Time-varying Macroeconomic Risk of Real Estate Returns

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Abstract

Macroeconomic risks have a huge effect on the economy in general and on both stock and real estate market in particular. Studies assume that across all U.S. stocks around 60% of the cumulative annual excess returns are earned on announcement days of important macroeconomic factors. However, according to the efficient-market hypothesis, in the majority of cases the surprise component – the unexpected part – of macroeconomic news should have an influence on the daily excess returns. We find that real estate returns are much less exposed to the risk of macroeconomic announcement days than stocks and bonds in the U.S. In the U.K., we are not able to find statistically significant differences of the daily excess returns for stocks, bonds, or real estate. Digging deeper, we find that mostly surprise components of retail sales and unemployment rate are statistically significant linked with real estate returns. Nonetheless their impact changed after 2009 and their signs are different in the U.S. and the U.K. Properties in the U.K. show a negative link to unexpected inflation over the whole sample, whereas in the U.S., this only partly applies before 2009.

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I. Introduction

This paper studies the sensitivity of listed real estate returns with respect to the surprise component of a wide range of macroeconomic data announcements. Stock returns are linked to the macroeconomic information risk which arises in two ways. On the one side, news of the macroeconomic data are sometimes randomly published. On the other side, and in the majority of cases, news of macroeconomic key factors occur on the prescheduled date. Although these dates are common currency, the precise value of these factors can only be anticipated. To predict these values, consensus estimations of professionals are a highly trusted and reliable source among the broad set of forecast values. Following the efficient-market hypothesis at least in the semi-strong form, the predicted values are immanently included in the price after the consensus data are published. The remaining surprise component – the unexpected difference between the predicted and the announced data – should be the predominating reason for the observed higher risk and hence higher expected excess returns on such announcement dates. Therefore, we firstly pose the general question which sort of surprise component of macroeconomic news is important for the pricing of real estate securities. Are these news related to broader economic activity, labor market conditions, sentiment and confidence in the market, or to inflation? Second, we dissect how the sensitivity of real estate returns with respect to the different kinds of macroeconomic news change over time, e.g. prior/post quantitative easing (QE) periods. With the second part of the analysis, we want to shed new light on some highly debated issues in literature and industry of time and its effects on real estate returns. First, whether we can detect periods in which real estate securities become less sensitive towards macroeconomic news. In other words, fundamental factors have become less important for pricing and other factors, which may be more behavioral in nature, have become more important. Such data patterns may prove to be helpful in identifying periods of mispricing. Second, one would expect that real estate investments offer a better inflation hedging characteristics in periods of high inflation risk.

If indeed such a non-linear relationship exists, we should observe that real estate securities are more sensitive to inflation surprises during times when market participants are particularly concerned about soaring price levels. The surprise components of macroeconomic news releases, on which we base our study, are obtained from World Economic Calendar and Economic Indicators (WECO) for the U.S. and are available via Bloomberg. News surprises are computed on a daily frequency as the difference between the released value of the macroeconomic variable and the expected value of the variable. The latter is based on surveys from financial market institutions and professional forecasters. The news surprises we cover for the U.S. are: measures of Capacity Utilization, Consumer Confidence Index, Consumer Price Index (CPI), GDP (advance), ISM Manufacturing, Leading Index, New Home Sales, Nonfarm Payrolls, Retail Sales Ex Autos, and the Unemployment. For the U.K., the surprise components of macroeconomic news release are obtained by means of Reuters Poll from Thomson Datastream. The news surprises we cover for the U.K. are: GfK Consumer Confidence, Inflation, GDP (preliminary), Nationwide's House Price Index, Claimant Count Unemployment Change, Retail sales, and the Unemployment. The real estate markets which we include in our study are listed real estate securities in the U.S.A. and the U.K. We use both sectoral indices and individual listed real estate firms. The daily-frequency nature of the surprise component of macroeconomic data releases limits our sample to listed real estate vehicles. However, as long as the underlying assets of listed real estate instruments are properties the observed reaction to the macroeconomic shocks should come from the properties themselves or passed-through the stock entity to the properties.

II. Literature

Our literature review is divided into two strands: First, we address the different approaches of the literature which explain the effect of macroeconomic shocks on stock returns. Second, we briefly summarize the previous real estate literature concerning the influence of different

macroeconomic factors on real estate returns.

The influence of macroeconomic factors on the stock market has been discussed in finance literature for a long time. For example, the existence of a monetary policy effect – also the major driver for a majority of the other macroeconomic factors – was debatable for a long time. In line with the theory, stock prices are equal to the expected present value of future net cash flows. An expansionary monetary policy, for example, increases future cash flows or decreases the discount factor and consequently induces higher stock returns. Thus, a concluding hypothesis is, that monetary policy has a real and quantitative effect on real variables like stock returns – at least in the short run. However, Black (1987, 2009) concludes that monetary policy has no influence on interest rates, employment, investment, or stock returns. By using a vectorautoregressive regression (VAR) for event dates and monthly data, Boudoukh, Richardson, and Whitelaw (1994) find that the question whether monetary policy influences the real economy remains unclear. And if yes, whether it is quantitatively and economically relevant or not. On the other side, they also analyze the cross-sectional relation between industry-sorted stock returns – neglecting real estate – and expected inflation and conclude that both variables are linked to cyclical movements in their industry-specific output. Returns of less cyclical industries – like the real estate industry – are positively linked with the expected inflation et vice versa. For the explanation of the linkage between unexpected inflation and stock returns, Tobin (1978, 1988) postulates that news of a higher inflation will induce a monetary tightening of the Federal Reserve and this will then reduce the present value of future cash flows of the companies, and consequently, the stock returns. This theoretical causal chain was confirmed by Bernanke and Blinder (1992) and Fuhrer and Moore (1995). They showed that the Federal Reserve tightened its monetary policy after news of inflation. However, these results once again raise the puzzling question, why stock returns, a claim against real assets, are not endowed with a good hedging property against unexpected changes of inflation. Rozeff (1974) already, showed a positive linkage between the growth rate of money and the stock returns. Furthermore, Thorbecke

(1997) demonstrates that monetary policy has, due to its influence of a company's access to debt, a huge effect on stock market returns – both ex-ante and ex-post returns. Besides the increase of equity, this debt channel is very important for the capital-intensive real estate sector. He uses different techniques (impulse-response function and variance decomposition from a vector autoregression, generalized method of moments estimation, event study, and nonlinear seemingly unrelated regression) and sorts the effect by size and industry, but he also neglects the real estate industry. His size portfolio shows that smaller companies – like it is the case for real estate companies – are more exposed to monetary shocks. Bernanke and Kuttner (2005) find that a theoretical unexpected fund rate decrease of 25 basis points (bp) induces an increase of 1% for U.S. equities in general. Savor and Wilson (2013) show that stock returns and their corresponding Sharpe ratios are significantly higher on days when important macroeconomic news (inflation, unemployment, or interest rate) are announced. They find between 1958 and 2009 that excess returns for stocks are on average 10.3 basis points higher on such days than on normal days. The Sharpe ratio is around 10 times larger.

