Mispricing in Real Estate Markets

Shaun Bond, Hui Guo and Changyu Yang

Department of Finance

University of Cincinnati

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Abstract

Despite the extensive advancement of knowledge in the field of empirical asset pricing, little is known about how this literature applies to asset classes beyond common stocks and bond. In this paper we apply recent developments in financial economics, which posit an important role for the leverage of financial intermediaries and limited stock market participation, in understanding real estate returns. Consistent with these theories, we find that luxury consumption, funding liquidity and the capital share of income have significant explanatory power for the cross-section and time series of equity REIT. However, this relationship is the opposite of what we expected and the results point to a more complex set of findings that are difficult to reconcile with risk-based explanations. Our results suggest systematic mispricing of real estate assets that is heavily influenced by investor sentiment.

1. Introduction

Recent empirical studies, e.g., Adrian, Etula, and Muir (2014) and He, Kelly, Manela (2017), have shown that, in contrast with the standard asset pricing models such as CAPM or consumption-based CAPM, the intermediary asset pricing model provides a good explanation for the cross-section of expected returns on assets in many different markets, including stocks, U.S. Treasury bonds and corporate bonds, foreign sovereign bonds, options, credit default swaps, commodities, and foreign exchanges. Past attempts to apply standard asset pricing models to real estate have had mixed success. In this paper, we investigate whether a selection of limited participation models, including the intermediary asset pricing model, offer useful insights for real estate investors given the success of the models in asset classes beyond equities.

In a frictionless economy described by Lucas (1978), households can perfectly diversify away idiosyncratic risk by trading in the financial market. As a result, a household's consumption reacts only to systematic shocks to the economy; and consumption growth, which is perfectly correlated across households, provides a sufficient statistic of systematic risk that prices financial assets. While it is theoretically elegant and intuitively appealing, Lucas's consumption-based CAPM fails to a large extent to explain asset prices in empirical studies.

The failure of the standard representative-agent consumption-based CAPM is not too surprising because the real world is unlikely to be frictionless. It is difficult to perfectly diversify away idiosyncratic labor income shocks because we cannot trade human capital. While an individual can borrow (save) when there is a negative (positive) labor income shocks, most households face borrowing constraints. In addition, a large fraction of U.S. households owns no stocks, directly or indirectly. Guo (2004) incorporates these market frictions, i.e., idiosyncratic labor income shocks, borrowing constraints, and limited stock market participation, in an otherwise standard consumption-based CAPM. Guo shows that the modified *heterogeneous-agent* consumption-based CAPM provides a coherent explanation for several well-known stock market stylized facts such as the equity premium puzzle, stock market return predictability, and excess volatility puzzle.[1] In Guo's model, assets are priced by shareholders' consumption. Vissing-Jorgensen (2002) and Aït-Sahalia, Parker, and Yogo (2004) find that shareholders' consumption and luxury-goods consumption, respectively, provide a better explanation for expected stock returns than aggregate consumption. While these empirical findings are encouraging, it is a challenging task to test the limited stock market participation model empirically because it is difficult to measure the consumption of marginal shareholders who are likely to be very wealthy.

The intermediary asset pricing model is built on the premise that a financial intermediary is the marginal investor whose "consumption" sets asset prices. For example, in He and Krishnamurthy's (2013) model, only sophisticated investors, i.e., financial intermediaries, can trade risky assets. Unsophisticated investors, i.e., households, can invest in risky assets only through a financial intermediary. While this assumption is clearly unrealistic, it might hold approximately, especially for complex assets, e.g., mortgage-backed securities and credit default swaps, and perhaps commercial real estate, which are traded mainly by sophisticated investors such as the large financial intermediaries. That is, the intermediary asset pricing model is a variant

[1] The representative-agent models by Campbell and Cochrane (1999) and Bansal and Yaron (2004) can also explain these stylized facts. However, unlike Guo (2004), these models cannot explain the unstable relation between stock market volatility and the dividend yield documented by Schwert (1989). The empirical findings by Muir (2016) also cast doubt on the representative-agent model.

of the limited market participation model in which the financial intermediary's consumption growth is the priced risk factor.

In the intermediary asset pricing model, because the financial intermediary's consumption depends on its equity capital ratio or leverage, we can use shocks to the financial intermediary's equity capital ratio or leverage as the risk factor instead of using its consumption growth that is not readily observable. This feature makes the intermediary asset pricing model easy to implement empirically. Adrian, Etula, and Muir (2014) define intermediaries as broker-dealer firms and construct their leverage using the Flow of Funds data constructed by the Federal Reserve Board. They show that shocks to intermediaries price the cross-section of stock returns. He, Kelly, and Manela (2017) construct the equity capital ratio, the reciprocal of leverage, for Primary Dealer counterparties of the New York Federal Reserve. They show that their model not only explains the stock market return but also explain returns of many other markets. Interestingly, consistent with the conjecture that participation is more segmented for more complex assets, He, Kelly, and Manela (2017) find that the intermediary asset pricing model has better explanatory power for sophisticated assets such as credit default swaps than for unsophisticated assets such as stocks.

It is interesting to test the intermediary asset pricing model using the real estate market for at least three reasons. First, because commercial real estate investment requires sophisticated knowledge and typically is undertaken by institutional investors rather than retail investors, it is likely that intermediary asset pricing may provide a better explanation than standard models such as CAPM or consumption-based CAPM (which are based on households). It also incorporates a role for leverage, which is commonly employed by private equity firms in purchasing commercial real estate. Second, there is an ongoing debate on the relation between the financial intermediary's equity capital ratio and asset prices. Some models, e.g., He and Krishnamurthy (2016), suggest that the equity capital ratio is procyclical and shocks to the equity capital ratio have a positive price of risk. Empirical evidence by He, Kelly, and Manela (2017) supports this view. Other models, e.g., Adrian and Shin (2014), argue that the equity capital ratio is countercyclical and shocks to the equity capital ratio have a negative price of risk. This review is supported by empirical evidence by Adrian, Etula, and Muir (2014). Evidence from the real estate market might shed new light on this debate. Last, we compare the financial intermediary asset pricing model with the limited stock market participation model by Vissing-Jorgensen (2002) and Aït-Sahalia, Parker, and Yogo (2004). To the best of our knowledge, this test has not been done in the extant literature.

Much of the literature on real estate asset pricing has focused on equity REIT returns because of data availability and comparability to existing research methodology in financial economics. Following standard research practice established by Fama and French (1992), REITs along with other financial companies, are excluded from empirical asset pricing studies. This provides an opportunity to consider the extent to which recent advances in asset pricing can be applied to real estate. Furthermore, researchers have been able to exploit the unique regulatory requirements of the REIT structure[2] to gain insight into real asset markets in a way that studies of common stocks does not permit (see Hartzell et al. 2010, Bond and Chang 2013 for discussion on this parallel markets concept).

[2] REITs are required to hold 75% of their assets in real property or loans secured on such assets. Further 75% of REIT annual gross income must be from real estate related sources. Also important is the requirement that REITs distribute 90% of its taxable income, which limits the ability to retain earnings within the organization.

Our paper is related to the recent findings of Bond and Xue (2017) and Van Nieuwerburg (2018) who study the implication of developments in asset pricing for real estate returns. In the case of Bond and Xue they show the importance of profitability and investment factors in both the time series and cross section of returns. Van Nieuwerburg considers the exposure to stock and bond factors in the time series of real estate returns. He also studies the HKM factor in the time series of REIT returns and finds it to provide little explanation for returns beyond that of a five factor model.

