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Australian Real Estate Stock Reactions to FIRB Regulation Changes

SUBMITTED TO

Professor David Bjerk

BY

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for

SENIOR THESIS

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Abstract

This study analyzes the share price reactions of real estate development and building/construction materials corporations in relation to FIRB rule changes. It appears companies as a whole were indifferent to the rule changes; however individual securities returns were wildly different. These findings suggest that the FIRB rule changes had a mixed effect on different corporations possibly based on their exposure to the Australian real estate market.

Acknowledgments

First and foremost, I would like to thank my parents. We may have not agreed on things throughout my life, but I know you guys always had my best interest and heart. Your support has made all of this possible.

I would also like to thank Professor Bjerk on agreeing to be my reader, despite not having any experience in my field of study. A special thanks to Professor Burdekin, without your advice this thesis would not be possible. Your guidance helped me overcome many of the obstacles I faced throughout the writing process.

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Table of Contents

Acknowledgments

Abstract

I. Introduction……..1

II. Background……..5

a. FIRB…….....5

b. Australian-Chinese Economic Relations…….7

III. Empirical Approach…….8

a. Testing for Short-Term Returns……...9

b. Testing for Long-Term Returns…….11

IV. Data……13

V. Results……15

a. Testing for Short-Term Returns…….15

b. Testing for Long-Term Returns…….20

VI. Conclusion…….21

References……..23

Figures and Tables…….27

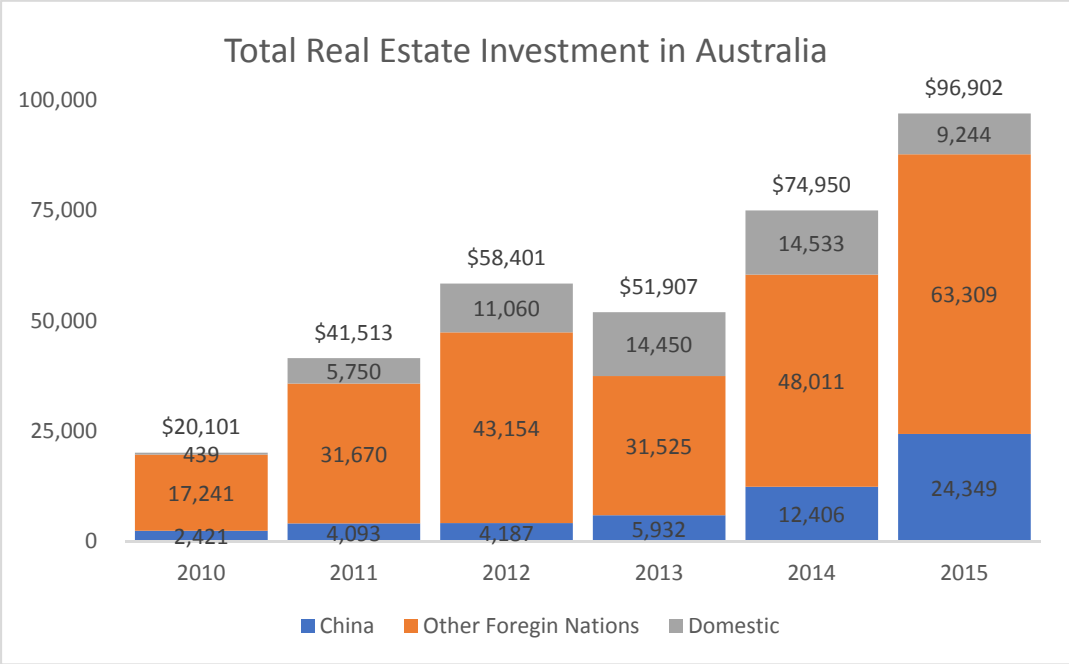
Appendix……37

I. Introduction

During the past few years, there has been a growing concern about the affordability of housing in Australia. From 2011 to 2016, Australian property prices have grown by 35%, Sydney by 57.3% and Melbourne by 50.7% (Australian Bureau of Statistics 2016), and are often cited as the least affordable in the world (Demographia 2016). Popular Australian media have portrayed the growing number of foreign real estate investors as the primary reason for the growth in real estate prices (Wong 2017). These claims are not baseless; diagram 1 shows Chinese investment has grown from 4 billion Australian dollars in 2011 to 24.35 billion in 2015. Specifically, Chinese investment has increased from 10% of total real estate investment to 25.1% in the same timeframe. Additionally, per a study by the National Australian Bank, at its peak, foreign buyers accounted for 15.7% of new home purchases in the third quarter of 2015 and 9% of total demand for established properties (NAB 2016). These numbers do not include all the illegal and alternative methods available to overseas investors, underestimating the figures above. These facts appear to present a correlation between the growth in housing prices and the increase in foreign investment, especially in Melbourne and Sydney, which are home to four-fifths of all foreign investment (Gauder Houssard & Orsmond 2014).

Diagram 1

(In Millions)



Source: FIRB

However, Chinese investment is not the only cause of Australia's rapid growth in housing prices. First, many Australian cities face major supply constraints that boost prices. Most Australian cities are built along the coast and along mountain ranges, which restricts the construction of new housing units outward (Richards 2008). Along with geographic constraints to supply, the country has installed policies to limit the outward expansion of cities to curtail 'urban sprawl,' resulting in boosted prices. In Australian cities, zoning laws have contributed to inflating housing prices by prescribing certain tracts of land to be high or low (Kulish, Richards and Gillitzer 2012).

On the demand side, in the 1970's, Australian housing markets were heavily regulated. In the mid-1980s, there was a decision to deregulate the housing market ultimately causing interest rates to lower in the 1990s. The deregulated housing market and the low-interest rate environment have been some of the many factors behind the

increase in domestic Australian housing demand (Stapledon 2016). Accompanied by the low-interest rates and deregulation, Australia is currently experiencing a migration shift in its largest cities, boosting major city prices. Structural changes in the economy have moved away from labor-intensive industrial production towards a centrally located knowledge-based economy, where the migration is centralized. The changes in the economommy has created a migration shift from the urban fringe towards the cities (Yates 2016).

While most Australians place the blame on Chinese buyers, the legislative framework has modeled the public's concerns by attempting to curtail foreign investment to keep Australian housing prices lower and push out housing supply. Under Australian laws, foreign nationals are not allowed to purchase existing dwellings, but rather they must purchase new dwellings (FIRB Factsheet 2015). With Chinese money still looking to go abroad to Australia, many residential housing builders have built housing specifically for Chinese buyers (Wong 2017). The restraints on spending has created a dichotomy between not only the prices of new dwellings and existing dwellings but also the purchasers of these homes. Foreign nationals often purchase homes above the average home price, whereas first-time domestic homebuyers bought homes below the average home price (Gauder Houssard & Orsmond 2014). Thanks to the pre-existing legislative framework, this may have pushed out the supply of housing, benefiting Australian citizens.

The legislative framework for foreign investment relies on on, what sets Australia apart from other countries, a government body called the Foreign Investment Review

Board, otherwise known as the FIRB. The FIRB's role is to review foreign investments and prevent any investment that may be against Australia's national interest (FIRB About 2017). The FIRB evaluates investments in business acquisitions, agribusiness, media business, commercial and agricultural land, mining tenements, and most importantly, for the purposes of this study, real estate. The FIRB changes, mentioned above, were announced on Saturday, May 2, 2015, by Prime Minister Tony Abbott and Treasurer Joe Hockey while making a joint announcement confirming a raft of changes to the foreign investments rules that would be implemented on December 1st, 2015. The changes implemented focused on tightening foreign investment rules already in place. The new changes included streamlining the process for finding violators by putting detection under one agency, the Australian Tax Office, and increasing fines and jail time for violators. More importantly, the new rules implemented fees for new foreign investment applications. These fees can range from AUD$5,000 to AUD$100,000, depending on the value of the property (McCullough Robertson 2015).

Overall, with the legislative framework, Australian housing prices have experienced a dramatic increase during the past decade due to numerous factors. Endogenous factors include the lack of brownfield and greenfield development areas in Melbourne and Sydney. The lack of readily available land to develop can lead to a supply constraint pushing prices up. Exogenously, clear increase in investment abroad, especially from Chinese nationals, has pushed demand out as well. These developments mirror other English-speaking countries such as the United States, the United Kingdom, and Canada, specifically, in such cities as Palo Alto, Los Angeles, New York, London, and Vancouver. The major difference between other major English speaking developed

nations and Australia is the FIRB and the legislative framework that it enforces. This study will explore the effect of the new FIRB regulatory framework on the Australian real estate market through an event study of Australian public equities.

II. Background

II(a) FIRB

Australia's Foreign Investment Review Board, otherwise known as the FIRB, is a non-statutory body established in 1976 to advise the Treasurer and the Government on Australia's Foreign Investment Policy and its administration. Their role is to review foreign investments and prevent any investment that may be against Australia's national interest (FIRB About). The FIRB will evaluate investments in business acquisitions, agribusiness, media business, commercial and agricultural land, mining tenements, and most importantly for the purposes of this study, real estate. Under the FIRB's legislative framework, a foreign national can only purchase new dwellings, and can only buy an established dwelling under special circumstances. The purpose behind Australia's legislative framework is to channel foreign investments into new dwellings to create additional jobs in the construction industry, increase government revenues from stamp duties and other taxes, and increase Australia's housing supply (FIRB About).

Individual foreign investment in real estate has been on the FIRB's agenda since the 1980s. Initially, in 1976, the FIRB did not consider real estate acquisitions by foreigners. However, by 1982, purchases of real estate by foreign nationals came under the FIRB's authority. Through the 1960's and 1970's, Australia experienced its most restrictive environment for business development. The Australian government has

recognized a 30 percent decline in capital productivity during that period due to the restrictive nature of the regulatory environment. The restrictive setting was due to a wave of economic nationalism that perceived foreign investment as a loss of sovereignty and foreign acquisitions to mean a loss of jobs (Foreign Investment Policy in Australia). The Australian government recognized these flaws in their self-harmful legislative framework and sought to liberalize the system to encourage foreign investment. For example, in 1999 'Advanced-off-the-plan certificates' were introduced, which allowed developers to pre-approve the sale of up to 50 percent of development to foreign investors. In 2008, temporary residents no longer needed FIRB approval to purchase real estate. However, by 2009, sections of the housing industry were reporting increasing real estate prices (Rogers Lee & Yan 2015). In result, following in 2010, the rising concerns of housing affordability and the anti-foreign investment rhetoric in Australian media led to re-tightening of restrictions (Wong 2017).