Also, the real estate market is influenced by the state of the economy. Growing wealth should have a positive influence on the real estate market. As general stocks, listed real estate returns are also depending on unexpected changes of macroeconomic factors. Following the results of Ling and Naranjo (1997), unexpected changes in macroeconomic factors like production and output induce lower real estate returns. Karolyi and Sanders (1998) compare the predictability of stocks, bonds, and REITs returns by using a multi-beta asset pricing model with a broad set of economic variables. They find that these economic variables are highly important to explain the returns of all these assets and that traditional multi-beta asset pricing models cannot capture the important economic risk premium for REITs. By combining firm-specific variables and macroeconomic factors in an asset pricing model, Chen, Hsieh, Vines, and Chiou (1998) observe that the unanticipated change in term structure can help to explain return variations in a model that even excludes firm-specific variables. Ewing and Payne (2005) show that shocks to monetary policy, economic growth, and inflation are

associated with lower expected returns of REITs. On the other side, a shock to the default risk premium leads to higher returns. Plazzi, Torous, and Valkanov (2008) analyze the cross-sectional dispersion of real estate returns and growth in rents for commercial real estate. They find that macroeconomic key factors can explain the time-series fluctuation of the returns and identify the credit channel as a driver for these effects.

The market participants anticipate the result of the macroeconomic factors and include these estimations into their present value calculation. But what happens when they make a mistake and, for example, the interest rate is different than estimated? This paper answers this question with respect to listed real estate returns.

III. Data

A. The dependent returns

Our data set is based on the U.S.A. from January 1997 through December 2014 and on the U.K. from January 2005 through December 2014. On the dependent side of our analysis, we analyze the listed real estate excess returns on a daily-frequency basis which we obtained from Thomson Reuters Datastream. To calculate the excess returns over a daily risk-free rate, we use the daily return that, over the number of the specific trading days in a month, compounds to the three-month Treasury Bill. The daily-frequency nature of the surprise component of macroeconomic data releases limits our sample to listed real estate vehicles. For the real estate market, we use aggregated indices of REITs and REOCs of the Datastream index family and individual REITs and REOCs – as long as they are traded from the beginning of our observation period – traded in the U.S.A. and U.K. to calculate the daily return. The aggregated indices of listed real estate also cover different property foci (all Real Estate, REIT, office, and residential).

B. The explaining macroeconomic factors

On the independent side, we use both the current macroeconomic as well as the forecasted data. The surprise components of macroeconomic news releases are obtained from World Economic Calendar and Economic Indicators (WECO) via Bloomberg for the U.S. and from Thomson Reuters for the U.K. News surprises are computed on a daily-frequency as the difference between the released value of the macroeconomic variable and the expected value of the variable. The latter is based on surveys among financial market institutions and professional forecasters. The U.S. news surprises which we cover are: measures of Capacity Utilization, Consumer Confidence Index, Consumer Price Index (CPI), GDP (advance), ISM Manufacturing, Leading Index, New Home Sales, Nonfarm Payrolls, Retail Sales Ex Autos, and the Unemployment Rate.[1]

In the following section, we define our used factors for the U.S., their original publication source, and their release frequency.

- Capacity Utilization: The U.S. Census Bureau defines Capacity Utilization as a ratio of a manufacturer's actual production to their theoretical full production capability. It shows whether level of potential output is used. It is published on a monthly basis.

- GDP (advance): The U.S. Bureau of Economic Analysis defines the Gross Domestic Product as the value of goods and services production in the U.S., adjusting it for price changes. It is published on a quarterly basis. The advance release takes place four weeks after the quarter ends. The final release takes place three months after the quarter ends.

- Consumer Confidence Index: The Conference Board defines the Consumer Confidence Index as a health-barometer of the U.S. economy from consumer perspective based on current business and employment conditions from consumers' perceptions, including

[1] To gauge the importance of each variable from the viewpoint of market participants, we take their importance into account as measured by how many professionals have subscribed to each variable in Bloomberg.

the consumers' expectations for six months hence regarding income, business conditions, and employment. It is published on a monthly basis by Nielsen Holdings. It is published on the last Tuesday of the month.

- Consumer Price Index (CPI): The U.S. Bureau of Labor Statistics defines the CPI for all urban consumers as a measure of inflation by measuring changes in the prices paid by urban consumers for a representative basket of goods and services over a specific time period. The figure is typically released during the third week after the conclusion of the reference month.

- ISM Manufacturing: The Institute for Supply Management defines the ISM Manufacturing as a national report serving as an index for national economic conditions including new orders, production, employment, supplier deliveries, inventories, customers' inventories, prices, backlog of orders, exports, and imports. This monthly figure is typically released on one of the first business days after the conclusion of the reference month.

- Leading Index: The Conference Board uses its Leading Economic Index to predict the direction of the economy's movement of the U.S. in the near future. It includes 10 components: 1) Average weekly hours in manufacturing; 2) Average weekly initial claims for unemployment insurance; 3) Manufacturers' new orders, consumer goods and materials; 4) ISM Index of New Orders; 5) Manufacturers' new orders, nondefense capital goods excluding aircraft orders; 6) Building permits, new private housing units; 7) Stock prices, 500 common stocks; 8) Leading Credit Index; 9) Interest rate spread, 10-year Treasury bonds less federal funds; 10) Average consumer expectations for business conditions. The Conference Board Leading Economic Index is published on a monthly basis at the end of the third week after the conclusion of the reference month.

- New Home Sales: According to the U.S. Census Bureau, a new home sale occurs when

the sales contract of a new house (which can be in any stage of construction) or the acceptance of a deposit for it is signed. New home sales are released on a monthly basis at the end of the third week after the conclusion of the reference month. The New Home Sales series usually lead the alternative series of Existing Home Sales by one or two months and therefore, it is appropriate to indicate changes in real estate market.