Another set of literature has developed since the financial crisis that considers the tail-risk of financial markets as a risk factor. Van Niewerburg examines the probability of disaster from Siriwardane (2015) and the financial fragility factor of Giglio, Kelly and Pruitt (2016) and finds that REITs load positively on this factor although the effect is reduced when standard factors such as size, value and momentum are included. Alcock and Andrilikova (2018) shows that a measure of asymmetric dependence is priced in the cross section of REIT returns. In a contemporary paper, Boudry, Connolly and Steiner (2018) show that REITs offer a hedge against the flight to safety risk of Baele et al. (2014).

A final related development in real estate asset pricing points to the role of sentiment as an important factor beyond traditional risk-based explanations for asset returns. Early work by Clayton and McKinnon (2003), and Gentry, Jones and Mayer (2004) extended the literature on sentiment in closed-end fund discounts to REITs pricing relative to net asset value. Ling, Naranjo and Scheik (2014) find a positive relationship between measures of investor sentiment for private real estate markets and subsequent period real estate returns. However, long-horizon regressions show this sentiment is associated with possible mispricing. Das et al. (2015) such that the sentiment of institutional investors "spills over" from private real estate markets to public markets and highlights the role of economic conditions in determining the direction of this spillover.

To preview our results, we find the financial intermediary risk factor, measures of limited stock market participation and the traditional stock market factors are all significantly priced in the cross section of real estate returns. However, the economic information contained in these factors are all subsumed by the luxury consumption factor of Aït-Sahalia, Parker and Yogo (2004). This finding is robust to alternative definitions of luxury consumption or proxies for shareholder consumption. Surprisingly, the sign of all these risk factor is the opposite to that expected, which suggests a negative price for risk. Our explanation for this finding is that the REIT market is driven by sentiment. When sentiment is strong, stocks with lower past returns, low returns on assets, and negative earnings surprises are overvalued compared with stocks with high past returns, high returns on assets and positive earnings surprises. The mispricing is corrected when the sentiment subdues. Our findings are consistent with an extensive literature on real estate returns that points to sentiment as being a pervasive factor. This finding also accords with recent work by Stambaugh and Yuan (2017) on mispricing in the stock market.

The next section describes the methodology used to construct the main variables in our study along with the data selected. Section 4 discusses our empirical results and section 5 concludes.

2. Methodology and data

We construct the equity capital (leverage) ratio of financial intermediaries following Adrian, Etula, and Muir (2014) and He, Kelly, Manela (2017). As in Adrian, Etula, and Muir (2014) and

He, Kelly, Manela (2017), we investigate whether shocks to the equity capital ratio are priced in the cross-section of expected returns on real estate assets. For comparison, we construct shareholders' consumption following Vissing-Jorgensen (2002) and construct luxury goods consumption following Aït-Sahalia, Parker, and Yogo (2004).

In the intermediary asset pricing model, e.g., He and Krishnamurthy (2013), the equity capital ratio is a state variable that forecasts stock market returns across time. In the second stage of this project, we will also investigate whether the equity capital ratio forecasts aggregate real estate market returns. Similarly, Guo's (2004) limited stock market participation model implies a time-varying conditional equity premium and Guo and Savickas (2008) show that the forecasting variables stipulated by Guo (2004) forecast stock market returns in sample and out of sample. We can compare the intermediary asset pricing model with the limited stock market participation model using time-series forecasts of real estate market returns.

The databased used in this study are taken from CRSP/Ziman database. CRSP/Ziman database lists all publicly traded REITs during 1980 to 2017. Our analysis focuses on a sample of equity REITs. From 1980 to 2017, the unique number of equity REITs ranges from 55 to 199 and the market cap grow from 2 million dollars to 1 trillion dollars. REITs return data are from CRSP and the accounting data are from COMPUSTAT.

Table 1 reports summary statistics of main risk factors that we consider in the paper over the 1987Q1 to 2016Q4 period. HKM is the He, Kelly, and Manela (2017) market capital factor defined as the ratio of total market equity to total market assets (book debts plus market equity) of primary dealer holding companies. AEM is the Adrian, Etula, and Muir (2014) leverage factor as the ratio of total financial assets to the difference between total financial assets and total liabilities) of brokers and dealers. ΔLUXCON is the year-over-year log changes in luxury sales that we construct following Aït-Sahalia, Parker, and Yogo (2004). ΔSHCON is Shareholders' consumption growth following Malloy, Moskowitz, and Vissing-Jorgensen (2009). ΔCS4 is year-over-year changes in capital shares proposed by Lettau, Ludvigson, and Ma (2018). MKT is the excess stock market return. REIT is the excess REIT market return. ΔDEF is the change in the default spread. ΔDIV is the change in the aggregate REIT dividend price ratio. SMB, HML, RMW, and CMA are the Fama and French factors. SMB is the return difference between small and big cap stocks. HML is the return difference between high and low book-to-market equity ratio stocks. RMW is the return difference between high and low profitability stocks. CMA is the return difference between low and high asset growth stocks.

Table 2 reports the summary statistics of returns on REIT hedging portfolios. SIZE is the return difference between the first and fifth quintiles sorted by market capitalization. BM, MOM, AG, ROA, and PEAD are the return differences for portfolios sorted by the book-to-market equity ratio, past stock returns, asset growth, the return on assets, and earnings surprises, respectively. Consistent with evidence from common stocks, we find that MOM, ROA, and PEAD are significantly positive. SIZE, BM, and ROA are positively but economically small and statistically insignificant. The REIT hedging portfolios correlate with their common stock counterparts. The correlation coefficients are 0.13, 0.28, 0.56, 0.19, and 0.36 for SIZE, BM, MOM, AG, and ROA, respectively (untabulated).

3. Results

3.1 Financial Intermediary Models

In Table 3, we report the univariate Fama and MacBeth (1973) cross-sectional regression results. For each risk factor, we first estimate its loadings for 30 excess REIT portfolio returns using the full sample data, and then run the cross-sectional regression of the excess REIT portfolio returns on the loadings. We report the estimated risk price and its standard errors in Table 3. The Fama and MacBeth (1973) standard error and the Shanken (1992) corrected standard error are in parentheses and brackets, respectively.

He and Krishnamurthy (2013) argue that a decrease in primary dealers' equity, for example, during the 2008 financial crisis, increase the marginal utility of primary dealers who are the marginal investors. If an asset perform poorly when primary dealers' equity decrease, it should have a positive risk premium. Consistent with this theoretical implication, He, Kelly, and Manela (2017) find that the market capital factor, HKM, carries a positive risk price for many asset classes. We find HKM is significantly priced at the 5% level for REIT portfolios; however, its estimated risk price is *negative*. The puzzling result reflects the fact that while MOM, ROA, and PEAD are significantly positive, they correlate negatively with HKM (Table 2). In particular, Figure 1 shows that HKM decreases drastically in 2008Q4, while MOM is about 22%. Results are similar for ROA and PEAD (untabulated).

Adrian, Etula, and Muir (2014) argue that a decrease in brokers and dealers' leverage, for example, during 2008 financial crisis, indicates a tighter funding liquidity. Assets that do poorly when the leverage decreases thus require a positively risk premium. Consistent with this implication, Adrian, Etula, and Muir (2014) find that AEM has a significantly positive risk price for common stock portfolios. In contrast with their findings, Table 3 shows that the risk price of AEM is negative albeit statistically insignificant for REIT portfolios. The puzzling result reflects the fact that while MOM, ROA, and PEAD are significantly positive, they correlate negatively with AEM (untabulated). For example, Figure 2 shows that AEM decreases drastically in 2008Q4, while MOM is about 22%.