The most recent legislation was announced in 2015 and was enforced at the beginning of 2016 under the *Foreign Acquisitions and Takeovers Regulation 2015* and the *Foreign Acquisitions and Takeovers Fees Imposition Regulation 2015*. The new legislation had three parts. One was to streamline the process for finding and prosecuting violators of existing FIRB rules by putting all relevant information under one organization, the Australian Tax Office. The second was to increase the penalties and fines for violators, including jail time. The third was to impose an application fee for foreign investors from A$5,000 to A$100,000. The new regulation also imposed a cap on the amount an individual foreigner can purchase interests in "advanced off the plan" developments to A$3 million, down from A$5 million.

II(b) Chinese Australian Economic Relations

Australia has been one of the many beneficiaries of China's economic growth. Since 2009, China has become an increasingly important trade partner for Australia. In 2013 to 2014, China accounted for roughly one-third of all export dollars in the fiscal year and accounted for eighty percent export of dollar growth during the same period (Australian Trade Commission 2015). In result, in December 2015, the Australian and Chinese government announced the China-Australia Free Trade Agreement, CHAFTA. CHAFTA eliminated customs duties, incorporated non-tariff measures, and introduced many other policies to encourage trade between the two nations (CHAFTA 2015). China's increased role in Australia's export market along with CHAFTA have made Australia more vulnerable to fluctuations in the Chinese market.

The link between shocks in the Chinese economy and the Australian economy has been shown at the macroeconomic level. It has been shown that shocks to Chinese M2 have significance effects on the Australian economy (Burdekin & Tao 2016). For instance, Australia avoided a technical recession because of China's two-year fiscal stimulus in the wake of the 2008 financial crisis, and the ensuing slowdown in world trade. China accelerated already existing infrastructure plans and built up a strategic stockpile of raw materials. China's increase demand for raw materials led to a boom for Australian GDP, and without the increased stimulus, Australia would have experienced three straight quarters of negative growth in real GDP (Day 2011).

As the link between the Chinese and Australian grew stronger, so has Chinese immigration to Australia. For instance, more and more Chinese students are flocking to

Australian universities. In 2016, 196,315 Chinese students attended Australian undergraduate and graduate institutions, representing approximately 27% of the international population in Australia (Australian Government 2017). Chinese tourism has experienced a similar trend. Chinese visitors increased from 100,000 in the year 2000 to one million in January 2016, with an average annual growth rate of 18 percent since 2010. Chinese visitors spent A$ 1.5 billion in 2015 and spent A$7.7 billion in 2015. The increase in Chinese tourism is not by accident. Australian tourism executives aggressively target Chinese tourists through marketing, distribution, and partnership strategies (Tourism Australia 2016). China's growing economic ties are some of the many reasons why Chinese nationals have increased their investment in Australian real estate. (Rogers & Co 2015)

III. Empirical Approach:

The goal of this analysis is to test if the announcement of FIRB rule changes affected the stock performance of relevant real estate development and building/construction materials companies. To accomplish this, I utilize two empirical processes, an event study, and an OLS regression, to determine if the rule changes affected short-term and long-term returns.

I reason increased restrictions on foreign direct investment in real estate will decrease construction activity in Australia. Such decreased construction activity would hurt the top and bottom line growth for all real estate development and construction/building material companies. Therefore, I hypothesize there will be a negative spike in stock price returns for all Australian companies that have high

exposure to the real estate market relative to normal market returns, or negative long-term returns relative to normal market returns.

Method (A) Testing for Short-Term Effects on Returns

To test for short-term effects on Australian real estate development and building/construction materials companies, I use an event study. An event study aims to examine the impact of positive and negative news on investor reactions in the stock market. Brown and Warner (1984) find event study results are consistent across altered conditions like smaller samples and longer event periods. The efficient market hypothesis states that at any given time and in a liquid market, security prices fully reflect all available information (Morning Star 2017). Using the efficient market hypothesis, the stock market is efficient enough to determine the impact of the FIRB rules changes in relation to relevant corporations' future earnings.

Specifically, in this thesis, an index of real estate development and building/construction materials companies share price reactions in response to the FIRB rule change was assessed. These reactions are measured through calculating the abnormal returns relative to the Australian stock market while controlling for lagged effects. In this study, to perform the regression for the distributed lag model, I need to consider relevant construction companies and an index that reflect normal equity performance in Australia. The index I use for market returns will be the All Ordinaries Index. The All Ordinaries Index is the oldest index of shares in Australia and is made of the 500 largest companies listed on the Australian Securities Exchange (S&P 2017). In my regressions, I use two separately made indices that weight each stock by market cap

within the index. The two indices are a compilation of representative Australian real estate development and building/construction materials companies. One index contains the seven largest equities by market capitalization in the sector, and the other index contains all relevant public companies. I reason that companies of different size have different exposure to foreign direct investment, and the FIRB rule has different effects on corporate profits.

This event study is performed through STATA in reference to Kim (2015). The event dates assessed on May 2nd, 2015, the date of the rule change announcement. The event window is the minimum number of observations before and after the event date and the estimation window is the minimum number of observations before the event window. In this thesis, event windows of ±1 and ±2 days and estimation windows of 15, 30, and 45 days were applied to the two indices to assess the immediate share price responses.

Before the abnormal returns analysis, it is necessary to estimate the normal performance of the indices' share price, which is completed through using a market model that assumes a linear relationship between the daily returns of the index and the All Ordinaries index. The equation is as follows:

$$R_{ft} = \alpha_f + \beta_f R_{mkt} + e_{ft}$$

Where R_{ft} is the daily return of the real estate development and construction materials index at time t, α_f is the intercept, β_f is the coefficient of R_{mkt} which is the daily return of the All Ordinary index, and e_{ft} is the error for the construction equity index.

Thus, the dependent variable in this model is the daily return of the index and the independent variable is the daily return of the All Ordinaries index. The normal

benchmark performance is the return around the event window that would have followed in the absence of any shift.

After estimating normal performance, abnormal returns are calculated by simply subtracting the predicted normal return from the actual return for the dates within the event window. The equation is as follows:

$$AR_{ft} = R_{ft} - \hat{\alpha}f - \hat{\beta}_f R_{mkt}$$

Then cumulative abnormal returns were computed by adding all the abnormal returns for the index. Under the null hypothesis in which the event's effects are insignificant, the abnormal return should normally be determined with a zero conditional mean and conditional variance. The significance of the abnormal returns is calculated by dividing the cumulative abnormal return ΣAR_{ft} by the standard deviation of AR_{ft}. The statistical significance was determined at the 90%, 95%, and at the 99% level which corresponds to absolute statistical values of 1.64, 1.96, and 2.58.

<u>Method (B) Testing for Long-Term Effects on Returns</u>

The event study method above looks at short-term changes in stock prices to see the market reaction to different incidents. In this case, it is possible that the market does not react rapidly to the information. Rather, the effect of a new policy or law can be spread out over time. When looking at figures 1 through 10, there is a dip in stock price for both indices and the individual securities examined in methodology 1. The dip in stock price may be due to the lag in response of the stock market. I reason that the existence of the longstanding FIRB and the pre-existing rules will not make investor sentiment change. Only the new regulations could affect overall corporate earnings.

Even, if the new FIRB rules did affect corporate earnings, then it's effect could emerge gradually over time, rather than immediately. To account for this possibility, I will employ an ordinary least squares multivariate regression to determine whether an association exists between the returns of a composite of real estate development companies and the announcement and enforcement of new FIRB rule changes, when controlling for returns of the overall Australian stock market returns. I regress four separate indices that were used in the event study against the corresponding lag dependent variables. Two of the four indices were re-used from method 1, and the other indices were the first two indices removing Lend Lease Group, the largest real estate development company in Australia. I remove Lend Lease Group because its size may bias the results, as its returns will be weighted more than all other companies. The lags are determined using the likelihood ratio test. I use the likelihood ratio test because it is the most forgiving methodology for determining lags. I then use the All Ordinaries Index as the proxy for normal market returns to see test if the effect of the new FIRB regulations affected the market over time rather than in the window.

Using the methodology above and the simple Ordinary Least Squares regression, the following econometric model is specified as:

$$\textit{Index Returns}_{i,t} = \beta_1 \textit{ All Ordinaries}_{i,t} + \beta_2 \textit{ Index returns}_{i,t-1} + \ldots + \beta_n \textit{ Index returns}_{i,t-n} + D_n + \varepsilon_{i,t}$$

Where *Index returns* represent the daily return of the composite of publicly traded Australian real estate development companies, *All Ordinaries* represents the daily return of the All Ordinaries Index, i.e., the daily return of the Australian stock market and the

lags represent the lag dependent variables determined by the likelihood ratio test. For the dummy, I use it to account for any changes in return to the indices relative to the All Ordinaries Index. I use three different regressions to run the dummy variable. One dummy variable is "turned on" day of the announcement. I refer to this dummy as dummy 1. The next regression, the dummy is "turned on" for a three-day "window", the day before the announcement, the day of the announcement, and the day after the announcement. I refer to this dummy as dummy 2. In the last regression, the dummy is "turned on" for perpetuity after the announcement. In the regression, I refer to this dummy as dummy 3.

Since the FIRB rule changes not only include changes in foreign direct investment in real estate but also in investment in other parts of the economy, it is possible that the new rule changes will depress the entire market and not just the real estate sector. To account for this, I will also run an OLS regression of the All Ordinaries index regressed upon lags of its returns and the same dummy variables for the regressions mentioned above. This regression will test if there is any effect on the market as a whole from the aforementioned rule changes.