- Nonfarm Payrolls: The U.S. Bureau of Labor Statistics includes the total number of paid U.S. workers in their Nonfarm Payroll statistics, excluding employees in general government, private households, nonprofit organizations serving individuals, and farms. Nonfarm Payrolls are published on a monthly basis.

- Retail Sales Ex Autos: The U.S. Census Bureau defines the Retail Trade sector as establishments engaged in retailing merchandise and rendering services incidental to the sale of merchandise. Retail sales serve as an indicator for performance (consumer expenditures) and price level activity. Retail Sales figures except for auto sales cover the dollar value of the prior month's merchandise sold within retail trade, excluding auto sales due to their high sticker price (they add extra volatility to the data). The retail sales are published on a monthly basis.

- Unemployment Rate: The U.S. Bureau of Labor Statistics defines the unemployment rate as the number of unemployed civilian labor force as a percent of the labor force. The classification for unemployment are: no employment during reference week, availability for work at the time, specific efforts of the people to find employment during a 4-week period ending with the reference week. The survey is published on a monthly basis.

The U.K. news surprises which we cover are: measures of GfK Consumer Confidence, Inflation, GDP (preliminary), Nationwide's House Price Index, Claimant Count Unemployment

Change, Retail sales, and the Unemployment Rate. In the following section, we define our used factors for the U.K., their original publication source, and their release frequency:

- GfK Consumer Confidence: The U.K. Consumer Confidence Index is conducted by GfK on behalf of the EU. The survey is carried out on a monthly basis and aims to monitor the general public's confidence in the British economy.

- Inflation: The consumer price index (inflation) is offered with percentage changes and weights and the components that make up this index from the U.K. Office for National Statistics.

- GDP (preliminary): The U.K. Office for National Statistics publishes the estimate for gross domestic product containing gross value added data.

- Nationwide's House Price Index: Nationwide provides the longest unbroken run of house price data for the U.K. on a monthly basis in their house price reports.

- Retail Sales: The U.K. Office for National Statistics offers the Retail Sales Index (RSI) which measures the value and volume of retail sales in Great Britain on a monthly basis.

- Claimant Count Unemployment Change: The U.K. Office for National Statistics releases the Claimant Count Unemployment Change that records the number of people receiving unemployment benefits from the government.

- Unemployment Rate: The ILO Department of Statistics publishes the number of unemployed workers divided by the total civilian labor force.

IV. Empirical identification

The empirical framework of our study aims to estimate the extent of the sensitivity of real estate returns to macroeconomic news surprises over time. Our approach follows Swanson

and Williams (2014) and has three steps: First, we identify the unexpected part of major macroeconomic announcements in the U.S, and the U.K. Second, we estimate the average sensitivity of real estate returns (real estate markets, different real estate foci, etc.) to announcements over different benchmark samples (stocks returns, different time periods, QE period, etc.). Third, we compare the time-varying sensitivity of the different returns and determine when and to what extent each series is affected by the macroeconomic news surprises.

A. The unexpected part of major macroeconomic announcements

Following Gürkaynak, Sack, and Swanson (2005), we compute the unexpected part of each macroeconomic factor as the difference between the realized value of the macroeconomic data release and the median value of each forecast to be independent from the distribution of the forecasts. It is important that the surveys are carried out only a few days before the publication of the realized values, so that they include the then prevailing sentiment and knowledge of the market. The macroeconomic variables are released at a quarterly, monthly, or weekly frequency. For this reason, our regressors, i.e. the macroeconomic news surprises, have a specific value one in a quarter, month, or week and zero on all other days.

B. Sensitivity of real estate returns to macroeconomic announcements

We estimate the real estate excess return by a regression of the form:

$$r_t = \alpha + b \cdot X_t + \varepsilon_t, \tag{1}$$

whereby r_t stands for the daily change of real estate prices minus the daily risk-free rate, X_t is a vector of the unexpected news surprise of each macroeconomic factor, and b is a vector

which captures the sensitivity of real estate excess returns with respect to the macroeconomic news surprises. The macroeconomic data are normalized by their standard deviation to make the coefficients comparable. This is how we identify the basic structure and the sensitivity of real estate returns in relation to macroeconomic announcements.

C. Time-varying sensitivity of real estate returns

We extend our approach by additionally examining if the sensitivities of real estate returns are time-varying. For example, if there was irrational exuberance in the real estate market, we would assume that real estate returns become less sensitive to fundamental news. A way to implement a test on such time-varying sensitivity is to add the time-varying scalar, δ_t, to the econometric model:

$$r_t = \alpha + \delta_t b \cdot X_t + \varepsilon_t. \tag{2}$$

This specification allows for the identification of time-varying sensitivity common to all macroeconomic news. For example, if δ_t decreases in the run-up to the financial crisis, this is an indicator for real estate returns being less sensitive to the macroeconomic fundamentals during this period of time. Consequently, other, possibly behavioral, factors are more important for pricing. Another interesting question we want to address within this framework is related to the inflation-hedging characteristics of real estate assets. We expect that real estate assets provide inflation protection in times when inflation risk is high, but not when there is no risk of soaring price levels. We can test this hypothesis i) by specifying the time-varying scalar, δ_t, to macroeconomic news surprises related to inflation, and ii) by testing whether this time-varying measure of inflation sensitivity lines up with periods of high inflation risk regimes.

V. Results

This section confronts our model with the empirical data. We provide results for the effects of the surprise component of macroeconomic data announcements on the whole listed real estate market and the sub-indices in the U.S. and U.K. We examine two specifications: First, for the sample of different listed real estate indices and second, for the individual real estate companies between January 1997 and December 2014 in the U.S. and between January 2005 and December 2014 in the U.K.

A. Descriptive statistics of macroeconomic data

Table 1 reports the distribution of the news over time and distribution of announcement days over the whole period. In the U.S., most macroeconomic data are released on Thursday, Friday, and Tuesday at 08:30am or 10:00am. According to literature (see among others Savor and Wilson (2013)), mostly Mondays would show significantly lower returns compared to Fridays, so that the returns on announcement days in our sample are not systematically lower. Macroeconomic news are released on roughly the half of the 4,530 trading days. Therefore, only one macroeconomic announcement is released on 33.2% of the days , two announcements on 14.7%, three announcements on 1.3%, and four announcements on one day. In the U.K., macroeconomic data are released almost identically distributed between Tuesday and Friday at 10:30am. Macroeconomic news are released on roughly 20.3% of the 2,524 trading days. Therefore, only one macroeconomic announcement is released on 14.7% of the days , two announcementson 5.5%, and three and four announcements on one day.

