. Cod_entity==4 BRML BRMALLS\. Cod_entity==5 CCIM Camargo Correa Real Estate Development. Cod_entity==6 CYRE Cyrela Brazil Realty. Cod_entity==7 EVEN Even. Cod_entity==8 EZTC EZTEC. Cod_entity==9 GFSA Gafisa. Cod_entity==10 IGTA Iguatemi. Cod_entity==11 INPR TCI Inpar. Cod_entity==12 JHFS JHSF Participações S.A. Cod_entity==13 LPSB Lopes Consultoria de Imóveis. Cod_entity==14 MRVE. Cod_entity==15 MULT Multiplan. Cod_entity==16 PDGR PDG Realty. Cod_entity==17 RSID Rossi Residencial. Cod_entity==18 TCSA Tecnisa.

Table 9
Additional factors.

Variable	Obs	Mean	Std. Dev.	Min	Max
Price/EBITDA	11,757	76.63736	318.6205	−1388.835	4050.949
PriceStock	14,744	6.657534	23.83782	.14677	307.6258
EV/EBITDA	11,757	80.3216	312.5143	−1551.32	3708.19
Tangibles	14,755	.1773861	.250388	.0011879	.8350065
StDebt/TD	14,749	37.44012	26.82131	0	100
NetDebt/NetWorth	14,755	−58.91263	685.3194	−9598.003	261.5688
FinLev	14,746	3.168498	14.46644	−65.94014	196.9921
OpLev	14,746	.9350865	18.46874	−255.4321	92.70477
CurrTrGDP	14,737	−9.877967	13.98946	−34.66029	34.73973
DirInvGDP	14,737	15.29466	23.30446	−141.8911	89.9343
ForDirInvGDP	14,737	18.01621	31.22167	−60.15597	103.3563
Depth	13,054	7.669819	2.027944	−3.241349	14.51573
CreditGDP	14,737	.0084459	.0008298	.006682	.0102645
AssetTotal	14,755	10.15728	.8696392	5.20758	12.01275
ReFinTerm	14,737	349.4144	34.03374	240	360
TaxSales	14,755	351.2619	360.7617	16.10606	2214.667
ProfitPrice	14,734	145.4123	818.929	−1629.364	14439
ProfitShare	14,746	.143427	.4406717	−2.238103	4.617846
ProfitNet	14,755	1075.152	1746.119	−1135.97	16582.85
SharpeBov	14,737	−442.3023	1806.606	−8028.127	.1661844
SpreadCDC	14,737	.0096176	.0007123	0	.0113936
MortSavInd	14,737	.0456897	.0032347	.0384733	.0605296
MortSavCo	14,737	.0202989	.0261592	−.0002663	.1564374
InterestLT	14,737	.0002361	.0000255	0	.0003532
PremVar	14,148	.0233762	.056192	0	.6708202

Notes: Price/EBTIDA = price to earnings before taxes, interest, depreciation and amortization, an accrual flow multiple; PriceStock = price of the share divided by the book value per share; EV/EBITDA = the enterprise value over earnings before interest, taxes, depreciation and amortization; Tangibles = permanent assets divided by total assets; STDebt/TD = short term debt over total debt; NetDebt/NetWorth = ratio of the company net debt to net worth; FinLev = company financial leverage; OpLev = company operational leverage; DirInvGDP = direct investment over GDP; ForDirInvGDP = foreign direct investment over GPD; CurrTrGDP = current transactions over GDP accounted by the Central Bank of Brazil; Depth = daily volume over the return standard deviation (liquidity); Credit/GDP = credit to the private sector over GDP; AssetTotal = company total assets, in logarithms; REFinTerm, the terms for real estate financing in months; TaxSales = total value of taxes charged on sales of real estate; ProfitNet = company net profits; ProfitPrice = company profit over price ratio; ProfitShare = company profit per share; SharpeBov = Sharpe ratio of the BOVESPA stock index; SpreadCDC = spread of the interest on the interbank certificates of deposits and the risk free interest (Over Selic rate); MortgSavInd = spread between interest on mortgage financing and interest on saving for individuals ; MortgSavCo = spread between interest on mortgage financing and interest on saving for firms ; InterestLT = long term monthly nominal interest rate; PremVar = the volatility of the market premium.

increases volatility. Thus, the external factors that influence momentums and reversals lead to effects on the domestic real estate market so that when the market is mildly bullish, premium and volatility are positively related; but when the market is heavily bearish, or in crash mode, they move in the opposite direction. On the macroeconomic factors, GDP growth increases the premium and inflation decreases it, but the effect on volatility is not robust to the inclusion of distributed lagged volatility control. The debt measure NetDebt/NetWorth$_{it}$ has a robust positive effect on the risk premium and a negative effect on volatility when distributed lagged volatility is included in the skedastic function. Market depth has a significant negative effect on the risk premium and on volatility as well. The Sharpe ratio of the Bovespa index decreases robustly the premium, but increases volatility when distributed lagged volatility and time trend are not controlled for. The time trend increases both premium and volatility.

We present estimates of OLS linear correlation and quadratic fit between premium and volatility in Fig. 4. The first column of graphs of Fig. 4 is the estimated conditional premium and conditional volatility according to model 3a of Table 4b and model 3' of Table 12 respectively; those that include Fama-French factors, macroeconomic factors, instrumented momentums/reversals and lagged controls. The second column of graphs is the estimated conditional premium and conditional volatility according to model 6' of Table 10 and model 6 of Table 13 respectively; those including all factors, instrumented momentums/reversals, multiples and controls. The results are very instructive: There is a negative relationship between premium and volatility in this market in this period, indicating that on a daily basis the market, on average, has opportunity for short term arbitrage. The introduction of domestic additional multiples and domestic risk factors mildly mitigates the negative slope, but does not revert it.

Fig. 5a and b presents the same models on a company by company basis. In the linear fit case, there is a clear difference between Fig. 5a and b. When additional controls are included, the negative slope on a company by company basis is mitigated, and in the case of a handful of companies it becomes positive. However, in the quadratic fit case those differences are less perceptible.

Bowman (1980) was one of the first to identify a negative relationship between risk and average return [see more recently Chou et al. (2009)]. A potential theory that explains this phenomenon is based on Kahneman and Tversky's (1979) prospect theory. Empirically, Fiegenbaum and Thomas (1988) and Fiegenbaum (1990) document, among other things that a negative association exists between risk and return for firms having returns below a reference point such as the industry level target. On the other hand, a positive association may exist for firms with returns above the target, and the below target tradeoff is

Table 10
Determination of daily variation of company premium.