IV. Data

The daily returns of the four separate indices were all drawn from Capital IQ as daily returns weighted by their market capitalization. The two event dates were assigned based on the announcement of the event and the date that it had announced that the rules were to be enforced.

The two indices will be referred to as Index 1 and Index 2. In Index 1, the public companies I include are Boral Limited (BLD), Stockland Corporation (SGP), LendLease Group (LLC), CSR Limited (CSR), Mirvac Group (MGR), Adelaide Birghton (ABC), Sunland Group (SDG), and Villa World (ltd). These equity companies are picked from a list of the top residential homebuilders in Australia (Resolute Equipment 2016) and a list of the top building and construction material companies in Australia (Barron's 2017) Index 2 is comprised of 14 different companies; the companies mentioned above and AVJennings Limited (AVJ), Axiom Properties Limited (AXI), Brickworks Limited (BKW), Cedar Woods Properties Limited (CWP), Devine Limited (DVN), Finbar Group Limited (FRI), and Velocity Property Group Limited (VP7). These additional companies are found using a Capital IQ screen. The criteria for the company are as follows; they must be public companies, their primary source of revenue is through real estate development or supplying construction materials, must be geographically based in Australia, and must be listed on the ASX (Australian Stock Exchange).

Lend Lease Group (LLC), Sunland Group Limited (SDG), and Villa World Limited (VLW) were specifically chosen because they were the three largest public real estate development firms based on market capitalization in Australia. I exclude two larger companies than SDG and VLW, Peet Limited (PPC) and Aveo Group (AOG). These two companies are intentionally excluded because their main focus is the development of retirement communities, and since this study's focuses on residential real estate, they were not seen as relevant companies for this analysis. Finally, BLD was added because it was one of the largest building and construction material businesses in Australia, and therefore would also be affected by a drop in construction activity.

Only selecting publicly traded firms limits the scope of the study. A 2016 study of the top 10 construction firms by the value of contracts, the study included many construction companies that are private and therefore cannot be included in the survey (Resolute Equipment 2016). The limit on a number of companies that can be included in this study leads to a restrained sample size. Although not possible, the study would be greatly enhanced if data on the value of private firms was available.

The event date for the indices to be regressed upon is May 4th, 2015. The new rule changes were announced on May 2nd, 2015 (Vendor Finance 2015). I select May 4th, because May 2nd was a Saturday, and the first day Australian market could react to the news would be the next closest trading day.

The regressions for method two are based on May 4th, 2015, for reasons mentioned above, and December 1st, 2015. December 1st, 2015 is the date in which the FIRB announced the new regulations were to be enforced (Vendor Finance 2015).

V. Results

Method (A) Testing for Short Term Effect on Returns

Tables 1.1 through 3.2 display my findings. The left-hand side of each table displays which iteration of the model is run. An event date set at plus or minus one or two days with either an event window of 15, 30, or 45 days creates six possible iterations per index or stock. On the right-hand side are two columns, one of which is cumulat~n, which stands for the cumulative abnormal return relative to the All Ordinaries Index. If cumulat~n is positive, that means the index or stock had a positive abnormal return

relative to the All Ordinaries Index, and if the value is negative, the index or stock had a negative abnormal return. The next column contains the t test. A t-test assesses whether the means of two groups are statistically different from each other. The statistical significance was determined at the 90%, 95%, and at the 99% level which corresponds to absolute statistical values of 1.64, 1.96, and 2.58.

Table 1.1 presents the findings for the six different iterations for my first basket of stocks, which I refer to as index 1. Of the six, only one iteration produces significant results at the 90% significance level, the 15-day estimation window set at plus or minus two days. However, the significance is lost at the 30 and 45 window. The iteration produces a positive result, which goes against my hypothesis. The positive return means the market reacted positively to the FIRB rule changes.

Table 1.2 also presents the findings for index 2's returns. The reaction for index 2's return to the announcement of the FIRB rule change is assessed. As can be seen in table 1.2, none of the iterations produced significant effects.

The findings of table 1.1 and 1.2 together suggest little to no correlation between the change in the FIRB rules and the stock price performance of real estate development and building material companies in Australia. Although there may have been a positive effect on raw returns, the connection is weak at best. However, when the analysis was decomposed into individual stock returns, results varied.

Table 2.1 shows the results for Lend Lease Group. As can be seen in Table 2.1 there are positive results at the 99% significant level for both event windows and at every estimation window except for plus or minus one day, 30-day window, where it is at the

95% significance level. These results suggest a positive and significant effect of the FIRB rule changes on the returns of the company. The results of Table 2.1 go against my hypothesis, as results are positively significant. These results suggest that the investor sentiment believed that the resulting rule changes would help the corporate profits of the company.

However, when looking at other individual securities in tables 2.2, 2.3, and 2.4, results are in line with my hypothesis. There is a negatively significant return at the 99% significance window for Sunland Group (SGP) when the estimation windows are set at plus or minus one day. Returns are negatively significant at the 99% significance for every iteration except for the 45-day estimation window, where it is significant at the 95% significance level. Results for Villa World Limited (VLW) are statistically significant only when set at plus or minus one day. In the 15-day estimation window, it is significant at the 99% significance level and was significant at the 95% significance level in the 30 and 45 day-estimation levels. However, when set at plus or minus one day, results were insignificant. For Boral Limited (BLD), every iteration is negatively significant when set at both plus or minus one and two days at the 99% significance level. These results produce a clear negative boost on stock performance in relation to the All Ordinaries index.

When looking at Mirvac Group (MRG), iterations are mixed but insignificant. When looking at the plus or minus one-day event window, all iterations are positive and insignificant. When the event window is widened to plus or minus two-day event window, iterations remained insignificant, however, were now negative. As the most

diversified company in my group, the results make sense that returns are insignificant from the rest of the group.

After running the analysis on different individual public equities, I determine that it is possible that the Lend Lease Group is simply an outlier. The Lend Lease Group is the largest construction company by market capitalization. It also secures substantially more building contracts than any other group in Australia. In 2015 alone, the Lend Lease group secured A$4.9 billion in construction contracts, nearly double its next closest competitor, who secured A$2.85 billion (Resolute Equipment 2016). Lend Lease Group's size comes with it geographic diversity, and it is projects in America, which may have protected it in the eyes of investors from potential decreases in spending from Chinese nationals in Australia (Lend Lease Group 2017). Regardless of the possible reasons for Lend Lease Group's positive returns and significance, its size causes it to have a high weight in the indices, and therefore could be biasing the results upward. As a result, I remove Lend Lease Group from the two indices and re-ran the event window. As can be seen in Table 3.1 and 3.2, without Lend Lease Group in the study, all results are still positive but results remained insignificant at every iteration and additionally, the 15-day estimation window set at plus or minus two days lost its significance.

For each security, returns could be wildly different from the returns of the All Ordinaries index. However, once brought together as a whole, the returns of the real estate development and building materials companies became more in line with the index. The results could be interpreted in several different ways. One possible explanation is investor sentiment did not change due to the announcement of regulations.

They believed that the regulations would not affect total construction activity because either foreign direct investment from Chinese nationals was not large enough to affect the construction activity or the regulations were not robust enough to stem the tide of investment. Therefore, the vast changes in the different individual securities are a result of happenstance changes in microeconomic factors unrelated to the FIRB. As a result, when evaluated as a whole, the returns of the entire sector fall in line with the returns of the rest of the Australian equities market.

Another reason could be the changes in the FIRB affected individual securities differently. The individual securities selected are not a representative sample, as shown by the fact that I did not run a regression with each individual security in my index. However, the companies that have significant results have different profiles. For instance, Villa World Limited has a market capitalization around A$220 million, and Sunland Group Limited has a market capitalization around A$200 million, whereas Lend Lease Group market capitalization of 6.7 billion (Capital IQ 2017). These differences in market capitalizations are due to the amount of construction, geographic diversity, and diversity in different projects. This means the companies have varying abilities to react to changes in rules to foreign direct investment. Each company's individual exposure to Chinese direct investment affects their stock price, and therefore, only companies with high exposure should have their earnings decrease. If only a trivial amount companies have high exposure, once indexed, those changes will be dispersed into normal market returns.

Method (B) Testing for Long-Term Effect on Returns

Tables 4.1 through 5.3 display my results for the OLS regression. Each table displays the results for each index and the All Ordinaries index, the t-statistic, and a p-value. A t-test assesses whether the means of two groups are statistically different from each other and p-value evaluates how well the sample data support the argument that the null hypothesis is true. It measures how compatible my data is with the null hypothesis. A high p-value means I accept the null and a low p-value means I reject the null. My null hypothesis is that the FIRB rule changes were immediately priced in and there is no effect on the market. As one can see in Tables 4.1 through 5.3, after running the OLS regression on the separate indices to see if the FIRB rule changes had any lasting effect on the market, I find no significant results for any of the dummies.

Table 6.1 and 6.2 examine the independent variable of the All Ordinaries Index in each of the regressions. Each table displays the beta, t-stat, and p-value of the All Ordinaries index. Beta value is a measure of how strongly each predictor variable influences the criterion (dependent) variable, one can see the beta for the All Ordinaries Index was typically very high, around .88 to 0.9, and it is always significant at either the 95% or 99% confidence level in all the regression. With a beta, so close to one and with 99% significance, although the real estate development and building materials equity returns were down, the entire Australian equity market was also concurrently falling.

When looking at the All Ordinaries section in tables 4.1 through 5.3, the second regression with all three dummy variables is not significant either. These results say the Australian equity market did not react to either the announcement or the enforcement of

the new FIRB rules. These results tell us that there is no lasting effect of the FIRB rule changes on either the real estate development sector or the Australian equity market.