>>> TABLE 1 ABOUT HERE <<<

B. Descriptive statistics and correlations of excess returns

In Table 2, we analyze the announcement-day effect for stocks, bonds, and real estate. In line with the literature (see among others Andersen, Bollerslev, Diebold, and Vega (2007); Savor and Wilson (2013)), we find highly significant differences in the average daily excess returns of announcement and non-announcement days in the U.S. and the U.K. On the U.S. stock market, the average excess returns are both for S&P 500 and for Russel 3000 with 8.1 bp and 8.4 bp higher on announcement days at the 5% significance level. The bonds are on average with 2.7 bp higher at the 5% significance level. An analysis of the real estate market is new in our study. We find an average excess returns of 9.1 bp and 7.6 bp for all listed real estate stocks and for REITs, respectively. However, the mean difference of all real estate stocks is only statistically significant at the 10% level of confidence and the difference of REITs lacks statistical significance at conventional levels. Even if the mean differences are comparably high as for the stock market, the higher volatilities induce lower significance levels. In the U.K., the mean difference of all excess returns lacks statistical significance at conventional levels. However, the mean difference of U.K. real estate stocks is also very high. This first finding indicates that the risks linked with announcement days are of smaller importance for real estate market than for the stock and bond market in the U.S. In Figure 1, we analyze the rolling correlation of the daily excess returns over six months of the real estate market with a) the stock (Panel A) and b) the bond market (Panel B) on announcement and non-announcement days in U.S. With the stock market, the correlations are significantly higher than with bond market with an average of 0.63 and -0.09, respectively. At the same time, only with the bond market, the means of the correlations on announcement and non-announcement days are different. Besides the lower volatility of the correlation of 0.21 on the stock market compared with a volatility of 0.23 on the bond market, the stock market shows heteroscedasticity since the correlation coefficients converge during the last years as displayed in Panel C.

>>> TABLE 2 ABOUT HERE <<<

>>> FIGURE 1 ABOUT HERE <<<

C. Effects on the whole listed real estate market

Table 3 shows the influence of major macroeconomic factors on the whole listed real estate market, the REIT, and the non-REIT market in the U.S. (Panel A) and U.K. (Panel B). The factors 'GDP (advance)', 'ISM manufacturing', 'inflation', 'retail sales ex. autos', and 'unemployment rate' are partly significant over the entire time period.

The factor 'capacity utilization' affects REIT and non-REIT with approximately the same magnitude. Contrary to bonds, but in line with stocks, listed real estate excess returns are negatively influenced by the surprise component of this factor.

The same stock similarity applies for 'ISM manufacturing'. All real estate classifications are positively affected.

The factor 'unemployment rate' roughly has the same magnitude for all sectors. In the U.S. and the U.K. 'unemployment rate' has a negative impact on real estate returns. These findings are in line with the idea that a higher surprise component of of 'unemployment rate' reduces the respective probability to "consume" housing. 'Inflation' shows in the U.S. a positive impact and in the U.K. a negative impact, so that only U.K. properties have the desired inflation hedging characteristics.

D. Effects on the sub-indices

As can be inferred from Panel A in Table 3, the macroeconomic factors of 'GDP (advance)', 'ISM manufacturing', 'retail sales ex. autos', and 'unemployment rate' are mostly significant for the different listed real estate sub-indices. The factors 'CPI', 'capacity utilization', 'consumer confidence', 'leading indicator, 'new home sales', and 'nonfarm payrolls' are of lesser significance for the excess returns of the different sub-indices in U.S.

Even if 'GDP (advance)' is endowed with weak significance, the effect is clearly negative with roughly the same magnitude for all sub-indices and very strong for the 'retail' market. This GDP finding uncovers a puzzling relationship in comparison to the stock market.

In contrast, the 'ISM manufacturing' factor loads significantly positively on the returns of all indices. And therefore, they are in line with the stock market which is positively connected with 'ISM manufacturing' expecting higher future profits.

'Retail sales ex. autos' have a highly significant and positive effect on all listed real estate sub-indices, mostly on the 'office' and 'retail' sector.

The effect of the 'unemployment rate' is negative for all sectors. Its influence is highest on 'office' and 'retail'. By comparing the 'residential' and non-'residential' sectors, we observe a weaker effect for the 'residential' sector. This finding is coherent with theory because people also have to have a place to live during higher unemployment periods.

From Panel B in Table 3, we see the influence of the different macroeconomic factors in the U.K. In this sample, 'unemployment rate' and 'new home sales' are mostly significant for the different listed real estate sub-indices. The factor 'retail sales' is here of minor importance. The 'GDP' factor is positive and so in line with the findings for the stock market. 'Inflation' is also for the U.K. highly negative for all sub-indices and testify the positive inflation hedging characteristics of the different real estate sectors.

>>> TABLE 3 ABOUT HERE <<<

In the next step, we disentangle the effects on the different sub-sample and identify the time-varying influence of the respective factors on the results.

E. Effects during different time periods

Table 3 shows the effects of the macroeconomic factors on listed real estate excess returns prior of (until 2008) and within (after 2009) the QE period. For the most relevant factors of the entire time period, we identify a varying influence during the divided periods of

time. In comparison to the whole sample, the U.S. real estate indices are highly different in the two sub-samples regarding 'GDP (advance)', 'new home sales', and 'nonfarm payrolls'. Comparing the two sub-samples, 'capacity utilization', 'GDP (advance)', and 'new home sales' were exposed to large changes. the factors 'consumer confidence', 'GDP (advance)', 'new home sales', and 'nonfarm payrolls' also changed their signs. Since 2009, real estate returns are highly positively influenced by 'inflation' surprises. This was not the case prior to the QE period. In the U.K., the two sub-samples differs in comparison to the whole sample for 'GDP', 'retail sales', and ' unemployment rate'. Looking at the the sub-samples, mainly the 'inflation' is even more negatively linked to the surprise component in the younger period. Changes in the signs are relevant for the factors 'retail sales' and ' unemployment rate'.

F. Effects on the different real estate companies

In Table 4, we report the effects of the different macroeconomic factors on individually listed real estate excess returns. The U.S. sample comprises 102 and the U.K. sample 47 companies (REITs and REOCs) for the whole period. To control for outliers, we also display the median and the 25% and 75% quantiles. The U.S. results illustrate that for some factors, the real estate market comprises both positively and negatively influenced companies. However, 'consumer confidence', 'GDP (advance)', and 'unemployment rate' are always similarly influenced. For 'inflation', the 40% quantile is the turning point, so that also roughly 40% of real estate companies have a negative inflation link in the U.S. In the U.K. only 'GDP' and 'new home sales' always have the same the same sign for all companies. The turning point of 'inflation' is here roughly at the 65% quantile.