	(5')	(6')	(7')
Dep. Vble: Premium			
PreMkt	9.827***	9.737***	9.720***
MktCap	0.593*	0.658**	0.834**
BookTOmarket	2.155	0.554	1.465
GDP	4.801*	6.531*	7.206*
GPI	−0.317***	−0.352***	−0.242**
Mom1Hat	9.227***	8.439***	9.683***
Mom2Hat	−8.727***	−8.087***	−7.924***
Rev1Hat	−2.365	−2.714	−1.437
Rev2Hat	−14.92***	−13.76***	−15.40***
Price/EVBITDA	0.000194	0.000740	0.0015
PriceStock	0.0266***	0.0151***	0.0179***
EV/EBITDA	−0.0000605	−0.000653	−0.00135
Tangibles	−0.0638	0.0438	−0.219
StDebt/TD	−0.000406	0.000256	−0.0004
NetDebt/NetWorth	0.000715***	0.000450**	0.00527***
FinLev	0.00222	0.00167	0.00201
OpLev	0.00233	0.00415	0.00730
CurrTrGDP	0.00687	0.00298	0.00348
DirInvGDP	0.00373	0.00400*	0.00331
ForDirInvGDP	−0.00921***	−0.00704***	−0.00616***
Depth	−0.0758*	−0.0977**	−0.0990**
CreditGDP	189.8	114.3	−517.3*
AssetTotal	−0.194	−0.161	−0.389
ReFinTerm	0.00350	0.00231	0.000907
TaxSales	−0.0000685	−0.0000650	−0.000178
ProfitPrice	−0.00002	−0.00001	−0.000009
ProfitShare	0.240**	0.216	0.246*
ProfitNet	−0.0000805**	−0.0000701*	−0.0000748*
SharpeBov	−0.000102***	−0.000122***	−0.000118***
SpreadCDC	146.8	118.8	480.5
MortSavInd	−3.292	−1.828	17.03
MortSavCo	−4.383	−4.136	−8.016
InterestLT	3103.0	3621.2	18759.9
PreLag		1.014***	1.008***
PreVarLag		0.174*	0.166*
Trend			0.00439***
_cons	−10.60	−11.03	−17.61*
N	9936	9282	9282
AR-sq	0.079	0.116	0.118

Standard errors in parentheses.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Notes: Premium = Company premium; Premkt = Premium of Bovespa index (market); MktCap = Market capitalization in logarithm; BookToMarket = Book to market ratio; GDP = Monthly rate of change of real GDP/Brazil; GPI = Monthly rate of change of general price index/Brazil (IGPM); Prelag = Prediction of distributed lag of company premium; PreVarLag = Prediction of the distributed lag of the return volatility of company; Trend = Time trend; Momentums and Reversals as defined in text; Price/EBTIDA = price to earnings before taxes, interest, depreciation and amortization, an accrual flow multiple; PriceStock = price of the share divided by the book value per share; EV/EBITDA = the enterprise value over earnings before interest, taxes, depreciation and amortization; Tangibles = permanent assets divided by total assets; STDebt/TD = short term debt over total debt; NetDebt/NetWorth = ratio of the company net debt to net worth; FinLev = company financial leverage; OpLev = company operational leverage; DirInvGDP = direct investment over GDP; ForDirInvGDP = foreign direct investment over GPD; CurrTrGDP = current transactions over GDP accounted by the Central Bank of Brazil; Depth = daily volume over the return standard deviation (liquidity); Credit/GDP = credit to the private sector over GDP; AssetTotal = company total assets, in logarithms; REFinTerm, the terms for real estate financing in months; TaxSales = total value of taxes charged on sales of real estate; ProfitNet = company net profits; ProfitPrice = company profit over price ratio; ProfitShare = company profit per share; SharpeBov = Sharpe ratio of the BOVESPA stock index; SpreadCDC = spread of the interest on the interbank certificates of deposits and the risk free interest (Over Selic rate); MortgSavInd = spread between interest on mortgage financing and interest on saving for individuals ; MortgSavCo = spread between interest on mortgage financing and interest on saving for firms; InterestLT = long term monthly nominal interest rate.

generally steeper than that above the target. Thus, when the regression is applied to all firms, the estimate of the slope term should be dominated by below-target firms, which would have a steeper negative risk–return relationship.

Our results in Figs. 4 and 5a–b can be interpreted in light of the prospect theory suggested above. In Fig. 4, we have the sample of all firms in the sector and in Fig. 5a–b the company by company figures. The below target firms dominate the sector and the overall evidence is that the sector is below the perceived potential industry returns. On a company by company basis, companies 4 and 9 (and 15 in the quadratic fit case) seem to be operating on a perceived potential industry return above the target (have a positively sloped risk-return tradeoff), while most others are below target. The evidence is that the vast majority of the companies are characterized by a negatively sloped tradeoff between risk and return and are being perceived as high potential

Table 11
Conditional volatility estimates I.

	(1)	(2)	(3)	(4)	(5)
Dep. Vble: RetVar					
PreMkt	0.541	0.445	1.054*	1.030*	0.890*
MktCap	−0.366	−0.292	−0.166	−0.143	−0.496*
BookTOmarket	12.79**	13.27***	6.855	6.787	−0.551
GDP	−10.06***		−3.504*		−4.875**
GPI	0.266**		0.0789		0.248*
Momentum1	3.577***	3.557***	3.357***	3.347***	3.372***
Momentum2	−0.986***	−1.032***	−0.622***	−0.636***	−0.149
Reversal1	3.343***	3.358***	3.159***	3.159***	3.163***
Reversal2	4.460***	4.480***	4.223***	4.223***	4.264***
PremVar	3.670***	4.300***	2.108***	2.282***	1.958**
PreLag			0.0849*	0.0820*	0.0757*
PreVarLag			0.779***	0.797***	0.741***
Trend					0.00160***
_cons	6.103	5.100	1.564	1.208	5.005
N	14597	14,597	13,340	13,340	13,340
AR-sq	0.429	0.421	0.524	0.524	0.539

Standard errors in parentheses.
* p<0.05, ** p<0.01, *** p<0.001.
Notes: RetVar = company return volatility; Premkt = Premium of Bovespa index (market); MktCap = Market capitalization in logarithm; BookToMarket = Book to market ratio; GDP = Monthly rate of change of real GDP/Brazil; GPI = Monthly rate of change of general price index/Brazil (IGPM); Prelag = Prediction of distributed lag of company premium; PreVarLag = Prediction of the distributed lag of the return volatility of company; PremVar = the volatility of the market premium; Trend = Time trend; Momentums and Reversals as defined in text.

