The linkage between Stock Market Returns and GDP Growth Rate in the

United States

by

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Abstract

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The purpose of this project is to determine the relationship between stock market returns and GDP growth in the United States, and the reasons will be discovered as well. In this changing global financial market, the results discovered will hopefully provide investors advice and assistance in making investment decisions.

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Chapter 1: Introduction

1.1 Background

When investors pick the countries they want to invest in, they tend to be guided by the countries' overall economic performance. Investors assume that the faster an economy grows, the faster the corporate earnings will grow in the country, and as a result investors will get relatively high returns. Alas, this appears not to be the case. As shown by Dimson, et al (2002) at the London Business School. From 17 countries with data going back to 1900, they found there was actually a negative correlation between investment returns and growth in GDP per capita. So they performed a second test that they took the five-year growth rates of the economies and divided them into quintiles. The outcome is quite surprising to many investors that the quintile of countries with the highest growth rate over the previous five years, produced average returns over the following year of 6%, while those in the slowest-growing quintile produced returns of 12%. The questions and puzzles raised by this research need to be answered.

This research paper will talk about the relationship between GDP growth rates and annual stock market returns in the United States. The reasons that may underpin the results we find will be analyzed as well. As some major developing countries experienced spectacular growth in recent decades, and they are expected to have higher growth rates than developed countries in the future, so many institutional investors and the general public wonder if they should invest more in those

fast-growing countries. Then, comes the question, does higher GDP growth rates mean higher stock market returns? Or is there any relationship between the two? To answer those questions, both quantitative and qualitative outcome should be determined. To limit the scale of the study, I will use the United States as an appropriate economy to study. A further reason is that United States is the world's biggest economy with the most multinational companies and has the most advanced financial markets.

GDP growth rate is considered as a leading indicator measure of and macroeconomic performance. It also has a major impact on the unemployment rates, CPI and other measures of an economy's condition. As a result, people relate many things in the market to GDP, and intuitively believe that a market with a higher GDP growth rate will give a higher stock market return. It seems reasonable that when an economy is expanding, companies within it are more likely to have higher profits and then the stock market should be bullish at those times. But investigation shows that, at least in China, GDP growth rate does not translate into stock price appreciation.

When China had growth rates between 9% to 15% from 2007 to 2011, its Shanghai Composite Index dived from above 5500 to below 2500, which caused confusion and big losses for investors. In the long-run, countries with a higher GDP growth rate may have lower annualized stock market returns than countries with lower GDP growth rate. So in order to clarify the relationship between GDP growth rate and stock market

returns, and help people focus on the right factors when making investment decisions, and create real value for investors, this topic is worth studying and may create real value for investors. However, in my point of view, for developed markets, the outcome will likely be the same. For developing countries, the financial systems are at different stages, but when they become mature, those results could be used in developing countries as well.

1.2 Structure of the research

As mentioned earlier, many people think high GDP growth rates translate into high stock market returns based on the following logic. First, a high GDP growth rate leads to increased aggregate corporate profits. Second, growing corporate profits translate into increased earnings per share. Third, increased earnings per share mean a higher stock price.

In this paper, after discovering the relationship between GDP growth rate and stock market return, the above three internal relationships will be analyzed as well. By testing those internal relationships, the reasons for the result will be discovered. Some research showed the reasons why GDP growth rate and stock market return are not necessarily positively related.

Firstly, globalization resulted in many multinational companies listed in one country, but with a major presence in other countries. Secondly, growth in non-public

companies contributes to GDP growth, but not stock market return. Thirdly, methods of valuing stock price may differ through time. Besides those, other causes will be analyzed in this paper as well. Coefficients of those relationships will be calculated by using Stata, hypotheses will be tested, and the conclusions reached will be based on empirical analysis.

The US as the world's leading economy with the most advanced financial system, has more multinational companies than any other economy, and also has the complete data needed for study. It is therefore considered the best sample to represent the whole global financial industry, and the results will have real impact on investors' way of making investment decisions.