>>> TABLE 4 ABOUT HERE <<<

VI. Conclusion

In the U.S., listed real estate returns are on average 9.1 bp higher on announcement days of macroeconomic data than on non-announcement days. At the same time, stock returns are with 8.4 bp and bonds with 2.7 bp significantly higher on such days. For the U.K., we are not able to find significantly relevant differences in the means. Analyzing the surprise component – the unexpected part – of important macroeconomic risk factors and their effects on excess returns of listed real estate, we find some interesting results. The sensitivity of real estate returns with respect to the different kinds of macroeconomic news are different in the U.S and the U.K., vary among different real estate companies, and change over time. The most significant surprise components for listed real estate returns are 'retail sales' and 'unemployment rate'. In the U.S., the 'unemployment rate' is negatively linked with returns. This effect is of less importance for the residential sub-sector. At the same time, 'retail sales' are positively connected to the real estate market. In the U.K., both factors have a positive effect on listed returns. Comparing the time period before and after 2009, we see that both factors have the same sign in the U.S. However, this is not the case for the U.K., where the signs change. By analyzing the effect on individual real estate companies, we also observe a varying sensitivity regarding the different factors among the companies. For example, 40% of all U.S. real estate companies have a negative connection to 'inflation', whereas 65% of the U.K. real estate companies show this characteristic. In the U.S., This characteristic was even stronger before 2009, whereas in the U.K., the period after 2009 drives the negative impact of the unexpected inflation on listed real estate.

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Table 1

Panel A: USA

Time	Obs.	%	Day	Obs.	%	# of Macro Events per Day	Obs.	%
08:03	2	0.1%	Monday	178	8.0%	0	2,303	50.8%
08:30	1,938	64.3%	Tuesday	405	18.2%	1	1,502	33.2%
09:15	214	7.1%	Wednesday	302	13.6%	2	665	14.7%
09:26	1	0.0%	Thursday	885	39.7%	3	59	1.3%
09:36	1	0.0%	Friday	457	20.5%	4	1	0.0%
09:50	2	0.1%	Sum	2,227	100.0%	Sum	4,530	100.0%
10:00	854	28.3%						
22:30	1	0.0%						
Sum	3,013	100.0%						

Panel B: UK

Time	Obs.	%	Day	Obs.	%	# of Macro Events per Day	Obs.	%
01:00	1	0.2%	Monday	6	1.2%	0	2,011	79.7%
01:01	64	12.5%	Tuesday	151	29.4%	1	371	14.7%
01:05	17	3.3%	Wednesday	143	27.9%	2	140	5.5%
02:00	1	0.2%	Thursday	116	22.6%	3	1	0.0%
08:00	59	11.5%	Friday	97	18.9%	4	1	0.0%
10:30	334	65.0%	Sum	513	100.0%	Sum	2,524	100.0%
11:30	37	7.2%						
15:00	1	0.2%						
Sum	514	100.0%						

Table 2

Panel A: USA

		Ann.	No Ann.	Diff.
Stocks				
S&P 500	Mean	0.07%	-0.01%	0.081%
	Std. dev.	1.29%	1.24%	(0.031)
Russell 3000	Mean	0.07%	-0.01%	0.084%
	Std. dev.	1.31%	1.25%	(0.027)
Bonds				
Gvt 10 Years	Mean	0.03%	0.00%	0.027%
	Std. dev.	0.40%	0.37%	(0.02)
Real Estate				
All	Mean	0.09%	0.00%	0.091%
	Std. dev.	1.83%	1.76%	(0.089)
REITs	Mean	0.06%	-0.01%	0.076%
	Std. dev.	1.82%	1.76%	(0.153)
	N	2,227	2,303	

Std. dev. stands for standard deviation of the macroeconomic news surprise before we standardize it. Ann. and No Ann. for the returns on announcement dates and non announcement dates. The Diff. column displays the difference between Ann. and No Ann. The p-value for the equal mean test are given in brakets in the last column.

Panel B: UK

		Ann.	No Ann.	Diff.
Stocks				
FTSE100	Mean	0.03%	0.02%	0.009%
	Std. dev.	1.18%	1.22%	(0.872)
UK all	Mean	0.03%	0.02%	0.010%
	Std. dev.	1.16%	1.22%	(0.868)
Bonds				
Gvt 10 Gilt	Mean	0.01%	0.02%	-0.008%
	Std. dev.	0.48%	0.54%	(0.757)
Real Estate				
All	Mean	0.16%	0.01%	0.149%
	Std. dev.	2.16%	2.27%	(0.169)
REITs	Mean	0.14%	-0.01%	0.148%
	Std. dev.	2.17%	2.29%	(0.174)
	N	513	2,011	

Std. dev. stands for standard deviation of the macroeconomic news surprise before we standardize it. Ann. and No Ann. for the returns on announcement dates and non announcement dates. The Diff. column displays the difference between Ann. and No Ann. The p-value for the equal mean test are given in brakets in the last column.