IV. Conclusion

This thesis aims to determine the share price reactions for the real estate development and building/construction materials sector in Australia based on the rule changes on foreign direct investment. By comparing the returns of a composite of companies and individual securities to the returns of the overall Australian equities market, this study finds that as a group, the Australian real estate development and building/construction materials sector was not affected by the FIRB rule changes. However, as individual securities, share price reactions are negative and significant for many smaller real estate developers and one large building and construction material company. These results are in line with my hypothesis that companies in that sector would face negative reactions. One outlier company is Lend Lease Group, which experienced positive and significant returns in relation to the All Ordinaries market. Lend Lease Group's positive returns go against my hypothesis and further research would be required to identify why their returns are positive. Given more resources, an event study of all different sectors within real estate, such as REITs would be regressed as well. Also, event studies with securities placed into different buckets based on size, geographic presence, diversity, and most importantly exposure to Chinese investment could be made to see what type of real estate development companies were affected more by the rule changes.

The OLS regression of the Australian real estate development companies and construction/building materials companies along with a regression of the All Ordinaries Index against itself result in no significance. Therefore, there is no lasting effect of the FIRB rule changes on the Australian equities markets. This suggests the FIRB rule changes were priced into the Australian securities at the date of the announcement.

Overall, the results offer some support that the FIRB rule changes harmed possibly smaller less diversified real estate development companies, but the overall perception for the sector remained unchanged. The FIRB rule changes were not just isolated to residential real estate and it is possible, because the beta for the All Ordinaries Index is so high, the entire market was affected by the FIRB rule changes and therefore, the market depressed as well, making differentiating the returns of the real estate development sector and the overall equity market indistinguishable.

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Figures and Tables

Table 1.1

Index 1		**Coef cumulat~n**	**t test**
Event Window -1/+1	Estimation Window 15	0.0217	1.3040
Event Window -1/+1	Estimation Window 30	0.0200	1.1845
Event Window -1/+1	Estimation Window 45	0.0234	1.3875
Event Window -2/+2	Estimation Window 15	0.0405	1.6599*
Event Window -2/+2	Estimation Window 30	0.0199	1.0363
Event Window -2/+2	Estimation Window 45	0.0176	0.7789

Table 1.2

Index 2		**Coef cumulat~n**	**t test**
Event Window -1/+1	Estimation Window 15	0.0215	1.2765
Event Window -1/+1	Estimation Window 30	0.0194	1.1427
Event Window -1/+1	Estimation Window 45	0.0229	1.3430
Event Window -2/+2	Estimation Window 15	0.0399	1.6313
Event Window -2/+2	Estimation Window 30	0.0206	0.9113
Event Window -2/+2	Estimation Window 45	0.0176	0.7737

Table 2.1

Lend Lease Group (LLC)		**Coef cumulat~n**	**t test**
Event Window -1/+1	Estimation Window 15	0.0283	2.7448***
Event Window -1/+1	Estimation Window 30	0.0238	2.5163***
Event Window -1/+1	Estimation Window 45	0.0294	3.4381***
Event Window -2/+2	Estimation Window 15	0.0784	4.6417***
Event Window -2/+2	Estimation Window 30	0.0612	4.9512***
Event Window -2/+2	Estimation Window 45	0.0601	7.4276***

Table 2.2

Sunland Group (SDG)		**Coef cumulat~n**	**t test**
Event Window -1/+1	Estimation Window 15	(0.0518)	(12.2241)***
Event Window -1/+1	Estimation Window 30	(0.0232)	(28.3599)***
Event Window -1/+1	Estimation Window 45	(0.0156)	(8.0618)***
Event Window -2/+2	Estimation Window 15	(0.0514)	(2.9004)***
Event Window -2/+2	Estimation Window 30	(0.0487)	(2.7921)***
Event Window -2/+2	Estimation Window 45	(0.0467)	(2.15)**

Table 2.3

Villa World Limited (VLW)		**Coef cumulat~n**	**t test**
Event Window -1/+1	Estimation Window 15	(0.0535)	(2.902)***
Event Window -1/+1	Estimation Window 30	(0.0473)	(2.3706)**
Event Window -1/+1	Estimation Window 45	(0.0477)	(2.4185)**
Event Window -2/+2	Estimation Window 15	(0.0322)	(0.9611)
Event Window -2/+2	Estimation Window 30	(0.0193)	(0.5462)
Event Window -2/+2	Estimation Window 45	(0.0201)	(0.5732)

Table 2.4

Boral Limited (BLD)		**Coef cumulat~n**	**t test**
Event Window -1/+1	Estimation Window 15	(0.0640)	(7.6649)***
Event Window -1/+1	Estimation Window 30	(0.0471)	(4.3927)***
Event Window -1/+1	Estimation Window 45	(0.0407)	(4.9589)***
Event Window -2/+2	Estimation Window 15	(0.0823)	(6.2272)***
Event Window -2/+2	Estimation Window 30	(0.0684)	(7.3946)***
Event Window -2/+2	Estimation Window 45	(0.0436)	(3.1379)***

Table 2.5

Mirvac Group (MGR)		**Coef cumulat~n**	**t test**
Event Window -1/+1	Estimation Window 15	0.0056	0.5912
Event Window -1/+1	Estimation Window 30	0.0058	0.7331
Event Window -1/+1	Estimation Window 45	0.0013	0.1784
Event Window -2/+2	Estimation Window 15	(0.0091)	(1.2002)
Event Window -2/+2	Estimation Window 30	(0.0049)	(0.5505)
Event Window -2/+2	Estimation Window 45	(0.0091)	(1.2002)

Table 3.1

Index1 - LLC		**Coef cumulat~n**	**t test**
Event Window -1/+1	Estimation Window 15	0.0174	1.5199
Event Window -1/+1	Estimation Window 30	0.0152	0.9774
Event Window -1/+1	Estimation Window 45	0.0173	1.1311
Event Window -2/+2	Estimation Window 15	0.0218	1.0219
Event Window -2/+2	Estimation Window 30	0.0040	0.1759
Event Window -2/+2	Estimation Window 45	0.0010	0.0425

Table 3.2

Index2 - LLC		**Coef cumulat~n**	**t test**
Event Window -1/+1	Estimation Window 15	0.0174	1.5062
Event Window -1/+1	Estimation Window 30	0.0147	0.9337
Event Window -1/+1	Estimation Window 45	0.0169	1.1071
Event Window -2/+2	Estimation Window 15	0.0214	0.9413
Event Window -2/+2	Estimation Window 30	0.0039	0.1646
Event Window -2/+2	Estimation Window 45	0.0015	0.0639

Table 4.1

Dummy 1 **May 4th, 2015**

Security/Index	*T-Stat*	*P-Value*
Index 1	(0.66)	0.507
Index 2	(0.62)	0.534
Index 1 - LLC	(0.67)	0.506
Index 2 -LLC	(0.61)	0.540
All Ordinaries	(1.26)	0.210

Table 4.2

Dummy 2 **May 4th, 2015**

Security/Index	*T-Stat*	*P-Value*
Index 1	1.14	0.254
Index 2	1.14	0.255
Index 1 - LLC	0.84	0.404
Index 2 -LLC	0.84	0.401
All Ordinaries	0.35	0.850

Table 4.3

Dummy 3 **May 4th, 2015**

Security/Index	*T-Stat*	*P-Value*
Index 1	0.99	0.324
Index 2	0.96	0.338
Index 1 - LLC	1.17	0.244
Index 2 -LLC	1.13	0.260
All Ordinaries	0.22	0.828

Table 5.1

Dummy 1	**December 1st, 2015**	
Security/Index	*T-Stat*	*P-Value*
Index 1	1.42	0.507
Index 2	1.41	0.161
Index 1 - LLC	1.28	0.202
Index 2 -LLC	1.27	0.206
All Ordinaries	0.68	0.499

Table 5.2

Dummy 2	**December 1st, 2015**	
Security/Index	*T-Stat*	*P-Value*
Index 1	0.90	0.371
Index 2	0.89	0.373
Index 1 - LLC	0.69	0.492
Index 2 -LLC	0.69	0.491
All Ordinaries	0.50	0.619

Table 5.3

Dummy 3	**December 1st, 2015**	
Security/Index	*T-Stat*	*P-Value*
Index 1	1.40	0.164
Index 2	1.36	0.174
Index 1 - LLC	0.21	1.270
Index 2 -LLC	1.23	0.221
All Ordinaries	1.59	0.112

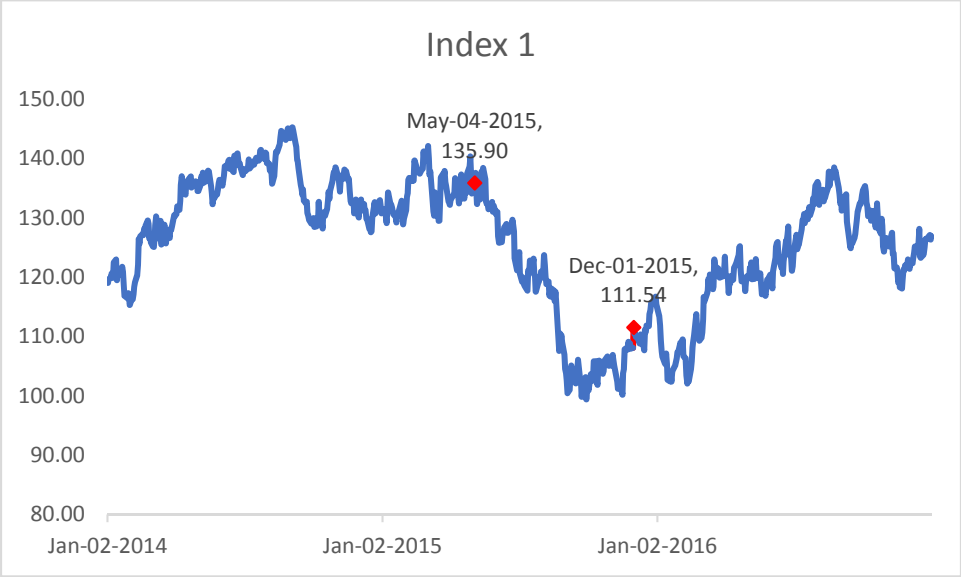
Table 6.1

Significance of All Ordinaries		**May 4th, 2015**	
Index 1	*Beta*	*T-Stat*	*P-Value*
Dummy 1	1.000	16.71	0.000
Dummy 2	1.000	16.71	0.000
Dummy 3	0.998	16.59	0.000
Index 2	*Beta*	*T-Stat*	*P-Value*
Dummy 1	0.978	16.48	0.000
Dummy 2	0.977	16.48	0.000
Dummy 3	0.975	16.37	0.000
Index 1 - LLC	*Beta*	*T-Stat*	*P-Value*
Dummy 1	0.931	14.73	0.000
Dummy 2	0.930	14.70	0.000
Dummy 3	0.928	14.63	0.000
Index 2 -LLC	*Beta*	*T-Stat*	*P-Value*
Dummy 1	0.901	14.51	0.000
Dummy 2	0.901	14.49	0.000
Dummy 3	0.899	14.41	0.000

