

Home bias, abnormal return and GDP growth

by

Yang Zhou

B.Sc., Shandong University of Finance and Economics, 2014

and

Jie Yu

B.Sc., Shandong University of Finance and Economics, 2015

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Approval

Name: Yang Zhou, Jie Yu

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Supervisory Committee:

Amir Rubin
Senior Supervisor
Associate Professor

Alexander Vedrashko
Second reader
Associate Professor

Date Defended/Approved: _____

Abstract

We build on the home bias phenomenon and hypothesize that company performance as measured by abnormal return is correlated with the GDP growth rate of the state in which its headquarter is located. We categorized all companies on CRSP database from Wharton Research Data Services (WRDS) by state and region. We find that the abnormal return of companies in a given state tends to correlate with next year GDP growth of that state, which is consistent with the home bias phenomenon in that states tend to be better off when the local firms generate positive alphas.

Keywords: Home bias; Abnormal return; GDP; Significance;

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1.Introduction

Does company performance, as measured by abnormal return improve the economy of the state? This question has not really received much attention in the literature. In general, it is natural to believe that when companies do well then the economy does well. However, company performance is measured by alpha (excess return over systematic risk), while the economy performance is measured by GDP growth rate. The two constructs may not be strongly related because the former is the surplus to diversified shareholders, while the latter is the gross product generated by the entire population which includes all stakeholders, not only diversified shareholders. In this paper, we hypothesize that firm's abnormal return and GDP growth are correlated because of the home bias phenomenon. Home bias has showed its usefulness in generating investment strategy. Coval and Moskowitz (1999) find that one of every 10 companies in a fund manager's portfolio is chosen because it is located in the same city as the manager, and individual investors exhibit an even larger degree of preference for local stocks than U.S. mutual fund managers do (Ivković and Weisbenner (2005)). This home bias suggests that local investors are made better off when companies in their locality generate a positive alpha. As a result, they tend to have more cash to dispose, and that could lead to a measurable effect on the state of their local economy in the following year. We collected data from all traded companies listed in the U.S. market from 1985 to 2015 and examined whether there is a certain relationship between geographical location and alpha.

We started by investigating whether there is a significant difference between returns of different regions in the United States. To answer this question, we used locality of a corporate headquarter to represent that of the firm and divided the U.S. into five geographical regions. Then we regressed the monthly excess returns of each stock on market excess returns, analyzed the alpha of companies in each region, and tested the significance of difference between the various regions. The results show that the Northwest region outperforms all other regions. However, the economic difference of this result is small and is insignificant in sub-periods analyses.

Inspired by the home bias phenomenon, we then analyzed our main hypothesis of whether abnormal returns are related to future economic growth at the state-level. We find that average alpha is negatively related to the previous one year GDP growth rate of the state. In addition, we find evidence that when companies outperform the market, it benefits the growth rate for the state. This is consistent with the home bias phenomena as well as the idea that the headquarter location affects GDP growth in the locality.

The rest of the paper is organized as follows. Section 2 discusses the relevant literatures on the home bias as well as the possible reasons behind this bias, and geographical issues that could affect the return, including the weather and cluster phenomena. Section 3 describes the steps of processing data and the methodology we applied to test the hypothesis. Section 4 explains the results and Section 5 concludes our findings.

2.Literature Review

Numerous papers have found empirical evidence that geography would affect corporates' performances and decisions, and in turn, affect the investment returns of investors through the effect of home bias, cluster phenomenon and weather. Coval and Moskowitz (1999) first show that U.S. money managers are more likely to invest in the firms headquartered in the same city as the manager than in other firms. Garcia and Norli (2010) find that stocks of truly local firms outperformed stocks of geographically dispersed firm by 70 bps rate of return monthly and the local portfolio has a Jensen's alpha of 48 bps monthly evaluated by a factor model which takes liquidity, firm size and risk into account. Likewise, by testing a sample of S&P 500 companies during 2000-2005, Barker and Loughran (2007) demonstrate how badly the geographic proximity could affect monthly return correlations. Specifically, "the correlation coefficient between two stocks increases 12 bps for every 100-mile reduction in distance." They also find that the "average household generates an additional annualized return of 3.2% from its holdings relative to its nonlocal holdings over a 1-year horizon." and the average share of local investment accounts for approximate 30% in the household portfolio while this number would be even 20% higher when all firms headquartered within 250 miles from the household. Even for traders, Hau (2001) confirms that higher trading profits benefit from the corporate headquarter proximity while no evidence found for a financial center advantage or of increasing institutional scale economies in proprietary trading. In addition, stock returns of companies headquartered in the same geographic area exhibit a strong degree of movement. Empirically, when companies change their headquarters,

their stocks prices change as well, implying that price formation linked to the trading patterns of local residents (Pirinsky and Wang (2006)). So simply mimicking what locals do is about as good as being local (Ivković and Weisbenner, 2005).