Table 3

Panel A: USA

1997-2014	All RE	REIT	Office	Retail	Residential
	beta (10^2)				
Constant	0.027	0.030	0.027	0.037	0.034
Capacity utilization	-0.104	-0.112	-0.083	-0.124	-0.138
Consumer confidence	-0.211	-0.205	-0.113	-0.285	-0.173
Inflation	0.031	0.060	0.067	0.125	0.048
GDP (advance)	-0.090	-0.109	-0.101	-0.258	-0.126
ISM manufacturing	0.161	0.164	0.154	0.161	0.190
Leading indicators	0.037	0.040	0.106	0.061	0.006
New home sales	0.014	0.023	0.005	0.039	0.005
Nonfarm payrolls	-0.089	-0.118	-0.121	-0.136	-0.061
Retail sales ex. autos	0.645	0.661	0.781	0.714	0.697
Unemployment rate	-0.151	-0.146	-0.160	-0.233	-0.059
1997-2008					
	beta (10^2)				
Constant	0.008	0.013	0.012	0.018	0.015
Capacity utilization	0.001	-0.009	0.070	-0.009	-0.067
Consumer confidence	-0.386	-0.377	-0.323	-0.510	-0.286
Inflation	-0.021	0.012	-0.009	0.095	0.007
GDP (advance)	0.169	0.139	0.159	0.025	0.146
ISM manufacturing	0.107	0.116	0.124	0.117	0.166
Leading indicators	0.040	0.044	0.178	0.053	0.014
New home sales	-0.018	-0.008	-0.025	0.001	-0.023
Nonfarm payrolls	-0.229	-0.260	-0.276	-0.299	-0.206
Retail sales ex. autos	0.450	0.476	0.547	0.486	0.565
Unemployment rate	-0.136	-0.126	-0.115	-0.207	-0.067
2009-2014					
	beta (10^2)				
Constant	0.058	0.058	0.052	0.068	0.069
Capacity utilization	-0.302	-0.308	-0.371	-0.345	-0.269
Consumer confidence	0.092	0.093	0.249	0.102	0.020
Inflation	0.137	0.158	0.223	0.178	0.133
GDP (advance)	-0.734	-0.729	-0.750	-0.962	-0.802
ISM manufacturing	0.284	0.273	0.226	0.264	0.241
Leading indicators	0.021	0.024	0.014	0.059	-0.017
New home sales	0.310	0.310	0.287	0.380	0.266
Nonfarm payrolls	0.477	0.457	0.510	0.528	0.518
Retail sales ex. autos	0.921	0.924	1.114	1.038	0.884
Unemployment rate	-0.192	-0.193	-0.245	-0.292	-0.066

Panel B: UK

2005-2014	All RE	REIT	Office	Retail
	beta (10^2)			
Constant	-0.001	0.000	0.001	-0.001
Consumer confidence	0.172	0.180	0.217	0.145
Inflation	-0.258	-0.285	-0.346	-0.241
GDP (advance)	0.666	0.705	0.527	0.862
New home sales	0.597	0.648	0.562	0.730
Retail sales	0.017	0.017	-0.038	0.058
Unemployment rate	0.296	0.308	0.390	0.248
2005-2008				
	beta (10^2)			
Constant	-0.103	-0.092	-0.085	-0.100
Consumer confidence	0.086	0.093	0.098	0.098
Inflation	-0.121	-0.124	-0.142	-0.114
GDP (advance)	2.535	2.432	2.035	2.733
New home sales	0.679	0.704	0.631	0.777
Retail sales	-0.130	-0.098	-0.112	-0.089
Unemployment rate	-1.684	-1.543	-1.166	-1.931
2009-2014				
	beta (10^2)			
Constant	0.040	0.037	0.038	0.035
Consumer confidence	0.208	0.219	0.271	0.163
Inflation	-0.330	-0.370	-0.454	-0.309
GDP (advance)	0.290	0.354	0.215	0.485
New home sales	0.516	0.589	0.495	0.675
Retail sales	0.063	0.047	-0.027	0.103
Unemployment rate	0.303	0.314	0.395	0.257

Table 4

Panel A: USA

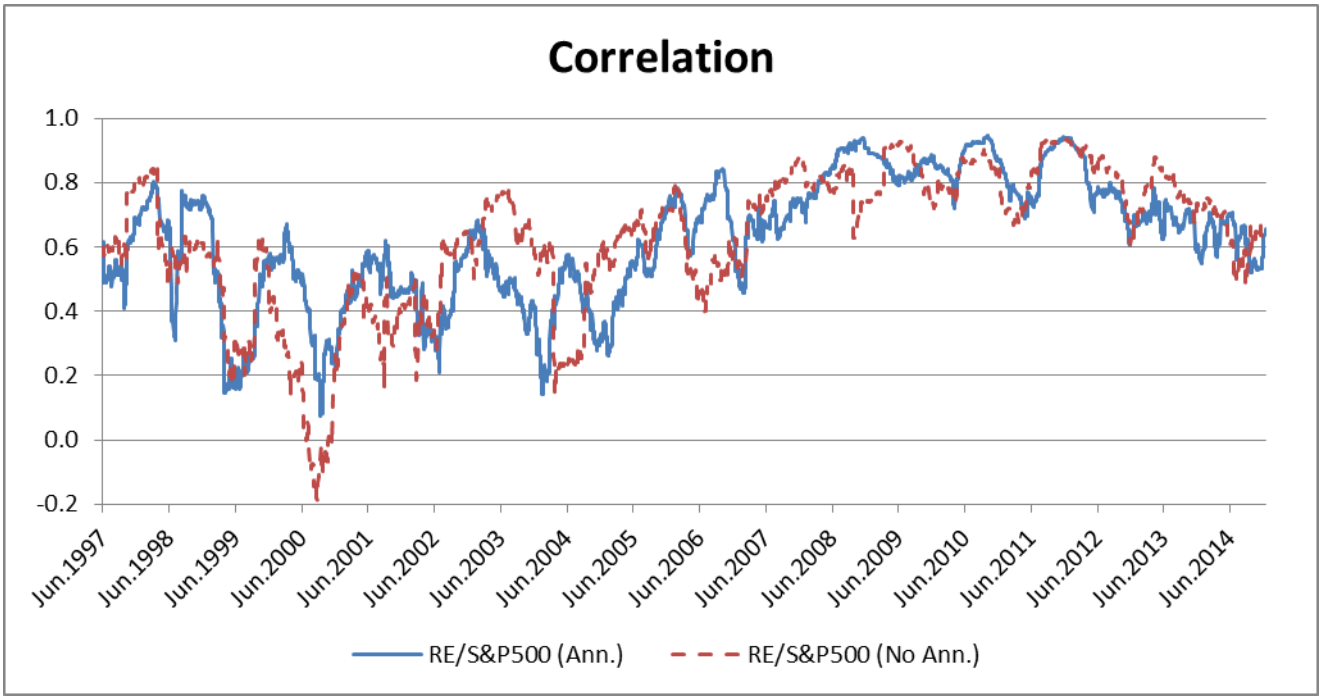
1997-2014	Mean	Median	25% Quantile	75% Quantile	Std. dev.
	beta (10^2)				
Constant	-0.001	0.020	0.000	0.035	0.069
Capacity utilization	-0.092	-0.070	-0.171	0.080	0.947
Consumer confidence	-0.117	-0.127	-0.216	-0.010	0.370
Inflation	0.066	0.042	-0.066	0.116	0.450
GDP (advance)	-0.136	-0.207	-0.312	-0.019	0.787
ISM manufacturing	0.036	0.097	-0.007	0.194	0.432
Leading indicators	0.111	0.044	-0.068	0.117	0.603
New home sales	-0.058	0.024	-0.072	0.092	0.405
Nonfarm payrolls	-0.029	-0.051	-0.140	0.072	0.435
Retail sales ex. autos	0.386	0.561	0.191	0.728	0.609
Unemployment rate	-0.216	-0.136	-0.247	-0.042	0.733
1997-2008					
	beta (10^2)				
Constant	-0.015	0.001	-0.017	0.020	0.066
Capacity utilization	-0.052	-0.029	-0.133	0.149	1.304
Consumer confidence	-0.149	-0.208	-0.334	-0.028	0.543
Inflation	0.100	0.020	-0.118	0.097	0.632
GDP (advance)	0.146	0.062	-0.065	0.230	1.089
ISM manufacturing	0.063	0.087	-0.037	0.183	0.587
Leading indicators	0.123	0.064	-0.080	0.156	0.763
New home sales	-0.078	-0.017	-0.115	0.063	0.433
Nonfarm payrolls	-0.101	-0.185	-0.279	0.013	0.477
Retail sales ex. autos	0.226	0.343	0.106	0.536	0.675
Unemployment rate	-0.190	-0.128	-0.224	0.006	1.076
2009-2014					
	beta (10^2)				
Constant	0.025	0.050	0.023	0.072	0.121
Capacity utilization	-0.176	-0.209	-0.346	0.005	0.895
Consumer confidence	-0.065	0.038	-0.080	0.148	0.714
Inflation	-0.022	0.112	-0.089	0.244	0.857
GDP (advance)	-0.835	-0.743	-1.100	-0.132	1.125
ISM manufacturing	-0.030	0.228	-0.026	0.354	0.923
Leading indicators	0.089	0.029	-0.114	0.124	1.080
New home sales	0.131	0.320	0.071	0.445	1.145
Nonfarm payrolls	0.256	0.441	0.090	0.716	1.318
Retail sales ex. autos	0.611	0.809	0.215	1.099	0.987
Unemployment rate	-0.259	-0.174	-0.308	-0.033	0.928