Table 12
Conditional Volatility Estimates II.

	(1')	(2')	(3')	(4')	(5')
Dep. Vble: Retvar					
PreMkt	0.504	0.486	0.642	0.666	0.627
MktCap	−0.449*	−0.370	−0.203*	−0.187*	−0.274**
BookTOmarket	4.482*	4.709*	0.486	0.407	−0.362
GDP	−4.546*		1.919		1.934
GPI	0.201***		0.0449		0.0995**
Mom1Hat	4.555***	4.032***	2.041**	2.196**	2.097**
Mom2Hat	−4.933***	−4.527***	−2.079**	−2.184**	−1.611*
Rev1Hat	−0.0633	0.135	−0.455	−0.181	−0.0356
Rev2Hat	19.72***	19.72***	13.63***	13.20***	12.90***
PremVar	4.160***	4.409***	3.147***	3.061***	3.139***
PreLag			0.0410	0.0408	0.0390
PreVarLag			0.808***	0.805***	0.803***
Trend					0.000428**
_cons	7.951*	6.929*	2.905*	2.655*	3.434**
N	13,946	13,946	12,746	12,746	12,746
AR-sq	0.111	0.109	0.194	0.194	0.194

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001
Notes: RetVar = company return volatility; Premkt = Premium of Bovespa index (market); MktCap = Market capitalization in logarithm; BookToMarket = Book to market ratio; GDP = Monthly rate of change of real GDP/Brazil; GPI = Monthly rate of change of general price index/Brazil (IGPM); Prelag = Prediction of distributed lag of company premium; PreVarLag = Prediction of the distributed lag of the return volatility of company; PremVar = the volatility of the market premium; Trend = Time trend; Momentums and Reversals as defined in text.

grow companies, either due to new niches and/or aggressiveness of their management. Most importantly, those results are obtained including the proper controls for the U.S. crisis through the instrumented momentums and reversals.[15]

5. Conclusions

In this paper, we condition the likelihood of both momentums and reversals in the real estate equity sector of Brazil on U.S. risk factors and on the recent U.S. subprime lending and financial crisis. Our estimation of momentum, or boom probabilities

[15] In effect, Brazil does have a large untapped demand for housing, mainly at the lower levels of income. Nominal interest rates have been historically high, at the two-digit level. From 2006 and on, lower interest rates, below the two-digit level, have made long term financing of housing more feasible and thus have given the real estate sector a favorable future expected return. In addition, in 1997, a change introduced by a new mortgage law gave the ability to creditors to seize and liquidate the property upon a debtor's default in a more timely and efficient manner, thus paving the way for a more active mortgage market. Those can be potential explanations for the predominant above target reference point for the sector.

Table 13
Conditional volatility estimates III.

	(5)	(6)	(7)
Dep. Vble: Retvar			
PreMkt	0.530	0.541	0.545
MktCap	−0.460	0.0219	0.0969
BookTOmarket	−8.654*	−6.626*	−6.237
GDP	−9.448**	−1.814	−1.538
GPI	0.267**	0.101	0.148*
Mom1Hat	5.203***	3.346***	3.873***
Mom2Hat	−4.053***	−2.105	−2.036
Rev1Hat	−1.763	−2.307	−1.766
Rev2Hat	17.37***	13.76***	13.08***
Price/EBITDA	−0.00577***	−0.00271*	−0.00236*
PriceStock	−0.00569	−0.0101	−0.00889
EV/EBITDA	0.00502***	0.00207*	0.00177
Tangibles	−1.796	−0.313	−0.424
StDebtTD	−0.000756	−0.000277	−0.00056
NetDebt/NetWorth	−0.000437	−0.000474*	−0.00044
FinLev	−0.0119*	−0.00988**	−0.00973**
OpLev	−0.0275**	−0.0155**	−0.0142**
CurrTrGDP	0.00403	−0.000308	−0.000094
DirInvGDP	−0.00207	0.000466	0.00017
ForDirInvGDP	−0.000244	0.00212	0.00249
Depth	−0.938***	−0.941***	−0.942***
CreditGDP	−230.2	−342.9*	−610.5**
AssetTotal	1.268**	0.936**	0.839**
ReFinTerm	−0.00207	−0.00472*	−0.00531*
TaxSales	−0.000175	−0.0000451	−0.000092
ProfitPrice	0.0000183	0.0000400*	0.0000432*
ProfitShare	0.204*	0.0111	0.0238
ProfitNet	−0.0000715	−0.0000340	−0.0000307
SharpeBov	0.0000989**	0.0000291	0.0000307
SpreadCDC	−368.9	−721.3*	−567.9
MortSavInd	22.10	17.07	25.07
MortSavCo	10.08*	6.760	5.108
InterestLT	−36355.4**	−27496.4***	−21061*
PremVar	3.419***	2.697***	2.670***
PreLag	0.101	0.0981	
PreVarLag	0.742***	0.739***	
Trend	0.00186*		
_cons	17.05	15.03	12.24
N	9936	9282	9282
R-sq	0.318	0.391	0.391

Standard errors in parentheses.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$.
Notes: RetVar = company return volatility; Premkt = Premium of Bovespa index (market); MktCap = Market capitalization in logarithm; BookToMarket = Book to market ratio; GDP = Monthly rate of change of real GDP/Brazil; GPI = Monthly rate of change of general price index/Brazil (IGPM); Prelag = Prediction of distributed lag of company premium; PreVarLag = Prediction of the distributed lag of the return volatility of company; PremVar = the volatility of the market premium; Trend = Time trend; Momentums and Reversals as defined in text; Premium = Company premium; Premkt = Premium of Bovespa index (market); MktCap = Market capitalization in logarithm; BookToMarket = Book to market ratio; GDP = Monthly rate of change of real GDP/Brazil; GPI = Monthly rate of change of general price index/Brazil (IGPM); Prelag = Prediction of distributed lag of company premium; PreVarLag = Prediction of the distributed lag of the return volatility of company; Trend = Time trend; Momentums and Reversals as defined in text; Price/EBTIDA = price to earnings before taxes, interest, depreciation and amortization, an accrual flow multiple; PriceStock = price of the share divided by the book value per share; EV/EBITDA = the enterprise value over earnings before interest, taxes, depreciation and amortization; Tangibles = permanent assets divided by total assets; STDebt/TD = short term debt over total debt; NetDebt/NetWorth = ratio of the company net debt to net worth; FinLev = company financial leverage; OpLev = company operational leverage; DirInvGDP = direct investment over GDP; ForDirInvGDP = foreign direct investment over GPD; CurrTrGDP = current transactions over GDP accounted by the Central Bank of Brazil; Depth = daily volume over the return standard deviation (liquidity); Credit/GDP = credit to the private sector over GDP; AssetTotal = company total assets, in logarithms; REFinTerm, the terms for real estate financing in months; TaxSales = total value of taxes charged on sales of real estate; ProfitNet = company net profits; ProfitPrice = company profit over price ratio; ProfitShare = company profit per share; SharpeBov = Sharpe ratio of the BOVESPA stock index; SpreadCDC = spread of the interest on the interbank certificates of deposits and the risk free interest (Over Selic rate); MortgSavInd = spread between interest on mortgage financing and interest on saving for individuals ; MortgSavCo = spread between interest on mortgage financing and interest on saving for firms ; InterestLT = long term monthly nominal interest rate.

with U.S. risk, political and economic factors show that TED spreads, the 3-month certificate of deposit spread, the U.S. prime rate spread, Sharpe ratios of Nasdaq and of the Federal Funds rate and of the 3-month T-Bill rate, and the six month certificate of deposit spread, credit default swaps (CDS) of Citi Group have a statistically significant impact. On the political factors, the election of President Barack Obama has had a significant effect; and on the economic factors, the Case-Shiller house price index, the Economic Stimulus Act of 2008, and TARP (Troubled Asset Relief Program) have significantly impacted the probability of momentums in the Brazilian real estate sector. While reversals or crashes are slightly less sensitive to the U.S. factors in this sample period, the

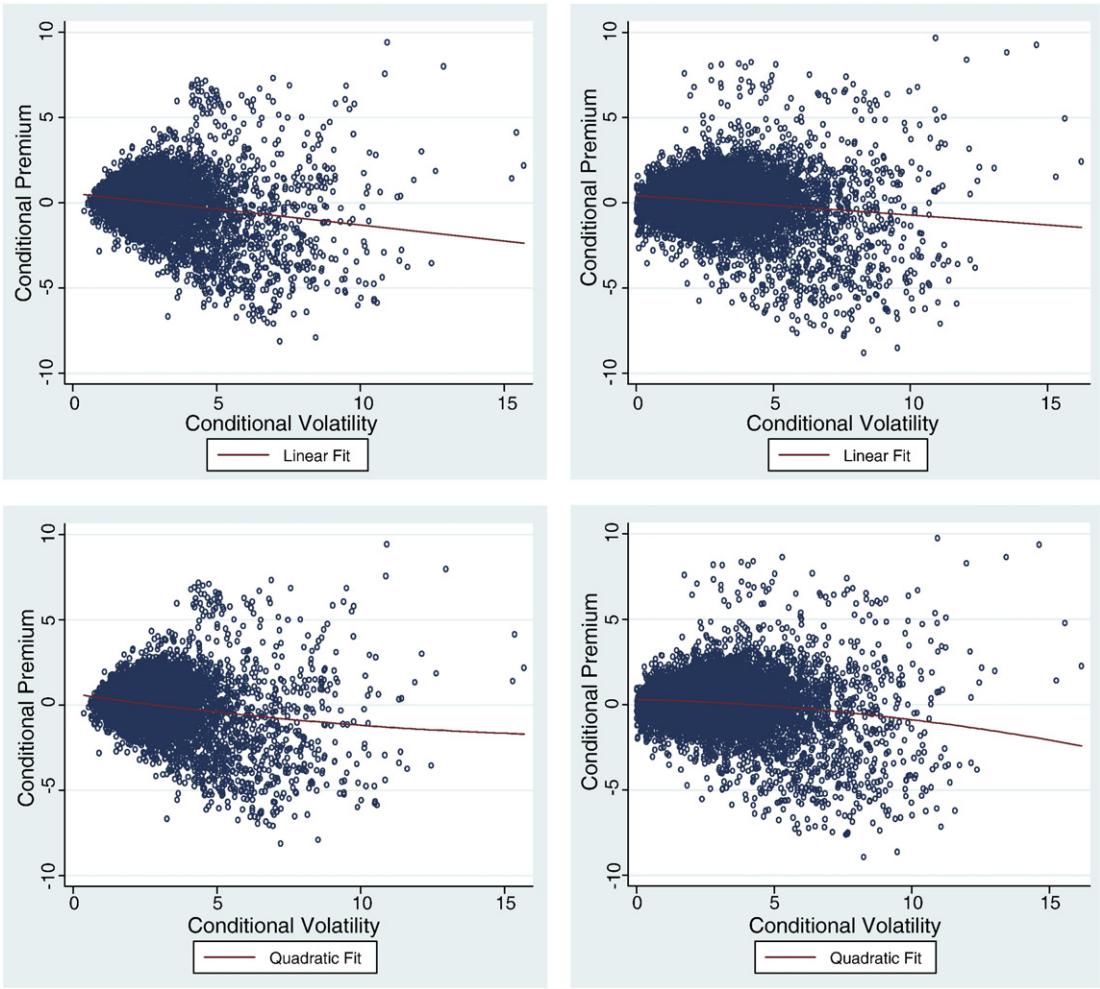


Fig. 4. Conditional premiums and volatilities.

political economy factor of the election of Obama, the Bear Sterns event, the Housing and Economic Recovery act of 2008, the prime rate spread and 1-month certificate of deposit spread, and the Sharpe ratio of Nasdaq significantly impact the probability of reversals. Most importantly, we find that conditional momentums and conditional reversal probabilities are significantly negatively correlated. The momentums are declining and flat during and after the U.S. crisis, while the reversals tend to increase after the U.S. crisis. We take those results as evidence that the U.S. factors provide a plausible exogenous identification of momentums and reversals in the daily variation of the real estate sector in the Brazilian capital market. In addition, we find that instrumented momentums are uncorrelated with the market premium, but reversals are. Hence, while downside risk from the U.S. in the real estate sector is part of the systematic risk of the market, upside risk is not in this period.