Table 6.2

Significance of All Ordinaries		**December 1st, 2015**	
Index 1	*Beta*	*T-Stat*	*P-Value*
Dummy 1	0.979	16.58	0.000
Dummy 2	0.986	16.74	0.000
Dummy 3	0.986	16.77	0.000
Index 2	*Beta*	*T-Stat*	*P-Value*
Dummy 1	0.962	16.47	0.000
Dummy 2	0.970	16.64	0.000
Dummy 3	0.968	16.67	0.000
Index 1 - LLC	*Beta*	*T-Stat*	*P-Value*
Dummy 1	0.902	15.07	0.000
Dummy 2	0.908	15.23	0.000
Dummy 3	0.907	15.25	0.000
Index 2 -LLC	*Beta*	*T-Stat*	*P-Value*
Dummy 1	0.882	15.00	0.000
Dummy 2	0.888	15.15	0.000
Dummy 3	0.887	15.17	0.000

Figure 1



Source:Capital IQ

Figure 2

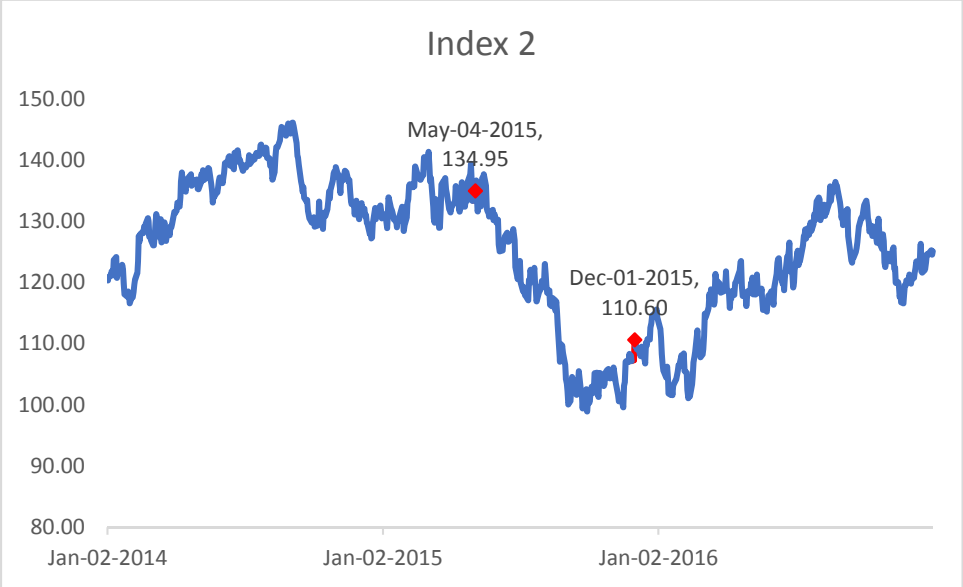


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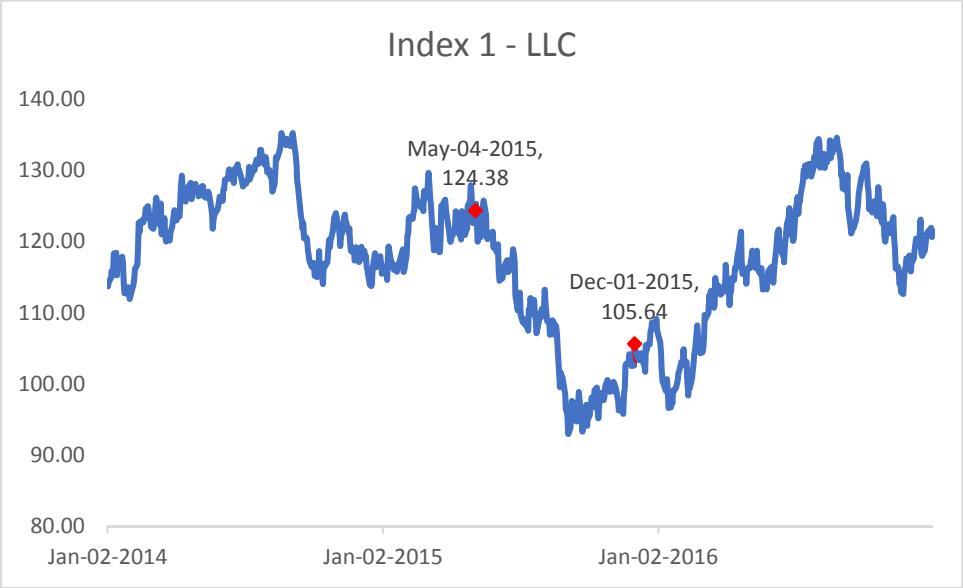
Figure 3



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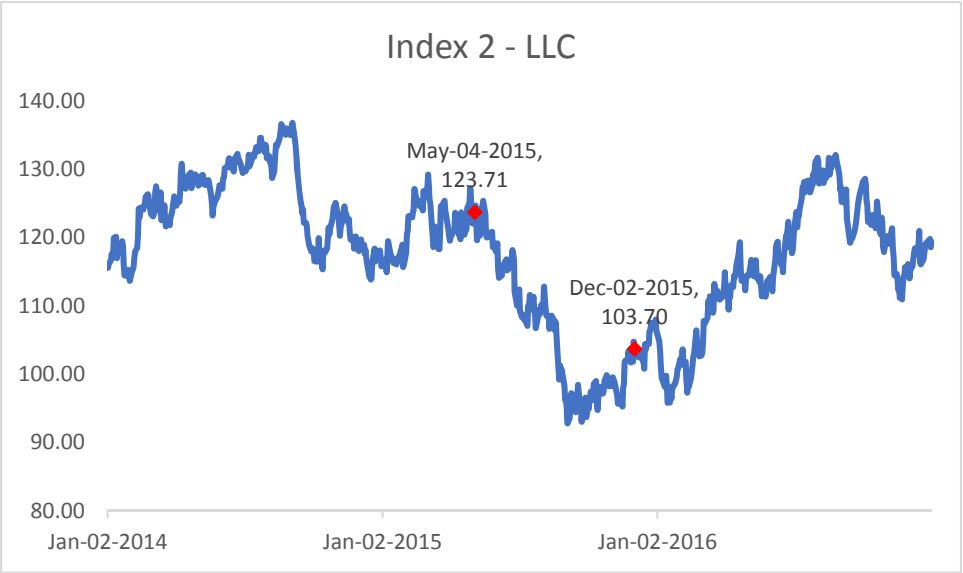

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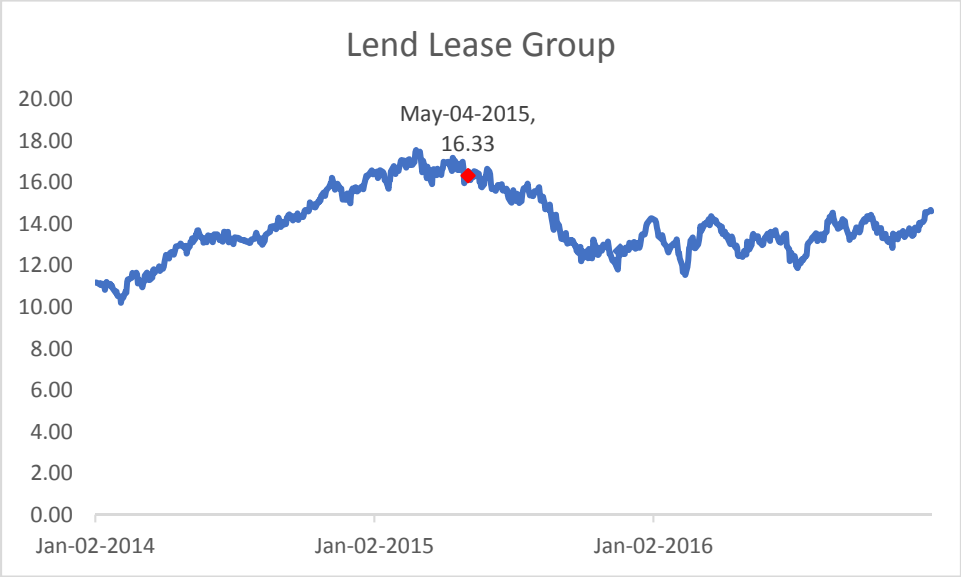

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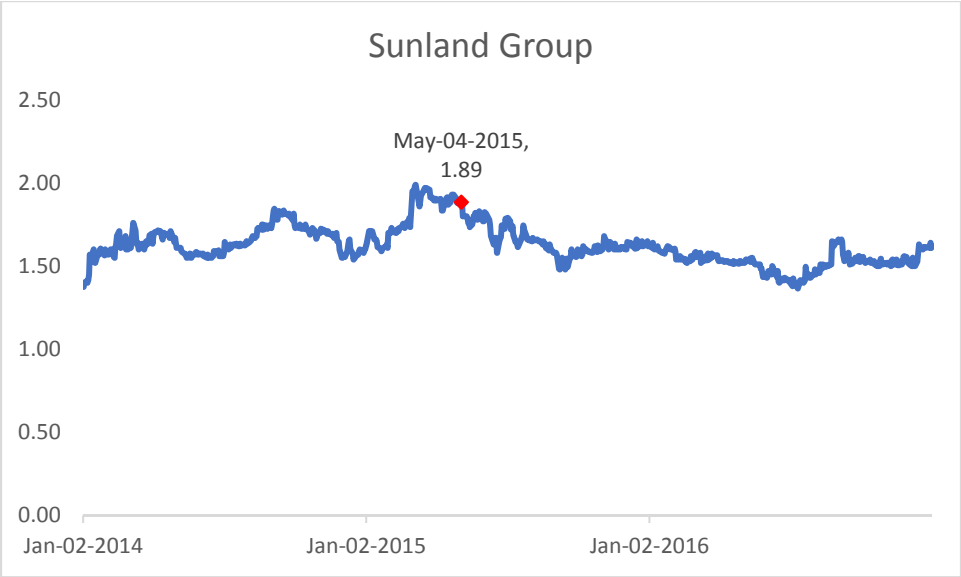

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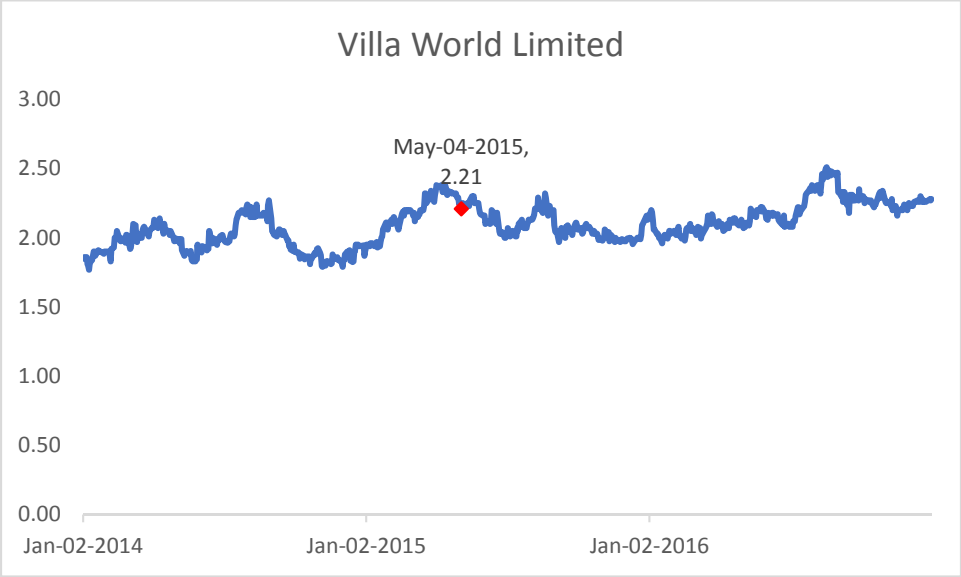

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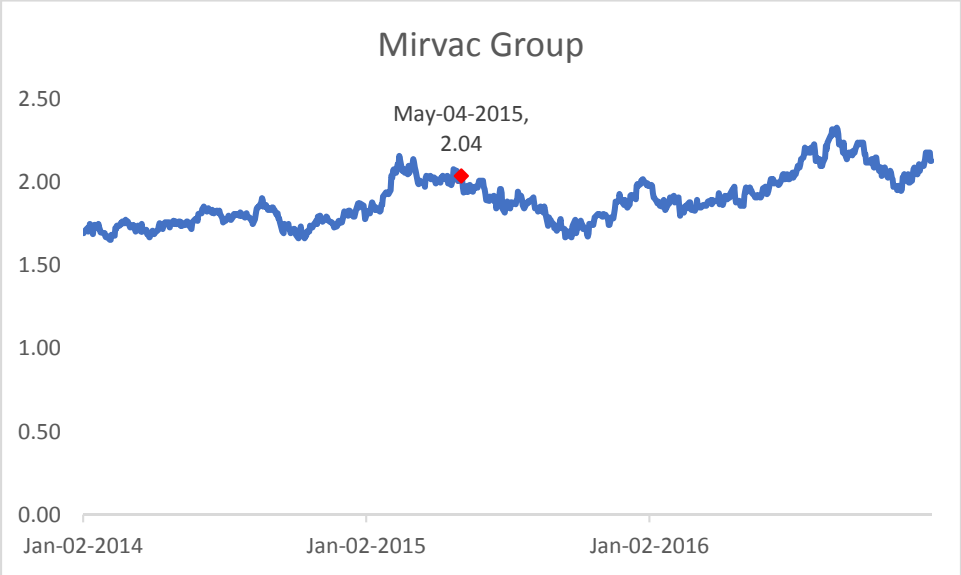

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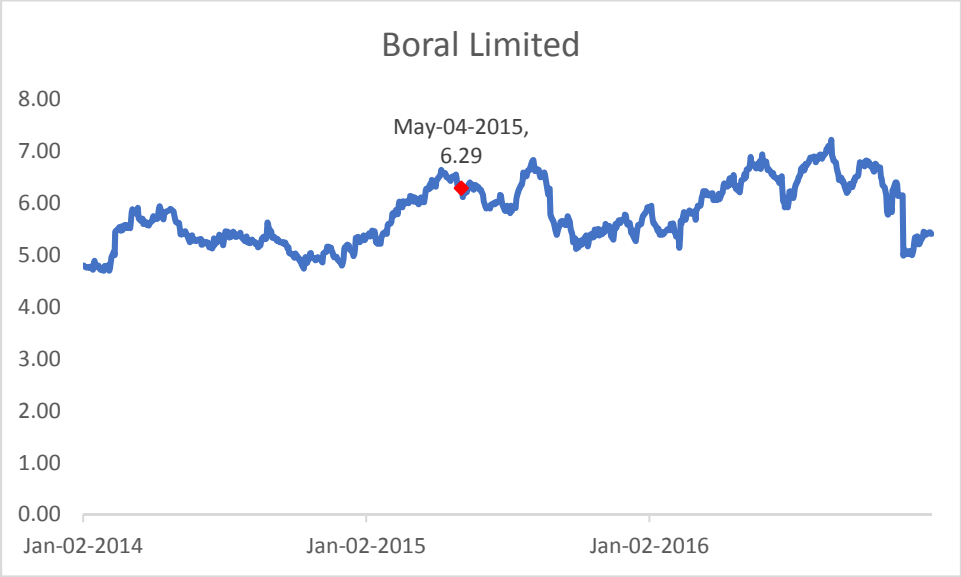

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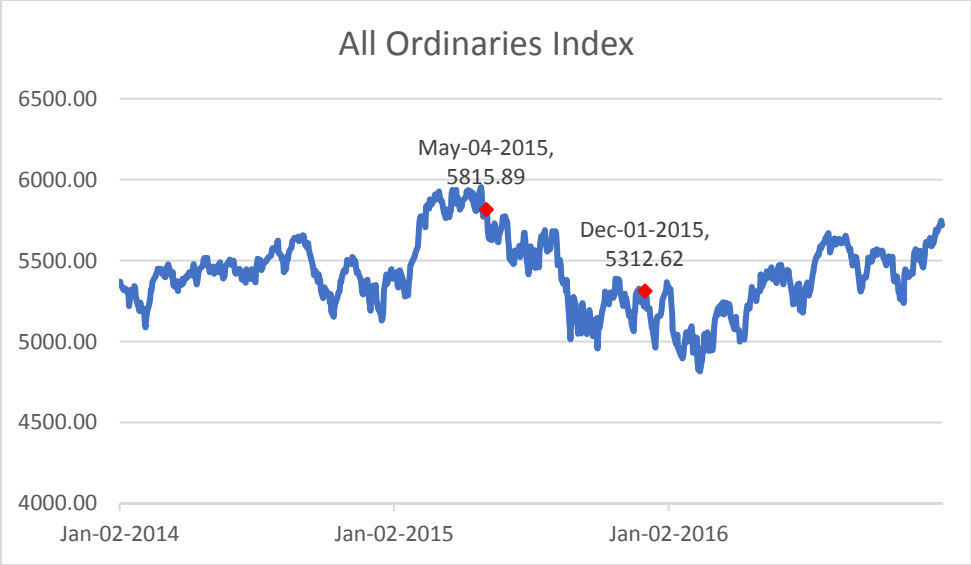
Figure 10



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Appendix

Index of 7 Results

```
varsoc index7, maxlag(10) exog(allords)
```

Selection-order criteria
Sample: 11 - 255 Number of obs = 245

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	792.682				.000092	-6.45455	-6.44304*	-6.42597*
1	792.976	.58783	1	0.443	.000093	-6.44879	-6.43152	-6.40591
2	793.09	.22724	1	0.634	.000093	-6.44155	-6.41853	-6.38439
3	795.226	4.2733*	1	0.039	.000092	-6.45083	-6.42205	-6.37937
4	796.973	3.4927	1	0.062	.000092*	-6.45692*	-6.42239	-6.37118
5	797.256	.56567	1	0.452	.000092	-6.45107	-6.41078	-6.35103
6	797.264	.01746	1	0.895	.000093	-6.44297	-6.39694	-6.32865
7	797.529	.52921	1	0.467	.000094	-6.43697	-6.38518	-6.30835
8	797.59	.12112	1	0.728	.000094	-6.4293	-6.37175	-6.28639
9	798.31	1.4401	1	0.230	.000095	-6.42702	-6.36371	-6.26982
10	798.34	.05987	1	0.807	.000095	-6.4191	-6.35004	-6.24761

Endogenous: index7
Exogenous: allords _cons

```
regress index7 L1index7 L2index7 L3index7 allords dummy1
```

Source	SS	df	MS
Model	.027135149	5	.00542703
Residual	.021954903	246	.000089248
Total	.049090052	251	.000195578

Number of obs	=	252
F(5, 246)	=	60.81
Prob > F	=	0.0000
R-squared	=	0.5528
Adj R-squared	=	0.5437
Root MSE	=	.00945

index7	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
L1index7	-.0330378	.0427464	-0.77	0.440	-.1172334	.0511579
L2index7	.0206669	.0431855	0.48	0.633	-.0643937	.1057274
L3index7	-.0887005	.0433159	-2.05	0.042	-.1740177	-.0033832
allords	1.000963	.0599138	16.71	0.000	.882953	1.118972
dummy1	.0094561	.0095666	0.99	0.324	-.0093867	.0282989
_cons	-.0010352	.0006003	-1.72	0.086	-.0022175	.0001471

```
regress index7 L1index7 L2index7 L3index7 allords dummy2

      Source |       SS           df       MS      Number of obs   =       252
-------------+----------------------------------   F(5, 246)       =     60.96
       Model |  .027164694         5  .005432939   Prob > F        =    0.0000
    Residual |  .021925358       246  .000089127   R-squared       =    0.5534
-------------+----------------------------------   Adj R-squared   =    0.5443
       Total |  .049090052       251  .000195578   Root MSE        =    .00944

------------------------------------------------------------------------------
      index7 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L1index7 |  -.0313294    .042745    -0.73   0.464    -.1155223    .0528634
    L2index7 |   .0212207   .0431301     0.49   0.623    -.0637307    .1061722
    L3index7 |  -.0882393   .0432773    -2.04   0.043    -.1734806    -.002998
     allords |   1.000395   .0598756    16.71   0.000     .8824608    1.118329
      dummy2 |   .0063408   .0055403     1.14   0.254    -.0045716    .0172532
       _cons |  -.0010708   .0006018    -1.78   0.076    -.0022561    .0001146
------------------------------------------------------------------------------

regress index7 L1index7 L2index7 L3index7 allords dummy3

      Source |       SS           df       MS      Number of obs   =       252
-------------+----------------------------------   F(5, 246)       =     60.57
       Model |  .027087455         5  .005417491   Prob > F        =    0.0000
    Residual |  .022002597       246  .000089441   R-squared       =    0.5518
-------------+----------------------------------   Adj R-squared   =    0.5427
       Total |  .049090052       251  .000195578   Root MSE        =    .00946

------------------------------------------------------------------------------
      index7 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L1index7 |  -.0350323   .0428936    -0.82   0.415    -.1195179    .0494532
    L2index7 |   .0130853   .0430725     0.30   0.762    -.0717525    .0979232
    L3index7 |  -.0952707   .0434078    -2.19   0.029    -.1807691   -.0097723
     allords |   .9980018   .0601444    16.59   0.000     .8795381    1.116465
      dummy3 |  -.0008008    .001205    -0.66   0.507    -.0031742    .0015726
       _cons |  -.0006059   .0008499    -0.71   0.477    -.0022799     .001068
------------------------------------------------------------------------------
```

```
varsoc index14, maxlag(10) exog(allords)
```

Selection-order criteria
Sample: 11 - 255 Number of obs = 245

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	795.438				.00009	-6.47704	-6.46554*	-6.44846*
1	795.669	.46245	1	0.496	.000091	-6.47077	-6.4535	-6.4279
2	795.793	.24725	1	0.619	.000091	-6.46362	-6.4406	-6.40645
3	797.893	4.1993*	1	0.040	.00009	-6.47259	-6.44382	-6.40114
4	799.729	3.6731	1	0.055	.00009*	-6.47942*	-6.44489	-6.39368
5	800.028	.59815	1	0.439	.00009	-6.4737	-6.43341	-6.37366
6	800.043	.02984	1	0.863	.000091	-6.46566	-6.41962	-6.35133
7	800.274	.46143	1	0.497	.000092	-6.45938	-6.40758	-6.33076
8	800.316	.08381	1	0.772	.000092	-6.45156	-6.39401	-6.30865
9	800.973	1.3142	1	0.252	.000093	-6.44876	-6.38545	-6.29156
10	801.013	.08046	1	0.777	.000093	-6.44092	-6.37186	-6.26943

Endogenous: index14
Exogenous: allords _cons

```
regress index14 L1index14 L2index14 L3index14 allords dummy1
```

Source	SS	df	MS
Model	.025883536	5	.005176707
Residual	.02149884	246	.000087394
Total	.047382376	251	.000188774

Number of obs	=	252
F(5, 246)	=	59.23
Prob > F	=	0.0000
R-squared	=	0.5463
Adj R-squared	=	0.5370
Root MSE	=	.00935

index14	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
L1index14	-.0293476	.0430563	-0.68	0.496	-.1141536	.0554584
L2index14	.0216672	.0434988	0.50	0.619	-.0640103	.1073448
L3index14	-.0889603	.0436264	-2.04	0.043	-.1748892	-.0030314
allords	.9777493	.0593224	16.48	0.000	.8609046	1.094594
dummy1	.0090942	.0094649	0.96	0.338	-.0095484	.0277368
_cons	-.0010766	.0005945	-1.81	0.071	-.0022476	.0000945

```
regress index14 L1index14 L2index14 L3index14 allords dummy2

      Source |       SS           df       MS      Number of obs   =       252
-------------+----------------------------------   F(5, 246)       =     59.40
       Model |  .025916593         5  .005183319   Prob > F        =    0.0000
    Residual |  .021465783       246  .000087259   R-squared       =    0.5470
-------------+----------------------------------   Adj R-squared   =    0.5378
       Total |  .047382376       251  .000188774   Root MSE        =    .00934

------------------------------------------------------------------------------
     index14 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L1index14  |  -.0275965   .0430533    -0.64   0.522    -.1123967    .0572037
  L2index14  |   .0222991   .0434328     0.51   0.608    -.0632485    .1078466
  L3index14  |   -.088396   .0435858    -2.03   0.044    -.1742449   -.0025471
    allords  |   .9771975   .0592787    16.48   0.000      .860439    1.093956
     dummy2  |   .0062573   .0054807     1.14   0.255    -.0045379    .0170524
       _cons |  -.0011122    .000596    -1.87   0.063    -.0022861    .0000617
------------------------------------------------------------------------------

regress index14 L1index14 L2index14 L3index14 allords dummy3

      Source |       SS           df       MS      Number of obs   =       252
-------------+----------------------------------   F(5, 246)       =     59.00
       Model |  .025836875         5  .005167375   Prob > F        =    0.0000
    Residual |  .021545501       246  .000087583   R-squared       =    0.5453
-------------+----------------------------------   Adj R-squared   =    0.5360
       Total |  .047382376       251  .000188774   Root MSE        =    .00936

------------------------------------------------------------------------------
     index14 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L1index14  |  -.0312539   .0432011    -0.72   0.470    -.1163452    .0538373
  L2index14  |   .0143506   .0433781     0.33   0.741    -.0710893    .0997904
  L3index14  |  -.0951231   .0437235    -2.18   0.031    -.1812433   -.0090029
    allords  |   .9749773   .0595516    16.37   0.000     .8576814    1.092273
     dummy3  |  -.0007429    .001192    -0.62   0.534    -.0030909     .001605
       _cons |  -.0006781   .0008409    -0.81   0.421    -.0023345    .0009783
------------------------------------------------------------------------------
```

Index of 7 – LLC

```
varsoc index13, maxlag(10) exog(allords)
```

Selection-order criteria
Sample: 11 - 255 Number of obs = 245

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	783.247				.000099	-6.37753	-6.36602*	-6.34895*
1	783.375	.25606	1	0.613	.0001	-6.37041	-6.35315	-6.32754
2	783.632	.5125	1	0.474	.000101	-6.36434	-6.34132	-6.30718
3	787.412	7.5615*	1	0.006	.000099	-6.38704	-6.35826	-6.31558
4	788.725	2.6247	1	0.105	.000098*	-6.38959*	-6.35506	-6.30384
5	789.309	1.1693	1	0.280	.000099	-6.3862	-6.34591	-6.28616
6	789.514	.41012	1	0.522	.000099	-6.37971	-6.33367	-6.26538
7	789.649	.26937	1	0.604	.0001	-6.37264	-6.32085	-6.24403
8	789.905	.51275	1	0.474	.000101	-6.36657	-6.30903	-6.22367
9	790.174	.53739	1	0.464	.000101	-6.3606	-6.2973	-6.20341
10	790.296	.24473	1	0.621	.000102	-6.35344	-6.28438	-6.18195

Endogenous: index13
Exogenous: allords _cons

```
regress index13 L1index13 L2index13 L3index13 allords dummy1
```

Source	SS	df	MS
Model	.02293147	5	.004586294
Residual	.023638416	246	.000096091
Total	.046569886	251	.000185537

Number of obs	=	252
F(5, 246)	=	47.73
Prob > F	=	0.0000
R-squared	=	0.4924
Adj R-squared	=	0.4821
Root MSE	=	.0098

index13	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
L1index13	-.015364	.0453834	-0.34	0.735	-.1047536	.0740256
L2index13	.0353308	.0458641	0.77	0.442	-.0550056	.1256671
L3index13	-.1307666	.0458544	-2.85	0.005	-.2210839	-.0404494
allords	.9015821	.0621353	14.51	0.000	.779197	1.023967
dummy1	.0112137	.0099236	1.13	0.260	-.0083324	.0307599
_cons	-.0009096	.0006217	-1.46	0.145	-.002134	.0003149

```
regress index13 L1index13 L2index13 L3index13 allords dummy2

      Source |       SS           df       MS      Number of obs   =       252
-------------+----------------------------------   F(5, 246)       =     47.51
       Model |  .022877023         5  .004575405   Prob > F        =    0.0000
    Residual |  .023692864       246  .000096312   R-squared       =    0.4912
-------------+----------------------------------   Adj R-squared   =    0.4809
       Total |  .046569886       251  .000185537   Root MSE        =    .00981

------------------------------------------------------------------------------
     index13 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   L1index13 |  -.0139335   .0454803    -0.31   0.760     -.103514     .075647
   L2index13 |   .0323535   .0457466     0.71   0.480    -.0577514    .1224584
   L3index13 |  -.1309892   .0459312    -2.85   0.005    -.2214579   -.0405205
     allords |   .9012455   .0622114    14.49   0.000     .7787106     1.02378
      dummy2 |   .0048375   .0057465     0.84   0.401    -.0064811    .0161562
       _cons |  -.0009241   .0006245    -1.48   0.140    -.0021542     .000306
------------------------------------------------------------------------------

regress index13 L1index13 L2index13 L3index13 allords dummy3

      Source |       SS           df       MS      Number of obs   =       252
-------------+----------------------------------   F(5, 246)       =     47.38
       Model |  .022845147         5  .004569029   Prob > F        =    0.0000
    Residual |   .02372474       246  .000096442   R-squared       =    0.4906
-------------+----------------------------------   Adj R-squared   =    0.4802
       Total |  .046569886       251  .000185537   Root MSE        =    .00982

------------------------------------------------------------------------------
     index13 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   L1index13 |  -.0173691   .0455523    -0.38   0.703    -.1070914    .0723532
   L2index13 |   .0260719   .0456644     0.57   0.569    -.0638713    .1160151
   L3index13 |  -.1357007   .0460704    -2.95   0.004    -.2264434    -.044958
     allords |   .8991892   .0624074    14.41   0.000     .7762683     1.02211
      dummy3 |  -.0007675   .0012497    -0.61   0.540    -.0032289    .0016939
       _cons |  -.0004881   .0008826    -0.55   0.581    -.0022264    .0012503
------------------------------------------------------------------------------
```

Index of 7 – LLC

```
varsoc index6, maxlag(10) exog(allords)
```

Selection-order criteria
Sample: 11 - 255 Number of obs = 245

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	778.683				.000103	-6.34027	-6.32876*	-6.31169*
1	778.875	.38358	1	0.536	.000104	-6.33367	-6.31641	-6.2908
2	779.138	.52544	1	0.469	.000105	-6.32765	-6.30463	-6.27049
3	782.966	7.6561*	1	0.006	.000102	-6.35074	-6.32197	-6.27929
4	784.138	2.3455	1	0.126	.000102*	-6.35215*	-6.31762	-6.26641
5	784.721	1.1657	1	0.280	.000102	-6.34875	-6.30846	-6.24871
6	784.886	.32963	1	0.566	.000103	-6.34193	-6.29589	-6.2276
7	785.058	.34307	1	0.558	.000104	-6.33516	-6.28337	-6.20655
8	785.385	.65411	1	0.419	.000104	-6.32967	-6.27212	-6.18676
9	785.717	.66524	1	0.415	.000105	-6.32422	-6.26092	-6.16702
10	785.888	.34141	1	0.559	.000106	-6.31745	-6.24839	-6.14596

Endogenous: index6
Exogenous: allords _cons

```
regress index6 L1index6 L2index6 L3index6 allords dummy1
```

Source	SS	df	MS
Model	.024424253	5	.004884851
Residual	.024480962	246	.000099516
Total	.048905215	251	.000194841

Number of obs	=	252
F(5, 246)	=	49.09
Prob > F	=	0.0000
R-squared	=	0.4994
Adj R-squared	=	0.4892
Root MSE	=	.00998

index6	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
L1index6	-.0199183	.0450651	-0.44	0.659	-.108681	.0688443
L2index6	.0354788	.0455319	0.78	0.437	-.0542032	.1251608
L3index6	-.129995	.0455209	-2.86	0.005	-.2196554	-.0403346
allords	.9308033	.0631883	14.73	0.000	.8063443	1.055262
dummy1	.0118041	.0100999	1.17	0.244	-.0080892	.0316974
_cons	-.000839	.000632	-1.33	0.186	-.0020838	.0004058

```
regress index6 L1index6 L2index6 L3index6 allords dummy3

      Source |       SS           df       MS      Number of obs   =       252
-------------+----------------------------------   F(5, 246)       =     48.72
       Model |  .024332648         5  .00486653   Prob > F        =    0.0000
    Residual |  .024572567       246  .000099888  R-squared       =    0.4975
-------------+----------------------------------   Adj R-squared   =    0.4873
       Total |  .048905215       251  .000194841  Root MSE        =    .00999

------------------------------------------------------------------------------
      index6 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L1index6 |  -.0220249   .0452392    -0.49   0.627    -.1111304    .0670806
    L2index6 |   .0258245   .0453444     0.57   0.570    -.0634883    .1151373
    L3index6 |  -.1354507   .0457377    -2.96   0.003    -.2255382   -.0453632
     allords |    .928194    .063466    14.63   0.000      .803188      1.0532
      dummy3 |  -.0008476   .0012723    -0.67   0.506    -.0033536    .0016584
       _cons |  -.0003741   .0008984    -0.42   0.677    -.0021438    .0013955
------------------------------------------------------------------------------

regress index6 L1index6 L2index6 L3index6 allords dummy2

      Source |       SS           df       MS      Number of obs   =       252
-------------+----------------------------------   F(5, 246)       =     48.82
       Model |  .024358118         5  .004871624  Prob > F        =    0.0000
    Residual |  .024547097       246  .000099785  R-squared       =    0.4981
-------------+----------------------------------   Adj R-squared   =    0.4879
       Total |  .048905215       251  .000194841  Root MSE        =    .00999

------------------------------------------------------------------------------
      index6 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    L1index6 |  -.0185242   .0451661    -0.41   0.682    -.1074857    .0704373
    L2index6 |   .0323148   .0454312     0.71   0.478     -.057169    .1217986
    L3index6 |   -.130398   .0456059    -2.86   0.005    -.2202259   -.0405702
     allords |   .9304848   .0632784    14.70   0.000     .8058482    1.055121
      dummy2 |   .0048928   .0058501     0.84   0.404    -.0066299    .0164155
       _cons |  -.0008521   .0006351    -1.34   0.181    -.0021029    .0003988
------------------------------------------------------------------------------
```

All Ordinaries Index

```
varsoc allords, maxlag(10)
```

Selection-order criteria
Sample: 11 - 255 Number of obs = 245

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	776.072				.000105*	-6.32712*	-6.32136*	-6.31283*
1	776.186	.22739	1	0.633	.000105	-6.31988	-6.30837	-6.2913
2	776.226	.08082	1	0.776	.000106	-6.31205	-6.29479	-6.26918
3	777.674	2.8951	1	0.089	.000106	-6.3157	-6.29268	-6.25854
4	777.985	.62161	1	0.430	.000106	-6.31008	-6.2813	-6.23862
5	780.637	5.3043*	1	0.021	.000105	-6.32357	-6.28904	-6.23782
6	781.015	.75744	1	0.384	.000106	-6.31849	-6.27821	-6.21846
7	781.547	1.0622	1	0.303	.000106	-6.31467	-6.26863	-6.20034
8	781.552	.0118	1	0.914	.000107	-6.30655	-6.25476	-6.17793
9	781.952	.79832	1	0.372	.000107	-6.30165	-6.2441	-6.15874
10	782.432	.95995	1	0.327	.000108	-6.2974	-6.2341	-6.1402

Endogenous: allords
Exogenous: _cons

```
regress allords L1allords L2allords L3allords L4allords L5allords dummy1
```

Source	SS	df	MS
Model	.000916019	6	.00015267
Residual	.024595697	243	.000101217
Total	.025511716	249	.000102457

Number of obs	=	250
F(6, 243)	=	1.51
Prob > F	=	0.1759
R-squared	=	0.0359
Adj R-squared	=	0.0121
Root MSE	=	.01006

allords	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
L1allords	-.0420961	.0636513	-0.66	0.509	-.1674748	.0832825
L2allords	-.0001502	.0636529	-0.00	0.998	-.125532	.1252316
L3allords	-.1049066	.0635411	-1.65	0.100	-.2300682	.0202551
L4allords	-.0572222	.0634999	-0.90	0.368	-.1823027	.0678583
L5allords	-.1448701	.063911	-2.27	0.024	-.2707604	-.0189798
dummy1	.0022166	.0101777	0.22	0.828	-.0178312	.0222644
_cons	-.0001049	.0006376	-0.16	0.869	-.0013609	.001151

```
regress allords L1allords L2allords L3allords L4allords L5allords dummy2

      Source |       SS           df       MS      Number of obs   =       250
-------------+----------------------------------   F(6, 243)       =      1.52
       Model |  .000923887         6  .000153981   Prob > F        =    0.1715
    Residual |  .024587829       243  .000101184   R-squared       =    0.0362
-------------+----------------------------------   Adj R-squared   =    0.0124
       Total |  .025511716       249  .000102457   Root MSE        =    .01006

------------------------------------------------------------------------------
     allords |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L1allords  |  -.0416168   .0636189    -0.65   0.514    -.1669318    .0836981
  L2allords  |   .0008522   .0637441     0.01   0.989    -.1247093    .1264137
  L3allords  |  -.1038428   .0635579    -1.63   0.104    -.2290376    .0213519
  L4allords  |  -.0564342   .0635526    -0.89   0.375    -.1816185      .06875
  L5allords  |  -.1454793   .0639285    -2.28   0.024    -.2714041   -.0195545
     dummy2  |   .0020938   .0059172     0.35   0.724    -.0095618    .0137494
       _cons |  -.0001212   .0006402    -0.19   0.850    -.0013822    .0011398
------------------------------------------------------------------------------

regress allords L1allords L2allords L3allords L4allords L5allords dummy3

      Source |       SS           df       MS      Number of obs   =       250
-------------+----------------------------------   F(6, 243)       =      1.77
       Model |  .001070112         6  .000178352   Prob > F        =    0.1052
    Residual |  .024441605       243  .000100583   R-squared       =    0.0419
-------------+----------------------------------   Adj R-squared   =    0.0183
       Total |  .025511716       249  .000102457   Root MSE        =    .01003

------------------------------------------------------------------------------
     allords |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  L1allords  |  -.0465202   .0635434    -0.73   0.465    -.1716865     .078646
  L2allords  |  -.0057841   .0635148    -0.09   0.928    -.1308939    .1193257
  L3allords  |  -.1120774   .0630898    -1.78   0.077    -.2363501    .0121953
  L4allords  |  -.0644387   .0634922    -1.01   0.311     -.189504    .0606266
  L5allords  |  -.1510027   .0638652    -2.36   0.019    -.2768028   -.0252027
     dummy3  |  -.0016138    .001284    -1.26   0.210     -.004143    .0009154
       _cons |   .0007297   .0009132     0.80   0.425    -.0010691    .0025285
------------------------------------------------------------------------------
```