Researchers have explored various factors generating home bias. Loughran and Schultz (2004) point out that access to information and familiarity would be powerful explanations. They argue that, because of the difficulty to obtain information and unfamiliarity to investors, rural firms have less liquidity, and are covered by fewer analysts as well as institutional investors than urban firms. Loughran (2007) then expands this argument by exploring the dissemination of information across stocks in the U.S. during 1973-2002 and finds that stock prices absorb the information in the same path as the information disseminates from urban to rural areas. Interestingly, Seasholes and Zhu (2010) hold opposite insight because their results show that individual portfolios of local holdings failed to generate abnormal returns based on the so-called value-relevant information. Hong and Kubik (2007) run cross sectional regressions on the log of a firm's market-to-book on a constructed variable (RATIO) and find that regional population density has a negative relationship with local stock prices and a positive relationship with local firms' return (Garcia and Norli (2010)). They interpret their results as the prospects of future growth. In addition, they hypothesize that production technology could be one of geographic components in the stock price, studied from their estimates that "an electric utility located in the Deep South has a stock price 8.9% higher than one located in the Middle Atlantic". Other papers investigate geography impact in terms of the amount of investable capital (Garcia and Norli (2010)), agency costs and firm dividend policies (John and Knyazeva (2010)).

In terms of clusters and the weather, Boasson and MacPherson (2001) t-test “the role of geographic location in the financial and innovation performance of publicly traded pharmaceutical companies” and conclude that clusters advantage generates stronger financial performance. Camison (2004) confirmed empirically the explanatory power of the cluster-shared competences on organizational performance. Almazan and Motta (2007) find that firms that are located within industry clusters tend to make more acquisitions and be less leveraged compared to their peers located outside clusters. Firms in growing cities and technology centers maintain more financial slack as well. Tonts and Taylor (2009) explore that spatial structure of labor markets and the knowledge, skills and expertise results in the distinctive agglomeration activities in various state capital cities in Australia. Keef and Roush (2002) use OLS regression on three weather factors to find that returns would be significantly affected by wind and have no reaction on the cloudy weather in New Zealand. Loughran and Schultz (2004) find that the time zone of a company’s headquarter affects intraday trading patterns in its stock.

Research to date has provided valuable insight into the effect of regional economic indicators. Pirinsky and Wang (2006) consider a composite measure of monthly economic activity at the state level and show that economic variable exhibits some explanatory power over stock returns. Korniotis and Kumar (2013) find that state portfolio abnormal returns are associated with the local macroeconomic conditions such as the state-level unemployment rates and housing collateral ratios. Given the above, our paper aims at empirically demonstrating home bias phenomenon and then, finding out the relationship between abnormal returns and the local GDP growth rate.

3.Data and Methodology

Basically, the analysis is divided into two steps. Firstly, we analyzed the relationship between geographical region and abnormal return and obtained abnormal returns of different regions using CAPM model (Jack Treynor, 1961; William F. Sharpe, 1964; John Lintner, 1965 and Jan Mossin, 1966, independently). Secondly, we performed the regression between abnormal return and GDP growth rate to find how these two variables are correlated with each other. The data of analysis is from Wharton Research Data Services(WRDS). Monthly holding period returns of companies from 1985 to 2015 on the entire CRSP database are from Stock/Security Files and monthly risk free rates of the same period are from US Treasury and Inflation Indexes. We dropped the incomplete one-year returns to make sure that each company has the completely annual data. The information of states that companies located in are from Compustat - Capital IQ of North America. We also dropped the company headquartered outside the United States. Then the states are divided into five regions: Northwest (including California), Southwest, Northeast, Southeast and Central region based on their geographical location. Additionally, GDP growth rates of both the U.S. and states are from Bureau of Economic Analysis(BEA).

We classified each company with monthly return from 1985 to 2015 based on the state and region. In order to obtain abnormal returns of different regions, the approach we used is based on the CAPM model (Jack Treynor, 1961; William F. Sharpe, 1964; John Lintner, 1965a, b and Jan Mossin, 1966, independently). The main idea is to generate the abnormal return for each company in each year, followed by the corresponding state and

region.

CAPM model (Jack Treynor, 1961; William F. Sharpe, 1964; John Lintner, 1965a, b and Jan Mossin, 1966, independently):

$$R(t) - RF(t) = \alpha + \beta[RM(t) - RF(t)] + e(t) \quad (1)$$

where:

$R - RF$: the company over risk-free return (excess return of the company)

$RM - RF$: the market over risk-free return (excess return of the market)

α : Jensen's alpha, the measure of abnormal performance

β : sensitivity between excess return of the company and excess return of the

market

Within the regression, excess return of the company is the dependent variable and excess return of the market is the independent variable. After the regression, we can sort data by region to obtain the abnormal returns for five regions. To further explore the geographical influence on the abnormal return, we tested the significance of the difference between abnormal returns across two regions using t test at 5% significant level. The result we obtained could examine if the difference of abnormal returns among regions is statistically significantly different from zero. The test will also be done at sub-periods (1985-2000 and 2000-2015) level.

The criteria for the t-test:

The purpose of the test is to identify if α is approximate equal to 0. The null hypothesis is $H_0: \alpha=0$ and the alternative hypothesis is $H_1: \alpha \neq 0$. According to the test criteria, if t-statistic falls in the interval of t critical value, we do not reject the null

hypothesis and the estimator is not significantly different from zero. Otherwise we reject the null hypothesis and accept the alternative, which means the result is significant. The critical value of t at 5% significant level is 1.962 and we check t -statistic for each one to see if the value falls in the interval of $[-1.962, 1.962]$. Also, we can check p value. If $p < 0.05$, we reject null hypothesis and accept alternative hypothesis. If $p > 0.05$, we do not reject null hypothesis.

Finally, we analyzed the relationship between abnormal return at state level and GDP growth rates (either for state and the U.S.). The purpose of this analysis is to identify how two factors interact with each other and whether the influence is significant. We did the analysis by regressing annual average abnormal return for each state and annual GDP growth rates from 1985 to 2015, average abnormal returns and lagged one period GDP growth rates, and GDP growth rates and lagged one period average abnormal returns. Also, we used t -test to examine the significance.

4.Results

Table 1 shows the abnormal return of five regions. We can see that Northwest outperformed the other four regions. In contrast, Central region is the worst performer among five regions. As the result indicates, different regions in the United States have different level of abnormal returns. Northwest, which includes states such as California and Washington has the highest abnormal return while Central region, due to the limitation of its locality, has the lowest abnormal return.

In order to figure out if the difference of abnormal returns between any two regions is statistically significant, we tested the significance of difference between Northwest which has the best performance and other regions. As we can see from t-statistics in the **table 2**, except for the difference between North West and Central Region, others are not significantly different from zero. The result means that although different regions have different level of alpha, the difference of them is insignificant and we can regard them to be zero from statistic perspective. One exception is the difference between best performer (North West) and worst performer (Central Region). In other words, the abnormal return by which Northwest exceeds the Central region is significantly different from zero. When grouping the other regions together and tested the significance of difference between Northwest and all the other regions, we find the result is significant and Northwest true outperformed the other regions.

So far, we have found the evidence that the difference of abnormal returns among regions is not significant to a great extent from 1985 to 2015. However, how about the significant level for the sub-period? In order to solve the question, we divided the whole

time interval into two sub-periods: 1985-2000 and 2000-2015. Firstly, we did t-test for the difference of regional abnormal returns from 1985 to 2000. As we can see from the result showed in **table 3**, from 1985 to 2000, Northwest is still the best performer in terms of abnormal return compared to other regions. However, all of these differences are significant while for the whole period, only the difference of abnormal returns between Northwest and Central Region is significant. The result is interesting and makes sense. Because when we narrow down the time interval to 15 years, the difference magnifies. The more data we collect; the closer result we obtain for different regions. So, in terms of years before 2000, abnormal returns for different regions display the significant difference.