All our specifications report the problem of potential strong persistence of premiums in the CAPM and Fama-French models given the significance of the coefficient of the distributed lagged of the dependent variable, as well as trending effects. Brennan and Wang (2006) recently report results of identification of persistence in premiums with mispricing of stocks. In the real estate sector in Brazil, the daily variation is persistent indicating the potential for mispricing and opportunity for arbitrage. When instrumented by U.S. factors, momentums and reversals continue to have a robust effect on the premium and the magnitude of the β's are large, of an order of close to nine indicating the aggressiveness and risky nature of the real estate sector. We also estimate volatility conditional on all factors of the Brazilian economy and find that the distributed lagged volatility is positive and significant in predicting current volatility, thus indicating a significant amount of conditional heteroskedasticity in this market. In addition, there are significant trending effects in volatility as well.

We use the conditional premiums and volatilities to construct a risk-return map for the real estate sector in Brazil in the late 2000's. We find a negative relationship between premium and volatility in this market in this period, indicating that on a daily basis the market, on average, has additional opportunity for short term arbitrage. The introduction of domestic additional multiples and domestic risk factors mildly mitigates the negative slope, but does not revert it. Our results can be interpreted in light of

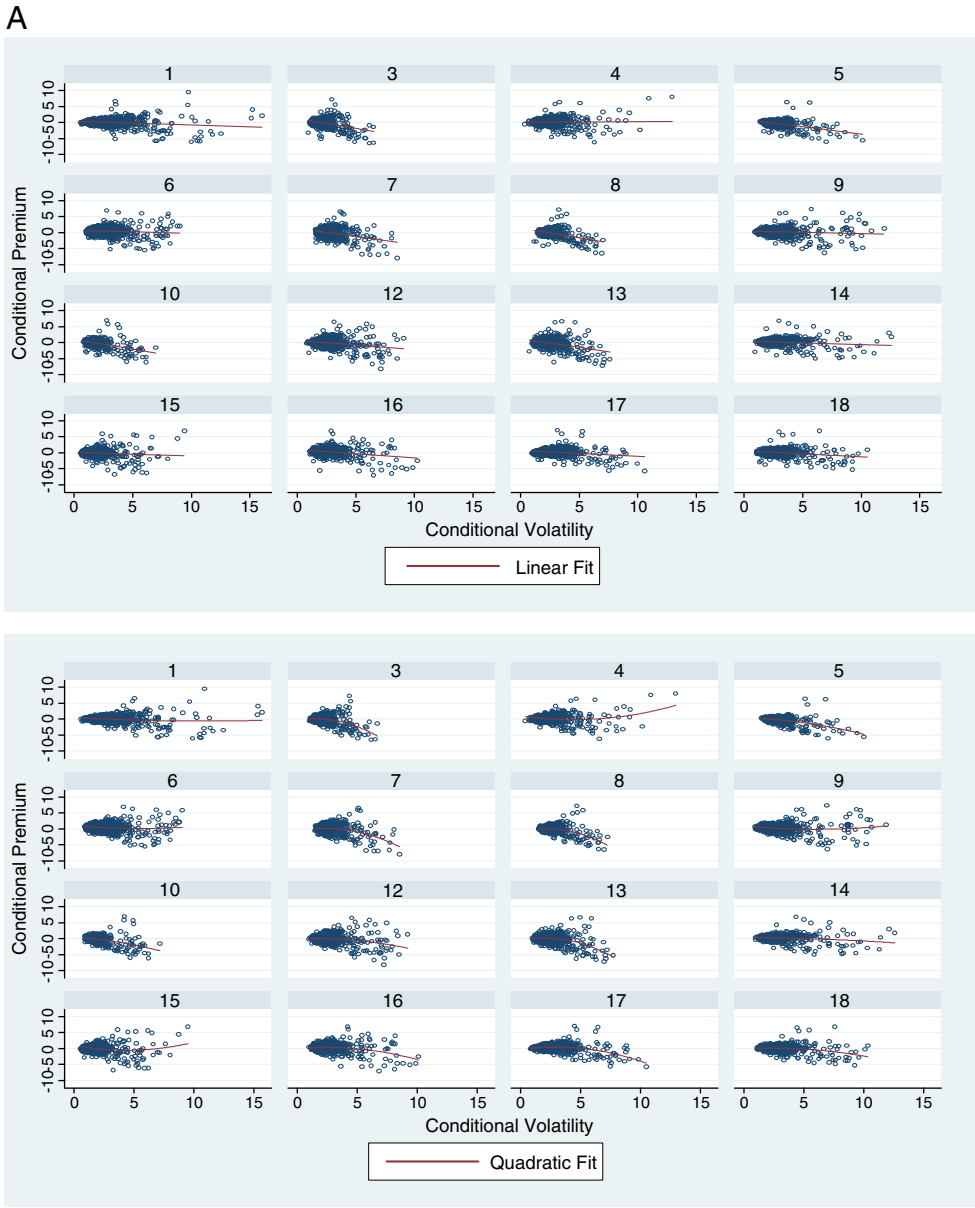


Fig. 5. A. Conditional Premiums and Volatilities: Fama-French Factors, Macroeconomic Factors, Instrumented momentums/reversals and Lagged controls, by Company. Cod_entity==1 ABYA Former Abyara, now: AGRE (BM&F Bovespa: AGEI3). Cod_entity==3 BISA Brookfield Incorporated. Cod_entity==4 BRML BRMALLS. Cod_entity==5 CCIM Camargo Correa Real Estate Development. Cod_entity==6 CYRE Cyrela Brazil Realty. Cod_entity==7 EVEN Even. Cod_entity==8 EZTC EZTEC. Cod_entity==9 GFSA Gafisa. Cod_entity==10 IGTA Iguatemi. Cod_entity==12 JHFS JHSF Participações S.A. Cod_entity==13 LPSB Lopes Consultoria de Imóveis. Cod_entity==14 MRVE. Cod_entity==15 MULT Multiplan. Cod_entity==16 PDGR PDG Realty. Cod_entity==17 RSID Rossi Residential. Cod_entity==18 TCSA Tecnisa. B: Conditional Premiums and Volatilities: Fama-French Factors, Macroeconomic Factors, Instrumented momentums/reversals, Risk and Multiples, and Lagged controls, by Company. Cod_entity==1 ABYA Former Abyara, now: AGRE (BM&F Bovespa: AGEI3). Cod_entity==3 BISA Brookfield Incorporated. Cod_entity==4 BRML BRMALLS. Cod_entity==5 CCIM Camargo Correa Real Estate Development. Cod_entity==6 CYRE Cyrela Brazil Realty. Cod_entity==7 EVEN Even. Cod_entity==8 EZTC EZTEC. Cod_entity==9 GFSA Gafisa. Cod_entity==10 IGTA Iguatemi. Cod_entity==12 JHFS JHSF Participações S.A. Cod_entity==13 LPSB Lopes Consultoria de Imóveis. Cod_entity==14 MRVE. Cod_entity==15 MULT Multiplan. Cod_entity==16 PDGR PDG Realty. Cod_entity==17 RSID Rossi Residencial. Cod_entity==18 TCSA Tecnisa.

prospect theory of risk attitudes. The below target firms dominate the sector and the overall evidence is that the sector is below the perceived potential industry returns. On a company by company basis, a handful of companies seem to be operating on a perceived potential industry return above the target, while the majority of the companies are below target.

There are several avenues for future research in this area. One would be to include a parameterization of the yield curve to get a better understanding of the effects of the cost of capital on the premium. Another would be to further investigate the risk and

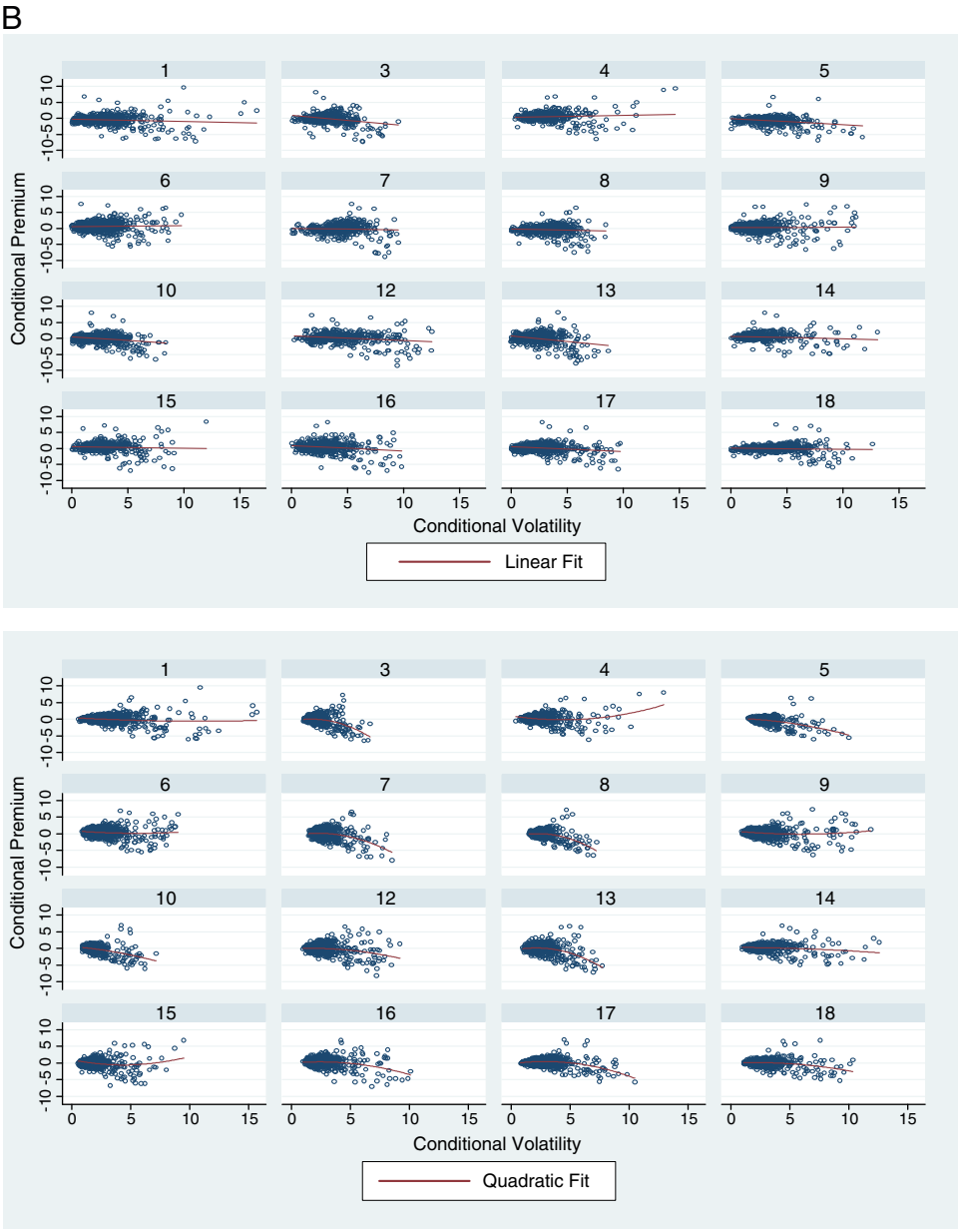


Fig. 5 (*continued*).

return characteristics of the firms in this sector, with particular attention to the potential connection of market returns to the actual prices of fixed assets offered by those firms.

Acknowledgments

We thank the participants of a seminar given at the Central Bank of Brazil, in particular, Rafael Chaves Santos and Tito Nicias for helpful comments; Cicero L. Yagi for comments and discussion; and participants of a seminar at FEA-FIPE-USP Economics. This paper was also presented at the XI Meetings of the Brazilian Finance Society; we thank the comments and suggestions of the discussant, Alberto Ronchi, the participants, and especially Marcelo Fernandes for comments and suggestions. We gratefully acknowledge the valuable comments and suggestions of anonymous referees for this journal. Finally, we thank Larissa Barbosa, Raphael Lolis and Fan Zhao for able research assistance. Any errors are our own.

This research benefited from the support of the Department of Economics of the University of Sao Paulo (FEA-USP), Fipe and Tufts University. Bianconi and Yoshino acknowledge the financial support of Fapesp in the Fall 2010 term.

Appendix A

1. Brief Description of Companies in the Sample:

Cod_entity==1 ABYA

Former Abyara, now: AGRE (BM&F Bovespa: AGEI3) is one of the largest real estate companies in Brazil, with a primary focus on project development. The company specializes in developing residential real estate for middle- and upper-middle-income customers.

Cod_entity==3 BISA

Brookfield BISA – Listed 2007–2008

Brookfield Inc. results from the merger of Brascan Residential from Rio de Janeiro, Company and MB Engenharia. Brookfield is a wing of Brookfield Asset Management, with US$ 100bil invested in renewable energy, infrastructure and real estate in the five continents.

Cod_entity==4 BRML

BRMALLS (Listed 2007–2008) is the biggest integrated company of shopping malls of Latin America with participation in 35 shopping centers. The malls where the BRMALLS have participation of 50% or more, represent 77% of the company portfolio. The company provides management services and marketing for 26 of the 35 malls it holds participation. The company is the only in the sector with presence in all regions of Brazil, catering to all different social classes.

Cod_entity==5 CCIM

CCDI (Camargo Correa Real Estate Development, listed 2007–2008) is a leader in the Brazilian homebuilding and commercial real estate development industries. CCDI is part of the Camargo Correa Group, one of the largest economic conglomerates in Brazil.

Cod_entity==6 CYRE

Cyrela Brazil Realty (Listed 2006–2007) is the largest residential construction and real estate developer in Brazil. Considered one of the most solid of the civil construction sector, currently operates in 17 states and 55 cities in Brazil and in Argentina.

Cod_entity==7 EVEN

Even (Listed 2007–2008) is a Brazilian construction and real estate company founded in 2002 and based in São Paulo. It results from the merger of ABC Construtora e Incorporadora and Terepins e Kalili Engenharia e Construções with the goal operating in the areas of construction and real estate. The company is one of the biggest construction and real estate companies in Brazil operating in the upper middle-class and high end of the market.

Cod_entity==8 EZTC

Eztec (Listed 2007–2008), established 29 years ago, EZTEC focuses on residential projects in the São Paulo Metropolitan Area. The Company has already launched 40 projects, totaling 1.1 million square meters of built area or areas under construction, and 6,590 concluded units.

Cod_entity==9 GFSA

Gafisa (Listed 2006–2007) is one of the largest Brazilian residential construction and real estate company. It's based in São Paulo and present in various cities of Brazil. In the market since 1954 it specializes in projects of high standard, is also holding a number of other companies.

Cod_entity==10 IGTA

Iguatemi (Listed 2006–2007) is a shopping mall operator in Brazil, with more than 30 years of experience in the industry. In the 2000–2002 it expanded reaching Rio de Janeiro and consolidating its leading position in accordance to new consumer demands (ex. Cinemas, entertainment complex, etc.). Its acquisition strategy consisted of increasing Iguatemi's stake in Iguatemi São Paulo, Campinas, Praia de Belas and Rio de Janeiro; and the development of 'greenfield' projects such as Iguatemi JK, Brasília, Alphaville and Florianópolis.

Cod_entity==11 INPR

TCI Inpar (Listed 2007–2008) operates in civil construction, with focus on residential buildings, commercial and mixed, tourism and development. It operates in 16 states of Brazil plus Brasilia.

Cod_entity==12 JHFS

JHSF Participações S.A. (Listed 2007–2008, "JHSF" or "Company") is a leader in Brazil's real estate industry, with significant operations in development of large-scale and mixed-use residential and office projects; development and management of shopping malls; rentals of office properties; and high-end hotels. Over the course of its 38 years, the Company has built more than six million square meters of real estate projects, particularly in São Paulo, the city that accounts for the largest share of Brazilian GDP. JHSF has developed unique expertise in the real estate luxury segment, known for its attractive margins and short payment cycles. The Company sets itself apart from its competitors especially thanks to its capacity to anticipate market trends (which lets JHSF acquire land on more favorable terms), the quality of its products, and its ability to introduce new concepts.

Cod_entity==13 LPSB

Lopes Real Estate Consulting is in sales, consulting and intermediation for real estate development in Brazil. It offers services to all segments of the market with 70 years of experience.

Cod_entity==14 MRVE

MRV (Listed 2008–2009) is the biggest Brazilian construction and real estate company for middle class and lower middle segment and the only one offering houses and apartments in more than 85 Brazilian cities.

Cod_entity==15 MULT

Multiplan (Listed 2008–2009) is one of the leading Brazilian developers of shopping malls. It develops, operates and holds one of the best portfolios of shopping malls in the country. The company is established as a full service company, which plans, builds and manages shopping malls, and develops residential and commercial ventures, creating synergies with activities related to shopping malls.

Cod_entity==16 PDGR

PDG Realty (Listed 2007–2008) is a new large real estate company in Brazil and it focuses on the popular segment. PDG Realty is based in Rio de Janeiro and commands a good reputation in the market.

Cod_entity==17 RSID

Rossi Residencial (Listed 2006–2007) operates in real estate and is present in more than 56 Brazilian cities, from headquarters in São Paulo and in regional offices located in cities such as Campinas, Porto Alegre, Rio de Janeiro, Belo Horizonte and others. Rossi takes part in all phases of a real estate venture; exploration of the land, construction, and delivery. Since its founding, the Rossi Group is characterized by the development of modern administrative and operational methods, the use of efficient building technologies and increasing experience in all types of construction.

Table A1
Descriptive statistics by company.

Cod_Entity:	Premium	MktCap (log)	Book-to-Market
1	0.0534	13.02011	0.061614
StDev	4.396991	0.954308	0.084117
N	911	935	935
3	−0.0368	14.4343	0.031544
StDev	3.156545	0.550293	0.028855
N	885	887	887
4	0.108182	14.8821	0.018733
StDev	3.899183	0.349426	0.009345
N	770	772	772
5	−0.11893	13.48373	0.0469
StDev	3.616077	0.588996	0.032212
N	744	827	827
6	0.212497	15.5815	0.013065
StDev	4.003551	0.517357	0.009393
N	1224	1226	1226
7	−0.01198	13.94041	0.025987
StDev	3.637844	0.577408	0.019157
N	773	775	775
8	0.009424	13.54796	0.022286
StDev	3.236274	0.574597	0.013349
N	715	717	717
9	0.080118	14.90834	0.021538
StDev	4.159708	0.350653	0.017228
N	1059	1061	1061
10	0.034046	14.19603	0.015715
StDev	2.451333	0.379169	0.007457
N	811	813	813
11	−0.15149	13.39674	0.056396
StDev	4.378457	0.803759	0.054128
N	725	729	729
12	−0.03559	14.42727	0.015727
StDev	3.997283	0.650219	0.011539
N	766	768	768
13	0.078307	13.71088	0.006227
StDev	3.330129	0.54211	0.005377
N	846	848	848
14	0.155179	15.14064	0.012654
StDev	4.643534	0.511778	0.008662
N	693	695	695

(continued on next page)

Table A1 (*continued*)

Cod_Entity:	Premium	MktCap (log)	Book-to-Market
15	0.064574	14.94693	0.013083
StDev	3.183576	0.337384	0.003805
N	690	692	692
16	0.161939	14.87431	0.015623
StDev	3.954527	0.473932	0.008163
N	820	822	822
17	0.207175	14.12237	0.02764
StDev	4.051871	0.935977	0.022695
N	1350	1356	1356
18	0.029717	13.90631	0.022483
StDev	3.853181	0.464305	0.014122
N	815	817	817

Cod_entity==18 TCSA

Tecnisa (Listed 2008–2009) is a building real estate company which specializes in the high-end segment of the market. It mainly builds residential buildings, home condominiums, flats and commercial buildings.