Chapter 2: Literature Review

In the financial industry there is a topic that people often think about: the relationship between stock market returns and economic growth. The economies of developing countries grow much faster than developed countries. As a result, investors in Europe and North America are considering if they should assign a higher weight to those fast-growing countries (especially big developing countries such as India, China, Russia and Brazil). Although the general public are more likely to believe that countries have strong GDP growth rate intend to have higher stock market returns than countries that have weaker growth expectations, after a great deal of time spent in researching and analyzing in this field, almost all the studies showed that stock market return is not necessarily positively related to GDP.

Dimson, et al (2002) in their article "Triumph of the optimists: 101 Years of Global Investment Returns" included stock market returns from 1900 to 2000 for 16 developed countries. They found that over long periods of time, stock market returns were negatively related to GDP growth rate. Then, Professor Jay Ritter (2005) updated it to 2002 in his paper Economic Growth and Equity Returns. Ritter further examined the data, to see if the relationship between GDP growth rate and stock market return may have changed over the course of the twentieth century. He analyzed the data for 19 developed countries from 1970 to 2002. He also compiled data for 13 large emerging markets from 1988 to 2002. His data indicate that there is a negative relationship between stock market return and GDP growth rate in developed

markets, and for developing countries, there is a tiny positive relationship. Based on Ritter's research, Jain and Kranson (2009) argued that firstly GDP is analogous to sales; stock returns to corporate profits. GDP represents the value of all goods and services produced in a country during a period, but it does not indicate corporate profits. Even if sales are strong and growing, corporate profit could be falling and share values are unlikely to appreciate. In a price war, some companies in order to take the market share, may sell products at a price below cost, which would boost GDP, but it can also hurts companies' profitability and as a result hurt share price. Secondly, the stock market does not reflect the full economy. GDP includes all public, private, government-owned and newly founded companies, while stock market return only reflects public companies. Thirdly, a company's profits may come from overseas. The economies around the world are continuingly being correlated and interdependent and many companies have major operations abroad, and some even have higher revenues from overseas than from home.

When a multinational company is highly profitable and its share price rises, it is more related to stock market than the overall economy of the country which it is listed in. In addition, as most equity market indices are market-cap weighted and multinationals usually have huge market-cap, so indices are dominated by those giant companies. Consequently, the differences between GDP growth and equity market returns may be exaggerated by multinationals. Last but not least, dilution could hurt shareholder returns. When a company issues additional shares to raise capital, the value of current

investors' shares may be diluted. In fact, earnings per share, not corporate earnings are what matter to stock market returns.

MSCI (2010), a leading provider of investment decision tools, discovered that some countries with higher long-term GDP growth rates may have lower annualized stock market returns. If we assume that:

1. The country's economy is closed with no trading with other countries.

2. Valuation ratios do not change over time.

3. Only domestic companies are listed in the country's stock market.

4. Payout ratio does not change and

5. The share of company profits in the total economy remains constant.

Then there should be an exact match between real price increase and real GDP growth. But this situation never happens in modern society. The authors conclude that several factors may explain this discrepancy. First, today's world is being more integrated and we need to look at global rather than local markets. Second, economic growth more likely comes from new enterprises rather than existing public companies and this situation leads to a dilution of GDP growth before it reaches shareholders. Lastly, expected economic growth may be built into the current prices.

In their refined version, supply side models indicate a relation between GDP and stock market return, but they do not suggest a perfect match between the two variables. Instead they view real GDP growth as a cap on long-run stock returns, because other factors could dilute the impact of GDP growth before it reaches

shareholders. Fuhrmann (2010) stated that although people are not able to predict stock market returns precisely based on GDP growth rate over shorter term, the relationship does hold loosely over the long haul. Foreign markets are appealing for some investors because diversification can benefit them by decreasing risk levels. For the enterprising investor, a good understanding of the individual economy and company performance as well as the drivers of the GDP growth can help in identifying lucrative investments around the globe.

Diermeier, et al (1984) argued that GNP measures real economic performance, which determines the supply of stock market returns, and is used in a simple model on the expected return on the aggregate of financial assets. They argued that investors should not expect a much greater (or fear a much smaller) return than the GDP growth rate provided by businesses in the real economy. Thus when people make investment-decisions, they should consider the condition of the overall economy.