Panel B: UK

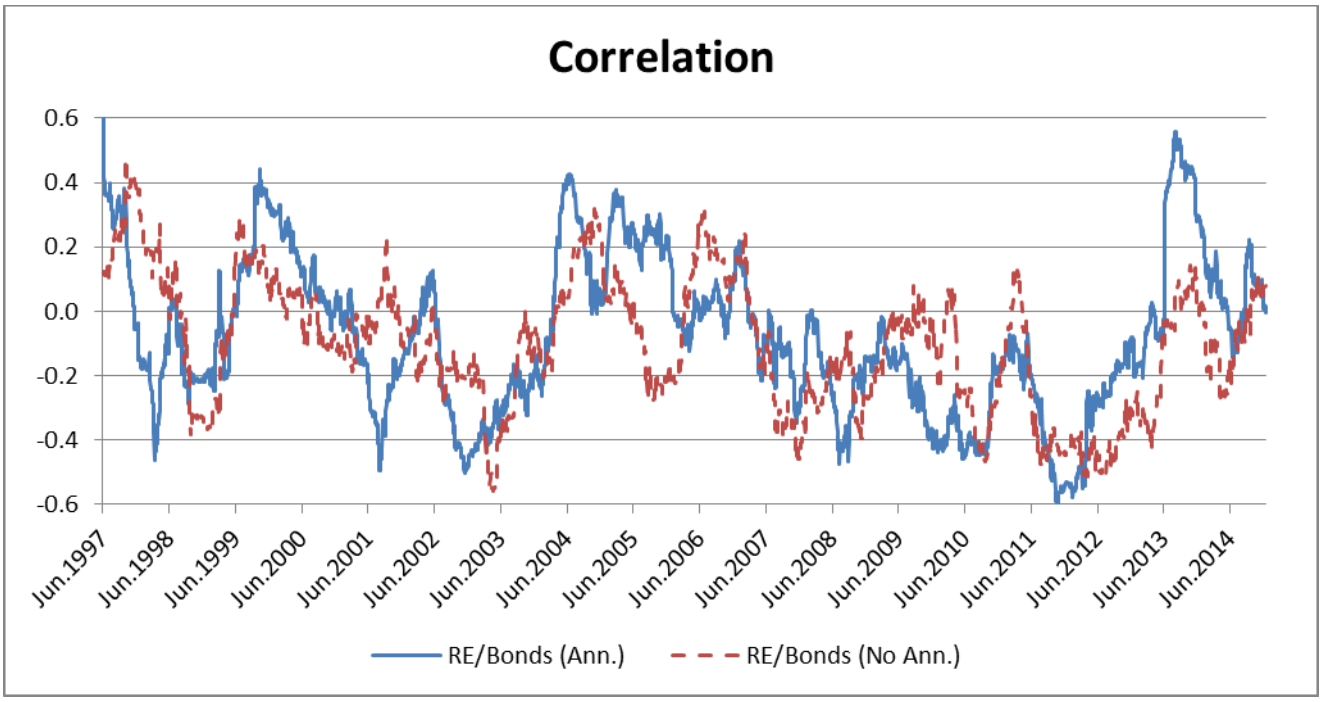
2005-2014	Mean	Median	25% Quantile	75% Quantile	Std. dev.
	beta (10^2)				
Constant	-0.008	0.004	-0.021	0.024	0.061
Consumer confidence	0.041	0.048	-0.108	0.165	0.207
Inflation	-0.116	-0.106	-0.308	0.051	0.279
GDP (advance)	0.487	0.479	0.061	0.817	0.543
New home sales	0.281	0.197	0.001	0.623	0.512
Retail sales	-0.026	-0.019	-0.107	0.073	0.239
Unemployment rate	0.118	0.016	-0.025	0.215	0.296
2005-2008					
	beta (10^2)				
Constant	-0.097	-0.094	-0.128	-0.045	0.110
Consumer confidence	-0.072	-0.084	-0.282	0.139	0.418
Inflation	0.058	0.005	-0.166	0.257	0.452
GDP (advance)	2.098	1.832	0.171	2.852	2.618
New home sales	0.391	0.238	0.011	0.684	0.559
Retail sales	-0.197	-0.142	-0.468	0.015	0.415
Unemployment rate	-1.525	-1.524	-3.021	0.164	2.953
2009-2014					
	beta (10^2)				
Constant	0.030	0.039	0.016	0.079	0.074
Consumer confidence	0.089	0.111	-0.019	0.221	0.264
Inflation	-0.207	-0.157	-0.361	-0.006	0.421
GDP (advance)	0.171	0.178	-0.152	0.598	0.592
New home sales	0.181	0.134	-0.031	0.505	0.639
Retail sales	0.039	0.014	-0.060	0.187	0.294
Unemployment rate	0.124	0.011	-0.018	0.227	0.300