3.2 Limited Stock Market Participation Models

Our results suggest that financial intermediary asset pricing models do not explain the cross-section of REIT returns. One possibility is that financial intermediaries are not the marginal investors of REIT assets. We explore whether shareholders' consumption explains the cross-section of REIT returns. We consider three measures of limited stock market participation risk factors. First is the luxury consumption growth. Because it exhibits strong cyclical variation, we use the year-over-year growth. For example, for 2000Q1, ΔLUXCON is the percentage change in luxury consumption between 2000Q1 and 1999Q1. We estimate loadings on two ways. First, we regress quarterly portfolio returns of 2000Q1 on ΔLUXCON of 2000Q1 and this is the specification ΔLUXCON in Table 3. Second, we regress portfolio returns over 1999Q2 to 2000Q1 on ΔLUXCON of 2000Q1, and this is the specification of on ΔLUXCON4. As a robustness check, we also construct ΔLUXCON8 as the growth ratio from 1998Q1 to 2000Q1 and use the returns over the 1998Q2 to 2000Q1 to estimate loadings. This is the specification ΔLUXCON8. We find that the luxury consumption growth is significantly priced and accounts for a large variation (for example, 60% for ΔLUXCON) of the cross-section of REIT portfolio returns. However, contrary to the prediction of limited participation theory, its risk price is negative.

The second limited stock market participation risk factor is the change in capital share of income proposed by Lettau, Ludvigson, and Ma (2018). Because top shareholders finance their consumption primarily out of capital income, change in capital share of income is likely to track top shareholders' consumption growth closely. As in Lettau, Ludvigson, and Ma (2018), we use the year-over-year change, $\Delta CS4$, and estimate loadings using the return over the corresponding four quarters period. Table 3 shows that contrary to implication of limited stock market participation theory, the risk price is *negative* albeit statistically insignificant.

The last limited stock market participation risk factor is the shareholders' consumption growth, $\Delta SHCON$. We follow Malloy, Moskowitz, and Vissing-Jorgensen (2009) and construct the variable using the Consumption Expenditure Survey. Table 3 shows that the risk price of $\Delta SHCON$ is positive albeit statistically insignificant at the 10% level.

3.3 Other Risk Factors

In Table 3, we also consider commonly used risk factors. In the CAPM, loadings on excess market returns explains the cross-section of stock returns. We use excess stock market returns (MKT) and excess REIT market returns as proxies for excess market returns. We find that contrary to CAPM, the risk price is significantly *negative* for both MKT and REIT. The risk price of excess Treasury bond returns is positive and marginally significant; however, it accounts for less than 40% of the cross-section of expected REIT portfolio returns. Untabulated results show that the explanatory power of the excess Treasury bond return vanishes when we control for loadings on MKT or REIT. Last, the risk price of excess corporate bond returns is positive albeit statistically insignificant at the 10% level.

REIT companies have high leverage, and their performance is significantly affected by interest rate changes. TED is the spread between the 3-month LIBOR rate and the 3-month Treasury rate. DEF is the credit spread between BAA and Aaa-rated corporate bonds. An increase in these variables indicate an increase in borrowing costs. An asset that performs poorly when funding costs increase should have a positive risk premium. Contrary to this conventional wisdom, we find that risk price is positive for both ΔTED and ΔDEF. We also consider the stochastically detrended risk-free rate (ΔRREL) and the spread between the long-term and short-term Treasury bonds (ΔTERM). Neither variable has a significant risk price, however.

Because investors are risk averse, an increase in stock market variance corresponds to deterioration in investment opportunities. Consistent with this conjecture, Ang, Hodrick, Xing, and Zhang (2006) show that stocks with higher loadings on changes in stock market variance have lower expected returns. As in Ang, Hodrick, Xing, and Zhang (2006), we measure stock market variance using options-implied variance. However, we find that changes in stock market variance, ΔMV, has a significantly positive price of risk.

In Campbell's (1993) ICAPM, risk factors are state variables that forecast stock market returns. Campbell (1996) includes the aggregate dividend price ratio as a risk factor, because of its predictive power for excess stock market returns. In Table 3, ΔDIV is the change in aggregate REIT dividend price ratio. We find that it is significantly priced with a positive price of risk. However, because ΔDIV has a strong negative correlation with REIT, untabulated results show that its explanatory power becomes insignificant when we control for loadings on REIT in the cross-sectional regression.

Lastly, we consider Fama and French risk factors and the momentum factor constructed using common stocks in univariate regressions. We find has MOM and RMW have significantly positive risk prices. The results reflect the fact that REIT momentum, profitability premium, and PEAD correlate positively with MOM or RMW. We will discuss the multivariate regression results using common stock risk factors in Table 5.

3.4 Multivariate Cross-Sectional Regressions

We find that that many risk factors are significantly priced in the univariate Fama and MacBeth (1973) regression. In Table 4, we compare their explanatory power in multivariate regressions. Column 1 shows that REIT subsumes the information content of MKT in explaining the cross-section of REIT portfolio returns. Untabulated results show that REIT drives out other risk factors with two exceptions. Column 2 shows that REIT and ΔDEF has similar explanatory power, and column 3 shows that ΔLUXCON drives out REIT. Columns 4, 5, and 6 show that ΔLUXCON drives out ΔDEF, ΔDIV and HKM.

Our results seem to suggest that MKT, REIT, ΔDEF, ΔDIV, and HKM have similar explanatory power for the REIT portfolio returns. They have relatively weak explanatory power possibly because of measurement errors. We address this issue in two ways. First, we also construct the first-principle component of these factors, PCF. Column 7 shows that PCF is only marginally significant in the bivariate regression, while ΔLUXCON is statistically significant at the 1% level. Second, we use construct a tracking portfolio for both HKM and ΔLUXCON. We regress HKM or ΔLUXCON on a constant and two extreme REIT portfolios of each characteristic, and use the fitted value as the risk factor. Column 10 shows that the results with tracking risk factors are similar to those reported in column 9. Overall, our results suggest that ΔLUXCON is a strong explanatory variable for the cross-section of REIT portfolio returns.

In Table 5, we compare ΔLUXCON with common stock risk factors. Column 1 reports the results of the Fama and French (1993) three-factor model. Column 2 reports the Fama and French three-factor model augmented by the momentum factor. Column 3 reports the Fama and French (2015) five-factor models. We control for ΔLUXCON in columns 4, 5, and 6 and find that the common stock risk factors become insignificant, while ΔLUXCON is statistically significant at the 1% level.

In Table 6, we compare ΔLUXCON with risk factors constructed using REIT portfolios. In column 1, the Three-factor model (REIT, SIZE, and BM) account for 53% of cross-sectional variation in REIT portfolio returns. When we add ΔLUXCON as a risk factor, the R2 increases to 72%, and ΔLUXCON is statistically significant at the 1% level (column 2). For the four-factor model (REIT, SIZE, BM, and MOM) in column, the R2 is about 70%, and MOM is significant at the 1% level. Column 4 shows that ΔLUXCON is significant at the 5% level when controlling for the four factors. Column 5 shows that the five-factor model (REIT, SIZE, BM, AG, and ROA) has good explanation power for the cross-section of REIT portfolio returns, with R2 of 78%. This result is hardly surprising because the risk factors are constructed using the testing REIT portfolios. In addition, column 6 shows that the explanatory power of ΔLUXCON becomes statistically insignificant when controlling for the five factors. However, when we using the tracking portfolio for ΔLUXCON, it explanatory power is significant at the 1% level even when we control for the five factors. Overall, our results suggest that ΔLUXCON, a macrovariable, does has a significant relation with the cross-section of REIT portfolio returns.

3.5 Alternative Measures of Luxury Consumption

Table 7 reports alternative measures of luxury consumption. JW is expenditure on Jewelry and Watches. BA is expenditure on boats and aircrafts. This risk price is significantly negative returns at least at the 10% level. NDS is the expenditure on nondurable goods and services. Interestingly, the risk price of NDS is also significantly negative at the 10% level.

3.6 Systematic Risk Factor or Systematic Mispricing Factor?

We find that financial intermediary risk factors, limited stock market participation risk factors, CAPM risk factors, credit market risk factors, and ICAPM risk factors are significantly priced in the cross-section of REIT portfolio returns. In addition, their information content is subsumed by that of ΔLUXCON. Our result suggests that ΔLUXCON is a pervasive systematic factor in the REIT market. However, the risk prices of these factors have the opposite signs to these stipulated by the theories that motivate them. It is very difficult to reconcile our results with the risk-based explanation. It is very hard to understand why a hedging portfolio that performs well during the financial crisis should have a high expected return. In this Section, we explore the hypothesis that our results reflect systematic mispricing.

The hypothesis is that REIT market is influenced by investor sentiment. When sentiment is strong, stocks with lower past returns, low returns on assets, and negative earnings surprises are overvalued compared with stocks with high past returns, high returns on assets and positive earnings surprises. The mispricing is corrected when the sentiment subdues. Stambaugh and Yuan (2017) use this hypothesis to explain the systematic mispricing in common stocks. However, there is an interesting difference between sentiment in the common stock market and sentiment in REIT.

Stambaugh and Yuan show that Baker and Wurgler (2006) sentiment measure that is orthogonal to business cycle variables is priced in common stocks. Our results suggest that REIT market sentiment has a strong comovement with business cycles.

Our hypothesis has following implications. First, weak stocks have stronger comovement with sentiment than robust stocks. This explains why weak stocks have low average returns than robust stocks because the former is more susceptible to overpricing. Second, MOM, ROA, and PEAD have higher returns mainly during the period when sentiment decrease. Third, with increase in institutional investors in REIT market, the explanatory power of sentiment for REIT becomes weaker. Our results are consistent with these implications.

We find that standard measures of business cycles, e.g., the industrial production and Chicago Fed National Activity index are negatively priced in the cross-section of REIT, and their information content is subsumed by ΔLUXCON (Table 7). This result indicates that sentiment in the REIT market is strongly procyclical. Second, standard sentiment measures, Michigan, OECD, Conference Board, housing market index, and house start permits are negatively priced, and their information content is similar to that of ΔLUXCON (Table 8). Interestingly, Baker and Wurgler sentiment measure is not priced (To be added to Table 8). Table 9 shows that MOM and ROA is positive only in quarters of the lowest ΔCCI quartile. Table 10 shows that the explanatory power of ΔLUXCON is stronger in the early sample spanning the 1987Q1 to 2007Q4 period. However, it decreases substantially in the post-1994 period and more institutional investors enter the REIT market.

4. **Conclusion**

This paper considers the question of asset pricing in real estate markets. We provide a detailed analysis of the cross section of REIT returns. Our results are based on models of limited market participation and include the recent work on financial intermediaries, as well as shareholder consumption models. Our first unexpected result is that while we find these factors are priced, the information content of the factors is subsumed by the changes in luxury consumption. This finding is robust to time period and alternative definitions of luxury consumption.

Another surprising finding, is that unlike the results for common stocks, the risk price associated with this factor was negative, which at first does not appear to be consistent with standard economic intuition. However, our explanation of this result is that real estate markets are heavily influenced by investor sentiment. This sentiment also has strong comovement with the business cycle. One implication is the lower quality REITs (low past returns, low return on assets and negative earnings surprises) get bid up in price relative to higher quality REITs. Eventually this mispricing is corrected when sentiment subsides.

5. References

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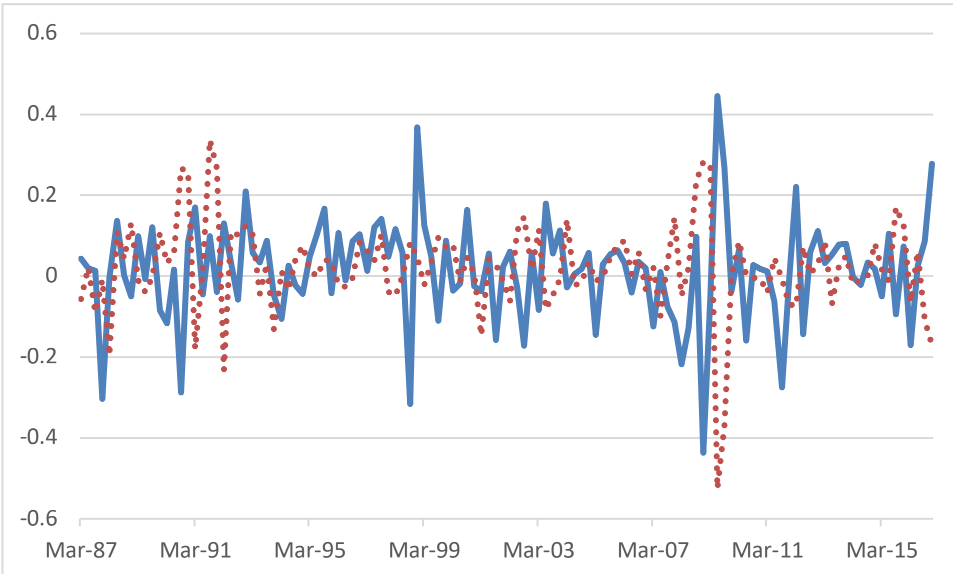

Figure 1: HKM (Solid Line) and MOM (Dashed Line)

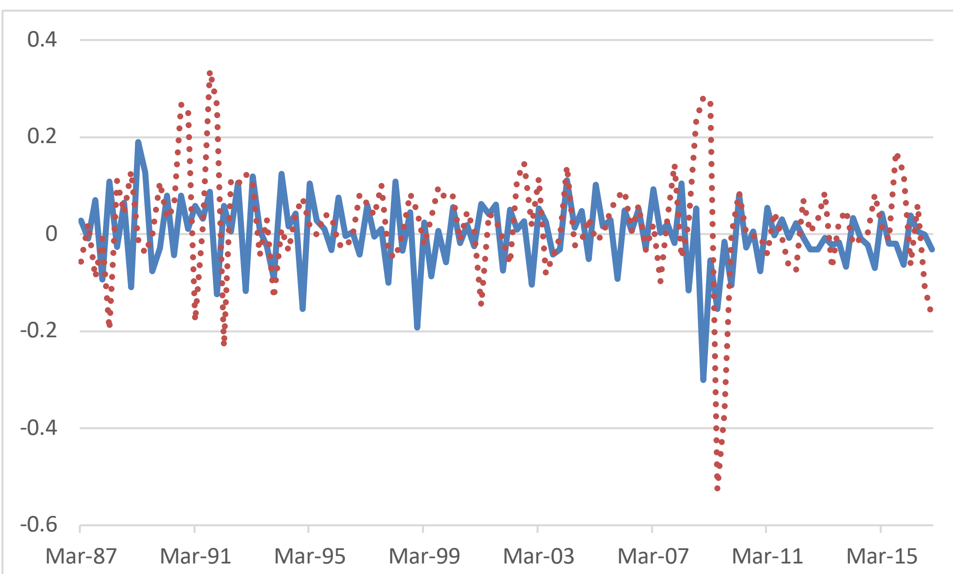

Figure 2: AEM (Solid Line) and MOM (Dashed Lin

Appendix

REITs Sample

We use the CRSP/Ziman Real Estate Data Series. CRSP/Ziman database include all REITs that traded on the three primary exchanges since 1980. We use equity REITs for our test (RTYPE=2). The number of firms record in CRSP/Ziman databased ranged from 55 to 199 each year. We also compare our sample to the sample identified by the National Association of Real Investment Trusts (NAREIT). The companies identified by both database are very similar.

REITs Portfolio Construction

At the beginning of each month. We sort equity REITs into five portfolios based on the following characteristic. Then we aggregate the portfolio monthly return to get portfolio quarterly return. Data used to construct portfolios can be download from CRSP and COMPUSTAT.

Market Equity (Size) is the share price times the number of shares outstanding. The market equity is calculated at the beginning of each month.

Book-to Market (B/M) is the book equity divided by market equity. The B/M is calculated at June each year. The book equity is from the end of last fiscal year. The market equity is from the end of last Calendar year.

Momentum (MOM) for month t is measured as the cumulative return in the past t-12 to t-2 month.

Investment (I/A) is the annual growth rate in total non-cash asset. Annual investment growth rate is considered know four months after fiscal year end

Profitability (ROE) is measured as quarterly return on equity, defined as income before extraordinary item dividend by one-quarter-lagged book equity. quarterly ROE is considered know on the earnings announcement date(RDQ).

Earnings Surprise (SUE) is measured as the standardized unexpected earnings. SUE is calculated as the change in the most recent quarterly earnings per share (EPSPXQ) from its value in the same quarter last year. Divided by the standard deviation of this change over the previous eight quarters. Earnings surprise is considered known on the earnings announcement date(RDQ).

Marco Factor

TED is the spread between 3-month Libor and Treasury bill.

DUNEM is year-over-year log change in aggregate unemployment rate.

TERM is the spread between Treasury bonds and Treasury bills.

DEF is the spread between Baa-rated and Aaa-rated corporate bonds.

DIV is the aggregate quarterly dividend divided by aggregate market cap.

Dividend data are from CRSP event dataset. CRSP event database document dividend per share ordered by ex-dividend day (DIVAMT). we select all ordinary dividend (DISTCD first digit=1) excluding year-end, extra dividend (DISTCD=1262) and special dividend (DISTCD=1272). The dividend ratio is calculated by using the sum of dollar amount dividend (dividend per share multiply number of share outstanding) within each quarter divided by the total market capitalization at the end of each quarter.

Market Factor

MKT is the value weighted excess return of SP500 stocks.

REIT_MKT is the value weighted excess return of all equity REITs identified by CRSP/Ziman database

LTR is the long-term bond excess return

CORPR is the corporate bond excess return.

Explanation of Limited Participation Factors

A. Stockholder consumption growth

Following Malloy, Moskowitz, and Vissing-Jorgensen (2009), we use the Consumer Expenditure Survey (CE) data to construct stockholder consumption growth factor. CE interviewed 4000~8000 household each quarter. Each household is interviewed once every three months over four consecutive quarters. About 20% sample households are replaced for each interview. The first interview is a practice interview and the results are not report in the data. The interview data only includes result from interview two to five.

The sample period is from 1982 to 2016. Sample from 1996 to 2016 can be directly download from Public-Use Microdata (PUMD) from CE website. The early sample 1982 to 1995 can be download from ICPSR website.

First, we classify all types of expenditure into durable, nondurable and service by NIPA definition. All durable items are excluded. As for the service, we exclude all housing expense (but include house operation cost), medical and education cost; we exclude the rental and finance expense for durable product (such as car finance). We also exclude all miscellaneous items since it is too ambiguous to classify. Table A1 shows the UCC (six-digit codes that identify the consumption item) we use for calculating household consumption.

Second, we construct household consumption growth. In each quarter, interviews are spread out in each month. This means that there are households get interviewed in each month. Thus, we can calculate the quarterly growth rate at a monthly frequency. For example, if a household got its third interviewed in May, it reported its consumption in February, March, April. This household would get its fourth interview in August and it would report its consumption in May, June, July. This household's consumption growth in July is calculated as follows:

log (total consumption reported in fourth interview)- log (total consumption reported in third interview).

Then we merge the household consumption growth data to household characteristics data. We clean the data with the following criteria: Any household with less than four interviews will be dropped. Nonurban households (variable: BLS_URBN) and households residing in student housing (variable: CUTENURE) are dropped. Households with incomplete income response (variable: REPSTAT) will be dropped. we also drop the observations for which the consumption growth ratio is less than 0.2 or greater than 5.

Last, we identify the stockholder in our sample and calculate the stockholder consumption growth rate. In the fifth interview, households will be asked the amount of stock, bonds, mutual fund they hold today and the amount they hold one year from today. The interview on financial information is a snapshot for the stockholding, a household might report zero holding if it sold all the stock right before the interview. In order to include all potential stockholders, we classify households with either positive holding today or positive holding one year ago today as stockholder. Then, we will take average of all stock holder consumption growth rate within each month to get the stockholder consumption growth factor.

B. Luxury consumption

Referring to Sahalia, Parker, and Yogo (2005). We use the sales of the high-end luxury goods to construct consumption growth factor. The high-end luxury good should not be considered as durable goods for the very rich since fashion is fickle.

The luxury retailer we use are Cucci (GUC), Saks(SKS) and Tiffany (TIFF, TIF since 1986). Their quarterly sale data can be get from COMPUSTAT. The sample period for Cucci and Saks are short. Cucci's sale data is available from 1995 to 2004. Sake's sale data is available from 1991 to 1997. Tiffany has the longest sample period which is from 1960 until now.

COMPUSTAT reports the quarterly sale (turnover) data for all public companies. COMPUSTAT segment reports the annual US sale and annual international sale data for all public companies. Using COMPUSTAT segment data, we can calculate the ratio of US retail to the total sale each year. Then, we multiply this ratio by the quarterly total sale to get quarterly US sale. The luxury good consumption growth is deseasonalized by computing growth rate with respect to the same quarter in the last year.

C. Intermediary Capital Ratio

He, Kelly, and Manela (2017) creates the intermediary capital ratio, which is the aggregate capital ratio of the New York Fed' s Primary dealer. The intermediary capital ratio is denoted as aggregate value of market equity divided by aggregate market equity plus aggregate book debt. Their factor could download at http://www.zhiguohe.com/research.html

D. Intermediary Leverage Ratio

Adrian, Etula, and Muri (2014) constructs intermediary leverage ratio, which is the total financial asset divided by the difference of total financial assets and total liability. The broker-dealer leverage index data can be download from Financial Accounts of the United states in Federal Reserve Website https://www.federalreserve.gov/releases/z1/current/default.htm.

E. Capital Share

Lettau, Ludvigson, and Ma (2018) constructs capital share. The relation between labor share and capital share is KS=1-LS. They calculate the labor share growth rate by taking the log difference of quarterly seasonally adjusted labor share index. The capital share growth rate is the labor share growth rate with opposite sign. The labor share index can be found at http://research.stlouisfed.org/fred2/series/PRS85006173.

The macro variable includes DUNEM (year-over-year log change in aggregate unemployment rate). TERM (the spread between Treasury bonds and Treasury bills). DEF (the spread between Baa-rated and Aaa-rated corporate bonds) and dividend ratio. The market variables are excess stock market return, excess equity REITs market return, excess long-term bond return, and excess corporate bond return. See Appendix for more detail.

Table A1. List of UCC

Referring to NIPA, we include UCC which represent nondurable goods and service. We exclude durable goods and some service with substantial durable components.

Category	UCC
FOOD	190904, 790220, 790230 190901, 190902, 190903, 790410, 790430, 800700
ALCOHOL	200900, 790310, 790320, 790420
HOUSEHOLD OPERATIOIN	340310, 340410, 340420, 340520, 340530, 340903,340906, 340910, 340914, 340915, 340211, 340212, 670310, 330511, 340510, 340620, 340630, 340901, 340907,340908, 690113, 690114, 990900
UTILITY	260211,260212,260213,260214, 260111,260112,260113,260114, 250111,250112,250113,250114, 250211,250212,250213,250214,250221,250222,250223,250224,250901, 250902,250903,250904, 270102,270130,270104,270101 270211,270212,270213,270214,270411,270412,270413,270414, 270901,270902,270903,270904
APPAREL	360110, 360120, 360210, 360311, 360312, 360320,360330, 360340, 360350, 360410, 360511, 360512, 360901 ,360902, 370110, 370120, 370130, 370211, 370212, 370213,370220, 370311, 370312, 370313, 370902, 370903, 370904, 380110, 380210, 380311, 380312, 380313, 380320,380331, 380332, 380340, 380410, 380420, 380430, 380510, 380901, 380902, 380903, 390110, 390120, 390210, 390221, 390222, 390230,390310, 390321, 390322, 390901, 390902, 410110, 410120, 410130, 410140, 410901, 400110, 400210, 400220, 400310, 420110, 420120, 430110, 430120, 440110, 440120,440130, 440140, 440150, 440210, 440900
PERSOANL CARE	640130, 640420, 650310
READING	590111, 590112, 590211, 590212
TOBACCO	630110, 630210
MEDICAL	540000
ENTERTAINMENT	610900, 620111, 620121, 620122, 620211,620212,620221,620222,620310,620903, 270310, 340610, 340902, 340905, 620904,620912
INSURANCE/ CASH CONTRIBUTION	002120, 700110, 800910, 800920, 800931, 800932, 800940
TRANSPORTATION	470111, 470112, 470113, 470211,470212, 530110, 530210, 530312, 530411,530510, 530901,530311,530412,530902

Table 1 Summary Statistics

	HKM	AEM	ΔLUXCON	SHCON	ΔCS4	MKT	REIT	ΔDEF	ΔDIV	SMB	HML	RMW	CMA
Panel A: Summary Statistics													
Mean	0.014	0.001	0.081	0.005	0.003	0.020	0.020	-0.000	-0.000	0.004	0.007	0.010	0.009
SD	0.126	0.072	0.124	0.043	0.015	0.084	0.095	0.002	0.009	0.048	0.059	0.048	0.041
Panel B: Cross-Correlation													
HKM	1.000												
AEM	-0.075	1.000											
ΔLUXCON	0.135	0.161	1.000										
SHCON	-0.011	-0.014	0.065	1.000									
ΔCS4	0.092	-0.046	-0.107	0.055	1.000								
MKT	0.754	-0.060	0.220	-0.082	0.081	1.000							
REIT	0.570	0.156	0.100	-0.017	0.130	0.607	1.000						
ΔDEF	-0.471	-0.276	-0.064	-0.002	-0.178	-0.382	-0.496	1.000					
ΔDIV	-0.541	-0.021	-0.042	-0.004	-0.069	-0.505	-0.814	0.384	1.000				
SMB	0.361	0.051	-0.076	0.004	0.132	0.340	0.471	-0.197	-0.418	1.000			
HML	0.178	0.275	-0.023	0.004	-0.004	-0.203	0.307	-0.181	-0.274	0.109	1.000		
RMW	-0.357	0.002	-0.251	0.012	0.039	-0.529	-0.194	0.206	0.058	-0.243	0.356	1.000	
CMA	-0.116	0.132	-0.033	-0.081	-0.002	-0.319	0.092	0.002	-0.028	-0.000	0.719	0.351	1.000

Panel A list the time series average of factor means and standard deviation. Panel B list the time series correlation. HKM: market equity capital ratio factor of NY Fed's primary dealers by He, Kelly, and Manela (JFE, 2017). AEM: leverage factor by Adrian, Etula, and Muir (JF, 2014). ΔLUXCON: year-over-year log changes in luxury sales by Aït-Sahalia, Parker, and Yogo (JF, 2004). SHCON: Shareholders' consumption growth, Malloy, Moskowitz, and Vissing-Jorgensen (JF, 2009). ΔCS4: year-over-year changes in capital shares by Lettau, Ludvigson, and Ma (2018). MKT: excess stock market returns. REIT: excess REIT market returns. ΔDEF: changes in default spread. ΔDIV: changes in REIT dividend yield. SMB: small minus big. HML: high minus low. RMW: robust minus weak factor. CMA: conservative minus aggressive.

Table 2 REIT Hedging Portfolios

	REIT	SIZE	BM	MOM	AG	ROA	PEAD	HKM	∆LUXCON	∆CCI
Mean	0.020	0.003	0.006	0.021	0.006	0.026	0.030	0.014	0.081	0.002
t-value	2.347	0.399	0.763	2.042	1.207	3.099	5.135	0.126	0.124	0.147
REIT_MKT	1.000									
SIZE	-0.252	1.000								
BM	0.337	0.439	1.000							
MOM	-0.417	-0.161	-0.491	1.000						
AG	-0.129	0.212	0.286	-0.003	1.000					
ROA	-0.290	-0.372	-0.659	0.647	-0.229	1.000				
PEAD	-0.273	-0.241	-0.415	0.653	-0.100	0.677	1.000			
HKM	0.570	-0.073	0.349	-0.390	-0026	-0.335	-0.220	1.000		
∆LUXCON	0.100	-0.021	-0.044	-0.081	-0.036	-0.169	-0.128	0.134	1.000	
∆CCI	0.466	-0.130	0.199	-0.527	0.140	-0.466	-0.423	0.533	0.214	1.000

CCI is consumer confidence index.

Table 3. Univariate Cross-Sectional Regressions

	Constant	Coefficient	R2		Constant	Coefficient	R2
MKT	0.047	-0.039	0.378	AEM	0.028	-0.036	0.125
	(4.923)	(-2.379)			(3.123)	(-1.537)	
	[4.463]	[-2.199]			[2.800]	[-1.389]	
REIT	0.060	-0.040	0.421	LUXCON	0.035	-0.183	0.603
	(4.671)	(-2.511)			(4.326)	(-3.952)	
	[4.308]	[-2.369]			[2.432]	[-2.269]	
TB	0.025	0.027	0.368	LUXCON4	0.038	-0.038	0.539
	(3.093)	(2.124)			(4.598)	(-2.801)	
	[2.774]	[1.935]			[4.399]	[-2.764]	
CB	0.017	0.012	0.029	LUXCON8	0.036	-0.004	0.376
	(1.881)	(0.898)			(4.193)	(-2.430)	
	[1.825]	[0.874]			[4.127]	[-2.451]	
ΔTED	0.026	0.001	0.237	SHCON	0.020	0.014	0.025
	(3.380)	(1.734)			(2.423)	(0.761)	
	[3.065]	[1.489]			[2.297]	[0.723]	
ΔRREL	0.020	-0.018a	0.097	ΔCS4	0.028	-0.003	0.182
	(2.322)	(-1.516)			(3.456)	(-1.667)	
	[2.063]	[-1.357]			[3.378]	[-1.648]	
ΔDEF	0.043	0.001	0.491	SMB	0.040	-0.021	0.359
	(4.753)	(2.433)			(4.096)	(-2.069)	
	[4.301]	[2.247]			[3.761]	[-1.929]	
ΔTERM	0.021	-0.003	0.184	HML	0.034	-0.027	0.252
	(2.517)	(-1.566)			(3.655)	(-1.781)	
	[2.203]	[-1.381]			[3.320]	[-1.635]	
ΔDIV	0.048	0.003	0.358	MOM	0.034	0.032	0.425
	(4.880)	(2.351)			(4.369)	(2.297)	
	[4.574]	[2.250]			[4.071]	[2.183]	
ΔMV	0.040	0.003	0.321	RMW	0031	0.029	0.332
	(4.713)	(2.166)			(4.041)	(2.255)	
	[4.279]	[1.999]			[3.463]	[1.963]	
HKM	0.044	-0.056	0.400	CMA	0.023	-0.013	0.045
	(4.640)	(-2.257)			(2.630)	(-0.872)	
	[4.243]	[-2.101]			[2.513]	[-0.835]	