Sources: Various sources from each company's web sites.

2. Premium, Market Value, Book-to-Market by company
3. Data Description and Sources:

Fig. 1 – Source: Bovespa, Sao Paulo

Table 1a – Source: ECONOMATICA

- Premium of company: From Bovespa (Daily Return, closing price) minus Risk-free return (SELIC daily return)
- Premium Market: Bovespa (Daily Return, closing price) minus Risk-free return (SELIC daily return)

Table 2:

- MktCap: Market capitalization of company: Market value of company – Source ECONOMATICA
- BookTOmarket: Total assets divided by market value of company – Source ECONOMATICA
- SMB:
- HML:
- GDP: Monthly real GDP growth rate – Source: IBGE/SCN and MCM Consulting
- GPI: Monthly growth rate of the general price index – Source: IPEA

Table 5: Source: Popular Press and Financial News websites.

Table 6:

- DebtForCurr: Debt in Foreign Currency of company – Source: ECONOMATICA
- Spread1m, 3m, 6m: Libor-OIS spreads – Source: Bloomberg terminal
- SharpeSP500, Nasdaq, DowJones, FedFunds, Prime1, CdFed_6: Average return of index minus return of three month U.S. treasury bill rate divided by standard deviation of return – Source: Bloomberg terminal, Saint Louis FED
- Cds spreads – Source: DataStream
- Case-Shiller index – Source: Standard&Poors

Table 9 – Sources: ECONOMATICA and Central Bank of Brazil (BACEN).

Further details and all files available from authors upon request.

References

Aizenman, J., & Jinjarak, Y. (2009). (2009) "Current account patterns and national real estate markets.. *Journal of Urban Economics*, *66*, 75–89.

Bianconi, M., & Yoshino, J. A. (2010). Firm Value, Investment and Monetary Policy. Available at SSRN:. http://ssrn.com/abstract=1583041

Bowman, H. E. (1980). The risk return paradox for strategic management. *Sloan Management Review*, *21*(3), 17–31.

Brennan, M. J., & Wang, A. (2006). Asset Pricing and Mispricing. Available at SSRN:. http://ssrn.com/abstract=912814

Carhart, M. M. (1997, March). On Persistence in Mutual Fund Performance. *Journal of Finance*, *52*(1) Available at SSRN:. http://ssrn.com/abstract=8036

Cheng, J. W., & Wu, H. -F. (2010, October). The profitability of momentum trading strategies: Empirical evidence from Hong Kong. *International Review of Economics and Finance*, *19*(4), 527–538.

Chou, P. -H., Chou, R., & Ko, K. -C. (2009). Prospect theory and the risk-return paradox: some recent evidence. *Review of Quantitative Finance and Accounting*, *33*(3), 193–208.

Cochrane, J. H. (2005, March). Financial Markets and the Real Economy. *NBER Working Paper Series*, *Vol. w11193*, Available at SSRN:. http://ssrn.com/abstract=684719

De Long, J. B., Shleifer, A., Summers, L. H., & Waldmann, R. J. (1990). Noise Trader Risk in Financial Markets. *Journal of Political Economy*, *98*(4), 703–738.

Engle, R. F., & Lange, J. (2001, April). Predicting VNET: A model of the dynamics of market depth. *Journal of Financial Markets*, *4*(2), 113–142.

Fama, E. F., & MacBeth, J. D. (1973, May–Jun). Risk, Return, and Equilibrium: Empirical Tests. *Journal of Political Economy*, *81*(3), 607–636.

Fama, E. F., & French, K. R. (1992, June). The Cross-Section of Expected Stock Returns. *Journal of Finance*, *47*(2), 427–465.

Fama, E. F., & French, K. R. (1993). Common Risk Factors in the Returns on Bonds and Stocks. *Journal of Financial Economics*, *33*, 3–56.

Fiegenbaum, A. (1990). Prospect theory and the risk-return association. *Journal of Economic Behavior and Organization*, *14*, 187–203.

Fiegenbaum, A., & Thomas, H. (1988). Attitudes toward Risk and the Risk-Return Paradox: Prospect Theory Explanations. *The Academy of Management Journal*, *31* (1), 85–106.
Jegaeesh, N., & Titman, S. (1993). Returns to buying winners and selling losers: Implications for stock market efficiency. *Journal of Finance*, *48*, 65–91.
Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decisions under risk. *Econometrica*, *47*, 313–327.
Laibson, D., & Mollerstrom, J. (2010). Capital Flows, Consumption Booms and Asset Bubbles: A Behavioral Alternative to the Saving Glut Hypothesis. *The Economic Journal*, *120*(May), 354–374.
Lintner, John (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *The Review of Economics and Statistics*, *47*(1), 13–37.
Schindler, Felix (2010). Market Efficiency in the Emerging Securitized Real Estate Markets. *ZEW - Centre for European Economic Research Discussion Paper No. 10–033* Available at SSRN:. http://ssrn.com/abstract=1622720
Sharpe, William F. (1964). Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk. *Journal of Finance*, *19*(3), 425–442.
Solnik, B. H. (1974). The International Pricing of Risk: An Empirical Investigation of the World Capital Market Structure. *Papers and Proceedings of the Thirty-Second Annual Meeting of the American Finance Association, (May, 1974). The Journal of Finance*, *Vol. 29, No. 2*. (pp. 365–378).
Wu, Pei-Shan, Huang, Chien-Ming, & Chien-Liang, Chiu (2011). "Effects of structural changes on the risk characteristics of REIT returns.. *International Review of Economics and Finance*, *20*(4), 645–653.
Xu, Pisun, & Yang, Jian (2009, November). U.S. Monetary Policy Surprises and International Securitized Real Estate Markets. *The Journal of Real Estate Finance and Economics*, 1–32.