However, years after 2000 tell a different story. The difference of regional performances from 2000 to 2015 is not significantly different from zero when we see the t-statistics. The reason is that more observations are involved. After 2000, we have more company emerged in each region and with a larger sample, the mean of the abnormal returns tends to be closer. Similarly, when we extend the time period up to 30 years, the whole sample demonstrates that the difference of abnormal returns is not significant among regions even if some companies or some states have the obviously better performances. In contrast, from 1985 to 2000, we obtained relatively small sample in terms of abnormal returns, so some extreme performances of companies can lead the abnormal return of the region to be outstanding compared to other regions.

In total, Northwest has the biggest abnormal return compared to other regions and Central region has the worst performance in terms of the abnormal return. However, the difference of abnormal returns between regions in the United States is not statistically

significantly different from zero from 1985 to 2015; the result is even similar in the sub-period with large observations. With the finding obtained, we explored further regarding to how the abnormal return and GDP growth rate interact with each other. In order to perform the analysis, we summarized the abnormal return acquired before to obtain the annual average abnormal return for each state. At the initial stage, we found that the GDP growth of the states has a negative impact on the abnormal return and vice versa. However, the impact is not significantly different from zero derived from t-statistics we got. The result means that no significant relationship between abnormal returns and the GDP growth of states for the same period.

How about the relationship between the variable and the one-period lagged factor? Theoretically, the good performances of companies within a state a year before can promote the GDP to grow in the next year. The regressing results for different variables are illustrated in the **table 4**. As expected, the previous year average abnormal return of a state has positive influence on the GDP growth rate of that state. In addition, we evaluated the effects of one-period lagged GDP growth rates (both the U.S. and the state) and one-period lagged average abnormal return on the following year state level GDP. The three factors have significant and positive effects on the it. In comparison, the average abnormal return one year before affects the following year GDP growth of that state more (coefficient of 16.087) while state GDP growth (0.422) and US GDP growth (0.105) for the previous year have little impact on it. Therefore, the influence of average abnormal return one-period before is more straight forward and significant. Lastly, we added the same year US GDP growth rate to the model, the result remains similar

compared to the three-factor model except that US GDP of the same year has more influence on the state GDP growth than that of one year before.

The result in **table 4** also demonstrates the relationship between the abnormal return of the state and the state level one-period lagged GDP growth rate. As the result shows, previous GDP growth rates are negatively related to the next year's abnormal return of the state. When we added additional three factors (one year lagged alpha and U.S. GDP growth as well as the current U.S. GDP growth) into the model, we found that U.S. GDP growth for the same year, has more significant impact on the performance of firms than lagged states and U.S.GDP growth although the influence is still negative. The result is surprising at the first glance but makes sense to some extent. When the GDP growth of some states increased, the expectation of the development of the state will also increase, accompanied by the rise of the assets' price within the state. In this way, companies of the state will buy more expensive assets and consequently reduce the return. In addition, as the GDP growth of some states increased, the competition within the state tends to become more intensive. As a result, the average return for companies would decrease. Except for the effect of GDP growth, we can see that previous performance of a company has more direct influence on the following performance.

5. Conclusion

Our paper tests the relationship between geographic location and abnormal returns, which could be applied in constructing investment strategy. We find evidence that in a certain period, Northwest part of the United States (including California and Washington states) outperformed the other four regions. This somehow provides us with instructions pertaining to the asset allocation in terms of the geography. The result is also consistent with the home bias phenomenon since investors would perform their geography preference based on their findings.

We then study whether such geographical difference is associated with the local macroeconomic conditions. By regressing the average abnormal return (alpha) and GDP growth rate on a state-level, taking the time-series effect into consideration, we find that generally the correlation between the two variables appears to be more significant and the test results have more explanatory power when we lagged one of them one period. A realized abnormal return would accelerate the GDP growth in the upcoming year which is consistent with the home bias phenomenon, as more incomes are disposed and more investment opportunities appear. But state GDP growth has insignificant influence on the abnormal return of following year while that of U.S. GDP growth rate of the same year is significant and negative. The possible explanation is that the expectation of the development of a state increases with the growth of the local GDP, accompanied by the rise of the assets' price. The increased purchasing cost of the local firms would reduce the return. At the same time, competition within the state are likely to be intensive when the local economic condition develops fast, lowering the expected return then. Our study

implies that it is possible to construct a buy-and-sell strategy in a portfolio resting on the factors such as company location and GDP growth rate in the short run to achieve abnormal returns.

6. Appendix

Table 1 Regional abnormal returns

We ran the regression between company excess return and market excess return to acquire the annual abnormal returns of each firm. And then we sorted them by region to obtain the summary of the regional average abnormal return.

	Mean (Abnormal Return)	Standard Deviation (Abnormal Return)
North West	0.0073539	0.0520259
North East	0.0059402	0.0462577
South West	0.0060823	0.0484495
South East	0.0057262	0.0412364
Central Region	0.0054062	0.0369532

Table 2 Difference of abnormal returns between North West and other regions

We did the t test for difference between abnormal returns of Northwest and other regions and obtained t-statistics to see if the difference is significant.

Region	Difference of Mean (Abnormal Return)	Difference of Standard Deviation (Abnormal Return)	t - statistics
mean(NW) - mean(CT)	0.0019477	0.0007946	2.4512
mean(NW) - mean(SW)	0.0006761	0.0008645	1.2513
mean(NW) - mean(NE)	0.0014137	0.0007781	1.8169
mean(NW) - mean(SE)	0.0016277	0.0008425	1.9319
mean(NW) - mean(others)	0.001576	0.0006055	2.6029

Table 3 Difference of abnormal returns between Northwest and other regions for sub-periods

We did the t test for difference between abnormal returns of Northwest and other regions from 1985 to 2000 and from 2000 to 2015 and obtained t-statistics to see if the difference is significant. T-statistics are showed in parenthesis.

Region	Difference of Mean (1985-2000)	Difference of Mean(2000-2015)
mean(NW) - mean(CT)	0.0035418 (2.8186)	0.0012287 (1.3318)
mean(NW) - mean(SW)	0.0048336 (2.7324)	0.0000864 (0.0762)
mean(NW) - mean(NE)	0.0037536 (3.1395)	0.0005494 (0.6421)
mean(NW) - mean(SE)	0.0040589 (2.8034)	0.0008006 (0.8534)
mean(NW) - mean(others)	0.0035373 (2.9854)	0.0008061 (1.1432)

Table 4 Average state level abnormal returns and GDP growth rates

The dependent variables are abnormal return and GDP growth of the state. Figures are corresponding coefficients of which significance at the 1%, 5%, and 10% level is indicated by ***, **, and *, respectively. T-statistics are showed in parenthesis.

	State GDP growth	State GDP growth	State GDP growth	State GDP growth	State alpha	State alpha	State alpha	State alpha
State alpha at t-1	10.364** (2.25)	14.563*** (3.54)	16.087*** (3.86)	9.484*** (2.71)		0.119*** (4.45)	0.108** (3.96)	0.115*** (4.24)
State GDP growth at t-1		0.461*** (19.01)	0.422*** (13.95)	0.380*** (14.99)	-0.000601*** (-3.78)	-0.000563*** (-3.56)	-0.000258 (-1.31)	-0.000212 (-1.08)
US GDP growth at t-1			0.105** (2.19)	-0.363** (-8.12)			-0.000812** (-2.59)	-0.000280 (-0.81)
US GDP growth at t				0.943*** (24.22)				-0.00107*** (-3.56)
R-Squared	0.0036	0.2105	0.2132	0.4482	0.0103	0.0243	0.029	0.0378
Number of Observations	1,382	1,382	1,382	1,382	1,382	1,382	1,382	1,382

Robust standard errors in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 5 States and the division of regions

state	region	state	region	state	region	state	region	state	region
WA	NW	AZ	SW	ME	NE	KY	SE	ND	CT
MT	NW	NM	SW	NH	NE	TN	SE	SD	CT
ID	NW	OK	SW	MA	NE	AR	SE	NE	CT
OR	NW	TX	SW	RI	NE	LA	SE	KS	CT
WY	NW			CT	NE	MS	SE	MN	CT
CO	NW			NJ	NE	AL	SE	IA	CT
UT	NW			VT	NE	GA	SE	MO	CT
NV	NW			NY	NE	FL	SE	WI	CT
CA	NW			PA	NE	SC	SE	IL	CT
AK	NW			DC	NE	NC	SE	MI	CT
						VA	SE	IN	CT
						WV	SE	OH	CT
						DE	SE		
						MD	SE		

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