Some researchers found some relationship between GDP releases and stock market reaction. A study by Rigobon and Sack (2006) using data from 1994 to 2006, used a standard OLS regression and found no significant effect from advance GDP release surprises on equity prices. However, they did find a significant relationship when using a more advanced econometric method which controls for censoring effects. Cunningham (2007) found that preliminary and final GDP release dates typically correspond to larger than average increases in equity prices. This surprised many

investors and puzzled people that why the market still reacts to those GDP release given that the direction and often the magnitude of the GDP release can often be accurately predicted based on the source data which are published after the advance report. However, Bernanke and Kutter (2003) tend not to find a significant effect of the GDP release news on equity price movements. Because there are some offsetting effects existing and it's not easy to measure the true news in the data released.

MSCI (2010) decomposed long-run returns of major equity markets into several components. In the majority of countries, they found that after inflation, dividend income was the most important part of equity returns. Growth in real book value had a low, but steady contribution to stock return. Changes in valuation had important implications to equity investing in the short run, but tended to smooth out in the long run. Campbell and Shiller (1998) argued that if we accept the premise that valuation ratios will continue to fluctuate, but not beyond their historical ranges in the future, then when a valuation ratio is at an extreme level, either the numerator or the denominator of the ratio must move in a direction that restores the ratio to a more normal level.

The Price-per-earnings ratio is a big part of stock market valuation and a factor involved in studying the relationship between stock market return and GDP growth rate. Shen(1998) stated that "high price-per-earnings ratio of the stock market as a sign that the stock market may be headed for a down-turn". Historical evidence

supported this view because very high price-per-earnings ratios have usually been followed by weak stock market performance. When price-per-earnings ratios have been high, stock prices are unlikely to grown quickly in the following decade. But forecasts based on such evidence are subject to much uncertainty, because fundamental changes in the financial markets may have happened, and as a result valuation ratios may continue to increase. Trevino and Robertson (2002) examined the relationship between current P/E ratios and subsequent stock market average returns. The findings indicated that there is a little correlation between P/E levels and subsequent short-term average returns.

Given the existing research does not have many quantitative outcomes stating the relationship between GDP growth rate and stock market return, I think this topic is worth further study. I have learnt many ideas and much knowledge from the existing literature, and will use the Supply-Side model to test this topic in the United States market. This study will give a comprehensive outcome of this topic and further clarify the relationship between stock market returns and GDP growth rates.

Chapter 3: Methodology

3.1 Model introduction

This paper will adopt supply-side models to explore the relationship between stock market return and GDP growth rate. These models assume that GDP growth is the original source of stock market returns. When an economy is booming or has a high GDP growth rate, the public companies in the economy are more likely to see a rise in profits and as a result, earnings per share of the public companies will rise as well, and finally stock price will appreciate.

If we assume that: 1. The country's economy is closed with no trading with other countries. 2. Valuation ratios do not change over time. 3. Only domestic companies are listed in the country's stock market. 4. Payout ratio does not change. 5. The share of company profits in the total economy remains constant. Then there should be an exact match between a real price increase and real GDP growth.

The relationship of stock market return and GDP growth will be explored by running a regression:

$R(smr)=a_0 + a_1 R(gdp)$…………………………………..………………….3.1

where R(smr) is annual stock market return;

R(gdp) is annual GDP growth rate.

H_0: a_1 is equal to 0

When the P value is less than 0.05, we can reject H_0, which means the performance of the stock market is significantly related to GDP growth rate. If P value is larger than

0.05, we should not reject the H_0. This means there is no significant relationship between stock market returns and GDP growth rate.

The supply-side models can be broken down into 3 steps. Firstly, does GDP growth translate into aggregate corporate earnings? The relationship between the two will be analyzed by running a regression:

$R(ace)=a_0 + a_1 R(gdp)$ …………………………………………………..……….3.2

where R(ace) is annual growth rate of aggregate corporate earnings;

   R(gdp) is annual growth rate of gross domestic production.

H_0: a_1 is equal to 0

When the P value is less than 0.05, reject the H_0, which means aggregate corporate earnings are significantly related to GDP growth rate. If the P value is larger than 0.05, we cannot reject H_0, which means there is no significant relationship between aggregate corporate earnings and GDP growth rate.

Secondly, does aggregate corporate earnings translate into earnings per share? This relationship will be discovered by running a regression:

$R(eps)=a_0 + a_1 R(ace)$……………………………………………………………….3.3

where R(eps) is annual growth rate of earnings per share of public companies;

   R(ace) is annual growth rate of aggregate corporate earnings.

H_0: a_1 is equal to 0

When the P value is less than 0.05, reject H_0, which means earnings per share of public companies is significantly related to aggregate corporate earnings. If the P value is larger than 0.05, we cannot reject H_0, which means there is no significant relationship between aggregate corporate earnings and earnings per share.

Thirdly, does earnings per share growth convert to stock price appreciation?

$$R(smr)=a_0 + a_1 R(eps)\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots3.4$$

where R(smr) is annual stock market return;

R(eps) is annual growth rate of earnings per share of public companies.

H_0: a_1 is equal to 0

When the P value for gdp is less than 0.05, we can reject H_0, which means stock market return is significantly related to earnings per share. If the P value is larger than 0.05, we cannot reject H_0, which means there is no significant relationship between stock market return and earnings per share.

3.2 Data selection

This paper is based on the United States, so all the data used in this article are American. GDP growth rates and aggregate corporate earnings were collected from the World Bank beginning in 1968 to 2010. S&P 500 will represent the whole stock market in the United States, and the data are from 1968 to 2011. S&P 500 is one of the most commonly followed indices and considered as the best representation of the American stock market and a bellwether for the U.S. economy.

The S&P 500 is constituted of 500 of the largest companies in the United States and represents roughly 75 % of the U.S. stock market. Annual growth rates of earnings per share of public companies in the U.S. market are calculated from the data of 100 companies within the S&P 500 randomly collected beginning in 1987 to 2011. In the last, the P/E ratio of S&P500 from 1987 to 2011 will be analyzed.

Chapter 4: Results

4.1 The overview of the relationship of stock market return and annual GDP growth rate

I first run the overview regression; Equation 3.1 from Chapter 3

$R(smr) = a_0 + a_1 R(gdp)$………………………………………………………….3.1

Table 4.1

Source	SS	df	MS			
Model	24.9476208	1	24.9476208			
Residual	13270.3504	42	315.960725			
Total	13295.2981	43	309.192978			

Number of obs = 44
F(1, 42) = 0.08
Prob > F = 0.7801
R-squared = 0.0019
Adj R-squared = -0.0219
Root MSE = 17.775

smr	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
gdp	.3468549	1.234383	0.28	0.780	-2.14423	2.83794
_cons	9.889956	4.416327	2.24	0.030	.9774464	18.80246

The P value for gdp is 0.78 which means there is no significant relationship between stock market return and annual GDP growth rate. The R-squared is 0.0019 and Adjusted R-squared is -0.0219, which means annual GDP growth rate cannot explain the performance of stock market returns.

4.2. The relationship between GDP growth rate and growth rate of aggregate corporate earnings

I then run the regression; Equation 3.2

$R(ace) = a_0 + a_1 R(gdp)$………………………………………………………….3.2

Table 4.2

Source	SS	df	MS			Number of obs =	43
						F(1, 41) =	0.63
Model	133.595467	1	133.595467			Prob > F =	0.4322
Residual	8705.67428	41	212.333519			R-squared =	0.0151
						Adj R-squared =	-0.0089
Total	8839.26974	42	210.458803			Root MSE =	14.572

ace	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
gdp	-.8052592	1.015194	-0.79	0.432	-2.855485	1.244967
_cons	11.31612	3.664676	3.09	0.004	3.915161	18.71709

The P value for gdp is 0.432 which means there is no significant relationship between aggregate corporate earnings and GDP growth rate. The R-squared is 0.0151 and Adjusted R-squared is -0.0089, which means GDP growth rate can't explain aggregate corporate earnings.

4.2.1. The reasons of not having a significant relationship between the GDP growth rate and aggregate corporate earnings. As we discussed earlier there are several reasons as to why it is not surprising to find the results above.

1. GDP is analogous to sales; while stock returns to corporate profits. All the value of goods and service produced in a country is captured in GDP, but high GDP growth rate doesn't mean increasing corporate profits. For example when a company is dumping is goods at prices below cost in order to take market share, the sales would go up, but the profitability could be lower.

2. Tax rates could play a role in this situation. When earnings before tax are higher than the preceding year, if the government charges corporations a higher tax, the net income for the corporations would be lower.

4.3. The relationship of average earnings per share and aggregate corporate earnings.

Run the regression; Equation 3.3

$$R(eps) = a_0 + a_1 R(ace) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3.3$$

Table 4.3

Source	SS	df	MS			
Model	.003950854	1	.003950854			
Residual	.41576002	21	.019798096			
Total	.419710874	22	.019077767			

Number of obs = 23
F(1, 21) = 0.20
Prob > F = 0.6597
R-squared = 0.0094
Adj R-squared = -0.0378
Root MSE = .14071

eps	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
ace	.1021444	.228655	0.45	0.660	-.3733697	.5776585
_cons	.0842979	.0355986	2.37	0.028	.0102665	.1583294

The P-value for ace is 0.66 which means earnings per share of public companies is not significantly related to aggregate corporate earnings. The R-squared is 0.0094 and Adjusted R-squared is -0.0378, which means aggregate corporate earnings can't explain the performance of earnings per share of public companies.

4.3.1. The reasons of not having a significant relationship between earnings per share and aggregate corporate earnings.

1. Aggregate corporate earnings captures all the profits earned by public and non-public companies and individuals as well in a country. While earnings per share of public companies only captures the variation of profitability of public companies. Although sometimes aggregate corporate earnings is increasing, earnings per share of public companies could decrease.

2. The value of current investors' shares may be diluted if a company issues additional shares to raise capital. So even if the net income is increasing, earnings per share could be decreasing and as a result stock prices could fall.

3. Some foreign companies are listed in the United States. The profitability of those

companies have a big impact on the stock market return, while they are not included

in the aggregate corporate earnings of the United States.

4.4. The relationship of earnings per share and stock market return contained in Table

4.4. Using Equation 3.4 as given below, the results are
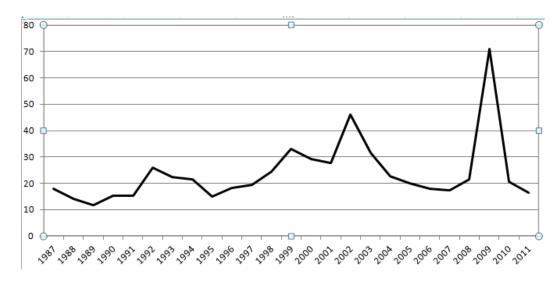
$$R(smr) = a_0 + a_1 R(eps) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3.4$$

Table 4.4

Source	SS	df	MS		Number of obs	=	23
					F(1, 21)	=	1.24
Model	439.880039	1	439.880039		Prob > F	=	0.2778
Residual	7442.19405	21	354.390193		R-squared	=	0.0558
					Adj R-squared	=	0.0108
Total	7882.07409	22	358.276095		Root MSE	=	18.825

smr	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
eps	32.37368	29.058	1.11	0.278	-28.05575	92.8031
_cons	8.514613	4.770648	1.78	0.089	-1.406492	18.43572

 The P-value for eps is 0.278, which means changes in earnings per share are not

significantly related to stock market return. The R-squared is 0.0558 and Adjusted

R-squared is 0.0108, which means earnings per share cannot explain changes in stock

market returns.

4.4.1. Reasons of not having a significant relationship between stock market return

and earnings per share of public companies.

1. As the P/E ratio changes over time, it is at different levels during the times of

bullish and bearish markets. For example, we can see from Figure 4.1 that

Figure 4.1

the P/E ratio of S&P 500 fluctuates dramatically during the time from 1987 to 2011.

Chapter 5: Conclusion

Although people intuitively think that investment in stock markets experiencing fast economic growth could obtain higher return than in markets with low economic growth, from this research, we can see that there is no significant relationship between stock market returns and GDP growth rates in the U.S. stock market.

The reasons for not having a significant positive relationship between stock market return and GDP growth rate are discovered by breaking down the relationship between stock market return and GDP growth rate into 3 steps:

1: The relationship between GDP growth rate and aggregate corporate earnings;

2: The relationship between aggregate corporate earnings and earnings per share of public companies;

3: The relationship between stock market return and changes in earnings per share.

We discussed the reasons in earlier chapters, but we can summarize them again.

1. GDP is analogous to sales; while stock returns to corporate profits. All the value of goods and service produced in a country is captured in GDP, but high GDP growth rates do not translate necessarily into increased corporate profits.

2. The tax rate could play a role in this situation, when earnings before tax is higher than the preceding year and the government charges corporations a higher tax, the net income for the corporations could be lower.

3. Aggregate corporate earnings captures all the profits earned by public and

non-public companies and individuals as well in a country. While earnings per share of public companies only captures the variation of profitability of public companies.

4. The value of current investors' shares may be diluted if a company issues additional shares to raise capital. So even if the net income is increasing, earnings per share could be decreasing, as a result stock price could fall.

5. P/E ratio is at different levels during a bullish period compared with in a bearish period.

Chapter 6: Recommendation

The global economy changes dramatically with developing countries experiencing spectacular growth while many major developed countries facing recession. As a result, many investors think is it necessary to shift their weight of investment to developing countries. This paper indicates that a fast developing economy doesn't mean higher return. So when making investment decisions across countries, a bottom-up strategy is more reasonable to use. Which means investors should consider the company and industry first instead of the countries they want to invest in.

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Appendix A: Data

1. GDP growth rate and stock market returns

Percent

	GDP	SMR		GDP	SMR
1968	4.8	11.06	1990	1.86	-3.11
1969	3.1	-8.5	1991	-0.26	30.47
1970	0.2	4.01	1992	3.4	7.62
1971	3.46	14.31	1993	2.87	10.03
1972	5.52	18.96	1994	4.11	1.32
1973	5.91	-14.66	1995	2.55	37.56
1974	-0.52	-26.47	1996	3.79	22.96
1975	-0.2	37.2	1997	4.51	33.36
1976	5.42	23.84	1998	4.4	28.58
1977	4.64	-7.18	1999	4.87	21.04
1978	5.63	6.58	2000	4.17	-9.11
1979	3.15	18.44	2001	1.09	-11.89
1980	-0.29	32.5	2002	1.83	-22.1
1981	2.54	-4.92	2003	2.55	28.68
1982	-1.98	21.55	2004	3.48	10.88
1983	4.52	22.56	2005	3.08	4.91
1984	7.19	6.27	2006	2.66	15.79
1985	4.11	31.73	2007	1.91	5.49
1986	3.43	18.67	2008	-0.4	-37
1987	3.17	5.25	2009	-3.5	26.46
1988	4.1	16.62	2010	3	15.06
1989	3.56	31.69	2011	1.7	2.05

2. Aggregate corporate earnings and changes of average earnings per share of 100 companies in S&P 500.

	ACE	EPS
1988	-0.01571	0.196
1989	0.089607	0.25
1990	0.076981	-0.174
1991	0.135635	0.109
1992	0.068468	0.101
1993	0.166379	0.119
1994	0.149298	0.224
1995	0.091747	0.224
1996	0.092284	0.175
1997	-0.14704	0.028
1998	0.099473	-0.119
1999	-0.02741	0.219
2000	0.003942	0.054
2001	0.124853	-0.056
2002	0.151309	0.161
2003	0.399576	0.2
2004	0.329795	0.111
2005	0.09912	0.386
2006	-0.04194	0.004
2007	-0.18718	0.116
2008	0.114378	-0.067
2009	0.232175	-0.038
2010	0.022245	-0.077