This table shows the univariate cross-section regression result for all factors. The dependent variables are 30 REIT portfolios formed by size, BM, momentum, asset growth, profitability, and post-earnings drift. The independent variables are: TB: Treasury bond returns. CB: corporate bond returns. ΔTED: changes in TED. ΔRREL: changes in stochastically detrended risk-free rate. ΔTERM: changes in the term spread. ΔMV: changes in market variance. We follow LLM using overlapping returns for ΔCS4. LUXCON: we regress quarterly returns on LUXCON to estimate beta. LUXCON4: follow LLM estimating betas using four-quarter returns. LUXCON8: follow LLM and estimate beta using two-year changes in luxury consumption growth and returns over two years.

Table 4: Multivariate Cross-Sectional Regressions

	1	2	3	4	5	6	7	8	9	10b
CON	0.061	0.045	0.053	0.043	0.047	0.043	0.048	0.057	0.047	0.043
	(4.708)	(3.903)	(4.352)	(4.762)	(4.832)	(4.564)	(4.103)	(4.193)	(3.566)	(4.519)
	[4.315]	[3.554]	[2.805]	[4.200]	[3.046]	[2.907]	[2.742]	[2.645]	[2.956]	[3.930]
MKT	-0.019									
	(-1.014)									
	[-0.943]									
REIT	-0.041	-0.024	-0.032				-0.027	-0.037		
	(-2.605)	(-1.696)	(-2.112)				(-1.887)	(-2.290)		
	[-2.448]	[-1.595]	[-1.512]				[-1.408]	[-1.588]		
ΔDEF		0.001		0.078a			0.066a			
		(1.864)		(1.648)			(1.083)			
		[1.718]		[1.181]			[0.753]			
ΔDIV					0.002					
					(1.713)					
					[1.234]					
HKM						-0.046		-0.025		-0.020
						(-1.913)		(-0.659)		(-2.029)
						[-1.309]		[-0.428]		[-1.894]
FPC									-0.349	
									(-2.317)	
									[-1.691]	
LUXCON			-0.145	-0.133	-0.151	-0.148	-0.136	-0.148	-0.145	-0.022
			(-4.316)	(-4.175)	(-4.404)	(-4.624)	(-4.104)	(-4.624)	(-4.478)	(-5.092)
			[-2.881]	[-2.908]	[-2.873]	[-3.062]	[-2.836]	[-3.033]	[-3.009]	[-4.846]
R2	0.422	0.491	0.693	0.696	0.687	0.669	0.700	0.698	0.685	0.775

Tracking portfolios: we regress HKM and LUXCON on r1, r5, r6, r10…, r26, r30, and use the fitted values, F1 and F2, respectively, as the risk factors. FPC: the first principle component of MKT, REIT, ΔDEF, ΔDIV, HKM

Table 5: Multivariate Cross-Sectional Regressions with Common Stock Factors

	1	2	3	4	5	6
CON	0.047	0.038	0.044	0.045	0.041	0.045
	(4.910)	(3.697)	(4.570)	(4.799)	(3.952)	(4.682)
	[4.608]	[3.458]	[3.242]	[2.775]	[2.377]	[2.867]
MKT	-0.028	-0.020	-0.029	-0.031	-0.026	-0.030
	(-1.862)	(-1.449)	(-1.974)	(-2.045)	(-1.919)	(-2.066)
	[-1.776]	[-1.383]	[-1.508]	[-1.301]	[-1.288]	[-1.390]
SMB	-0.011	-0.008	-0.017	0.012	0.013	0.005
	(-1.136)	(-0.821)	(-1.799)	(1.196)	(1.218)	(0.544)
	[-1.080]	[-0.777]	[-1.354]	[0.738]	[0.775]	[0.364]
HML	-0.003	0.002	0.005	-0.015	-0.012	-0.010
	(-0.261)	(0.109)	(0.407)	(-1.117)	(-0.884)	(-0.748)
	[-0.247]	[0.103]	[0.301]	[-0.683]	[-0.559]	[-0.484]
MOM		0.003			-0.006	
		(2.101)			(-0.457)	
		[2.005]			[-0.312]	
RMW			0.018			0.014
			(2.060)			(1.637)
			[1.566]			[1.097]
CMA			0.029			0.010
			(2.470)			(0.896)
			[1.796]			[0.569]
LUXCON				-0.168	-0.158	-0.146
				(-4.724)	(-4.919)	(-4.645)
				[-2.830]	[-3.084]	[-2.969]
R2	0.408	0.435	0.529	0.695	0.702	0.725

Table 6: REIT Factors and the Cross-Section of REIT Returns

	1	2	3	4	5	6	7
CON	0.080	0.006	0.039	0.048	0.031	0.034	0.040
	(5.136)	(4.294)	(2.362)	(2.927)	(1.782)	(1.912)	(2.369)
	[4.165]	[2.832]	[2.232]	[2.082]	[1.602]	[1.699]	[2.086]
REIT	-0.060	-0.044	-0.018	-0.027	-0.011	-0.014	-0.020
	(-3.355)	(-2.529)	(-0.992)	(-1.479)	(-0.547)	(-0.696)	(-1.036)
	[-2.837]	[-1.799]	[-0.949]	[-1.114]	[-0.501]	[-0.630]	[-0.935]
SIZE	0.002	0.003	0.001	0.003	0.003	0.003	0.003
	(0.236)	(0.436)	(0.181)	(0.393)	(0.358)	(0.377)	(0.406)
	[0.235]	[0.430]	[0.181]	[0.389]	[0.358]	[0.376]	[0.405]
BM	-0.004	-0.001	0.001	-0.002	-0.004	-0.004	-0.003
	(-0.480)	(-0.140)	(0.068)	(-0.267)	(-0.575)	(-0.537)	(-0.455)
	[-0.467]	[-0.135]	[0.068]	[-0.261]	[-0.573]	[-0.534]	[-0.453]
MOM			0.032	0.027			
			(3.020)	(2.553)			
			[3.009]	[2.082]			
AG					0.007	0.008	0.008
					(1.392)	(1.421)	(1.492)
					[1.380]	[1.407]	[1.477]
ROA					0.029	0.028	0.030
					(3.278)	(3.251)	(3.407)
					[3.254]	[3.225]	[3.379]
LUXCON		-0.133		-0.119		-0.004	-0.021
		(-4.094)		(-3.611)		(-0.975)	(-4.283)
		[-2.799]		[-2.648]		[-0.537]	[-4.032]
R2	0.532	0.721	0.595	0.731	0.775	0.777	0.791

Factors constructed using REIT stocks

LUXCON4 has strong correlation with RMW of both common stocks and REIT

Table 7: Cross-Sectional Regressions with Alternative Luxury Consumption and Aggregate Economic Activity

	1	2	3	4	5	6	7	8	9	10
CON	0.028	0.034	0.035	0.039	0.039	0.045	0.038	0.038	0.033	0.037
	(3.453)	(4.307)	(4.041)	(4.495)	(5.156)	(5.820)	(4.660)	(4.725)	(4.217)	(4.686)
	[2.472]	[2.396]	[3.325]	[2.672]	[4.303]	[3.245]	[3.186]	[2.864]	[3.769]	[3.148]
NDS	-0.004	-0.004								
	(-2.476)	(-2.367)								
	[-1.796]	[-1.341]								
JW			-0.019	-0.021						
			(-2.290)	(-2.543)						
			[-1.913]	[-1.557]						
BA					-0.037	-0.041				
					(-3.003)	(-3.193)				
					[-2.575]	[-1.886]				
ΔIP							-0.015	-0.015		
							(-2.913)	(-2.972)		
							[-2.026]	[-1.839]		
ΔCFNAI									-0.224	-0.140
									(-2.408)	(-1.450)
									[-2.195]	[-1.025]
LUXCON		-0.186		-0.165		-0.179		-0.154		-0.134
		(-4.346)		(-4.367)		(-3.919)		(-4.338)		(-3.968)
		[-2.478]		[-2.669]		[-2.233]		[-2.720]		[-2.753]
R2	0.320	0.605	0.365	0.655	0.213	0.678	0.568	0.665	0.486	0.679

NDS: Non-durable and service. JW: Jewelry and Watch.BA: Boats and aircraft. ΔIP: Industrial production. ΔCFNAI: Chicago Fed National Activity Index

Table 8: Cross-Sectional Regressions with Consumer Sentiment Measures

	1	2	3	4	5	6	7	8	9	10	11
CON	0.051	0.042	0.039	0.044	0.043	0.037	0.0268	0.039	0.034	0.048	0.037
	(4.965)	(4.744)	(4.281)	(4.827)	(4.599)	(4.053)	(4.460)	(4.749)	(3.415)	(4.528)	(3.621)
	[4.122]	[3.274]	[4.124]	[4.185]	[3.172]	[3.881]	[4.105]	[3.171]	[3.228]	[4.381]	[3.459]
MICHIGAN	-0.043	-0.031	-0.012								
	(-2.579)	(-1.771)	(-0.957)								
	[-2.337]	[-1.287]	[-0.745]								
OECD				-0.003	-0.002	-0.001					
				(-2.611)	(-1.818)	(-0.881)					
				[-2.314]	[-1.307]	[-0.868]					
HMI							-0.066	-0.029	0.006		
							(-2.332)	(-0.985)	(0.157)		
							[-2.189]	[-0.707]	[0.153]		
PERMIT4										-0.052	-0.022
										(-2.475)	(-1.456)
										[-2.454]	[-1.139]
LUXCON		-0.126			-0.125			-0.136			
		(-3.770)			(-3.592)			(-4.211)			
		[-2.685]			[-2.549]			[-2.913]			
LUXCON4			-0.035			-0.038			-0.043		-0.039
			(-3.275)			(-3.446)			(-4.102)		(-3.292)
			[-3.297]			[-3.461]			[-4.155]		[-3.282]
R2	0.537	0.693	0.541	0.544	0.682	0.539	0.455	0.680	0.544	0.432	0.539

Michigan sentiment measures

The correlation of Michigan sentiment and LUXCON4 is 26%, and it is 32% for OECD sentiment measure for US

The correlation of the two sentiment measures is 89%

Table 9: REIT Factors and Consumer Confidence Index

	SIZE	BM	MOM	AG	ROA	PEAD
CON	0.002	0.014	-0.002	0.012	0.005	0.017
	(0.264)	(1.665)	(-0.204)	(2.188)	(0.632)	(2.968)
DUMMY	0.003	-0.032	0.093	-0.022	0.083	0.053
	(0.175)	(-1.815)	(3.926)	(-1.658)	(4.213)	(3.556)
R2	-0.008	0.021	0.120	0.021	0.144	0.119

Table 10: Cross-Sectional Regressions in Subsamples

	Panel A 1987Q1 to 2007Q4					Panel B 1994Q1 to 2016Q4				
	1	2	3	4	5	6	7	8	9	10
CON	0.042	0.017	0.018	0.022	0.015	0.039	0.032	0.041	0.055	0.043
	(4.382)	(1.977)	(2.314)	(3.120)	(1.748)	(4.118)	(2.665)	(4.844)	(5.220)	(4.401)
	[3.672]	[1.429]	[2.044]	[2.270]	[1.723]	[3.998]	[2.445]	[4.710]	[3.919]	[4.262]
HKM	-0.071			-0.038	0.002	-0.031			-0.044	-0.024
	(-2.441)			(-1.569)	(1.376)	(-1.318)			(-1.539)	(-0.977)
	[-2.099]			[-1.213]	[1.398]	[-1.301]			[-1.214]	[-0.978]
LUXCON		-0.094		-0.091			-0.057		-0.111	
		(-3.302)		(-3.335)			(-1.223)		(-2.390)	
		[-2.472]		[-2.518]			[-1.130]		[-1.828]	
LUXCON4			-0.029		-0.009			-0.031		-0.033
			(-3.060)		(-1.977)			(-1.964)		(-2.709)
			[-2.094]		[-2.132]			[-1.945]		[-2.731]
R2	0.215	0.661	0.545	0.668	0.637	0.272	0.077	0.325	0.408	0.299

Panel A list the cross sectional result from 1987 to 2007(pre-crisis). Panel B list the cross-sectional result from 1994 to 2016.

Table 11: Explaining the Cross-Section of Common Stocks

	25 size and BM						25 size and momentum							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CON	0.038	0.036	0.049	0.047	0.020	0.037	0.030	0.018	0.029	0.013	0.008	0.030	0.022	0.030
	(4.004)	(3.207)	(4.657)	(4.767)	(2.400)	(4.417)	(4.150)	(1.639)	(3.068)	(1.105)	(0.394)	(3.995)	(2.611)	(4.574)
	[3.024]	[2.384]	[4.348]	[4.420]	[2.340]	[4.361]	[4.054]	(1.441)	[2.825]	[1.012]	[0.354]	[3.945]	[2.610]	[4.516]
MKT			-0.028	-0.027							0.015			
			(-2.167)	(-2.130)							(0.715)			
			[-2.071]	[-2.028]							[0.651]			
SMB			0.003	0.004							0.005			
			(0.725)	(0.812)							(1.074)			
			[0.721]	[0.809]							[1.048]			
HML			0.007	0.007							0.014			
			(1.279)	(1.253)							(1.145)			
			[1.275]	[1.248]							[1.049]			
MOM										0.015	0.015			
										(2.042)	(2.027)			
										[2.034]	[2.016]			
ΔCS4					0.003		0.002					-0.002		-0.002
					(2.001)		(1.737)					(-1.512)		(-1.486)
					[1.991]		[1.726]					[-1.514]		[-1.480]
HKM		-0.011							-0.008	-0.012				
		(-0.455)							(-0.350)	(-0.408)				
		[-0.357]							[-0.328]	[-0.378]				
LUXCON	-0.108	-0.112		-0.030				0.067	0.051	0.029	0.026			
	(-2.153)	(-2.228)		(-0.752)				(1.817)	(1.613)	(1.038)	(0.967)			
	[-1.644]	[-1.676]		[-0.702]				[1.614]	[1.501]	[0.963]	[0.885]			
LUXCON4						-0.020	-0.017						0.004	0.001
						(-1.772)	(-1.504)						(0.512)	(0.158)
						[-1.772]	[-1.505]						[0.004]	[0.160]
R2	0.310	0.314	0.557	0.562	0.322	0.250	0.460	0.334	0.406	0.741	0.841	0.415	0.013	0.415

Table 11 lists the cross-sectional result using 25 Fama Frech size and book to market portfolio and 25 Fama French size and momentum portfolio