Figure 1

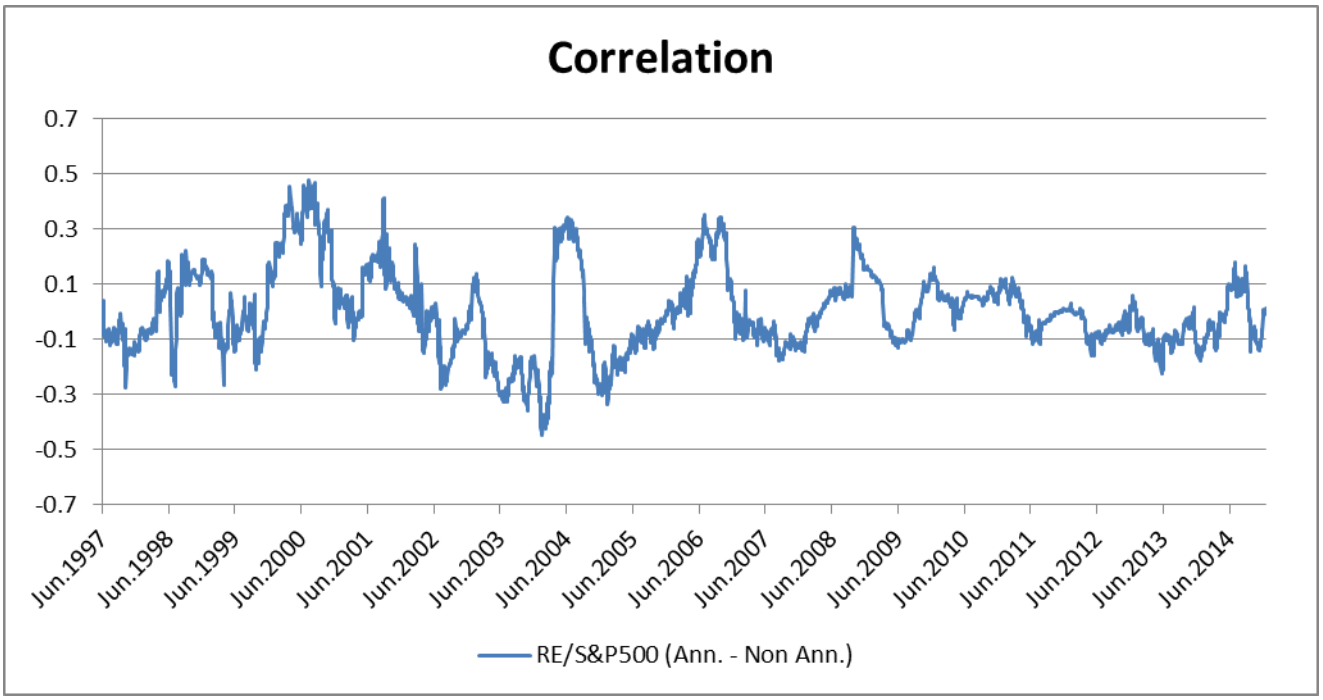
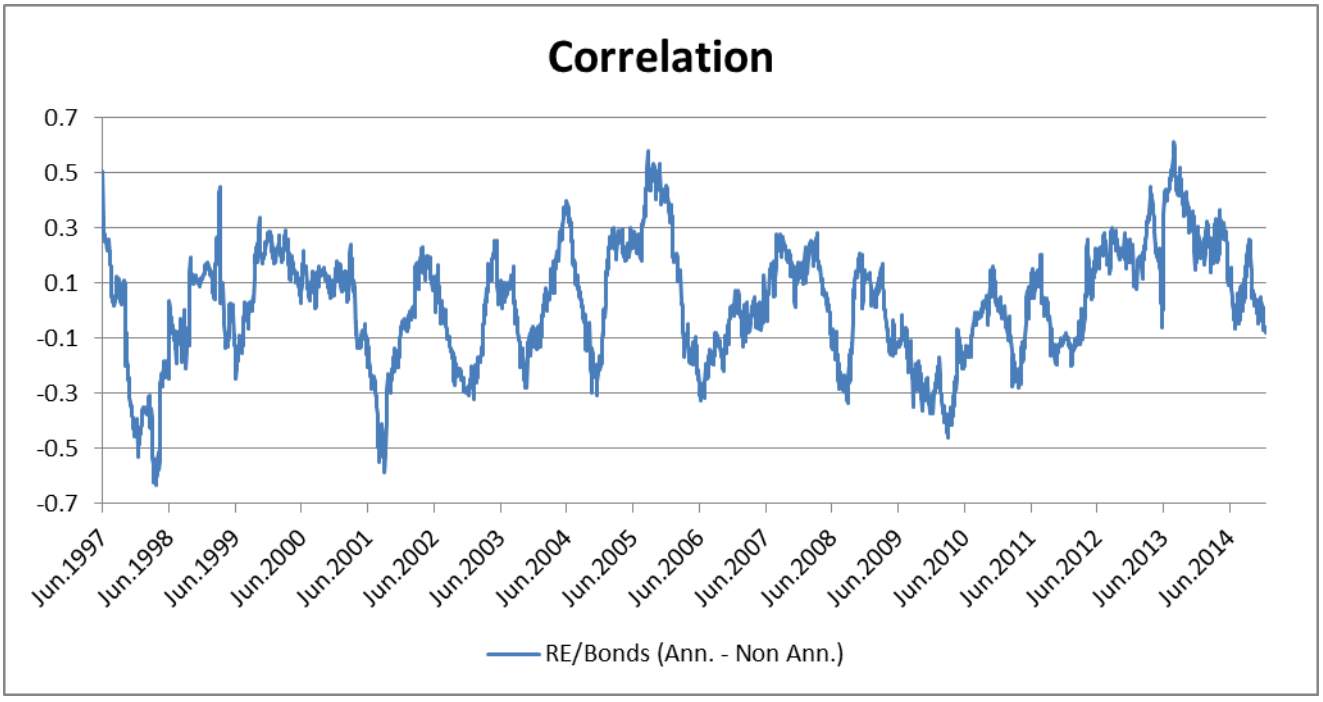
Panel A:



Panel B:



Panel C:



Panel D: