UNIVERSITA' DEGLI STUDI DI PADOVA

DIPARTIMENTO DI SCIENZE ECONOMICHE ED AZIENDALI "M.FANNO"

CORSO DI LAUREA MAGISTRALE IN ECONOMICS AND FINANCE

TESI DI LAUREA

" GDP AND STOCK RETURNS: ARE THEY RELATED? "

RELATORE:

CH.MO PROF. BRUNO MARIA PARIGI

LAUREANDO : RATTU ANTONIO

MATRICOLA N. 1061051

ANNO ACCADEMICO 2014 – 2015

Il candidato dichiara che il presente lavoro è originale e non è già stato sottoposto, in tutto o in parte, per il conseguimento di un titolo accademico in altre Università italiane o straniere.
Il candidato dichiara altresì che tutti i materiali utilizzati durante la preparazione dell'elaborato sono stati indicati nel testo e nella sezione "Riferimenti bibliografici" e che le eventuali citazioni testuali sono individuabili attraverso l'esplicito richiamo alla pubblicazione originale.

Firma dello studente

_____

TABLE OF CONTENTS

ABSTRACT

L'intenzione di questo lavoro è di analizzare la relazione tra il PIL e i ritorni azionari. Si tratta pertanto di una relazione tra due variabili di natura diversa: la prima strettamente macroeconomica mentre la seconda di natura finanziaria.

È credenza comune che un Paese con un tasso maggiore di crescita economica possa fornire dei ritorni azionari più elevati. Questa convinzione è basata sulla teoria economica che vuole che i ritorni azionari siano legati nel lungo periodo alla crescita economica. Per questo motivo, infatti, si preferisce investire in Paesi dove ci si sono ottime prospettive di crescita nel lungo termine, come la Cina o il Brasile, piuttosto che investire in Paesi che mostrano bassa crescita destinata anche a persistere come l'Argentina o la Grecia. Precedenti studi, tuttavia, evidenziano una correlazione negativa, con ampiezza differente a seconda degli studi, tra la crescita economica ed i ritorni azionari. Se è vero che, in alcuni casi, i Paesi emergenti hanno mostrato i più alti tassi di crescita del PIL accompagnati dai più alti tassi di ritorno sul mercato azionario, è vero anche che altri Paesi, come la China, hanno fallito nel tramutare gli alti tassi di crescita economica in crescita dei ritorni azionari. Non c'è stata dunque diretta proporzionalità tra le due variabili. Gli studi sostengono pertanto che in molti casi gli elevati ritorni azionari non siano giustificati dall'alto tasso di crescita economica ma da altre variabili quale per esempio il rischio sistemico più elevato.

Chiaramente sono state offerte molteplici spiegazioni alla mancanza di legame tra PIL e ritorni azionari; il fatto che le imprese siano sempre più delle multinazionali per esempio, e pertanto non dipendano più solamente dal tasso di crescita economica di un singolo Paese ma da una crescita globale in senso stretto. Un'altra spiegazione fornita da BERNSTEIN WILLIAM AND ROBERT D. ARNOTT (2003) riguarda l'effetto diluzione che graverebbe sulla crescita. Infatti, parte della crescita economica deriva dalla nascita di nuove imprese; pertanto questo non comporta un aumento dei ritorni azionari dei vecchi azionisti. JEREMY J. SIEGEL, (1998) invece spiega come i prezzi azionari incorporino e scontino già le informazioni circa la situazione economica futura; per questo motivo è impossibile trovare un legame positivo tra le due variabili. Partendo da questa spiegazione ho notato come tutti gli studi effettuati fino ad ora abbiano analizzato tale legame prendendo le variabili allo stesso momento. Credendo nella spiegazione del professor Siegel mi sono chiesto se possa essere possibile che i prezzi incorporino informazioni di natura economica ma riguardanti la passata situazione economica e pertanto agiscano in ritardo. Trovare infatti una correlazione positiva

tra i ritorni azionari e variabili economiche in un periodo precedente permetterebbe agevolmente di prevedere il ritorno azionario usando tutti valori noti. Cosi, prendendo come esempio il mercato statunitense, ho sviluppato un modello econometrico che mette in relazione il livello futuro dell'indice S&P500 con tre variabili: il livello del PIL reale statunitense un anno prima, il multiplo di Shiller (CAPE) riferito ad un anno prima ed una variabile che rispecchia il mercato immobiliare statunitense (Real Home Price Index) sempre riferita ad un anno prima. Dal modello è emerso che il livello futuro dell'indice S&P500 è altamente positivamente correlato con il valore del PIL reale di un anno prima. Il modello da me sviluppato inoltre ha la capacità di prevedere il 92% della variabilità dei dati dell'indice S&P500. Risulta pertanto molto accurato oltre che opportunamente testato per la robustezza dei risultati. Chiaramente ulteriori studi ed approfondimenti devono essere effettuati al fine di allargare l'analisi ed ottenere delle conferme ai miei risultati.

Credendo inoltre che la relazione tra PIL e ritorni azionari sia una relazione di tipo ciclico, ho ipotizzato l'esistenza di un legame anche tra il valore attuale dell'indice S&P500 ed il valore futuro del PIL reale statunitense. Questa relazione ipotizzata si basa sulla credenza che, dopo un primo momento in cui la crescita del PIL influenza il mercato azionario (primo modello), è il mercato azionario che innesca un processo di crescita tramite il vortice dei consumi e degli investimenti. Pertanto ho ipotizzato una relazione nuovamente positiva tra le due variabili in esame. Tale relazione positiva è stata confermata dal secondo modello econometrico presente in questo lavoro. Si tratta di un modello in grado di prevedere il valore futuro del PIL reale statunitense attraverso una combinazione di variabili tra le quali: il valore attuale dell'indice S&P500, il valore attuale dell'Indice dei Prezzi al Consumo, il valore al tempo attuale del Real Home Price Index, ed il valore attuale del tasso di interesse statunitense di lungo periodo. Il risultato del modello è che è possibile prevedere il valore futuro del PIL con precisione; infatti la forza di previsione è pari al 99,6%.

La relazione da me trovata pertanto tra il PIL ed il ritorno azionario è altamente positiva; grazie a questa relazione infatti, è stato possibile prevedere il valore futuro di entrambe le variabili in un esercizio di forecasting inside period. I modelli non possono essere usati per fini di investimento a breve termine (giornaliero, settimanale, mensile) in quanto, basandosi su dati trimestrali che coprono un periodo dal 1975 al 2014, non forniscono informazioni adeguate ed utili in ottica di investimento di breve periodo. I modelli in questione hanno ancora ampi margini di miglioramento e possono fornire un contributo sostanziale alla ricerca in un campo ancora non sviluppato.

INTRODUCTION

The subject of the thesis is to study the relationship between the GDP and stock returns. As it is possible to see from the title of the thesis, this is a question I will try to answer to. Indeed the existing literature is not exhaustive, therefore we do not have definite answers on this field. The purpose of my thesis is to shed light on this relationship clarifying what could be the possible channels and the possible effects from an empirical point of view. This is an important question since a lot of investment strategies are based on this relationship. Indeed the common view is that the economic growth leads to an increase in the stock returns trough the corporate profits channel. For this reason a lot of money is invested in emerging countries, which usually are the countries with the highest economic growth rate, based on the conviction that a growing economy is an economy where stock returns are higher.

Precedent studies do not confirm this conjecture explaining how in many cases countries which displayed the highest economic growth rate fails to display also the highest stock returns. Therefore, according to the major part of the studies, the equation more growth equals to more stock returns is not valid. Indeed there are other reasons why some countries have high stock returns which does not depend on the economic growth. A reason for example could be the higher systemic risks that some countries have, for which the investors have to be compensated. The authors of the principal studies on this field, which we will see in the second chapter, try to give some explanation for the missing link between GDP and stock returns; for instance the fact that nowadays we do not have any more just local corporations which operate only in the country's territory. In fact there are more and more multinationals corporations which do not depend on a single national economic growth but on the global GDP growth. Another reason, provided by BERNSTEIN W. AND ROBERT D. ARNOTT (2003), why to an increase in the economic growth does not correspond a proportional positive increase in the stock returns is the fact that GDP can growth also without generating benefits for shareholders. Indeed most of the economic growth can derive from the creation of new enterprises, therefore without passing through the old shareholders.

There are no reasons, according to the same authors, to avoid investments in countries with low economic growth prospects. In fact they told that there are other determinants of the stock returns which are not dependent from the GDP growth. I think, instead, that the link between

the GDP and stock returns exists and it is strong; for this reason I try in this work to discover it.

Ideally my thesis is composed of two parts: the first part includes the chapter 1 and 2 while the second part includes the chapters 3, 4 and 5. This because clearly they treat different arguments; in particular the second part is more experimental. I will lead the reader from the theory to the practice.

The rest of the study is organized as follows: in the first chapter I will describe the theory of the supply side models which are models born to explain stock market returns based on macroeconomic information such as GDP or inflation rate. I will explain their mechanics and in particular the three steps that link the GDP growth to the stock returns. Moreover I will describe an analytical method of stock returns derivations proposed by FAUGÈRE CHRISTOPHE (2006), which perfectly tracks the history of the S&P500. In the second chapter I will analyze the most influential empirical studies on the relationship between GDP and stock returns, discussing the different results and the different techniques; In the third chapter I hypothesize a positive relationship between the two variables since, in my opinion, it is possible that stock prices reflects information about the past economic situation. For this reason I give my personal contribution to the research developing an econometric stepwise model which is able to forecast the future level of the S&P500 index using current data of three variables where the most important is the Real GDP level. Indeed I found a strong positive correlation between the S&P500 index and the level of the past Real US GDP. The correlation coefficient is 0,939 which clearly indicates a very strong relationship between the two variables. The complete model is able to explain the 91% of the variability of the S&P500 index values. To implement the model I used quarterly data for a period between 1975 and 2014.

Thinking that stock returns and GDP are cyclically related I tried to verify if the positive relationship exists also considering the current level of S&P500 and the future level of Real GDP. This based on the conviction that a higher stock returns could trigger a chain report which, with lead to an increase in the consumption and to an increase in the investment, therefore to an increase in the future Real GDP level. For this reason in the fourth chapter I give my second personal contribution developing another econometric stepwise model able to forecast the future level of the Real GDP using current data of four variables where there is also the current level of the S&P500 index. Also in this case I found a strong positive relationship between the two variables and the correlation coefficient is 0,952. The complete

model instead it is able to explain the 99,6% of the differences in the future Real US GDP values.

In the fifth and last chapter instead there are the conclusions of the work where I analyze the global path and the global results giving some personal hints to improve this study in the future. The final part of the thesis is composed by the appendices where there are some statistical calculations in order to test the robustness of the results of the models.

1. THE SUPPLY SIDE MODELS

1.1 INTRODUCTION TO SUPPLY SIDE MODELS

In this first chapter we will discuss how is it theoretically possible that GDP growth can influence stock returns analyzing the theory of SUPPLY SIDE MODELS for the Equity Risks Premium.

The supply side models have received a lot of attention and questions in the recent years. It enters in the four approaches to derive the ERP (Equity Risk Premium). Supply-side models have been developed to explain and forecast stock market returns based on macroeconomic performance. These models are based on the theory that equity returns have their roots in the productivity of the underlying real economy and long term returns cannot exceed or fall short of the growth rate of the underlying economy (MSCI BARRA, MAY 2010). In particular the supply-side approach uses fundamental information such as earnings, dividends, or general economic productivity figures in determining the expected ERP. The term "supply-side" is not referred to the classic economic supply and demand equilibrium of the market. Supply-side ERP means constructing an ERP model which takes into account the earnings that companies generate (supply).

1.2) MECHANICS OF SUPPLY-SIDE MODELS

The general assumption of a supply side model is that GDP growth flows to shareholders in three steps:

1. The first step is that GDP growth translates into corporate profit growth
2. The second step is that the aggregate earnings growth translates into earnings per share (EPS) growth
3. The third step is that EPS growth translates into stock price increases.

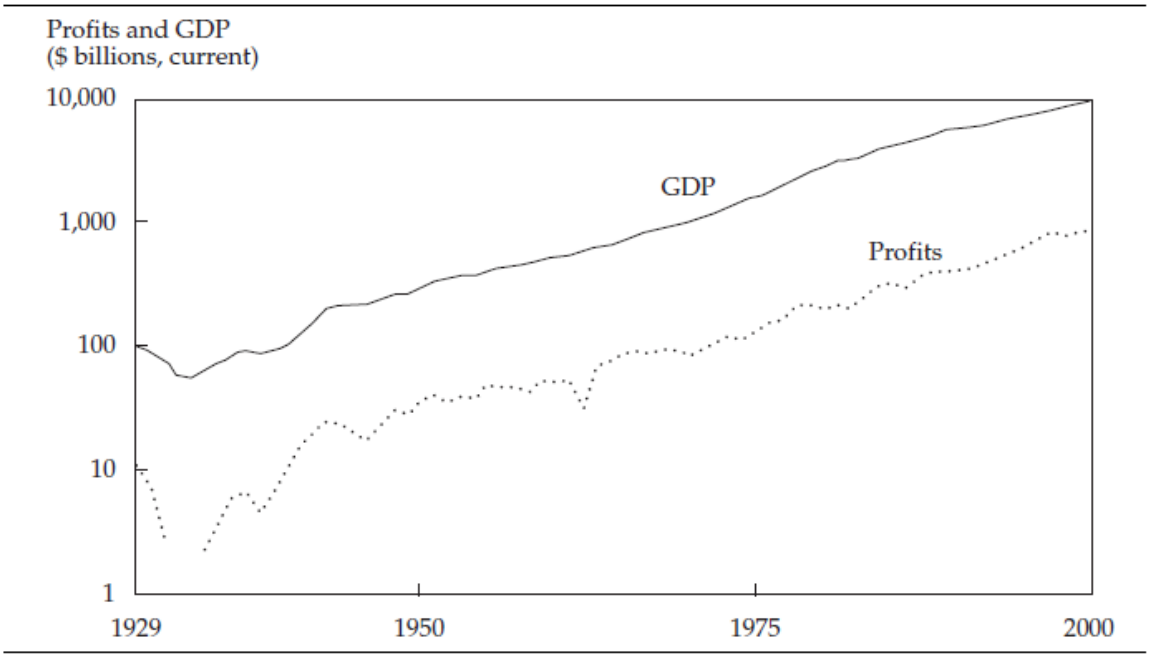
But to have an exact match between real GDP growth and real increase in price we need to add further assumptions (MSCI BARRA, MAY 2010): We assume that the share of company profits in the total economy remains constant; that investors have a claim on a constant proportion of those profits, valuation ratios are constant and that the country's stock market only list domestic companies being its market closed.

1.2.1) FIRST STEP: GDP GROWTH TRANSLATES INTO CORPORATE PROFITS GROWTH

As we have seen before the first step involves two variables: GDP growth and corporate profit growth. In theory, they are positively related through the chain that leads from an increase in the GDP level to an increase in the total economic activity and then also an increase in the corporate profits. Usually studies are conducted on the USA for different reasons: because it is the greatest and more mature economy, and because it is easier to obtain data since most of information is public.

The table 1 (BERNSTEIN W. AND ROBERT D. ARNOTT, 2003), plots after-tax corporate profits from the NIPAs (National Income and Product Accounts) and the US GDP for the period between the 1929 and 2000. It is a comprehensive study because it covers almost seventy years.

Table 1. Nominal U.S. Corporate Profits and GDP, 1929-2000



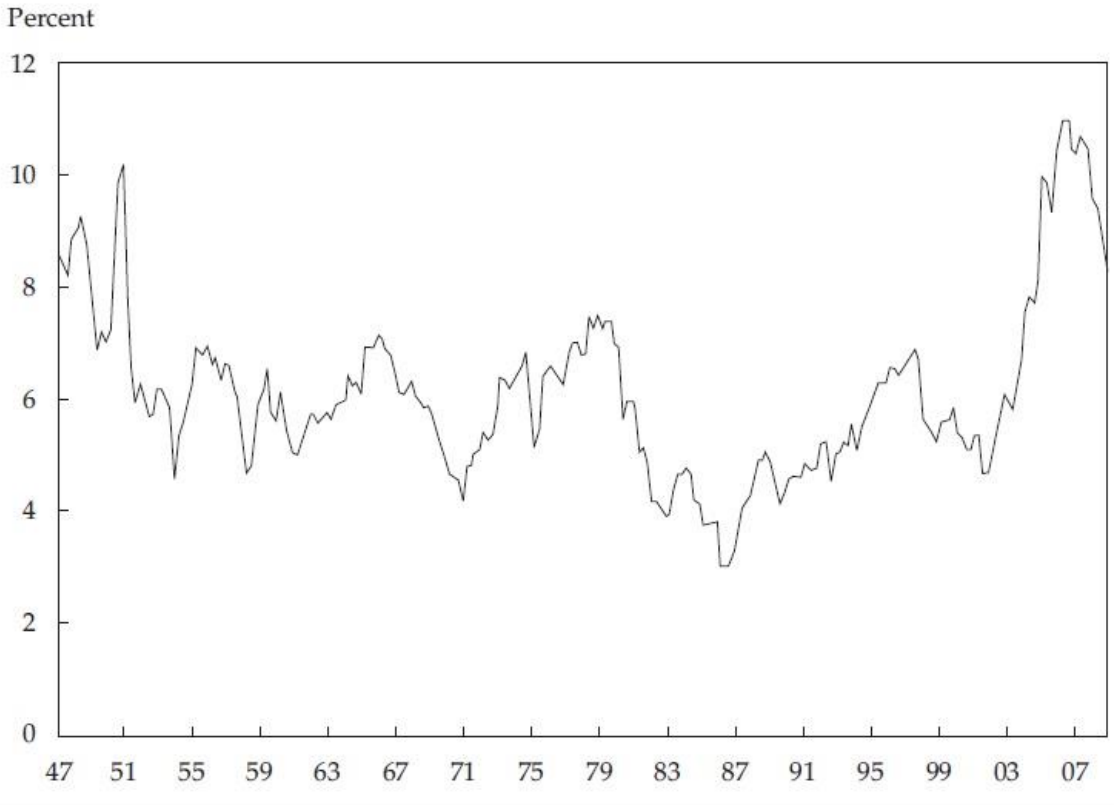
Just by looking at the graph it is possible to note that the growth rate for the two variables is almost similar for the entire period considered except for two years of great depression, 1932 and 1933, during which overall NIPA's corporate profits disappeared. For the rest of the period nominal aggregate corporate earnings growth has tracked nominal GDP growth. All this means that maybe the two variables are related; therefore it is useful to go deeper. Indeed to prove this fact we present Table 1.1. (BRADFORD CORNELL, 2010) where are represented Nominal US corporate profits as a percentage of GDP. We can see how the figure

reveals no overall trend. The fraction is approximately the same at the end as at the beginning, and thus, the growth rate of corporate profits is almost identical to that of GDP.

Table 1.1. Corporate Profits As A Percentage Of GDP, 1947-2009 (**Source:** BRADFORD CORNELL, 2010)

LEGEND:

PERIOD OF OBSERVATION: from 1947 to 2009
X-AXYS : Period
Y-AXIS : Nominal US corporate profits as a percentage of GDP



Summarizing the information included in the two graphs we can say that the first step of the theory is correct, so that in the long run GDP and corporate profits tend to grow at the same pace.

1.2.2) SECOND STEP: AGGREGATE EARNINGS GROWTH TRANSLATES INTO EARNING PER SHARE (EPS) GROWTH

This is the most problematic step, the weakest link in the chain. First of all we need to distinguish between growth in aggregate earnings of an economy and the growth in earnings per share to which current investors have a claim. These variables are not the same; therefore they don't grow at the same pace.

While it is simple to understand what is the growth in aggregate earnings of an economy, we need to explain better what the growth in earnings per share is, firstly understanding what is earning per share.

What Is EPS?

Earnings per share or basic earnings per share is calculated by subtracting preferred dividends from net income and dividing by the weighted average common shares outstanding. The earnings per share formula looks like this:

$$\text{EPS} = \frac{\textit{Net Income} - \textit{Preferred dividends}}{\text{Weighted Avg Outstanding Shares}}$$

As we can see from the formula in the numerator to calculate EPS we have net income that usually we find it in the income statement, but where it is applicable we need to subtract from the net income the preferred dividends; why? Because EPS wants to measure the income available to common stockholders. Preferred dividends are not common therefore they are subtracted from the net income.

At the denominator we have the weighted average common shares outstanding; it is the simple average between the common share outstanding at the beginning and at the end of the year. This in order to take into account of all the operations that a firm could conclude during the year like issue new stock and buy back treasury stock.

Why growth in aggregate earnings of an economy and the growth in earning per share do not coincide?

The principal reason why EPS growth does not coincide and follows perfectly the rate of economic growth is the "Dilution Effect" (BERNSTEIN W. AND ROBERT D. ARNOTT,

2003), due to the entrepreneurial capitalism. In fact, per share earnings and dividends keep up with GDP only if no new shares are created. A portion of GDP growth comes from capital increases, such as new share issuances, rights issues, or IPOs, which increase aggregate earnings but are not accessible to current investors. For this reason, investors do not automatically participate in the profits of new companies. When buying shares of new businesses, they have to dilute their holdings in the "old" economy or invest additional capital. This dilution causes the growth in EPS available to current investors to be lower than growth in aggregate earnings. (MSCI BARRA, MAY 2010)

How much aggregate earnings of an economy and the growth in earning per share differ?

We have seen that the major causes of the gap between these two variables is due to the dilution effect, so to understand how much they differ we simply measure the dilution effect.
Bernstein and Arnott (2003) suggested an ingenious procedure for estimating the combined impact of both effects on the rate of growth of earnings to which current investors have a claim. They noted that total dilution on a market wide basis can be measured by the ratio between the proportionate increase in market capitalization and the proportionate increase in stock price. For example, if over a given period, the market capitalization increases by a factor of 10 and the cap-weighted price index increases by a factor of 5, a 100 percent net share issuance has taken place in the interim.
More precisely, net dilution for each period is given by the equation:

$$\text{Net dilution} = \frac{1 + c}{1 + k} - 1$$

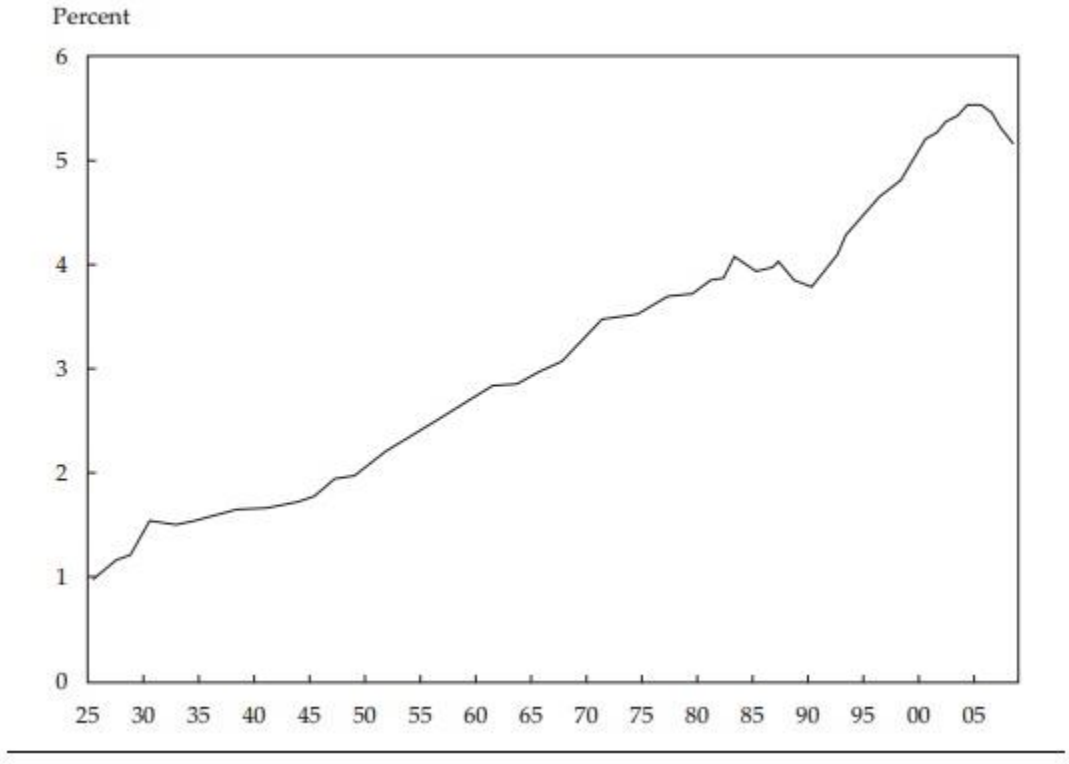
Where c is the percentage capitalization increase and k is the percentage increase in the value-weighted price index. This relationship has the advantage of factoring out valuation changes, which are embedded in both the numerator and denominator, and neutralizing the impact of stock splits. Note that this dilution measure holds exactly only for the aggregate market portfolio. For narrower indices, the measure can be artificially affected if securities are added to or deleted from the index. (BERNSTEIN W. AND ROBERT D. ARNOTT, 2003)

Table 1.2 (BRADFORD CORNELL, 2010) plots the compounded estimate of net dilution from 1926 to 2008. It rises continuously except for downturns in the early 1990s and in 2006-2008. The average rate of dilution over the entire period is 2 percent. Essentially dilution comes from the creation of new shares as new companies capitalize their businesses with equity. This is not a surprising result because the impact of start-ups account for approximately half of the US GDP growth. Being start-ups so important in the US economic growth the only possibility to reduce the dilution effect is to reduce the rate of innovation; but in this way we will observe also a decrease in the GDP growth. Therefore it is reasonable to conclude that the rate of growth of earnings, net of dilution, will remain largely constant.
Therefore, to estimate the growth rate of earnings to which current investors have a claim, approximately 2 percent must be deducted from the growth rate of aggregate earnings.

Table 1.2 The Impact of Dilution on Investor Earnings, 1926-2008 (**Source:** BRADFORD CORNELL, 2010)

LEGEND:

PERIOD OF OBSERVATION: from 1926 to 2008
X-AXYS : Period
Y-AXIS : Compounded estimate of net dilution in percentage



1.2.3) THIRD STEP: EPS GROWTH TRANSLATES INTO STOCK PRICE INCREASES

The last assumption is that EPS growth translates into stock price increases. The determinants of the price return of the stock are: the growth rate in EPS and the growth rate in P/E ratio. So that, before to see the price return of the stock formula we understand better what are these two components. We have already seen before the EPS and its formula, now we look at P/E ratio.

The price earnings ratio (P/E ratio) is a market prospect ratio that calculates the market value of a stock relative to its current earnings by comparing the market price per share by the current earnings per share. In other words, the price earnings ratio shows what the market is willing to pay for a stock based on its current earnings. Investors often use this ratio to evaluate what a stock's fair market value should be by predicting future earnings per share.

Now that we have discussed its components, we can derive the price return of the stock formula as follows:

Price Return Of The Stock Formula (MSCI BARRA, MAY 2010)

$$1 + r = (1 + g_{rEPS}) (1 + g_{PE})$$

Where: **r** is the price return of the stock, $\mathbf{g_{rEPS}}$ is the growth rate in real earning per share, $\mathbf{g_{PE}}$ is the growth rate in Price to Earnings ratio. This equation is only valid if there are no changes in valuations (the price to earnings ratio) which is a condition for which many authors agree with and for this reason support the supply-side models assumptions.

Discussion On The Supply Side Models

The aim of the thesis is to verify if there exist a relationship between GDP growth and stock returns. The answer to this question could be very useful to build up an investment strategy. Supply side models try to connect both variables with some assumptions. In particular there are some assumptions required from the theory that, according to me, are a bit unrealistic. Nowadays stock markets list not only domestic companies, at least the most important stock markets, for example FCA (ex FIAT) is listed also in the USA stock market, or a lot of Italian companies are listed in the UK stock market just because we don’t have one anymore. This

will be a crucial point also in the explanation of the results for the empirical analysis that we will see in the third part.

Moreover another assumption is that economies are closed but we know that, thanks to the globalization we can speak no more of national markets but of global market.

1.3) LINKING GDP GROWTH WITH STOCK RETURNS: FROM THE THEORY TO THE MODEL

In this paragraph we introduce the principal model in which stock returns are presented as a function of the GDP growth plus other components. Most of the authors are focused not directly on the relationship between GDP growth and stock returns but on the GDP growth – Equity Premium relationship. We will extrapolate from those theories the specific contents for our purposes.

In particular we examine the model by Cristophe Faugère and Julian Van Erlach (2006): The equity premium: consistent with GDP growth.

He tried to develop an exact analytical relationship linking the average real stock return and long-term GDP per capita growth.

(CRISTOPHE FAUGÈRE AND JULIAN VAN ERLACH ,2006) established a link between macroeconomic and finance variables by positing that in the long run, the unconditional expected growth of the economy's corporate capital stock must equal the unconditional expected growth in book value of a broad stock index (S&P500). Let *Kt* denote the capital stock, *Bt* denote the book value of a broad equity index, this key assumption can be written in this way:

$$\mathrm{E}\left(\frac{K_{t+1}}{K_t}\right) = \mathrm{E}\left(\frac{B_{t+1}}{B_t}\right)$$

Where $E(\cdot)$ denotes the unconditional expectation operator.
Then assuming that the expected long-run growth rate of population *n* and net new shares *gs* are both constant he posits that in the stationary equilibrium net new share growth *gs* equates population growth *n*. This assumption is reasonable because in the long run, aggregate stock wealth cannot grow faster than GDP, to rule out permanent bubbles.

The same must be true on a per capita basis, given that the distribution of wealth is stable in the steady state.

The main result of this theory is this stock returns equation (CRISTOPHE FAUGÈRE AND JULIAN VAN ERLACH, 2006):

$$\mu = \frac{g_y + \mathrm{COV}(b_{t+1}, R_{t+1}) - \mathrm{COV}\left(\frac{g_{s,t+1}}{(1+g_{s,t+1})}, \frac{V_t}{B_t}\right)}{1-b}.$$

Where:

- **μ** is the long run nominal stock return
- $\mathbf{e_t}$ = total earnings for the index at the beginning of the period t
- $\mathbf{B_t}$ = book value of a broad equity index
- $\mathbf{V_t}$ = market value of the index
- $\mathbf{g_y = g - n}$ denote the GDP per capita growth rate
- $\mathbf{b_{t+1}}$ =the portion of earnings that is paid out as dividends
- $\mathbf{R_{t+1} = e_{t+1} / B_t}$ = ex post ROE at the end of the period t
- $\mathbf{g_{s,t+1}}$ = ex post rate of net stock issues at the end of period t

This formula shows that long-run nominal stock return (μ) is a direct function of the GDP per capita growth rate. This return also depends on the retention rate (1 – b) and the difference between the two covariances:

1. the covariance between dividend payout and the index ROE
2. the covariance between market-to-book ratio and the normalized growth rate of shares the following period

This difference between the two covariances are the "Risk Premium Term" that has to be added to the expected GDP per capita growth rate and then all divided by the percentage of new earnings retained in order to obtain the long-run nominal stock return.

We have to remember that the retention rate (1 – b) and the steady state growth rate g_y are determined in the background by optimal consumption-investment decision.

Two results are possible:

1. When the first covariance COV (*bt*+1, *Rt*+1) is large, this means that companies pay out a greater fraction of earnings when their ROE is high (procyclical), which exacerbates the volatility of cash flows and thus price volatility.
2. When the second covariance COV (*gs*, *t*+1 / (1+*gs*, *t*+1) , *Vt* / *Bt)* is large, greater stock issuance is associated with periods of high market-to-book ratios (procyclical). In that case, greater stock issuance will bring the market-to-book ratio back down, and vice versa in periods of low valuation. Thus, price volatility is dampened.

At this point Faugère try to reinforce his study verifying with data and the empirical analysis if his model is able to tackle the history of the S&P500.
In particular he calculated that: 1) the arithmetic average yearly population growth rate is n = 1.19% and is assumed equal to the growth rate of shares *gs*, 2) the estimate for g is 6.65%. 3) the arithmetic average nominal growth rate of GDP per capita over the 1926–2001 period is $gy \sim = g - n$ = 6.65% − 1.19% = 5.46%, 4) the average S&P 500 dividend payout is 55.5%. 5) the estimate for the covariance between dividend payout and ROE is −0.51%.

Surprisingly this value is identical to the value of the sample covariance between the market-to-book ratio and the subsequent period (normalized) shares growth rate, over 1925–2001.
This means that over the period, both dividend payouts and net new share issuance have been *countercyclical* in the United States, thereby creating coupling effects that offset the risk premium.

So that he obtained that the final value of the arithmetic average nominal stock return (μ)

$$\mu = \frac{5.46\%}{(1 - 55.5\%)} = 12.27\%$$

This final value is nearly identical to the arithmetic average nominal stock return value of 12.2% estimated for example by Siegel (2002) for the period 1926–2001.
This means that the authors derived an exact analytical relationship between per capita GDP growth and average stock returns for the long run period
We can observe that the smaller the retention ratio is, the greater the stock return is for a *given GDP per capita growth rate.*

2) EMPIRICAL STUDIES ON THE GDP-STOCK RETURNS RELATIONSHIP

2.1 SURVEY OF ACADEMIC LITERATURE: LONG-PERIOD STUDIES

Surprisingly, there are not so many academic studies on this subject, especially for the empirical point of view. The question that some authors have tried to answer is whether more economic growth (more GDP) means more stock returns. In this sense they empirically have verified if the emerging markets[1], which are those that displayed the highest growth rate, also had the highest stock returns.

A lot of investment decisions are made on the idea that more economic growth means more stock returns. For this reason it is important to verify empirically the correctness of this relationship. This because, even if in theory there should be a link between GDP growth and stock returns through the channel of more economic growth means more earnings for companies which lead to an higher stock returns, there could be some obstacles which hinders the relationship. Some authors try to turn the light on this subject comparing the emerging market's GDP growth rate and stock returns with those of the developed markets.

A summary of the long-period studies is available at the table A in the Appendix 1.

2.1.1) ECONOMIC GROWTH IS NO GUARANTEE OF SUPERIOR STOCK RETURNS.

The first author that has tried to investigate in this relationship was Jeremy Siegel (1998) who said that economic growth is no guarantee of superior stock market returns. In the Table 2.1 (SIEGEL, JEREMY J. 1998) he compared the stock returns and economic growth among seventeen developed countries and eighteen emerging countries monitored by the Morgan Stanley. The developed countries are: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Singapore, Spain, Sweden, Switzerland, United Kingdom and United States. The emerging countries are: Argentina, Brazil, Chile, Greece,

[1] Are considered emerging markets the middle-to-higher income developing countries in transition to developed status, which were often undergoing rapid growth and industrialization, and which had stock markets that were increasing in size, activity and quality. The major indexes to classify emerging markets are MSCI, S&P and FTSE

India, Indonesia, Israel, Jordan, Korea, Mexico, Pakistan, Perù, Philippines, Portugal, South Africa, Thailand, Turkey and Venezuela. The period of observation is from 1970 to 1997; therefore it covers 27 years.

Table 2.1 Economic Growth and Dollar Stock Market Returns

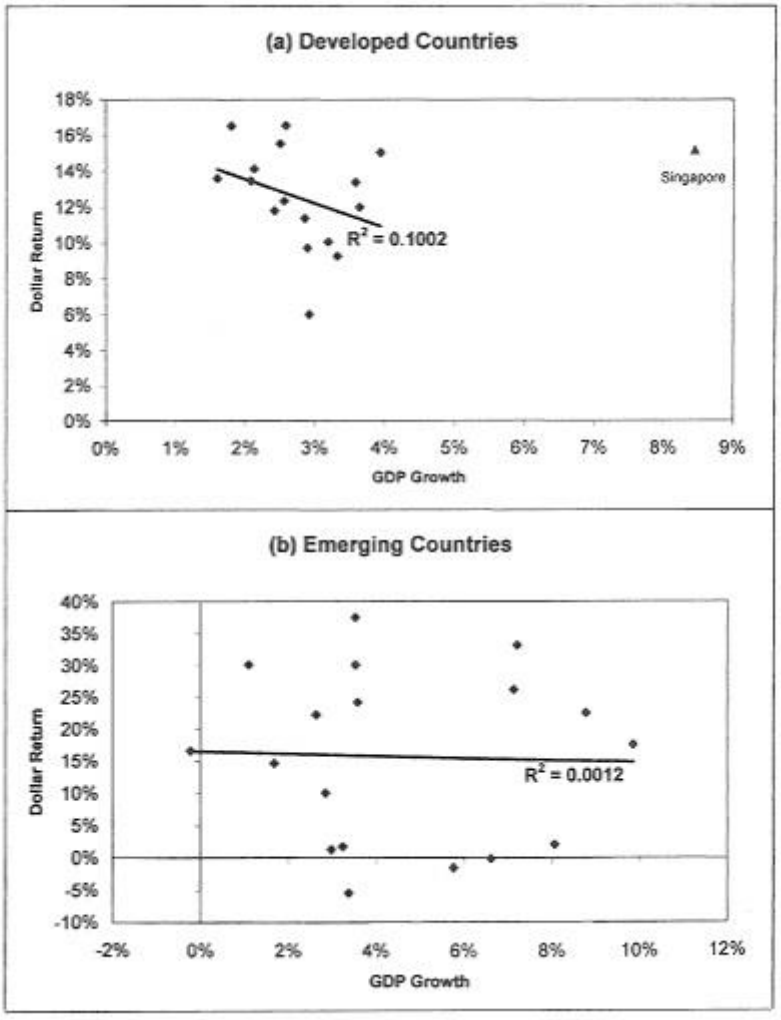
LEGEND:

PERIOD OF OBSERVATION: from 1970 to 1997
VARIABLE USED: GDP Growth and Dollar Returns
COUNTRY IN THE SAMPLE: Developed Countries (a) and Emerging Countries (b)

Country	Growth	Return
Australia	3.3%	9.3%
Austria	2.9%	11.4%
Belgium	2.5%	15.5%
Canada	3.2%	10.1%
Denmark	2.1%	14.1%
France	2.6%	12.3%
Germany	3.6%	12.0%
Italy	2.9%	6.0%
Japan	3.9%	15.1%
Netherlands	2.5%	16.5%
Norway	3.6%	13.4%
Singapore	8.4%	15.2%
Spain	2.9%	9.7%
Sweden	1.8%	16.5%
Switzerland	1.6%	13.6%
United Kingdom	2.1%	13.5%
United States	2.4%	11.8%
Correlation		-0.32

Country	Growth	Return
Argentina	3.5%	37.5%
Brazil	1.1%	30.1%
Chile	7.2%	33.2%
Greece	1.7%	14.7%
India*	6.6%	0.0%
Indonesia	7.1%	26.2%
Israel*	5.8%	-1.4%
Jordan	3.0%	1.3%
Korea	8.1%	2.2%
Mexico	3.5%	30.1%
Pakistan*	3.4%	-5.4%
Peru*	8.8%	22.6%
Philippines	3.6%	24.3%
Portugal	3.2%	1.8%
South Africa*	2.6%	22.3%
Thailand	9.9%	17.6%
Turkey	2.8%	10.1%
Venezuela*	-0.2%	16.6%
Correlation		-0.03

*Data extends from 1992 through 1996.



It is immediately possible to observe what the main result of his study is: there is no correlation between economic growth and stock returns. Nevertheless we don't know if the correlation coefficient is statistically significant. Therefore we must be careful with the results of the Professor's research. We have just information about the R square which is a measure of the accuracy of the relationship and it is very low.

In particular at the top of the figure we have the table for the developed markets containing information about growth rate and returns and the regression analysis on the right. The slope of the regression line is negative and this means that the correlation is negative.

For developed markets the negative correlation is -0.32. We can see for example that even if Italy has displayed higher growth rate with respect to the United States, stock returns in the USA are almost twice the Italian ones. The only exception to the confirmed-by-data rule that more economic growth doesn't mean more stock returns is Singapore where the opposite is true but we can consider it as an outlier.

The same analysis has been conducted for the emerging countries (at the bottom of the figure) where the negative correlation is confirmed, even if it is weaker. In fact the correlation is -0.03 while the R square is 0.0012. In this group very significant is the case of Venezuela where the economic growth was -0.2% while stock returns were 16.6%. The opposite situation instead is found in Korea where despite an economic growth rate of 8.1% , the stock returns were just 2.2%. A detail we should have in mind is that these results are in dollars term and this means that they were converted from their original currencies. We will see later in this chapter how this is an important factor which we should take into account for a correct analysis.

As surely surprising are the global results coming from Siegel, we need to go deeper because his study was conducted on data that go back only as far as 1970. Moreover the sample is very reduced since the observations are yearly; therefore the significance of the test is very reduced. In the sample we don't find China because in those years there weren't data available.

2.1.2) A CONFIRMATION OF THE NEGATIVE CORRELATION

Siegel's study was the milestone, the first important contribution in this field, so every authors based his study on that work. For a long time every study which followed the Siegel's one tried to find the correlation between economic growth and stock returns simply by adding in the regression more observation, more years, and more countries. A proof of this is the second study conducted in the 2002 by E. Dimson, P. Marsh, M. Staunton (from now on DMS) in their book "Triumph of the optimists" which, albeit with different techniques and instruments, essentially arrived to the same conclusion enlarging the sample.

The underlying assumption of their work is that it is true the Gordon model for the equity returns that we summarize in this prospect:

$$\text{Stock Value (P)} = \frac{D}{k - G}$$

Where:

- D = Expected dividend per share one year from now
- k = Required rate of return for equity investor
- G = Growth rate in dividends (in perpetuity)

From this model we can see that the price of a stock, or the level of an index, equals the present value of future dividends. If these grows at a constant rate, then the required returns on equity equals the dividend yield plus the expected future growth rate in dividends.

DMS ague that in the Gordon model the key variable is the expected dividend growth. This particular variable is very debated in the finance world because some authors think that dividend growth stay in the range of 2-5% while others think that the growth rate for dividend cannot exceed in the long run the growth rate of the economies otherwise corporate profits would assume an ever larger share of the GDP.

Until now in the precedent studies, authors used the growth rate in the absolute level of GDP in order to search for a link with the equity returns. DMS introduce a different and more classic variable: the per capita GDP growth rate. With this variable is possible to adjust for large differences in population growth. In fact if we don't control for the population growth we can have situation where GDP growth is higher just because the population growth is higher. We know from data that in the period between 1900 and 2000 the population growth is very different among the countries and we summarize it in the table 2.2

Table 2.2 Overview Of The Population Growth 1900-2000 (Source: World Bank Data)

COUNTRY	POP. GROWTH	COUNTRY	POP. GROWTH
IRELAND	19%	AUSTRALIA	420%
FRANCE	49%	CANADA	470%
BELGIUM	52%	SOUTH AFRICA	825%
UNITED KINGDOM	53%	UNITED STATES	267%

From the table 2.2 we can see how the growth rate of the population could be a strong determinant of the absolute GDP growth level of an economy; therefore if we have an estimate of the population growth it is possible to standardize the results between countries making them comparable.

In their study DMS have included 16 countries: Japan, Italy, Denmark, Belgium, Germany, France, Spain, Ireland, Nederland, Switzerland, Canada, United Kingdom, United States, Austria, South Africa, and Sweden. So the number of countries in the sample is smaller than Siegel's sample. But despite this fact, the length of time of observations is bigger. Indeed DMS study covers from 1900 to 2000 while the Siegel's one from 1970 to 1997.

The main results of the DMS research can be summarized in two graphs. In the first one, the Table 2.3 there is the negative relationship between the real dividend growth rate and the real GDP per capita growth rate while in the second one there is the relationship between Real GDP per capita growth and Equity returns. Why is it important to test the relationship between Real per capita GDP growth and Real dividend growth? Because dividend growth is the major determinant of the equity returns (Gordon Model), therefore if we test this relationship we have already tested also a big part of the relationship between real GDP per capita growth and equity returns.

TABLE 2.3 Real GDP Per Capita – Real Dividend Growth 1900-2000

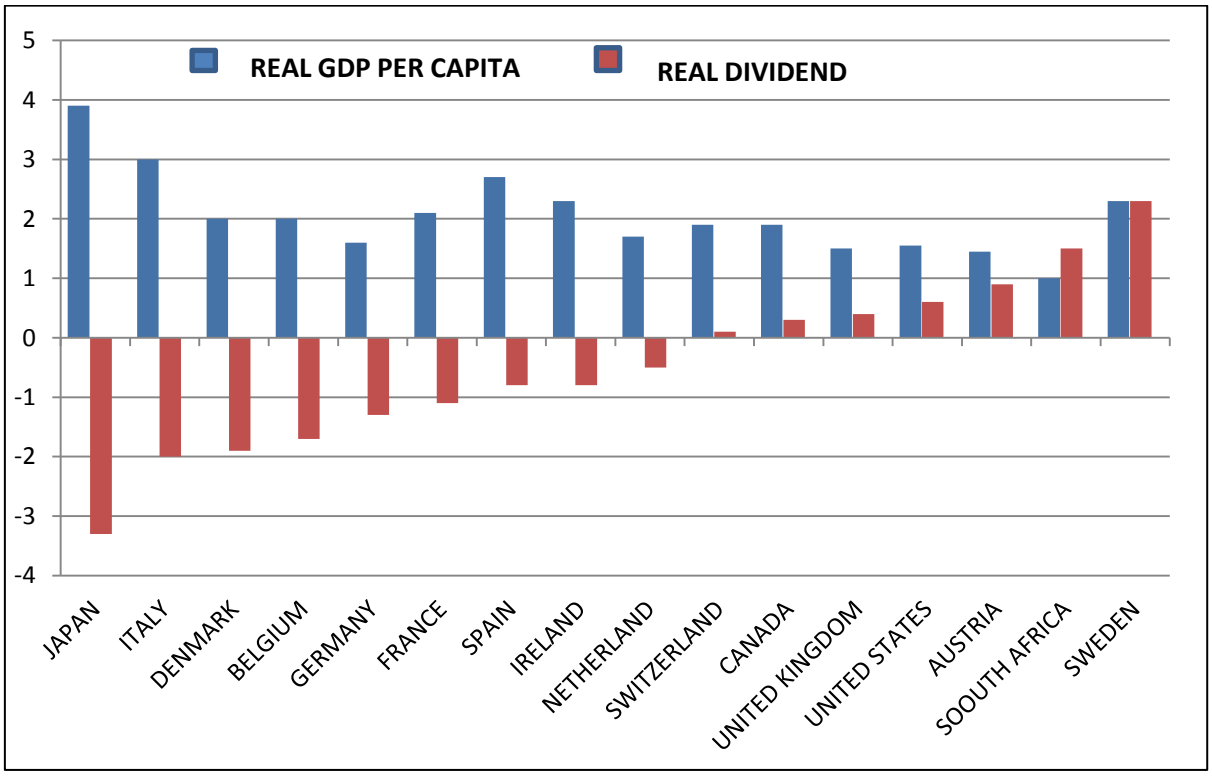
LEGEND:

SOURCE: Triumph of the Optimists (DMS 2002)

PERIOD OF OBSERVATIONS: 1900-2000

X-AXYS: Countries

Y-AXYS: Annualized Real Rate (%)



As we can see the blue bars represent the Real GDP per capita growth while the red ones represent real dividends growth. Both variables are calculated as annualized geometric mean for the period between 1900-2000 and to control for the impact of inflation are converted in real terms. The countries are ranked in ascending order for the Real dividend growth. From this graph we can see how for almost every case, except for South Africa the real dividend growth rate is always below the growth rate for the GDP. There has been considerable variation in dividend growth, ranging from Japan, where real dividends fell by 3.3 percent per year, to Sweden, where they grew by 2.3 percent per year. US and UK dividend growth ranked fourth and fifth highest behind Sweden, South Africa, and Australia. Only two other countries, Canada and Switzerland, had positive real dividend growth.

The blue bars instead, representing the Real GDP per capita growth rate, display also variability among the countries but not so much as in the dividend growth case. We have to remember that these results are for a very long period which includes both world wars; so in the sample there are countries which were impacted from the wars and others do not. Nevertheless for all countries Real GDP growth is positive.

Simply by looking at the graph, then confirmed by calculations, it is possible to note that GDP growth and dividend growth are negatively correlated, in fact to a higher economic growth does not correspond a higher dividend growth. This negative correlation has been calculated by DMS and it is -0.53 for the period between 1900-2000. They also checked if in some way the negative results are driven by the first part of the century with the two world wars, therefore they computed also the same correlation analysis for the period between 1951 and 2000 but the same results emerged with the confirm of the negative correlation.

The second main result coming from DMS research can be summarized in the Table 2.4

In this graph we have the comparison between the Real GDP per capita growth (light blue bars) and Real equity returns (dark blue bars). As in the previous graph both variable are the results of the annualized geometric mean and are corrected for the inflation

TABLE 2.4 real GDP per capita growth – real EQUITY RETURNS growth 1900-2000

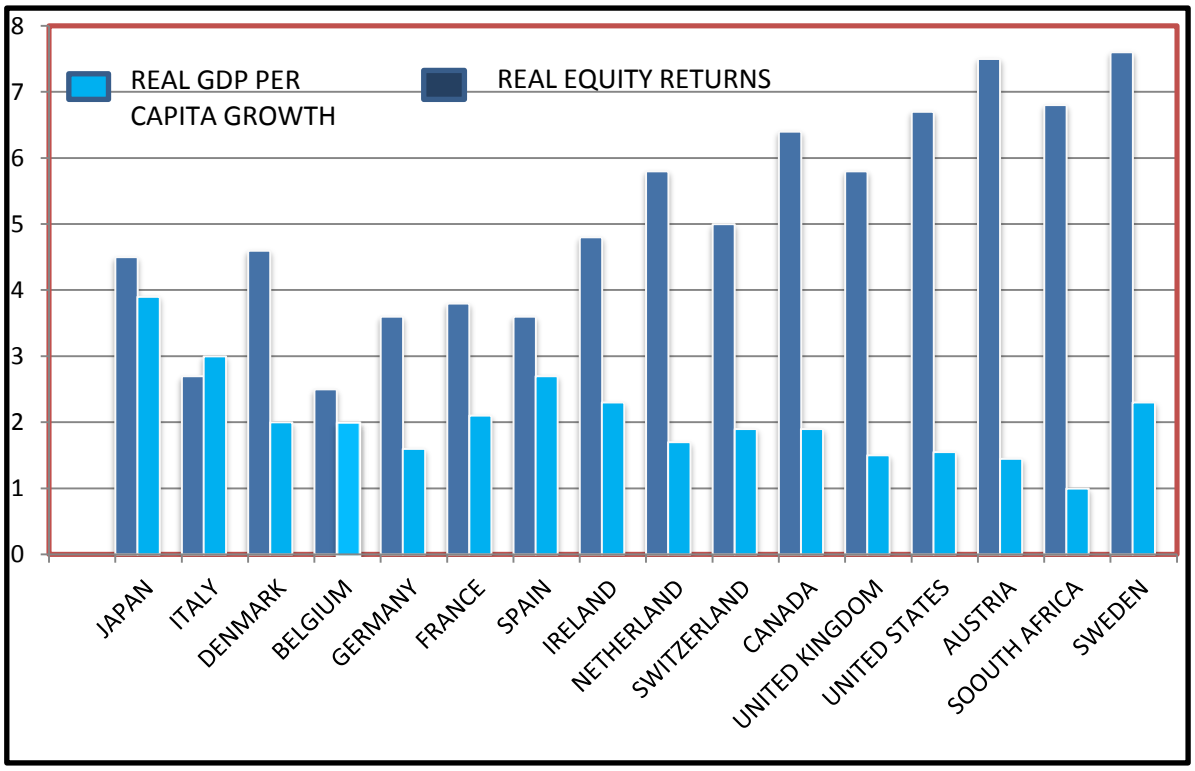
LEGEND:

SOURCE: Triumph of the Optimists (DMS 2002)

PERIOD OF OBSERVATIONS: 1900-2000

X-AXYS: Countries

Y-AXYS: Annualized Real Rate (%)



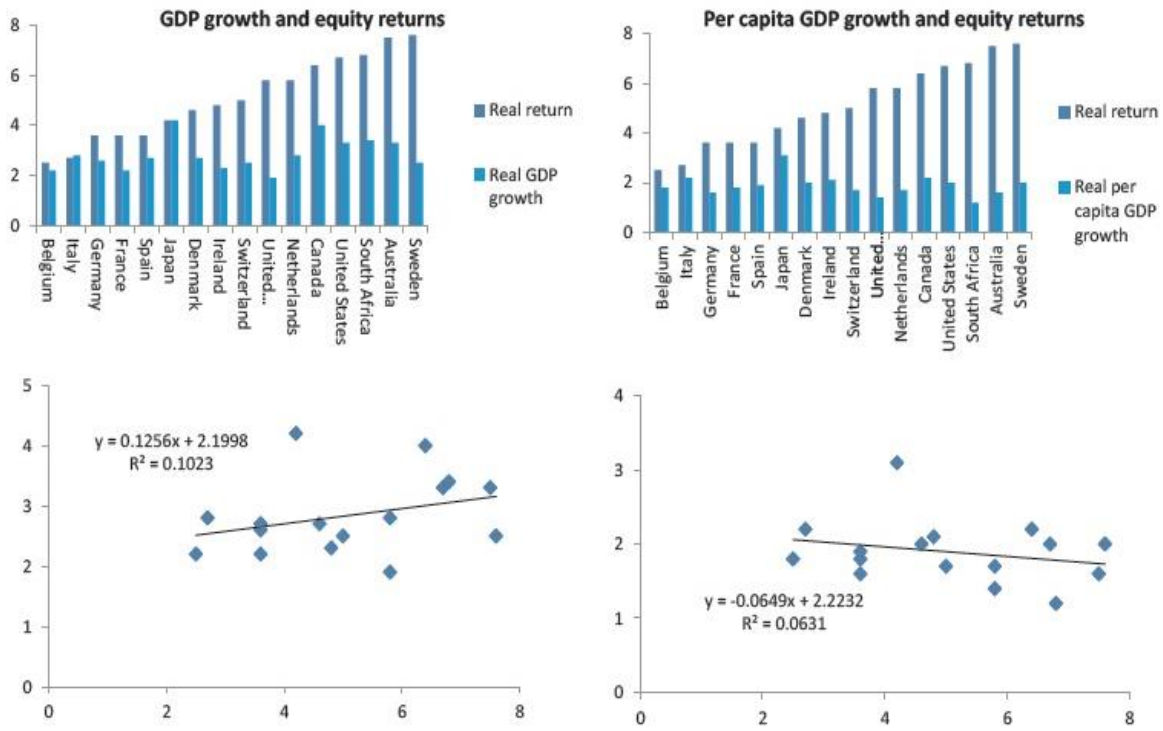
At first glance it is easy to note that there isn't a relationship between GDP growth and equity returns; in fact what happens is that countries with high economic growth don't display also high equity returns. Significant is the case of the United States where the Real GDP growth rate is almost 7% while the Real Equity returns are near the 2%. Another important result is that in every country the GDP growth rate exceeds the equity returns growth rate and this maybe confirm the theories of some authors according to which in the long run equity returns growth cannot exceeds GDP growth (MSCI BARRA 2010). This conjecture is confirmed by the analysis because DMS have calculated the correlation between the Real GDP growth rate and Real equity returns is -0.27 for the period 1900-2000 and -0.03 for the period between 1951-2000. As in the previous case the analysis for different periods has been made in order to control for possible influences of the wars in some countries. Nevertheless we do not have information about the significance of the correlation coefficient; therefore we know that there is a negative correlation but we cannot exclude totally that this result is obtained by chance.

2.1.3) AGGREGATE GDP GROWTH IS BETTER

BERNSTEIN W. AND ROBERT D. ARNOTT, (2003) have analyzed the relationship between GDP growth and stock returns using for the GDP variable both the aggregate growth and the per capita growth. The results are different and we summarize them in the Table 2.5

The sample includes the same 16 countries of DMS(2002) but analyses two relationships, in the left and side of the panel there is the GDP growth-equity returns relationship while in the right and side there is the Per capita GDP growth – equity returns relationship. The difference is very surprising and it is visible looking the slope of the regression line. Indeed using per capita GDP the negative correlation is confirmed while the correlation became positive (0.32) using the aggregate growth rate for GDP for a period of time of 100 years. Nevertheless both positive and negative correlations are not statistically significant at 10% level. This means that we need to go deeply in order to find a structural and significant relationship. Moreover total GDP over such a long period could be subject to structural breaks such as significant migration waves or discontinuities in the definition of nation states. (NBIM 2012)

Table 2.5 Correlation GDP-GDP per capita growth vs. Real equity returns, 1900-2000 (Source**:** BERNSTEIN W. AND ROBERT D. ARNOTT, 2003)



2.1.4) UNIT OF MEASUREMENT MATTERS A GREAT DEAL

Three years after the DMS research, also another author, RITTER JAY R. (2005), have studied the GDP growth-stock returns relationship from an empirically point of view. In his study he included the same 16 countries included in the DMS 2002 for the period from 1900 to 2002. According to his study the negative correlation is -0.39 with a p-value of 0.10 rather than the -0.27 that DMS report.

Apart from the difference in the size of the negative correlation Ritter found something more. Indeed he found that the unit of measurement matter a great deal. There is some effect from whether local currency units or purchasing power parity numbers are used for real GDP growth. (RITTER JAY R. 2005). He went deeper in the analysis of this effect in his work in the 2012. When the returns are adjusted for changes in the exchange rate relative to the U.S. dollar, so that they represent what a U.S. investor would have received, Table 2.6 (Morgan Stanley publication. 2012) reports that the correlation changes slightly, to -0.32 (p-value=0.18).

The importance of these findings is that an investor would have been better off avoiding countries where per capita GDP rose the most and investing in countries with slower per capita growth. Actually such a strong result means that the major part of the investment decisions made by the investors are wrong, in the sense that it could be that they reach an higher returns investing in emerging countries rather than developed countries, but the higher returns could be not justified from the economic growth. There could be some other factors that affect the returns.

Table 2.6 Real Annual Per Capita GDP Growth Rates and Stock Returns, 1900-2011

Country	Real per capita GDP growth	Mean geometric real return		Real dividend per share growth	Dividend yield
		Local currency	U.S. dollars		
Australia	1.68%	7.2%	7.3%	0.99%	5.7%
South Africa	1.13%	7.2%	6.4%	1.05%	5.8%
United States	1.85%	6.2%	6.2%	1.31%	4.2%
Sweden	2.21%	6.1%	6.2%	1.80%	4.0%
New Zealand	1.30%	5.8%	5.5%	1.17%	5.4%
Canada	1.96%	5.7%	5.7%	0.67%	4.4%
United Kingdom	1.48%	5.2%	5.2%	0.45%	4.6%
Finland	2.41%	5.0%	5.1%	0.23%	4.8%
Denmark	1.86%	4.9%	5.4%	-0.96%	4.6%
Netherlands	1.78%	4.8%	5.2%	-0.61%	4.9%
Switzerland	1.70%	4.1%	5.1%	0.47%	3.5%
Norway	2.45%	4.1%	4.4%	-0.07%	4.0%
Ireland	2.30%	3.7%	4.0%	-1.29%	4.5%
Japan	2.69%	3.6%	4.2%	-2.36%	5.2%
Spain	2.14%	3.4%	3.5%	-0.58%	4.2%
France	1.85%	2.9%	2.8%	-0.75%	3.8%
Germany	1.78%	2.9%	3.2%	-1.27%	3.7%
Belgium	1.66%	2.4%	3.0%	-1.48%	3.7%
Italy	2.15%	1.7%	1.8%	-2.21%	4.0%
Correlation of growth and returns		-0.39	-0.32		
p-value		(0.10)	(0.18)		

For real per capita GDP growth per year, data come from an updated version of Angus Maddison (1995) Monitoring the World Economy 1820-1992 Paris: OECD Development Centre Studies, as explained in Appendix Table A-1 for 1900-2008, and from the World Bank's World Development Indicators for 2008-2011. Real per capita income is expressed in terms of dollars of 1990 Geary-Khamis dollars (purchasing power parity-adjusted) through 2008 multiplied by the ratio of 2011/2008 real per capita income in local currency units from World Development Indicators to obtain the 2011 number, and converted into an annualized number. The South African GDP numbers start in 1913 rather than 1900. The geometric mean annual real dividend growth rates, dividend yields, and real returns (dividends plus capital gains) per year from Dimson, Marsh, and Staunton (2012) are used for 19 countries for the 112 years from 1900-2011. The equally weighted mean real return is 4.6% per year in local currency units and 4.7% per year in U.S. dollars, and the mean per capita growth rate of real GDP is 1.8% per year.

From the Table 2.6 it is also possible to note that the Real per capita GDP growth varies from 1.13% registered for South Africa to 2.69% registered for Japan. Countries are ranked according to the mean geometric real returns measured in local currency which we can find in the second column; in this case Italy displays the lowest result with 1.7% while Australia and South Africa are the winners with 7.2%. The question which is possible to ask looking this table is how is it possible that some country are able to reach high mean geometric real returns while others not. Indeed there is something in common in some countries that depicts high real returns. First of all, the top seven countries—Australia, South Africa, the United States, Sweden, New Zealand, Canada, and the United Kingdom—all have had the good fortune to avoid having major wars fought on their own soil in the last century, a misfortune that befell most of the continental European countries. Second, the high-return countries, with the exception of Sweden, are English-speaking with traditions of English common law and, apart from South Africa, long histories of democratic government and universal suffrage. Third, and also worth noting, several of these countries have had economies where the natural resources sector has played an important part in their success (Morgan Stanley publication.

2012). All these confirm the hypothesis that maybe the higher returns reached by some emerging markets are not due only and exclusively by the economic growth, but by some other factors.

Another important result we can see in this table it is represented by the fourth column where there is the real dividend per share growth. We have already discussed about this variable saying that it is the key driver of the Gordon model for the expected returns; for this reason it is interesting to test whether there is a relationship between GDP growth and dividend growth. In particular there is evidence for some country showing high economic growth rate and high real dividend per share growth while for other countries this relationship is not true. The most emblematic example is represented by Japan which is the country with the highest GDP per capita growth but has also the lowest real dividend per share growth with -2.36%. This is a significant result because let us to understand how in some cases a country can fails to transform economic growth into growth of dividends. For the Japan case it is known that Japanese policymakers have long professed their commitment to growth and full employment—when necessary, at the expense of corporate profitability—and this commitment is reflected in the negative dividend growth and, until 1994, a ban on corporate repurchases of stock. The policymakers behavior could be one of the reason of the until-now missing link between GDP growth and stock returns.

2.1.5) CHANGING THE PERIOD DOES NOT CHANGE THE RESULTS

Before reviewing conclusions from the professor's research, we address their research methods. Studying the relationship between economic growth and stock market returns, the professors ran regressions using four different definitions of real GDP:

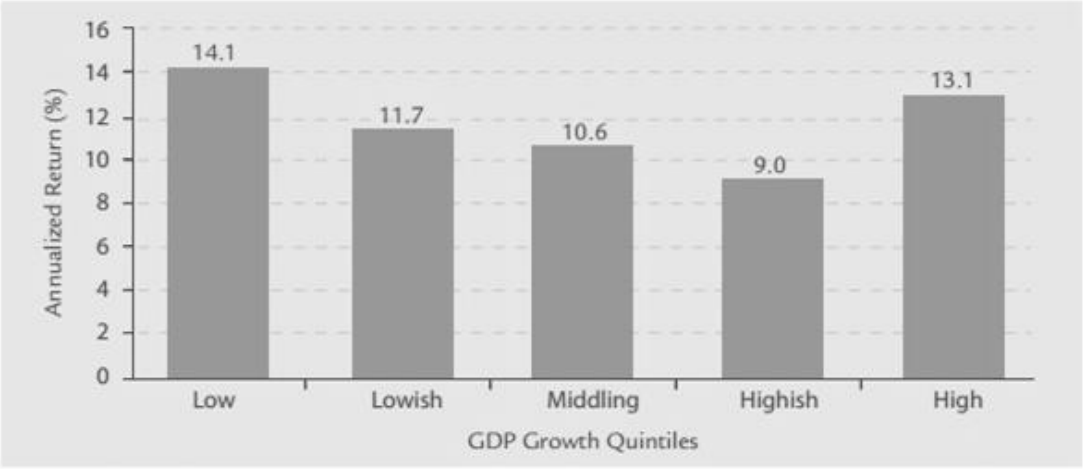
1. GDP converted into real terms using each country's Consumer Price Index (CPI)
2. GDP converted into real terms using each country's GDP deflator
3. Aggregate GDP for each country
4. Per capita GDP for each country

They report findings based on GDP deflated by the CPI, but the results were "virtually identical" for all four specifications for GDP. The data for both GDP and returns comes from the professors' extensive database.

To investigate any potential link between past economic growth and future returns, the authors segmented 83 countries from their database (which included developed and emerging countries) by quintiles. Countries were segmented at the start of each calendar year, based upon their real GDP growth over the preceding five years. The lowest quintile had the lowest GDP growth. Within each quintile, they created portfolios for an equal amount invested in the equity market of each constituent country. These investments were held for one year, with dividend income reinvested at year-end. Countries were re-ranked each year, the portfolios rebalanced, and this process repeated through 2009.

The authors' findings demonstrated no discernable relationship between returns and GDP growth. The table 2.7 (Credit Suisse, 2010) reflects results for all 83 countries in the study. Of these 83 countries, the majority were identified as emerging or frontier market countries by MSCI. GDP and returns data were used from the first year in which it was available for each country

Table 2.7 Annualized equity Returns by GDP Growth Quintiles; 83 Countries; 1900-2009 (Source**:** Credit Suisse, 2010)



Source: Credit Suisse Global Investment Returns Yearbook 2010. Past performance is not a guarantee of future results.

They applied also the same technique studying just 19 countries for the same period of time and the results were different. In my opinion the study which analyze 83 countries is more significant since it is more representative of the population; nevertheless, increasing the number of observation it increase also the possibility to amplify the error in the analysis since other factors may bias the results like inherent specific characteristics.

Table 2.8 Growth Quintiles; 19 Countries, 1900-2009

	1900–2009
	19 countries
Lowest growth	10.9
Lower growth	9.3
Middling growth	10.1
Higher growth	7.8
Highest growth	11.1

As we can see, the Table 2.8 records the quintile country portfolio returns for the 19 DMS countries for the 1900-2009 period. The lowest-growth quintile yields nearly the same performance (+10.9 percent) as the highest-growth quintile (+11.1 percent), and the second-highest-growth quintile actually experiences the lowest growth. Therefore we can conclude that economic growth does not seem to grant higher returns.

2.2 SURVEY OF ACADEMIC LITERATURE: INTERMEDIATE-PERIOD STUDIES

Until now we have seen a panoramic of the major studies of the GDP-stock returns relationship. But all the previous study had something in common: they took a great period of observation for the analysis. The recent literature instead, abandoned the idea of a long period to test the relationship focusing better on the intermediate period.
A summary of the intermediate-period studies is available at the table B in the Appendix 1.

One of the intermediate-period studies is the Dimson, Marsh and Statunton's study published in the 2010; they took as the base of their work the Ritter's study including other two things: more years of observations (until the 2009) and they not only try to study the relationship in the intermediate period but addressed also another problem: the starting point.
Indeed as we have seen in the theoretical part the choice of the period sample is very important because a change of just one year could change the entire result.
To illustrate better this point DMS make a comparison, in the Table 2.9 (DMS 2010), between GDP growth and real equity returns for two different period : from 1985 to 2009 and from

2000 to 2009. Clearly the results are quite different; the most significant result comes from emerging markets which if we take into account the entire period did not experienced a stellar growth rate, but for the last decade only they reach a very high growth rate in some cases also five-six times the growth rate of the developed markets.

Table 2.9 GDP Growth and Real Equity returns in selected countries

	2000-2009		1985-2009	
	GDP growth % p.a.	Real equity returns % p.a.	GDP growth % p.a.	Real equity returns % p.a.
China	9.9	7.7	9.9	2.6
India	7	9.5	6.2	11.2
Indonesia	5.1	6.8	4.7	0.4
Sri Lanka	4.9	9.4	4.7	2.2
Brazil	3.2	13.9	2.9	11.1
France	1.5	1.8	1.9	8.7
USA	1.9	2.7	2.8	7.3
UK	1.8	1	2.4	6.7
Germany	0.8	2.5	1.8	6.1
Japan	0.7	4.8	1.9	0.2

A different situation regards the analysis of the period 1985-2009. In fact, it is not true that emerging countries display the highest returns rate; indeed, a part from two emerging markets, India and Brazil, the other emerging markets returns are below the GDP growth rate. There is the opposite situation for the developed economies where equity returns are higher (at least double) than the GDP growth.

Another improvements that Dimson, Marshall and Statunton (2010) have done to the Ritter's study is to show that using the GDP per capita the relationship between coincident economic growth and equity returns for period of ten years is slightly positive on average even if statistically not significant. But this result is not useful since information about GDP are provided with a certain delay; therefore an investment strategy needs to be constructed on past or future data.

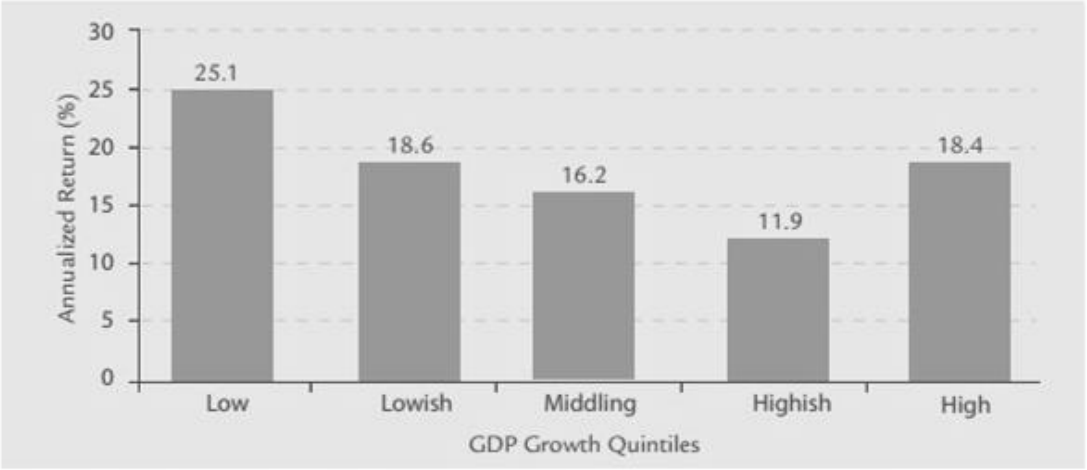
Using per-capita GDP, DMS (2010) show that the relationship between coincident economic growth and equity returns for 44 countries over investment horizons of ten years over the

1970-2009 period is slightly positive on average, but statistically insignificant. Even so, coincident GDP growth cannot be employed in a real-time investment strategy because it would require knowledge of economic data for the same period for which the return is measured.

An investable strategy has to use past GDP growth or requires an explicit forecast of future GDP growth.
In that spirit, DMS examine returns to country portfolios divided into quintiles based on their *past* five-year GDP growth rates and reconstituted on an annual basis. They find that high-growth economies identified using historical data have no discernible tendency to outperform their low-growth counterparts.

In the 1972-2009 period, which is shown in the Table 2.10 (CREDIT SUISSE, 2010), the lowest-growth quintile outperforms all other quintiles by a considerable margin. DMS attribute this arguably counterintuitive outperformance of low-growth markets to a "value effect" at country level. The lowest-growth markets will probably be shunned by investors due to their poor economic performance and higher distress risk; hence their lower valuations may set them up for higher returns in the future. High-growth markets, on the other hand, may appear less risky to investors and a lower risk premium is therefore priced, leading to less stellar returns.

Table 2.10: Annualized Equity Returns by GDP Growth Quintiles; 83 Countries; 1972-2009 (Source: CREDIT SUISSE, 2010)



2.3 SURVEY OF ACADEMIC LITERATURE: SHORT-PERIOD STUDIES

We now turn on the part of the literature that tries to study the GDP-stock returns relationship for short time horizons like five or ten years.

A summary of the short-period studies is available at the table C in the Appendix 1.

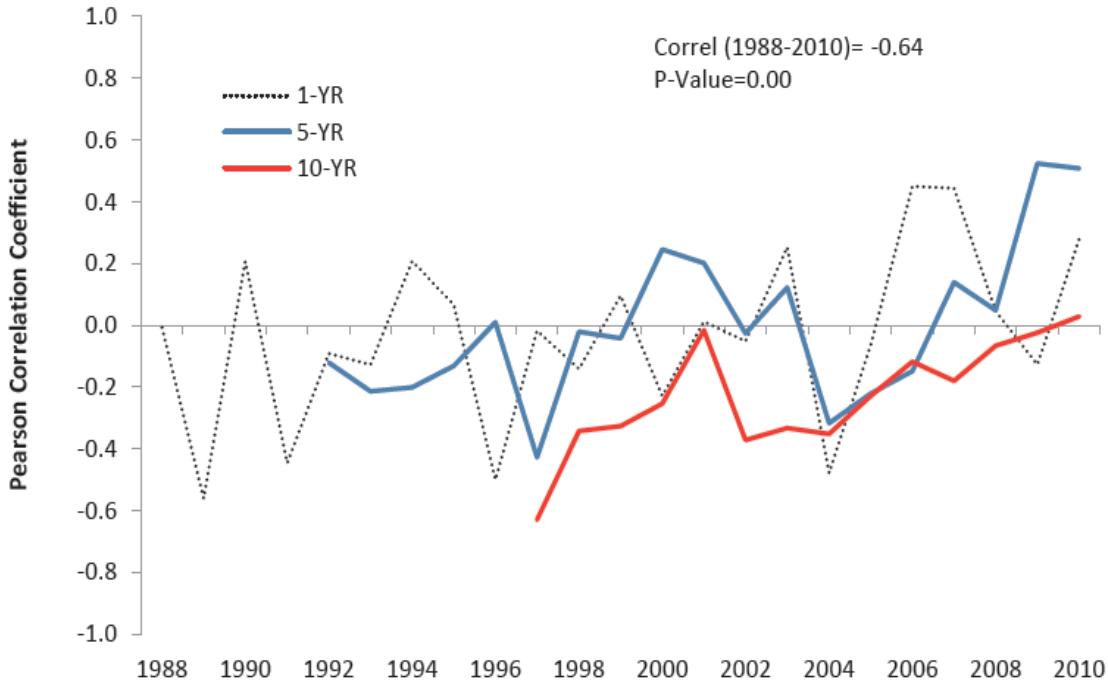
Essentially the most important paper regarding the short-period GDP-stock returns relationship is Economic Growth and Equity Returns (O'NEILL, STUPNYTSKA AND WRISDALE, 2011).

The study is conducted as the long-run one, so it analyzes both emerging markets and developed markets. For that reason, one of the limitations faced by the authors is the availability of the data for some country, especially for the emerging ones.

2.3.1) EMERGING MARKETS

In the Table 2.11 there is the analysis of 21 emerging markets running regression for one, five or ten years of time horizon to discover the correlation between GDP and returns.

Table 2.11 Real GDP growth rates vs. real USD returns for 20 emerging market countries, 1988-2010 (**Source:** O'NEILL, STUPNYTSKA AND WRISDALE,2011)



The result for the full sample correlation is a correlation of -0.64 which is statistically significant at 1% level.

Taking into account the ten year time horizon we obtain still a negative correlation which vanishes when you consider a 5 year time horizon which means that the relationship between GDP growth and stock returns is weak also for short time period

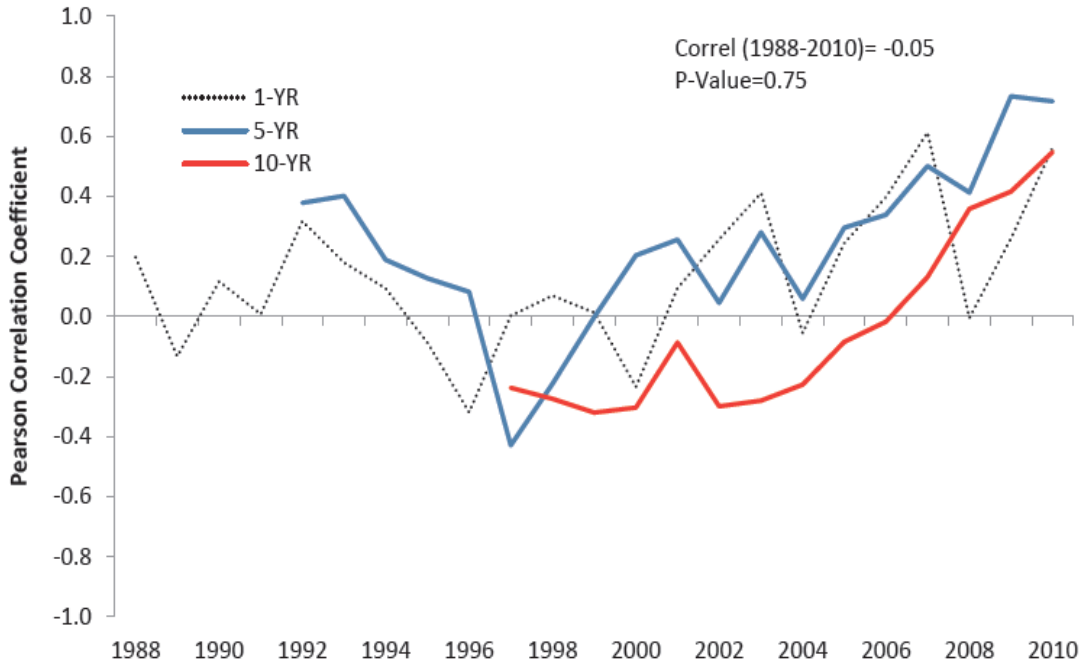
2.3.2) DEVELOPED MARKETS

The same analysis was conducted for 39 developed countries for a longer period from 1988 to 2010. The results are presented in the Table 2.12 are slightly different with respect to the emerging markets one. In this case the full sample correlation is still negative but the value is -0.05 but not statistically significant.

If we turn to intermediate time horizon we have interesting results because the one-year correlation is around zero like for the emerging markets while five-year correlations are more often positive, especially in the 2000's. Ten-year correlations are negative until the mid-2000's when they also turn positive.

It appears that a positive correlation between growth and equity returns emerged in the last decade. When developed and developing markets are considered together, the incidence of strong relative GDP growth in the emerging world and the outperformance of emerging equity markets in the 2000's yields the positive relationship during that period.

Table 2.12 Real GDP vs. real USD returns for 39 countries, 1988-2010 (**Source:** O'NEILL, STUPNYTSKA AND WRISDALE, 2011)



2.4) CAUSES OF THE MISSING LINK BETWEEN ECONOMIC GROWTH AND STOCK RETURNS

Until now we have seen five studies which are the most important contributions for the empirical perspective of the relationship between economic growth and stock returns. It is clear that they share a unique result: there is a negative correlation between GDP and stock returns. We want now to understand why there is no link.

Each author of the top five studies we have examined has expressed his motivations to the failure link between GDP growth and stock returns. However, other authors have offered other reasons criticizing the methodology used in the previous studies.

2.4.1) STOCK PRICES REFLECT EXPECTED GROWTH

(SIEGEL, JEREMY J. 1998) suggests as his first reason for the missing link that growth stocks, which are the stocks of the Growth companies which may currently be growing at a faster rate than the overall markets, do not necessarily have higher returns than value stocks, which are the stocks of undervalued companies, because expected growth is already factored into the price. The same situation holds between countries. Those with high expected growth rates, such as Japan, have higher P-E ratios than lower-growth countries, such as the U.K. The supercharged Japanese economy of the 1960s and 1970s led to the overly optimistic price-earnings ratios. When economic growth failed to meet expectations, stock prices fell. This leads to a decrease in the realized returns which means that to receive the same dividends investors have to spend more capital. So that if, as an effect of the high economic growth expectations, countries have stocks priced with consistent overvalued multiple, and then the economic growth fails, this could explain the negative correlation between economic growth and stock returns

2.4.2) MULTINATIONAL CORPORATIONS

According to Siegel a second reason for the lack of correlation between economic growth and stock returns is that even if multinational corporations are headquartered in a particular country, their profits depend on worldwide economic growth. This is particularly true of economies whose firms are oriented to export markets. Nevertheless the reasons exposed by Siegel cannot be the full story because there are several factors that we should take into account (DMS 2010). First of all they think that their findings span 101 years and that at the

start of their period in 1900, multinationals were far less important. Furthermore, it is hard to believe that investors in 1900 had factored into stock prices a fully accurate assessment of the next 101 years' GDP growth

2.4.3) MEASUREMENT PROBLEMS AND FALSE EXPECTATIONS

DMS (2010) conjecture two other explanations for why, even over very long periods, there is no link between stock market performance and GDP growth.

First, part of the explanation may lie in measurement problems. GDP estimation today is far from the precise science many imagine, but back in 1900 it was excessively crude.

Second, they think we may be misguided in expecting a relationship since GDP can grow without generating wealth gains to equity holders. Over the twentieth century, the three fastest growing economies among the sixteen countries in the study were Japan (3.9 percent per year GDP per capita growth), Italy (2.8 percent), and Spain (2.6 percent). Historically, none of these countries seems to have a strong concern with shareholder value.

2.4.4) DILUTION AND CONCENTRATION EFFECT

In this paragraph we introduce two other explanations to the missing link coming from two different authors.

In the work of the 2003 Bernstein and Arnott identified the principal cause of the negative correlation between GDP growth and stock returns with their "dilution effect" which is the phenomenon of GDP growth outpacing earnings growth of about 2%. We have already discussed this effect in the first section of this thesis.

Dilution can occur if a substantial part of economic growth is driven by the value added by new or unlisted enterprises, which does not benefit the shareholders of established companies. A similar effect arises when existing companies need to issue new shares or debt to fund their growth. While aggregate profits may rise, the earnings per share accruing to existing shareholders are diluted by the increase in shares or bonds outstanding.

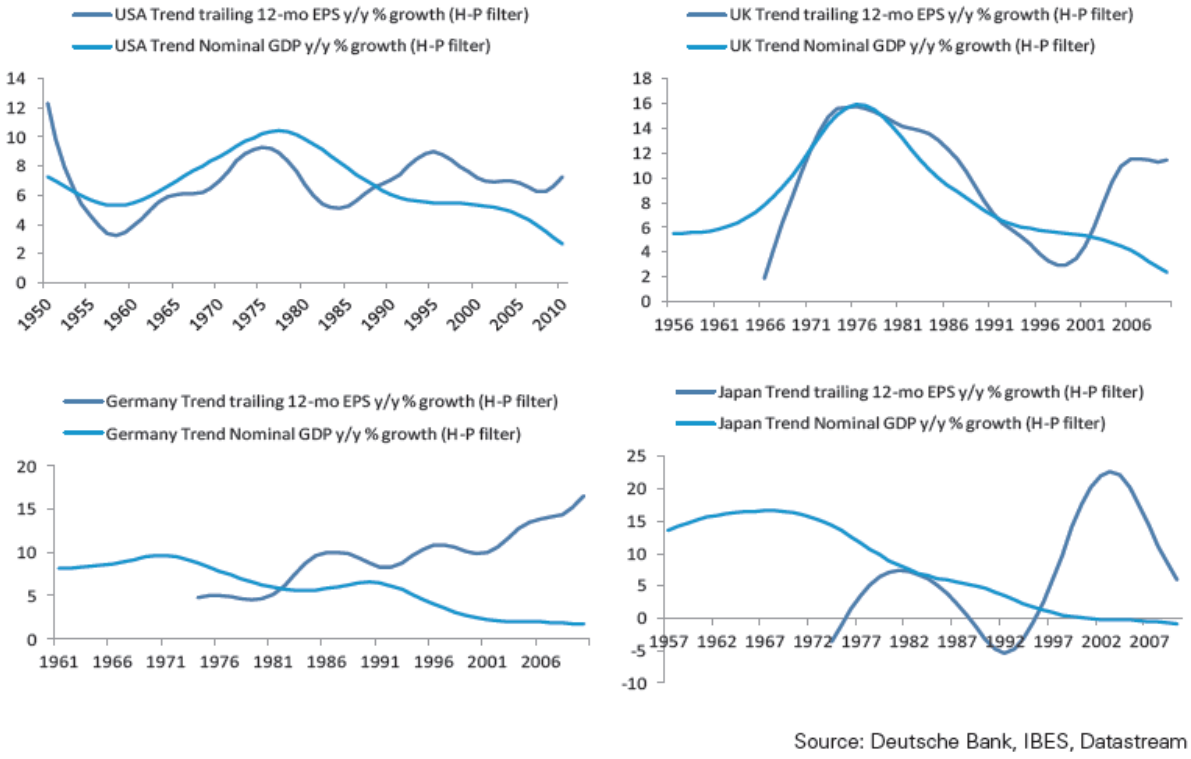
A phenomenon we have already seen which may work against dilution, but one that should also be impounded in stock prices, is the fact that multinational companies are operating on a global rather than a domestic basis. They can tap into a global market and become linked to world growth rather than their home country's GDP growth.

In the NBIM (2012) work the authors looking at the long-term trends in GDP and EPS growth, find that dilution has given way to the opposite effect in several developed markets.

They can call this “concentration” or “crowding-in”, and it is shown in the Table 2.13 (DEUTSCHE BANK). The “dilution” identified by Bernstein and Arnott (2003) is visible in the upper left panel, which depicts the trend growth in nominal GDP and EPS for the US. Between the mid-1950’s and the early 1990’s, nominal EPS growth lags the trend in nominal GDP by a few percentage points although they appear to broadly co-vary. From the early 1990’s onwards, the relative growth rates reverse and nominal earnings remain around 8 percent while nominal GDP growth initially decelerates towards 5 percent and slows down further at the end of the last decade.

The figures for the UK, Germany and Japan show similar patterns, although the timing of the relative EPS acceleration varies from country to country. In Germany, earnings start outpacing GDP as early as the 1980’s, whereas the UK and Japan only experience the same phenomenon in the late 1990’s and the 2000’s. In some way, EPS growth decouples from national GDP growth in the developed markets considered here.

Table 2.13 Nominal GDP and EPS trends in four major economies (Source: DEUTSCHE BANK, IBES, DATASTREAM)



There are several possible explanations for this. The first is that globalization, the opening of hitherto segregated markets in the developing world, has made multinational firms that are headquartered in the advanced economies less dependent on economic growth in their domestic markets. The second reason is that the corporate sector has been able to capture a greater share of GDP in the last two or even three decades, which may also be related to the effects of globalization.

Notwithstanding that long-run relationship, the trends shown here demonstrate that the profit growth of firms incorporated in a certain country can deviate substantially from domestic GDP growth over years and even decades. Equating a company's profit growth potential with its home market's prospects for GDP is clearly too simplistic.

2.4.5) SURVIVORSHIP BIAS

Part of the fact that the U.S. historically is the country which has displayed the highest real equity returns is attributed to survivorship bias. It was not obvious a century ago that Germany would be on the losing end of two world wars, nor that the U.S. would be on the victors' side not only in the two world wars but in the Cold War, too. The quantitative effect of this survivorship bias is unclear, but is not likely to be very large for three reasons. First, as LI AND XU (2002) argue, for survivorship bias to have a large effect, there must be a high probability that a country's stock market will be wiped out, and at the beginning of 1900 there was a general feeling of optimism about the future in the developed world. This optimism was reflected in relatively high stock valuations, not the conservative multiples that would be observed if investors were concerned about the possibility of catastrophic losses. Second, to a remarkable extent, the economically advanced countries in 1900 are the economically advanced countries today. The most notable exception is Japan, which has gone from moderately poor to rich. Argentina is the only country that has moved from relatively rich to relatively poor. Therefore survivorship bias is important in explaining realized stock returns.

2.4.6) ECONOMIC GROWTH MIRACLE

Paul Krugman and Alwyn Young argue that the high growth rates of the Soviet Union in the 1930–1970 period, and the high growth rates in many East Asian countries in 1960–1993, arose from taking societies with vast amounts of under-utilized labor and very little capital, and applying capital (due to high savings rates) and labor (by moving people out of subsistence agriculture) with the application of imported technology. While this transition was

occurring, high rates of economic growth occurred. Much of the real economic growth in emerging markets comes from high savings rates and the more efficient utilization of labor, neither of which necessarily translates into higher profits accruing to the shareholders of existing firms. Although economic growth does not directly lead to higher corporate profitability, ROMER (2000) argues that higher growth should lead to higher discount rates because people are less willing to defer current consumption for future consumption when they will be wealthier. This effect would result in more conservative valuations when long-run growth is expected to be high.

2.4.7) CORPORATE GOVERNANCE

A second reason proposed by Ritter regards the role of Corporate Governance. Until now we have seen how in some cases more economic growth doesn't mean more returns because firms fail to transform GDP growth into more profits. A possible cause of this failure is represented by the behavior of the corporate governance with respect to the minority shareholders. We know that the decisional power is more or less in the hands of the controlling shareholders and top managers and this means that managers may expropriate profits via sweetheart deals, tunneling, etc.

Minority shareholders obviously knows that there is this possibility and protect themselves. Therefore they correctly evaluate in advance the chance of receiving future dividends, and if the legal and institutional mechanisms are weak, firms would be unable to sell equity to the public at terms that are attractive enough to make it an optimal financing/ ownership mechanism. Having the decisional power corporate governance influences also the profits of the firms because they can invest in good projects which have a positive NPV or bad projects which have negative NPV; in both cases dividends are influenced by these choices. Other studies confirm this hypothesis. In particular LAPORTA ET AL. (2000) report evidence that dividends are higher in countries where minority shareholders have better rights.

RITTER (2012) explain that, according to him, the most important explanation for the negative correlation between GDP growth and stock returns begins with the recognition that stock returns are determined not by growth in economy-wide earnings, but by improvement in measures of firm-specific corporate performance, such as growth in earnings per share and return on equity, that reflect the amount of equity capital contributed by investors and the efficiency with which such capital is used.

2.4.8) CONSIDER THE BUSINESS CYCLE

The relationship between GDP growth and financial markets needs to be seen in the context of the broader economic cycle. In particular, the behavior of GDP growth needs to be considered alongside changes in inflation and monetary policy. In support of Dimson, Marsh and Staunton, the Schroders Economics team finds evidence that markets can perform well during periods of weak economic growth if accompanied by an easing in monetary policy. However, in the years following the global financial crisis of 2007-2008 this relationship has shifted such that there appears to be a stronger relationship between GDP growth and equity returns. Inflation has become less important as a driver of asset returns, a result we attribute to a change in central bank behavior.

Analysis from Schroders Economics team found that over the past sixty years there has been a positive relationship between GDP growth and equity market returns during the recovery, expansion, and slowdown phases of the traditional business cycle. However this relationship has traditionally broken down during the recession phase and we have confirm of this in the Table 2.14 (SCHRODERS, 2013)

Table 2.14 The traditional business cycle model (Source: SCHRODERS, 2013)

	Slowdown	Recession	Recovery	Expansion
GDP growth	Positive but falling	Negative and falling	Negative but rising	Positive and rising
Inflation	High and rising	Falling	Low and falling	Rising
Policy stance	Tight	Loosening	Loose	Tightening
Interest rates	Stable	Falling	Stable	Rising
Excess return* on equity	*-8.4*	*7.7*	*8.4*	*8.4*
Driver of equity returns	Earnings/ Valuations	Valuations	Earnings	Earnings

Source: Schroders, Datastream. S&P 500 composite (1950 - 2010). Figures are based on a completed phase of the cycle; the last phase ended in March 2010. Data for capacity utilisation and the unemployment rate in the US are used to estimate the output gap and stage of the cycle. *Excess return over the 3-month Treasury bill.

In the recovery and expansion phases of the business cycle, the stock market tends to perform well as rising GDP and earnings growth drives positive excess returns on equity (Figure 2). In the slowdown phase, inflation is still high and monetary policy remains tight, resulting in a difficult environment for corporations. Reduced earnings and stock valuations tend to result in negative excess returns for equities: declining GDP growth is therefore usually matched with poor equity performance.

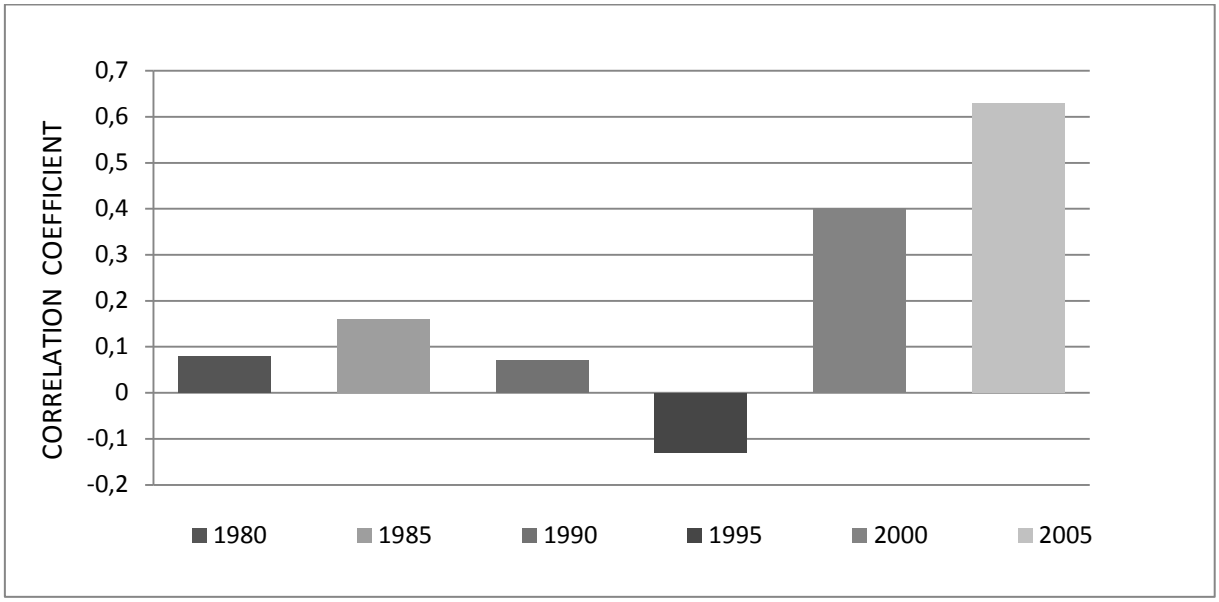
During the recession phase, there is often a de-coupling of GDP growth and stock market returns: GDP growth is falling, but the excess return on equity tends to be positive. Historically, falling inflation and an accompanying loosening of monetary policy during this phase has led to an adjustment of the equity markets multiple, such as P/E ratios.
The discounted cash flow approach to equity valuation equates the fair value of a stock to the present value of expected future cash flows. This is calculated by discounting expected future cash flows by the relevant interest rate. A reduction in interest rates (i.e. a loosening of monetary policy) can therefore cause stock prices to increase, and equity investors may experience good returns on equity during a period in which the rate of GDP growth is falling.

2.4.9) PERIOD OF OBSERVATION MATTERS

As I said before there are some authors that do not share the conclusions of the top five long-period studies we have discussed. Indeed, they think that the cause of the lack of correlation between GDP and stock returns is due to the wrong methodology used by the precedent authors. In particular the main study against the works of Ritter, DMS, Bernstein and Arnott and Siegel was conducted by O'NEILL, STUPNYTSKA AND WRISDALE (2011). They argue that, data quality issues aside, there are significant methodological and conceptual issues associated with this approach.

In particular they criticize the fact that the correlation between equity returns and GDP growth has been done for a period of time of almost 100 years. Moreover these are cross-sectional studies and this can create some methodological issue. They think that correlation analysis is significant only if we take different period; so that the choice of the time horizon is crucial for the results of the study. To support their idea O'NEILL, STUPNYTSKA AND WRISDALE (2011) take into account in their study 34 countries for different time periods. Before to discuss the results it is better to see the Table 2.15

Table 2.15 Cross Country Correlations of GDP Growth and Equity Returns



How it is possible to see from the graph the results are very interesting. To read this graph we have to imagine we are in the final point which is 2010 while in the horizontal axe there are the initial points. For instance the column over the 1985 is the correlation calculated for the period 1985-2010. Very surprising are the results for the last two columns corresponding to the last decade where the correlation between GDP growth and equity returns is very strong and significant. The more you go back in the time, the lower is the correlation and the less significant.

They admit that even if there is correlation in the short period between GDP growth and stock returns, this correlation might be misleading but running a regression for a very long period like 100 years for the authors is even worse. In fact, running long period regression fails to consider some important factors such as structural changes in the economy or in the market. As a result, a great deal of useful information is lost by ignoring the importance of the time dimension. As a consequence of that we risk to put into the regression information about the past that are not relevant to predict the future because the countries structure is changed and because other conditions are changed.

In addition to time variation, the top five studies are criticized because they do not take into account inherent differences between countries. For example, differences in growth conditions, tax regimes, political conditions, property rights, corporate governance, and other institutions related to doing business in a country, could shape the nature of the relationship between economic growth and returns within each country. Therefore, a cross-country analysis that includes developed, Growth and Emerging economies must account for these

differences. A simple exercise that entails estimating correlations of growth and equity returns for individual countries over time does reveal that the cross-sectional approach conceals differences across countries and time horizons. However, correlations are still weak and insignificant in the great majority of cases. Something more fundamental is missing.

2.5) TRY TO UNDERSTAND THE MISSING LINK: DECOMPOSITION

This analysis is the third one in which it seems that GDP growth and stock returns are not related. This probably confirms the fact that the potential link is not structural but could depend on the specific moment or situation.
For this reason the correlation analysis is not totally useful and another step is required in order to better understand the question; we need in fact to decompose the equity returns.

A similar decomposition was done also by IBBOTSON AND CHEN (2002) an MSCI (2010) but only for developed countries.
To examine the link between GDP growth rates and equity returns, they compare the average real GDP growth rates for 20 developed and 21 emerging markets to the average stock price returns for those countries, decomposing the equity returns into the change in the country-specific inflation rate, the change in the exchange rate, the growth in EPS, and the growth in the price-to-earnings (P/E) ratio as follows:

$$R_i \approx \Delta CPI_i + \Delta FX_i + g_{EPS,i} + g_{P/E,i}$$

Where

$\boldsymbol{R_i}$ = Average nominal equity price return in USD for country i

$\boldsymbol{\Delta CPI_i}$ = Average annual CPI inflation rate for country i

$\boldsymbol{\Delta FX_i}$ = Average annual change in the exchange rate of country i with respect to USD

$\boldsymbol{g_{EPS,i}}$ = Average annual growth of 12-month trailing earnings per share for country i

$\boldsymbol{g_{P/E,i}}$ = Average annual P/E growth of country i with respect to USD

In Table 2.16A and 2.16B there are the results of the decomposition. Equity returns in each country are taken by the returns of the respective MSCI equity index for each country. As

indicated in the second column of the tables, equity return and EPS data are available starting in 1988 for the developed countries and for a handful of the emerging market countries.

Table 2.16A: REAL GDP, EPS and P/E GROWTH FOR DEVELOPED MARKETS (**Source:** FactSet, IMF World Economic Database)

Country	Data Available From	To	Real GDP Growth Rate (Local Currency)	Nominal Stock Price Return (USD)	= Nominal Stock Price Return (Local Currency)	+ FX Change	= CPI Inflation	+ FX Change	+ Real EPS Growth	+ P/E Change	Real GDP Growth - Real EPS Growth (Local Currency)
Developed Markets											
Switzerland	1988	2010	1.60%	9.86%	7.51%	2.19%	1.66%	2.19%	5.31%	0.42%	-3.70%
Sweden	1988	2010	2.08%	9.65%	10.12%	-0.42%	2.41%	-0.42%	5.64%	1.78%	-3.56%
Denmark	1988	2010	1.57%	10.41%	9.35%	0.96%	2.25%	0.96%	4.66%	2.18%	-3.10%
Germany	1988	2010	1.71%	6.49%	5.54%	0.90%	2.01%	0.90%	3.52%	-0.06%	-1.81%
Finland	1988	2010	2.03%	6.97%	7.28%	-0.28%	2.16%	-0.28%	3.41%	1.55%	-1.38%
France	1988	2010	1.70%	6.10%	5.08%	0.98%	1.95%	0.98%	2.84%	0.22%	-1.13%
Spain	1988	2010	2.65%	5.66%	6.09%	-0.41%	3.70%	-0.41%	3.37%	-1.03%	-0.72%
Austria	1988	2010	2.21%	5.18%	4.24%	0.90%	1.99%	0.90%	2.84%	-0.62%	-0.63%
USA	1988	2010	2.50%	7.28%	7.28%	0.00%	2.82%	0.00%	2.71%	1.58%	-0.22%
Netherlands	1988	2010	2.45%	6.66%	5.70%	0.90%	2.17%	0.90%	2.66%	0.78%	-0.22%
United Kingdom	1988	2010	1.93%	4.73%	5.42%	-0.65%	2.72%	-0.65%	1.50%	1.12%	0.44%
Norway	1988	2010	2.51%	7.31%	6.72%	0.55%	2.37%	0.55%	2.00%	2.20%	0.51%
Canada	1988	2010	2.30%	8.14%	7.24%	0.83%	2.26%	0.83%	1.77%	3.05%	0.53%
Japan	1988	2010	1.35%	-2.23%	-4.13%	1.99%	0.50%	1.99%	0.44%	-5.02%	0.91%
Italy	1988	2010	1.08%	1.64%	2.09%	-0.45%	3.27%	-0.45%	-0.43%	-0.70%	1.51%
Hong Kong	1988	2010	3.89%	8.52%	8.50%	0.02%	3.50%	0.02%	2.15%	2.62%	1.74%
Australia	1988	2010	3.25%	6.50%	5.62%	0.84%	3.03%	0.84%	0.45%	2.05%	2.80%
Belgium	1988	2010	2.02%	2.72%	1.71%	0.99%	2.13%	0.99%	-1.14%	0.74%	3.16%
Singapore	1988	2010	6.72%	6.97%	4.97%	1.91%	1.78%	1.91%	3.26%	-0.13%	3.45%
New Zealand	1988	2010	2.39%	0.85%	-0.15%	1.00%	2.54%	1.00%	-5.38%	2.92%	7.77%
Equally-Weighted:											
Average DM	1988	2010	2.40%	5.97%	5.31%	0.64%	2.36%	0.64%	2.08%	0.78%	0.32%
Average EM	1994	2010	4.62%	9.59%	12.49%	-2.31%	7.63%	-2.31%	4.58%	0.00%	0.04%
Average DM + EM	1991	2010	3.53%	7.82%	8.99%	-0.87%	5.06%	-0.87%	3.36%	0.38%	0.17%
GDP-Weighted:											
Average DM	1988	2010	2.12%	5.27%	4.77%	0.50%	2.33%	0.50%	2.15%	0.20%	-0.03%
Average EM	1994	2010	6.34%	7.87%	10.37%	-1.99%	7.30%	-1.99%	3.35%	-0.50%	2.99%
Average DM + EM	1991	2010	3.46%	6.09%	6.54%	-0.29%	3.91%	-0.29%	2.53%	-0.03%	0.93%

Source: FactSet, IMF World Economic Database (September 2011)

Table 2.16B : REAL GDP, EPS and P/E GROWTH FOR EMERGING MARKETS (**Source:** FactSet, IMF World Economic Database)

Country	Data Available From	To	Real GDP Growth Rate (Local Currency)	Nominal Stock Price Return (USD) =	Nominal Stock Price Return (Local Currency) +	FX Change =	CPI Inflation +	FX Change +	Real EPS Growth +	P/E Change	Real GDP Growth - Real EPS Growth (Local Currency)
Emerging Markets											
Czech Republic	2000	2010	3.19%	20.23%	12.11%	7.24%	2.54%	7.24%	16.97%	-6.53%	-13.78%
Peru	1994	2010	4.84%	15.50%	17.98%	-2.10%	4.29%	-2.10%	12.20%	0.83%	-7.36%
Egypt	2000	2010	4.93%	20.28%	25.16%	-3.91%	7.88%	-3.91%	11.69%	3.88%	-6.76%
Brazil	1999	2010	3.64%	14.01%	13.14%	0.76%	6.69%	0.76%	8.80%	-2.53%	-5.16%
Russia	1998	2010	5.34%	24.94%	24.36%	0.47%	18.01%	0.47%	9.94%	-4.14%	-4.60%
Colombia	1994	2010	3.15%	13.22%	19.30%	-5.10%	9.50%	-5.10%	5.82%	2.96%	-2.66%
Mexico	1992	2010	2.43%	9.13%	17.79%	-7.35%	10.47%	-7.35%	4.43%	2.10%	-2.00%
South Africa	1993	2010	3.25%	7.88%	10.66%	-2.52%	6.51%	-2.52%	4.34%	-0.42%	-1.09%
Morocco	2001	2010	4.67%	14.22%	10.20%	3.65%	1.95%	3.65%	4.96%	2.99%	-0.29%
Chile	1994	2010	4.32%	7.16%	8.15%	-0.91%	4.14%	-0.91%	4.59%	-0.71%	-0.27%
Taiwan	1988	2010	5.36%	1.67%	1.82%	-0.15%	1.98%	-0.15%	5.26%	-5.14%	0.10%
Hungary	1998	2010	2.32%	7.09%	6.76%	0.31%	6.32%	0.31%	2.10%	-1.65%	0.22%
Turkey	1994	2010	4.14%	11.50%	40.36%	-20.56%	36.77%	-20.56%	2.71%	-0.08%	1.43%
India	1994	2010	7.02%	8.80%	11.24%	-2.19%	6.95%	-2.19%	4.43%	-0.41%	2.59%
Malaysia	1993	2010	5.22%	0.43%	1.23%	-0.79%	2.63%	-0.79%	2.19%	-3.48%	3.04%
Korea	1988	2010	5.57%	3.46%	5.86%	-2.27%	4.40%	-2.27%	2.08%	-0.66%	3.49%
Thailand	1988	2010	5.04%	4.07%	4.93%	-0.82%	3.00%	-0.82%	0.91%	0.95%	4.12%
Indonesia	1991	2010	4.46%	5.04%	13.71%	-7.63%	10.89%	-7.63%	-0.07%	2.62%	4.53%
Poland	1995	2010	4.39%	7.11%	8.41%	-1.20%	5.97%	-1.20%	-2.12%	4.51%	6.51%
Philippines	1988	2010	3.88%	4.26%	7.85%	-3.33%	7.39%	-3.33%	-4.51%	5.17%	8.39%
China	1995	2010	9.85%	1.33%	1.36%	-0.02%	2.03%	-0.02%	-0.50%	-0.16%	10.34%

First, we observe that high real GDP growth does not translate universally into high profit (EPS) growth across countries. Whereas emerging market countries have posted significantly higher real GDP growth rates (6.34 percent) than developed market countries (2.12 percent), emerging markets have been less successful in converting these higher growth rates into returns for existing shareholders. Countries such as China, the Philippines and Malaysia provide striking examples of this discrepancy. Although real GDP in China grew by 9.85 percent on average over the period 1995-2010, real EPS declined by 0.50 percent and valuation levels remained largely the same. As a result, China generated a "slippage" of 10.34 percent between its GDP growth and EPS growth and a comparable slippage between its GDP growth and stock price returns over this period. At the other end of the spectrum,

EPS growth in small, open economies such as Sweden, Switzerland and Denmark has significantly outpaced growth in real GDP. As the last column in Table 4 suggests, real GDP

growth does not appear to be a particularly strong determinant of earnings growth for many of the countries in our sample.

Second, stock price returns appear to be driven by fundamentals over the long run. As one would expect, high EPS growth rates are generally associated with commensurately high price returns. For example, developed countries such as Sweden, Switzerland and Denmark and emerging market countries such as Peru, the Czech Republic and Egypt have posted some of the highest EPS growth rates and equity returns of all the countries in the sample. Conversely, countries with negative EPS growth rates such as Belgium, China and New Zealand have recorded relatively low equity returns in local currency of 1.71 percent, 1.36 percent, and -0.15 percent respectively. Third, the cross-country variation in the gap between GDP growth rates and equity returns is largely accounted for by the difference between GDP growth rates and EPS growth rates. For example, countries such as Peru, Egypt and South Africa, whose growth in EPS has largely outpaced growth in real GDP, have also posted exceptionally high equity returns relative to growth in GDP. On the other hand, countries such as Australia, Singapore and New Zealand, whose EPS growth has lagged growth in real GDP, have realized relatively low equity returns.

The aim of the decomposition was to understand what could be a strong determinant of the stock returns. In the last column of the table we can observe that GDP growth does not seem a strong pillar for the determination of stock returns. And this confirm also all the empirical tests of correlation.
From this analysis in fact, what seems to matter for the construction of the returns in the long run are the fundamentals of the firms like the EPS, in fact in this direction is possible to find evidence of positive relation between the EPS growth and stock returns. Obviously is also true the opposite, so to a low EPS growth correspond a lower stock returns.

3) THE S&P500 FORECASTING MODEL

3.1) INTRODUCTION TO THE FORECASTING MODELS

Until now we have seen how many studies demonstrate that there is a negative correlation between the GDP growth and stock returns for the same period. We have also discussed about the possible explanations for this missing-link. In particular I agree with Siegel's explanation; so that the stock market should provide advanced information about the economy since stock prices represent the sum of expected future cash flows discounted at some appropriate discount rate. The reasons are two-fold. First, equity earnings and cash flows are naturally correlated with economic activity and the business cycle. Second, equity discount rates, which account for equity risk premia, are related to systematic common risk factors for which macroeconomic variables represent a natural choice.

So the basic idea of this chapter and the next is that until now the authors have searched for the wrong relationship, or better for the wrong periods of the variables. Therefore I tried to develop two econometric models on the relationship between US Real GDP level and S&P500 index. In this chapter we will see the first one while in the next chapter the second one. I took the US case because the united States are the biggest stock market in the world for capitalization; indeed they represent approximately the 30% of the world capitalization. Therefore including USA in the sample let us to have an immediate idea of what could be the global result. The first model is based on my personal idea, while the second one is based on the confirmed nature of leading indicator of the S&P500 for the US economy.

3.2) SPECIFICATIONS OF THE S&P500 FORECASTING MODEL

The starting point of this model was a possible explanation, according to (SIEGEL, JEREMY J. 1998), for the missing link between GDP and stock returns. He said that maybe stock prices already impound information about the future economic situation. But if stock prices impound already information about future economic situation it is impossible to find a correlation between the two variables at the same moment. Therefore I thought: it is possible that Siegel was partially right? And in particular: I agree with the fact that stock prices already impound economic information, but what if these information are past economic information and not about the future? Therefore I tried to develop a model in which it is possible to forecast stock prices through a combination of factors; one of these factors is the past Real GDP level. So the aim of my research is to verify if past Real GDP level affects current stock price and establish its impact on the output. The model I try to study is a multi linear regression model in which the current stock index price is the output, and then we have three explanatory variables. Data are quarterly.

The model analyzed is the following:

$$\mathbf{SP500_t} = c + \alpha\ \mathrm{RGDPLEVEL}_{t-4} + \beta\ \mathrm{CAPE}_{t-4} + \theta\ \mathrm{ESTINDEX}_{t-4} + \varepsilon$$

Where:

- $\mathbf{SP500_t}$ is the current stock price for the S&P500 index,
- $\mathbf{CAPE_{t-4}}$ is the Cyclically Adjusted Price Earnings Ratio 4 quarters before,
- $\mathbf{RGDPLEVEL_{t-4}}$ is the level of the real GDP 4 quarters before,
- $\mathbf{ESTINDEX_{t-4}}$ is the Real Home Price Index 4 quarters before.

In particular from this model it is important to verify what is the impact of the real GDP level_{t-4} on the Standard and Poor's 500 level at time t. Therefore we estimate this effect through the estimation of the coefficient α which is the partial effect of that explanatory variable on the output.

3.3) VARIABLES OF MODEL

S&P500

The S&P 500 is short for the Standard and Poor 500. It is a stock index which included the 500 most widely held stocks on the NYSE. It is used also as a proxy of the entire stock market since reflect risks and returns of the large capitalization companies. The S&P 500 also seeks to make sure the industry sectors in the S&P500 represent the industries in the economy. The data are from Standard and Poor's and they cover the period from 1975 to 2014. The observations are quarterly and do not include dividends.

RGDPLEVEL

The RGDPLEVEL is the level of the US Real GDP referred to a period of 12 months before. I included this variable since, in theory, GDP should be related to the future level of the S&P500 index trough different channels that we have already seen in the theoretical part. Recall that we conjectured that the growth in the economy leads to an increase in the profits of the firms and, therefore an increase in the level of the stock price. Data about Real GDP cover a period from 1975 to 2014 and they are taken from the Bureau of Economic Analysis of the United States. The observations are quarterly.

CAPE

It Is the Cyclically Adjusted Price Earnings Ratio. It is often called also Shiller P/E ratio from his inventor, Robert Shiller. It is a valuation measure usually applied to the US SP500 equity market. It is defined as price divided by the average of ten years of earnings (Moving Average), adjusted for inflation. It is already used by some authors to forecast future stock returns. Since the base of the CAPE is the P/E ratio, the correlation with stock returns is positive.

ESTINDEX

Estindex is the variable that indicates the Real Home Price Index which was developed by Karl Case and Robert Shiller and the data are available on the Robert Shiller's website after he published them in his book Irrational Exuberance. The index is based on the home price in 20 US cities chosen according different criteria. Now the index is owned by Standard and Poor's which updates it monthly.

3.4) DATA AND METHODOLOGY

Since we are interested more on the effect of the Real GDP level on the S&P500 index, the analysis has been conducted using a stepwise model which includes three linear regressions: in the first model the only input variable is RGDPLEVEL, in the second there are RGDPLEVEL and CAPE while the third one, the most comprehensive, includes RGDPLEVEL, CAPE and ESTINDEX. In this way we can better understand what is the partial importance of the RGDPLEVEL in forecasting the S&P500.

Using the 0.05 level of significance, the study tested whether or not CAPE , RGDPLEVEL and ESTINDEX have significant impact on the S&P500 price with the null hypothesis that CAPE, RGDPLEVEL and ESTINDEX have no significant impact on the index price. In case any of the variables failed the test, appropriate data transformation would be applied. The remaining of the chapter is organized as follows: first of all I present the global results of the model in order to have an immediate idea of its accuracy, then I present the analysis of the correlation coefficients which is the first step to arrive at the final and most important analysis of the study which is the regression coefficients analysis. At the end of the chapter I present also a practical test on real data of the predictive role of the model and a resuming chapter on the robustness of the results.

3.5) ANALYSIS OF THE RESULTS

3.5.1) MODEL SUMMARY

In this paragraph we discuss the results about the three models developed. In particular in the Table 3.1 there are information about the correlation coefficient (R) , the determination coefficient (R squared) , the adjusted R Squared, the standard error of the estimate and the Durbin-Watson statistics.

Table 3.1 Model Summary[d]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0,939[a]	0,882	0,881	187,16324566	
2	0,953[b]	0,909	0,908	164,95340055	
3	0,955[c]	0,912	0,910	163,05902867	0,167

a. Predictors: (Constant), RGDPLEVEL

b. Predictors: (Constant), RGDPLEVEL, CAPE

c. Predictors: (Constant), RGDPLEVEL, CAPE, ESTINDEX

d. Dependent Variable: SP500

The correlation coefficient is the Pearson coefficient and indicates how the variables included in the models are linked with the output; in the first model of the table we can note how there is already a great correlation between the Real GDP level and S&P500 index; indeed the correlation coefficient is 0.939 also confirmed from the correlation matrix in the Table 3.2 of the next paragraph. The general tendency is that the addition of one more relevant variable leads to an improvement also in the results of the regression; in fact the correlation coefficient passes from 0.939 of the first model to 0.955 of the last one. This tendency is obviously confirmed also in the R Square and in the Adjusted R Square, since the first one is just the square of the correlation coefficient while the second is a variant of the R Square. The R Square is a very important coefficient since it gives us an economic information. It tells us the percentage in the variability of the output that can be explained by the input. It is an accuracy measure of the model not a predictive one. Therefore if in the first model we have an R Square of 0.882 this means that RGDPLEVEL alone it is able to explain just 88,2% of the differences in the S&P500 level. So, it doesn't explain all the variability in the output; there are other reasons besides the Real GDP level why S&P500 changes the level. Actually it is already a big result for two reasons: first of all the starting point of 88,2% is a good point, and

second, we need some other variables to cover just the little gap between the variability of the output which is 100% and our starting point; this difference is 11,8%. This is the reason why we include in the other models also other variables. R Square does not provide a good test if adding a new variable to a regression model, this because R Square will increase regardless if the variable worthwhile or not. To test the importance of a new variable to the model there is another index: the Adjusted R Square. Indeed it adds a penalty for additional variables so it will only increase if the new variable contributes sufficient additional information. It will decrease if the new variable does not contribute much new information. Therefore we can use it as a test. In the first model Adjusted R Square is 0,881 which is already a good result, but adding one more variable each time lead the Adjusted R Square to 0,912. Therefore the two new variables added both new information contributing to the increment of the Adjusted R Square which is 0,031 or 3,1%.

Since the R Square and its variant Adjusted R Square are a measure of the accuracy of the model, as a consequence the higher their value is the lower is the Standard Error of the estimate.

The last result in the Table 3.1 is the Durbin-Watson statistics which measure if there is autocorrelation or not between the error terms. Being a value between 0 and 4 where a value of 2 indicates absence of correlation between the error terms while a value near to 0 indicates a positive correlation between the error terms. This is the case of my model where the Durbin Watson is 0,167. Nevertheless the presence of autocorrelation between the error terms is common on time series regressions; indeed we can have a phenomenon of temporal autocorrelation, due to the inertia or stability observed values, whereby each value is influenced by the previous one and determines relevant part of the next one.

3.5.2) ANALYSIS OF CORRELATIONS

The main result for this analysis is represented by in the Table 3.2 where there are information about all the correlation coefficients between the variables, information about the significance of the correlation coefficients and information about the number of observations on which it is based the correlation calculation. The top of the table is the classical correlation matrix; as it is possible to see if we take as dependent variable S&P500, the strongest correlation is with RGDPLEVEL which we recall it is referred to 4 quarters before. The correlation coefficient is 0.939; it is a very strong correlation and it is not so usual to find it a similar value between two variables. Then, in order of correlation values the second is between S&P500 and CAPE and the third one between S&P500 and ESTINDEX.

At a first glance, another result that it is possible to see from the Table 3.2 is that there is also correlation between the independent variables and this may lead some suspects about collinearity between the explanatory variables. But this is not the case since we exclude trough some statistical test in the Statistical Appendix A, Table 3.3 the presence of collinearity among variables.

Table 3.2 Correlations

		SP500	RGDPLEVEL	CAPE	ESTINDEX
Pearson Correlation	SP500	1,000	0,939	0,762	0,558
	RGDPLEVEL	0,939	1,000	0,684	0,649
	CAPE	0,762	0,684	1,000	0,389
	ESTINDEX	0,558	0,649	0,389	1,000
Sig. (1-tailed)	SP500	.	,000	,000	,000
	RGDPLEVEL	,000	.	,000	,000
	CAPE	,000	,000	.	,000
	ESTINDEX	,000	,000	,000	.
N	SP500	157	157	157	157
	RGDPLEVEL	157	157	157	157
	CAPE	157	157	157	157
	ESTINDEX	157	157	157	157

In the rest of the Table 3.2 I present the significance of the correlation coefficients and the number of observations for each pair. The test for the significance of the correlation coefficients is 1-tailed test which means that, using a significance level of 0.05, a one-tailed test assigns all of your alphas to testing the statistical significance in the one direction of interest. This means that 0.05 is in one tail of the distribution of the test statistic. When using a one-tailed test, we are testing for the possibility of the relationship in one direction and completely disregarding the possibility of a relationship in the other directions. Because the one-tailed test provides more power to detect an effect, usually we use a one-tailed test whenever we have an hypothesis about the direction of an effect. Every correlations is significant at 99 % level since all the p-values are smaller than 0.01. The number of observations is 157 for every variable since we have quarterly data for the period between 1975 and 2014. Therefore the sample is large enough for a robust conclusion.

3.5.3) ANALYSIS OF THE COEFFICIENTS

The central result of my study is represented by the Table 3.4 which is the Table of the analytical results for the variables in the regression. In particular we can see that, as usual, we divide the analysis in the study of three different models from the most simple to the complex one.

Table 3.4 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations		
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part
1	(Constant)	-866,377	49,063		-17,658	0,000			
	RGDPLEVEL	153,775	4,514	0,939	34,068	0,000	0,939	0,939	0,939
2	(Constant)	-873,287	43,253		-20,190	0,000			
	RGDPLEVEL	128,612	5,452	0,786	23,589	0,000	0,939	0,885	0,573
	CAPE	13,519	2,003	0,225	6,749	0,000	0,762	0,478	0,164
3	(Constant)	-751,862	70,950		-10,597	0,000			
	RGDPLEVEL	136,615	6,555	0,834	20,840	0,000	0,939	0,860	0,501
	CAPE	13,100	1,990	0,218	6,584	0,000	0,762	0,470	0,158
	ESTINDEX	-1,567	0,731	-0,068	-2,145	0,034	0,558	-0,171	-0,052

a. Dependent Variable: SP500

The first two columns refer to the information about the unstandardized coefficients with the values of the coefficients (B) and their Standard errors. The B coefficients are the coefficient of the independent variables. The column of B's, gives us firstly the value of the constant, c, which is the intercept or the predicted value of Y if X is 0. Obviously this concept has no economic meaning since it is not possible that the GDP level could be zero. Then there are the coefficients of the variables B which in my model are α, β and θ. Without these coefficients we cannot derive and/or forecast the value of S&P500. The economic sense of the coefficients is the value that $\boldsymbol{Y}$ will change by if $\boldsymbol{X}$ changes by 1 unit. In the first model for example if Real GDP level goes up by 1, S&P500 index level are predicted to go up by 153,775. Clearly the values of coefficients change according to the unit of measurement of the variables. In the third model the coefficient of the variable ESTINDEX is negative; this does not means that between ESTINDEX and S&P500 there is a negative correlation; indeed as it is possible to

see from the Table 3.2 in the precedent paragraph the two variables are linked by a correlation of 0,558.

The column next to the B coefficients shows the Standard Error associated to each variables and constants. This information is strictly correlated with the statistical significance; in particular the value of the Standard Error has to be compared with the value of the regression coefficients to understand how much the model was adapt to estimate the coefficients with precision. For instance if we take the Standard error of the RGDPLEVEL in the second model is 5,452 which is only the 4% of its regression coefficients. It follows that the lower the percentage of standard error with respect to its coefficient and the greater the statistical significance. A confirmation of this is the results of the ESTINDEX variable in the last model: its Standard error is just a bit under half of its regression coefficient; this is the highest Standard error in the model and the consequence is that the pvalue of the significance test is 0,034 which is the highest p-value in the models.

Then there are the Standardized Coefficients which give us an immediate idea of the individual importance of each independent variable since they are the same regression coefficients but with the same scale. Actually the name Standardized coefficient is the most used by practitioners even if it is a bit confusing. Indeed is not the coefficient that is standardized but the variables (David A Freedman, 2009). The greater is the Standardized coefficient of an independent variable the greater is its explanatory power. The standardized coefficient can be also interpreted as a percentage. In the first model, where the only explanatory variable is represented by RGDPLEVEL, being the model a simple linear regression, the standardized coefficient beta coincides also with the correlation coefficient which is 0.939. This will no longer be the case when we look at the relationship between more than two variables. Therefore the first important result of my study is that, differently from the studies of other authors, I find a huge correlation between Real GDP level and S&P500 index level. The key to find a strong relationship is to reason in terms of level and not growth rates. The great correlation between the two variables persist also in the second model, which is a multilinear regression thanks to the presence of a second explanatory variable, CAPE. Nevertheless we can see that the relative importance of the RGDPLEVEL in explaining the values of the S&P500 index is partially absorbed by CAPE which shows a correlation coefficient of 0.225. In the last model instead Real GDP level is again the most important variables and it accounts for 83% in explaining the values of the S&P500 index.

The fourth and the fifth columns are the part related to the T-statistics of the coefficients and their significance. To understand whether the coefficients are significant (we reject the null hypothesis) we can observe T-statistics or directly look at the pvalues (Sig in the table). In the first case we need to know the critical value for a certain number degree of freedoms for a normal distribution, in the second one we need only to compare the p-values with the value 0.05 which is the critical value associated to a significance level of 95%; therefore if the p-value is smaller than 0.05 the variable is significant and we reject the null hypothesis. As it is possible to see from the Table all the variables and the constants of the models are significant; actually in the first and in the second model all the variables and the two constants are significant at 99% level since the p-values are smaller than 0.01 which is the critical value for that probability. Even if it will improve the global accuracy as we can see later, the introduction of the variable ESTINDEX exclude the third model to be significant at 99% level but it is significant at 95% level.

The last section in the Table 3.4 refers to the zero-order, Partial and Part correlation; among these calculations the most important is the Part correlation, which sometimes in other studies is called Semi-partial correlation. If you square Part correlation value you get the contribution of each independent variable to the total R^2. In other word it tell us how much of the total variance in the outcome is uniquely explained by that variable; and also how much Rsquare would drop if we remove that variable. For instance we know from the Table 3.4 that in the third model R Square is 0,912, and we know also that the Part correlation in the third model associated to the RGDPLEVEL variable is 0,501; therefore if the square of 0,501 is 0,251 we are saying that if we cancel out the RGDPLEVEL variable the R square became 0,912 – 0,251 which is equal to 0,661. I recall that R squared value is not the sum of all the square Part correlations; this is because Part correlation represent only unique contribution of the single variable to the R square.

3.5.4) ANALYSIS FOR ROBUSTNESS OF THE RESULTS

In this paragraph we will check some assumptions to test the robustness of the model. It is a resuming paragraph; for more details I remind to the Statistical Appendix A

- All the variables of the models are quantitative (Statistical Appendix A, Table 3)
- All the variables have Standard deviation greater than zero (Statistical Appendix A, Table 3)

- The dependent variable S&PLEVEL and the independent variables RGDPLEVEL, ESTINDEX present problems of normality since they show values for the kurtosis higher than |1|. Nevertheless we are in presence of a normal multivariate therefore the individual non-normality does not introduce significant distortions. (Statistical Appendix A, Table 3)
- To test the assumption of absence of multicollinearity we calculate two important outputs: the Tolerance Index and the VIF. Both coefficient show values for all the models and variable in the range. (Statistical Appendix A, Table 3.3)
- The shape of the residuals follows a normal distribution (Statistical Appendix A, Table 3.5)

3.6) TEST OF THE MODEL

In this paragraph we will test the model; in particular we will choose a period from the dataset and we will test its forecasting power and its accuracy in a forecasting inside period exercise. The period for the test is randomly chosen from the dataset. We remember that the model is the following:

$$\mathbf{SP500_t} = c + \alpha\, RGDPLEVEL_{t-4} + \beta\, CAPE_{t-4} + \theta\, ESTINDEX_{t-4} + \varepsilon$$

The period chosen for the observation is from September1999 to September 2000. Therefore we will try, using the formula above to forecast the level of S&P500 in the 2000 with the values of the other variables in the 1999.

Table 3.6 Data of the variables in the model, period 1999-2000

DATE	SP500 INDEX	REAL GDP LEVEL	CAPE	ESTINDEX
Sept. 30, 2000	1390,1400	12,610	39,3715297	129,0640838
June 30, 2000	1473,0000	12,600	42,7601174	128,0693726
March 31, 2000	1461,3600	12,370	43,530562	126,0804238
Dec. 31, 1999	1425,5900	12,330	43,7743866	123,2993434
Sept. 30, 1999	1300,0100	12,120	40,5541286	121,6232347

Table 3.7 Summary of the regression coefficients

VARIABLE	COEFFICIENT	VALUE OF THE COEFFICIENTS
CONSTANT	C	-751,862
REAL GDP LEVEL	α	136,615
CAPE	β	13,1
ESTINDEX	θ	-1,567
STANDARD ERROR	ε	163,0590287

Having the data and the coefficients we can test the model. Only the final value is approximated at the third decimal; this in order to lose as little information as possible; also because already the original data were approximated. In the first equation we substitute only the values of the coefficients and we have:

[E] $SP500_{2000}$ = -751,862 + (136,615 * $REALGDPLEVEL_{1999}$) +(13,1 * $CAPE_{1999}$) + (-1,567 * $ESTINDEX_{1999}$) + ST. ERROR

Once we substitute the variables with their values we obtain:

[E] $SP500_{2000}$ = -751,862 + (136,615 * 12,120) + (13,1 * 40,5541286) + (-1,567 *121,6232347) + 163,0590287

[E] $SP500_{2000}$ = -751,862 + 1655,7738 + 531,25908466 -190,5836087 + 163,0590287

[E] $SP500_{2000}$ = 1407,6463

$SP500_{2000}$ = 1390,1400

$SP500_{2000}$ - [E] $SP500_{2000}$ = 1390,1400 – 1407,6463= - 17,5063

% DEVIATION = - 17,5063 / 1407,6463 = - 0,0124

Thanks to the model it has been possible to forecast the future value of the S&P500 index with an error in this case of 1,24%. Therefore from this model we learned that the current level of the Real US GDP could contribute significantly in determining the future level of the S&P500 index. This is a confirmation of the strong link between the two variables.

4) THE REAL GDP FORECASTING MODEL

4.1) SPECIFICATION OF THE MODEL

After finding a strong correlation between current level of Real GDP and future level of S&P500 index, and after developing a model with which it is possible, with the addition of other variables, to forecast the future level of S&P500, I tried to find the same strong correlation between future level of Real GDP and current level of S&P500 index. This is not a new hypothesis since the S&P500 index is already considered as a leading indicator for the real economy in the United States. For this reason I tried to develop a model able to explain, thanks to the current level of S&P500 index and the addition of other variables, the future GDP level.

The basic idea of the model is that it is possible to forecast the future level of the Real GDP through a combination of factors which work as engine for the GDP itself. Essentially we are interested on the partial effect of the current S&P500 and, therefore, on its coefficient. The model confirms the leading nature of the S&P; indeed it can be used to forecast, with other factors, the future level of the Real GDP.

The model I developed is the following:

$$\mathbf{RGDPLEVEL}_{t+4} = c + \alpha\, CPI_t + \beta\, SP500_t + \theta\, ESTINDEX_t + \Phi\, GS10_t + \varepsilon$$

Where :

- **RGDPLEVEL $_{t+4}$** is the level of the real GDP referred to the time t+12 months
- **SP500$_t$** is the stock price for the S&P500 index at time t
- **CPI$_t$** is the Consumer Price Index at time t
- **ESTINDEX $_t$** is the Real Home Price Index at time t
- **GS10$_t$** is 10-years Treasury Constant Maturity Rate at time t

The results of these models are very important since, once we derive a linear model able to explain the future Level of Real GDP it is possible, combining both models, to understand better what is the behavior of both variables and the cycle that they follow.

4.2) VARIABLES OF THE MODEL

In this paragraph we introduce the variables included in the model and we explain the reason why they are included in it. Some variables are also present in the precedent model while the new variables are CPI and GS10.

SP500

The Standard and Poor's 500 Index has some forecasting power inside in the sense that impound some economic information to anticipate the economic situation; therefore I included it in the regression since there are evidence that the increasing prices could become contributing cause of economic growth since the increase in stock prices is transmitted the real economy through three channels:

- Wealth Effect: the assets of consumers grow leading to a greater propensity to consume;
- Effect "q": the relationship between value and cost of business replacement of capital (the so-called Tobin's q) grows stimulating investment;
- Effect of the budget is the positive effect that the increased share price exerts on household budgets, businesses and banks. Families and businesses hold shares whose values have grown will access, thanks to the increased wealth, more easily to credit and will be able to increase, respectively, consumption and investment. Banks holding shares will see their coefficients Wealth improve and, consequently, may expand its loans.

ESTINDEX

I included ESTINDEX among the independent variables to forecast the Real GDP level because there is a positive correlation between them. The impact of the increased house prices and the creation of mortgage products intended for equity withdrawal have enhanced the

positive influence of house prices on household consumption. In addition rising house prices also influence consumer confidence which has a strong correlation to retail sale/consumption; therefore to the GDP.

CPI

CPI is the short for Consumer Price index, which is basically a measure of the inflation rate. For this reason I included this variable in the equation; in fact the inflation is related to the purchasing power of a currency and affects its exchange value in proportion to other currencies. A development in the economy (an increase in the GDP level) leads to an increase in the Index of Consumer prices. Therefore consequently currency purchases a larger value. The data are provided by the US Bureau of Labor Statistics and cover a period from 1972 to 2014.

GS10

Is the 10-years Treasury Constant Maturity Rate taken from the Federal Reserve Bank of St. Louis referred to a period between 1972 and 2014 and the observations are quarterly. I included this variable since we know that there is a significant inverse relationship between the GDP and the interest rate. Indeed a higher interest rate leads to a reduction in the value of the GDP components like the investments, the net exportation and consumption.

4.3) DATA AND METHODOLOGY

The methodology of this model is exactly like the previous one. In particular the analysis has been conducted using a stepwise model which includes four linear regressions: in the first model the only input variable is CPI, in the second there are CPI and SP500, in the third one there are CPI, SP500 and ESTINDEX while the fourth model, the most comprehensive, includes CPI, SP500, ESTINDEX and GS10. In this way we can better understand what is the partial importance of the SP500 in forecasting the RGDPLEVEL.

Using the 0.05 level of significance, the study tested whether or not SP500,CPI , ESTINDEX and GS10 have significant impact on the RGDPLEVEL with the null hypothesis that SP500,CPI , ESTINDEX and GS10 have no significant impact on the index price.

The rest of the chapter is organized as follows: first of all I present the global results of the models in order to have an immediate idea of their accuracy, then I present the analysis of the correlation coefficients which is the first step to arrive at the final and most important analysis of the study which is the regression coefficients analysis. At the end of the chapter I present also a practice test of the predictive role of the model and a resuming chapter on the robustness of the results.

4.4) ANALYSIS OF THE RESULTS

4.4.1) MODEL SUMMARY

In this first analysis I present in the Table 4.1 some information about the accuracy of the models estimated. In particular it is present the Pearson correlation coefficient (R), the determination coefficient (R square), its variant Adjusted R Square and the Standard error of the estimate. We have already explained in the precedent chapter what they are; therefore we look at the general tendency of these results. Indeed we can immediately note how adding one more variable each time there is an improvement of the results; in fact the correlation coefficient passes from 0,985 of the first model to 0,998 of the last one. Incredibly strong is the correlation coefficient between the future level of Real GDP and the CPI.

It is able to explain alone 97% of the variability in the output. It is almost a perfect correlation; nevertheless we add another variable in the second model which is the level of SP500 index. In doing this we can note an improvement in both R Square and Adjusted R square, besides that, obviously, an increase in the correlation coefficient. This is a good point because we are saying that the level of the SP500 index is important to forecast better the output values since it adds new information in the model able to explain part of the differences in the values of the Real GDP.

Table 4.1 Model Summary[e]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,985[a]	,970	,970	,60498889
2	,993[b]	,987	,987	,40207930
3	,996[c]	,991	,991	,32716687
4	,998[d]	,996	,996	,22429111

a. Predictors: (Constant), CPI

b. Predictors: (Constant), CPI, SP500

c. Predictors: (Constant), CPI, SP500, ESTINDEX

d. Predictors: (Constant), CPI, SP500, ESTINDEX, GS10

e. Dependent Variable: RGDPLEVEL

4.4.2) ANALYSIS OF THE CORRELATIONS

This is an important analysis since it allows us to understand what are the relationships between the variables and assessing the presence of multicollinearity. I present the main results of this paragraph in the Table 4.2 composed as usual by the top part regarding the correlation matrix, the middle part which explains the significance of the correlation coefficient calculated and at the bottom there is the number of observations in the analysis.

Table 4.2 Correlations

		RGDPLEVEL	SP500	CPI	ESTINDEX	GS10
Pearson Correlation	RGDPLEVEL	1,000	,952	,985	,658	-,803
	SP500	,952	1,000	,912	,633	-,788
	CPI	,985	,912	1,000	,582	-,737
	ESTINDEX	,658	,633	,582	1,000	-,490
	GS10	-,803	-,788	-,737	-,490	1,000
Sig. (1-tailed)	RGDPLEVEL	.	,000	,000	,000	,000
	SP500	,000	.	,000	,000	,000
	CPI	,000	,000	.	,000	,000
	ESTINDEX	,000	,000	,000	.	,000
	GS10	,000	,000	,000	,000	.
N	RGDPLEVEL	168	168	168	168	168
	SP500	168	168	168	168	168
	CPI	168	168	168	168	168
	ESTINDEX	168	168	168	168	168
	GS10	168	168	168	168	168

There are many interesting results. First of all, taking as the dependent variable the level of Real GDP, all the variables show a very high correlation with it; in the case of GS10 the correlation is strong but negative and it is useful to adjust the expected results.

Very strong is also the correlation coefficient between the future Real GDP level and the current S&P500 index level; indeed it is 0,952 which is near the value found in the opposite relationship in the previous model. Therefore it appears that the two variable are linked but only if we consider different period. Moreover in the Table 4.2 there are several correlation cases which require a bit of attention since they show high values. In general what appears from the table is that many variables are correlated with others, nevertheless we exclude this possibility in the Table 4.3 of the Statistical Appendix B.

We do not have problem of significance since all the correlation coefficients are significant at 99% level; Recalling that ,as in the previous model, it is a one tail significance test where we exclude the possibility of a different direction for the effect, we reject the null hypothesis of non-correlation. The number of observations is 168 and covers a period from 1972 to 2014 with a quarterly frequency.

4.4.3) ANALYSIS OF THE COEFFICIENTS

In this paragraph we show the analysis of coefficients for all the four models. Recall that this analysis is very important because it gives the values of the independent variables impact on the dependent one and let us to forecast the level of the future Real GDP with current data. The main result of this paragraph is the Table 4.4

First of all we find the regression coefficients in the Unstandardized Coefficient section under the letter B. As we can see in every model the coefficients are positive except from the last one, the most comprehensive one, where the value of the GS10 has to be multiplied by a negative coefficient because of its negative correlation with the dependent variable.

Table 4.4 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations		
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part
1	(Constant)	1,869	0,124		15,061	0,000			
	CPI	0,060	0,001	0,985	73,184	0,000	0,985	0,985	0,985
2	(Constant)	2,978	0,112		26,491	0,000			
	CPI	0,043	0,001	0,695	31,802	0,000	0,985	0,927	0,284
	SP500	0,002	0,000	0,317	14,520	0,000	0,952	0,749	0,130
3	(Constant)	1,619	0,173		9,334	0,000			
	CPI	0,042	0,001	0,693	38,943	0,000	0,985	0,950	0,283
	SP500	0,002	0,000	0,265	14,170	0,000	0,952	0,742	0,103
	ESTINDEX	0,013	0,001	0,087	9,231	0,000	0,658	0,585	0,067
4	(Constant)	2,928	0,153		19,160	0,000			
	CPI	0,042	0,001	0,681	55,689	0,000	0,985	0,975	0,278
	SP500	0,001	0,000	0,187	13,346	0,000	0,952	0,723	0,067
	ESTINDEX	0,013	0,001	0,089	13,740	0,000	0,658	0,733	0,069
	GS10	-0,132	0,010	-0,111	-13,636	0,000	-0,803	-0,730	-0,068

a. Dependent Variable: RGDPLEVEL

Near the regression coefficients there are the standard errors; these are very small and this is due to the precision of the model which we have already shown. Then there are the betas which are standardized coefficient useful to explain the individual contribution of the variables to the model. In particular we can see that adding always one more variables there is a reduction of the relative importance of the SP500 index level. At the contrary, except for the first model where, being the only independent variable the beta of CPI is about 0,985, in the other three models CPI maintains a relatively constant importance in explaining the output variable. From the column of the significance of the regression coefficients, the Table 4.4 suggests that all the coefficients of the four models are significant at 99% level since the associated pvalues are lesser than 0,01; this means that the results are not due to the chance. Then there is the last section in the Table which is related to the partial correlation; among the threes presented we are interested more in the Part Correlation. Recall that the square of the Part correlation associated to a variable is the percentage of the R square we lose if we drop that variable. It is easy to verify that the most powerful variable to explain the Real GDP level

is CPI; but thanks to the fact that all the variables in the models have strong correlation coefficient with the Real GDP level, even if we lose a variable, for instance CPI, with a correlation coefficient of 0,985, we reduce the accuracy of the model (R Square) of just 8% which is the square of its Part correlation.

4.4.4) ANLAYSIS FOR ROBUSTNESS OF THE RESULTS

In this paragraph we describe the main tests of the assumptions which I have conducted in order to improve the robustness of the results. It is a resuming paragraph; for more details I remind to the Statistical Appendix B

- All the variables of the models are quantitative (Statistical Appendix B Table 4)
- All the variables have Standard deviation greater than zero (Statistical Appendix B Table 4)
- All the variables, except from GS10, present normality problems since the Kurtosis value is higher than |1|. Nevertheless we are in presence of a normal multivariate therefore the individual non-normality does not introduce significant distortions. (Statistical Appendix B Table 4)
- To test the assumption of absence of multicollinearity we calculate two important outputs: the Tolerance Index and the VIF. It appears that there is collinearity between CPI and SP500, the other pairs instead, show value in the normal range or just a bit outside (Statistical Appendix B Table 4.3)
- The shape of the residuals follows a normal distribution (Statistical Appendix B Table 4.5)

4.5) TEST OF THE MODEL

In this section we will test the model in order to verify its forecasting power. First of all we need to remember the linear regression model which is the following:

$$\mathbf{RGDPLEVEL}_{t+4} = c + \alpha\, CPI_t + \beta\, SP500_t + \theta\, ESTINDEX_t + \Phi\, GS10_t + \varepsilon$$

Therefore we need now data about the dependent variable and of the four independent ones. The full sample includes quarterly observation for a period between 1972 and 2004. In this section we will test the model using a period randomly chosen from the dataset.

Table 4.6 Data of the variables in the model, period 2011-2012

DATE	SP500 INDEX	REAL GDP LEVEL	CPI	ESTINDEX	GS10
June 30, 2012	1359,7800	15,340	229,10	123,3128625	1,64
March 31, 2012	1386,4300	15,280	230,09	120,3628379	1,82
Dec. 31, 2011	1300,5800	15,190	226,67	114,0526298	2,04
Sept. 30, 2011	1207,2200	15,020	226,42	115,8393141	2,05
June 30, 2011	1325,1900	14,990	225,92	120,6455857	2,43

Table 4.7 Summary of the regression coefficients

VARIABLE	COEFFICIENT	VALUE OF THE COEFFICIENT
CONSTANT	C	2,928
SP500 INDEX	β	0,001
CPI	α	0,042
ESTINDEX	θ	0,013
GS10	Φ	-0,132

Having the data and the coefficients we can test the model. Only the final value is approximated at the third decimal; this in order to lose as little information as possible; also because already the original data were approximated.

[E]REAL GDP$_{2012}$ = 2,928 + (0,042 * CPI_{2011}) + (0.001 * $SP500_{2011}$) + (0,013 * $ESTINDEX_{2011}$) + (-0,132 * $GS10_{2011}$) + ST. ERROR

Once we substitute the variables with their values we obtain :

[E]REAL GDP$_{2012}$ = 2,928 + (0,042 * 225,92) + (0,001 * 1325,19) + (0,013 * 120,6455857) + (-0,132 * 2,43) + 0,22429111

[E] REAL GDP$_{2012}$ = 2,928+ 9,48864 + 1,32519 + 1,568393 – 0,32076 + 0,22429111

[E] REAL GDP$_{2012}$ = 15,214

REAL GDP $_{2012}$ = 15,340

REAL GDP $_{2012}$ - [E] REAL GDP$_{2012}$ = 15,340 - 15,214 = 0,126

% DEVIATION = 0,126 /15,214 = 0,00828

It is now possible to forecast the output variable with some precision. In fact the deviation between the forecasted value and the real observed value is less than 1%. This obviously does not mean that if we repeat the test with a different period we obtain the same percentage of deviation from the observed value; but the average error is about 1%.

Therefore we have the evidence that the current level of the S&P500 index could contribute significantly to the growth in the real economy.

5) CONCLUSION

The aim of this thesis was to verify what is the relationship between GDP and stock returns. Many authors and research centers have conducted analysis on this area concluding that, in theory, the two variables should be related by the profits channel. Indeed an increase in the GDP level, meaning an improvement of the economic situation, should bring positive effects on the consumption component and investment component and all these positive effects should translate in an increase in corporate profits. As a consequence of the increase in profits, stock returns would benefit.

The problem is that sometimes theory does not seem to correspond to realty. Indeed other authors tried to verify empirically this channel testing the equation more growth equals to more stock returns. In particular the main studies tested whether, in the long, intermediate and short period, the countries with highest economic growth experienced also the highest stock returns. Dividing countries in two categories, developed and emerging countries they show that, in most cases, the emerging countries were the countries with the highest GDP growth but sometimes failed to translate this economic growth into higher stock returns.

Nevertheless the results of the studies were a bit different essentially for two reasons: - the period of observation chosen, - the variables and therefore data used in the analysis. According to these differences in methodology in fact, we have seen how we went from negative to positive correlation results between the two variables. Moreover only a few studies were statistically significant. The authors tried also to give explanations of the causes for the missing link; among those (Theoretical Appendix 2): the fact the companies are multination therefore do not depend on a single country's GDP growth; or that maybe the behavior of the corporate governance may expropriate profits to shareholder therefore interrupt the profits channel; or even the fact that in the past there were measurement errors.

All of these studies had something in common. They all have analyzed the coincident relationship between GDP and stock returns which is the relationship in the same period. This was a first hint for my personal empirical analysis. A second hint was one of the Siegel's explanations for the missing link that is the fact that stock prices already impound information about the future economic situation. Believing that there was the possibility that stock price

impound information of the past economic situation I developed a stepwise model in which I tried to discover a relationship between the current S&P500 index level and past Real GDP level. Actually I find a strong positive relationship between the two variables; indeed the correlation coefficient is 0.939 and just the variable past Real GDP level is able to explain the 88,1% of the variability in the values of S&P500 index. After finding this strong link between the two variables I included also other variables to improve the accuracy and the forecasting power of the model until I arrived to a three-factors model where are included the Cyclically Adjusted Price Earning Ration and the Real Home Price Index able to explain the 91% of the differences in the S&P500 values. All the results are robust and significant at 95% level. We have also tested the model in a forecasting inside period as a proof of its operation.

After building a S&P500 forecasting model I try to hypothesize if stock returns can also be used to forecast the future economic situation. This because if it is true that an increase in the GDP level means an increase in corporate profits I think is true also the opposite since an increase in the corporate profits and therefore in the stock returns should lead to an increase in the consumption and therefore to an increase in the GDP level again. So we cannot say who anticipate who because both anticipate each other. For this reason the second model of my thesis try to forecast the future level of the Real GDP with current values of S&P500 index and other three variables. The results of this model are very impressive since, thanks to the strong positive correlation between each independent variable and the dependent one, it is able to explain 99,6% of the variability in the Real GDP values confirmed also by a practice test at the end of the relative chapter.

In conclusion I think that these two variables are strictly positively related and that the theories about their link are correct. I do not think that economy and finance are two different things and these models are the proof. Not only, but they open a street not yet fully discovered. Although the markets are constantly evolving, I believe that always they will be related to the real economy.

Nevertheless to find a correlation to develop a model I used quarterly data for a period of 39 years. Therefore my model cannot be used for investment purposes to explain intraday values or weekly values of the S&P500 for example. Indeed because of the volatility of the stock market it is impossible to find a relationship with the real economy world. Therefore we cannot forecast the short-time value with an economic equation.

This model leaves ample room for improvements. First of all it is possible to add more data in order to develop a model able to explain the link between the two variables also in the very short term; this would be useful also for the investment point of view.

Moreover it is possible to improve the accuracy and the forecasting power of the two models including other independent relevant variables.

A limit of my thesis is that I have analyzed only the relation between the US Real GDP level and S&P500 case; therefore it would be interesting to study the same relationship in different countries and different markets in order to confirm or to confute my results.

THEORETHICAL APPENDIX

APPENDIX 1

Summary Of The Academic Literature

In this paragraph we summarize all the GDP-stock returns studies and their results in order to facilitate the comparison between them. They will be divided into three tables (A,B and C) according to which category they belong.

Table A – Long-period studies

AUTHORS	VARIABLES USED	PERIOD OF OBSERVATION	CORRELATION COEFFICIENT
SIEGEL (1998)	Gdp growth Dollar returns	• 1970-1997	• Developed Markets -0.32 • Emerging markets: -0.03
DMS (2002)	Percapita GDP growth Real equity returns growth	• 1900-2000 • 1951-2000	• -0.27 • -0.03
BERNSTEIN AND ARNOTT (2003)	GDP growth-Real Equity returns Percapita GDP growth – Real Equity returns	• 1900-2000 • 1900-2000	• 0.32 • -0.27
RITTER (2005)	Real Percapita GDP growth Mean geometric Real returns	• 1900-2002	• Local currency: -0.39 • US dollars: -0.32
DMS (2010)	GDP growth Annualized Equity returns	• 1900-2009	No Correlation coefficient. Division in GDP growth quintiles and portfolios.

			Economic growth is not guarantee of superior returns.

Table B – Intermediate-period studies

AUTHORS	VARIABLES USED	PERIOD OF OBSERVATIONS	CORRELATION COEFFICIENT
DMS (2010)	GDP growth Real equity returns	• 1985-2009	DM : equity returns higher than GDP growth. This is not true, with exception, for EM
		• 2000-2009	EM experienced the highest ecnomic growth rate and the highest returns.
	GDP per capita the equity returns	• 1970-2009 (ten year horizon)	Slightly positive on average

Table C – Short-period studies

AUTHORS	VARIABLES USED	PERIOD OF OBSERVATION	CORRELATION COEFFICIENT
O'Neill, Stupnytska and Wrisdale (2011)	Real GDP growth rates vs. real USD returns	• 1988-2010	21 EM : -0.64 39 DM : -0.05

APPENDIX 2

Summary Of The Causes For The Missing Link

In this paragraph I present the Table Summary4 in which I summarize the causes for the missing link between GDP growth and stock returns, according to different authors. This in order to have a global view and to facilitate the comparison.

Table Summary4 – Causes of the missing link between GDP growth and Stock returns.

AUTHORS	EXPLANATION
SIEGEL (1998)	**Stock Price Reflects Gdp Expectation** Stock prices already impound information about the future economic situation. Therefore it is impossible to find a relationship between the two variables at the same moment. **Multinational** Nowadays companies are multinational; therefore depends on the worldwide economic growth not on the growth of a specific country
DMS (2010)	**Measurement Problems** The precision in measuring the GDP today is higher than in the past. Therefore the estimate may be wrong. **False Expectations** GDP can grow without generating wealth gains to equity holders.
BERNSTEIN AND ARNOTT (2003)	**Dilution Effect** Part of economic growth is driven by the value added by new or unlisted enterprises, which does not benefit the shareholders of established companies.
LI AND XU (2002)	**Survivorship Bias** Some countries show higher returns thanks to the fact that

	they were winners or not affected by the World Wars. The lowest catastrophic probability affects returns.
PAUL KRUGMAN AND ALWYN YOUNG	**Economic Miracle** The authors think that the great expansion and the consequently great economic growth of some countries is due to the high savings rates and the more efficient utilization of labor, neither of which necessarily translates into higher profits accruing to the shareholders of existing firms
RITTER (2005)	**Corporate Governance** A possible cause of this failure is represented by the behavior of the corporate governance with respect to the minority shareholders. Managers may expropriate profits via sweetheart deals, tunneling, etc.
SCHRODERS ECONOMICS (2010)	**Consider the business cycle** There is the evidence that market can performs well when in slow-down phases. Therefore the coincident link may be wrong.
O'NEILL, STUPNYTSKA AND WRISDALE (2011)	**Period of observation** There is the evidence that according to period of observation change also the relationship. For this reason we need to consider the period of observation of the studies.

STATISTICAL APPENDIX

APPENDIX A – FORECASTING S&P500 MODEL

Table 3. Descriptive Statistics

	N	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
SP500	157	543,53513526	295430,443	,401	,194	-1,141	,385
RGDPLEVEL	157	3,31988375	11,022	,131	,194	-1,411	,385
CAPE	157	9,03632390	81,655	,692	,194	,089	,385
ESTINDEX	157	23,59302153	556,631	1,738	,194	2,253	,385
Valid N	157						

Test Of The Normality Of The Variables

For what concerns the normality of the relationship between the variables , in the Table 3 we can see how the dependent variable S&PLEVEL and the independent variables RGDPLEVEL, ESTINDEX present problems of normality since they show values for the kurtosis higher than |1|. CAPE instead shows normal results.

Even if the normality in the distribution of the variables is not an assumption of the regression, the presence of distributions that are far from a normal one, can lead to a problem in some other assumptions like the linearity of the relationships, the normality and homoscedasticity in the residuals. Nevertheless, we can avoid to transform data if through a particular calculus we can show that even if a singular variable is not distributed like a normal, considering all the variables we are in presence of a multivariate normal.

Therefore we calculate the Mardia multivariate kurtosis index. The value of this index is the average of the square Mahalonobis distance. This value should be compared with a critical value calcutated as the multiplication between the number of variables (p) and p+2. In my case the number of variables (including the dependent one) is 4; so the critical value is 4*(4+2) which is equal to 24. The value of the Mardia kurtosis index instead is 16,15; therefore since it is smaller than 24 we can affirm that our distribution does not deviate from a multivariate normal. Ultimately even if the univariate distribution of a variable does not conform fully to a normal, the multivariate distribution can be considered substantially

normal. This is important because the multivariate normal ensures that the relations between the variables are essentially linear.

Test of Multicollinearity

Table 3.3 Regression Coefficients and Collinearity Statistics (VIF and Tolerance Index)[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-866,377	49,063		-17,658	,000		
	RGDPLEVEL	153,775	4,514	,939	34,068	,000	1,000	1,000
2	(Constant)	-873,287	43,253		-20,190	,000		
	RGDPLEVEL	128,612	5,452	,786	23,589	,000	,532	1,878
	CAPE	13,519	2,003	,225	6,749	,000	,532	1,878
3	(Constant)	-751,862	70,950		-10,597	,000		
	RGDPLEVEL	136,615	6,555	,834	20,840	,000	,360	2,779
	CAPE	13,100	1,990	,218	6,584	,000	,527	1,897
	ESTINDEX	-1,567	,731	-,068	-2,145	,034	,574	1,743

a. Dependent Variable: SP500

The Tolerance Index (Tolerance T_i) calculated with the SPSS software is used to estimate as an independent variable is linearly related to the other independent variables. This parameter varies between 0 and 1, indicating the amount of variance of an independent variable that is not explained by the other independent variables and is equal to: $Ti = (1 - Ri^2)$, where Ri^2 is the determination coefficient obtained from the regression of the independent variable on the other independent variables.

The higher the index of tolerance, the lower the variance that one independent variable shares with the other independent variables, the greater the contribution it can provide in the explanation of the dependent variable

The Variance Inflaction Factor (VIF) represents the reciprocal of Tolerance, therefore $VIF_i = 1/Ti = 1/(1 - Ri^2)$. Low values of VIF indicates low collinearity; high values of VIF indicates high collinearity. Values from 5 to 10 of VIF indicates strong collinearity. According to the value of accuracy choosen the range for the two indexes change; usually in the research papers the most common combination of limit values are: Tolerance Index = 0.5 and VIF = 2 .

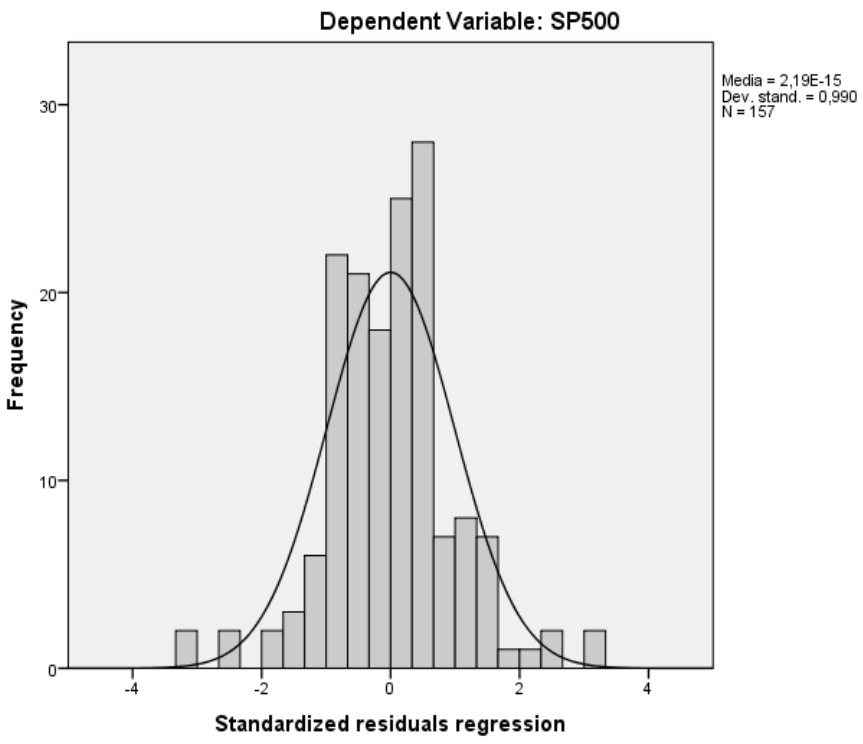
Nevertheless depending on the specific conditions of the model it is possible to accept also different values.

In the first model there is a perfect match between the two variables with both Tolerance Index and VIF which are |1|; therefore in the first model we do not have collinearity problems. When we insert a second variable (CAPE) in the second model we note that the relationship between the two variables is different but remains in the accepted range since the Tolerance Index which is 0,532 leads to a VIF of 1,878 which is smaller than 2. In the last model instead the only problem is for the VIF of the GDP LEVEL; it appears that there is some collinearity with ESTINDEX. Nevertheless the value is just a bit out of the range and it does not represent a problem also because we know that the two variables cannot be correlated since we cannot write RGDPLEVEL as a function of ESTINDEX. In conclusion we can say that the three models does not present collinearity problems since, except for the low Tolerance value of the GDP in the third model, in all other cases we have that more than 50% of the variance of each variables is not in common with the other independent variables.

Analysis of the residuals

Simply by looking at Table 3.5 we have the histogram of the residuals. It is possible to see that the average of the residuals is a number very close to zero and standard deviation near to 1. The shape of the residuals follows a normal distribution therefore it is verified also the last assumption of the model

Table 3.5 Histogram



STATISTICAL APPENDIX

APPENDIX B – FORECASTING GDP MODEL

Table 4 Descriptive Statistics

	N	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
CPI	168	139,6365476	56,85048562	3231,978	-,079	,187	-1,114	,373
ESTINDEX	168	123,8860594	23,26676266	541,342	1,813	,187	2,576	,373
RGDPLEVEL	168	10,2842976	3,47880877	12,102	,154	,187	-1,410	,373
GS10	168	6,8569643	2,91602156	8,503	,544	,187	,013	,373
SP500	168	640,4087500	517,89748083	268217,801	,451	,187	-1,336	,373
Valid N (listwise)	168							

Test Of The Normality Of The Variables

To test the normality assumption we need to look in Table 4 the values of Kurtosis. In Particular we can see that all the variables, except from GS10, present normality problems since the Kurtosis value is higher than |1|. One of the possible causes of the higher kurtosis could be the presence of outliers; therefore we verify it calculating the Mahalanobis distance that quantifies the weighted distance for each subject from the centroid of the sample (ie, the mean vector on 5 variables calculated on our sample) comparing this result with the distribution of chi-square. Remember that to calculate the critical value for the Mahalonobis distance we need to consider the number of variables as degree of freedom we have that with 5 degrees of freedom the critical value considering a critical probability value of 0.001 is 20.515. From the frequency distribution of the Mahalonobis distance we find the lowest and the highest values; no values exceeds the critical 20.515 therefore we can exclude the presence of multivariate outliers.

Now we can check if we are in presence of a multivariate normal using the values of the Mahalanobis distance to calculate the Mardia multivariate kurtosis index. We know from the Appendix A how to calculate it. In my case the number of variables (including the dependent one) is 5; so the critical value is 5*(5+2) which is equal to 35. The Mardia kurtosis coefficient in my case is 23.39 which means that we can avoid to transform data because we are in

presence of normal multivariate therefore there aren't assumptions which could be damaged from the high individual kurtosis of the variables .

Test of Multicollinearity

Table 4.3 Regression Coefficients and Collinearity Statistics (Tolerance Index and VIF)[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1,869	,124		15,061	,000		
	CPI	,060	,001	,985	73,184	,000	1,000	1,000
2	(Constant)	2,978	,112		26,491	,000		
	CPI	,043	,001	,695	31,802	,000	,167	5,974
	SP500	,002	,000	,317	14,520	,000	,167	5,974
3	(Constant)	1,619	,173		9,334	,000		
	CPI	,042	,001	,693	38,943	,000	,167	5,976
	SP500	,002	,000	,265	14,170	,000	,152	6,589
	ESTINDEX	,013	,001	,087	9,231	,000	,599	1,668
4	(Constant)	2,928	,153		19,160	,000		
	CPI	,042	,001	,681	55,689	,000	,166	6,006
	SP500	,001	,000	,187	13,346	,000	,127	7,892
	ESTINDEX	,013	,001	,089	13,740	,000	,599	1,669
	GS10	-,132	,010	-,111	-13,636	,000	,377	2,654

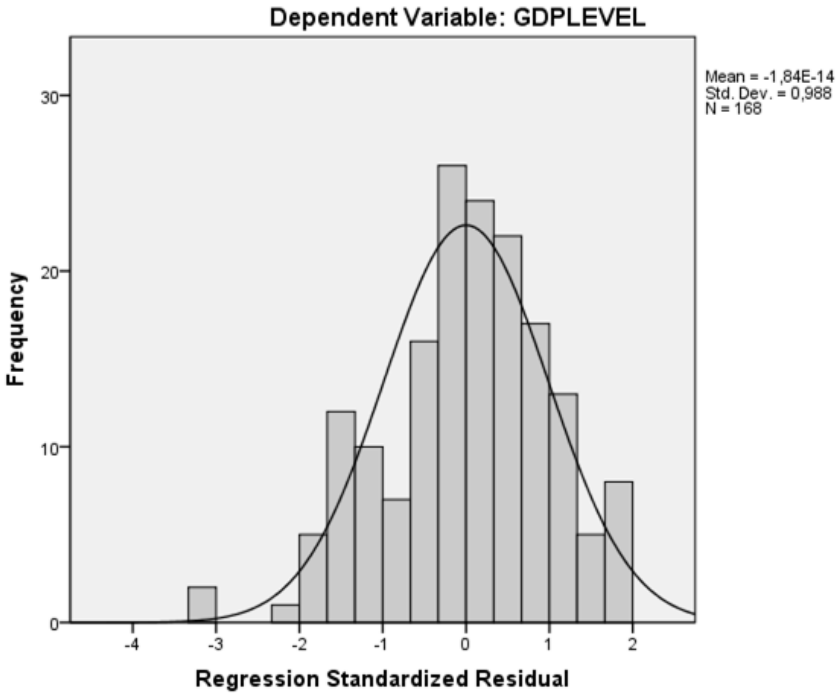
a. Dependent Variable: RGDPLEVEL

Now we need to prove that the results of the model are not biased because of the presence of multicollinearity, therefore we test it. The two most important index to test the presence of multicollinearity are the Tolerance Index and the Variance Inflation Factor (VIF) which we have already seen in the previous model. From the Table 4.3 we can see that there is collinearity between CPI and SP500 because the other pairs show value in the normal range or just a bit outside. If we take a less restrictive assumption it is good also the collinearity value for CPI and SP500 since they do not overcame 10.

Analysis of the residuals

The last assumption we test is on the residuals and in particular if they show a normal path or not. The most immediate way to see it is to plot the residuals in the Table 4.5

Table 4.5 Histogram



The residuals show a path which is pretty close to a normal one, in fact also by looking at the results in the table we have that the mean is very close to zero even if centered in the negative part and the standard deviation is just a bit under 1.

BIBLIOGRAPHY

BAKER DEAN Center for Economic and Policy Research J. BRADFORD DELONG University of California, Berkeley PAUL R. KRUGMAN Princeton University, Asset Returns and Economic Growth, Brookings Papers on Economic Activity, 1:2005

BERNSTEIN WILLIAM AND ROBERT D. ARNOTT, Earnings growth: the two percent dilution, Financial Analyst Journal, September/October 2003, 47 – 55

BRADFORD CORNELL, Economic Growth and Equity Investing, Financial Analyst Journal, Volume 66, 2010

CELLINO E ASSOCIATI, Ciclo economico e mercati azionari, una verifica empirica sul mercato americano, CELLINO E ASSOCIATI SIM, 2006

COCHRANE JOHN H. , Asset Pricing, June 12, 2000

DAVIS JOSEPH, PH.D., ALIAGA-DÍAZ ROGER, PH.D. , THOMAS CHARLES J. , CFA, RAVI G. TOLANI, The outlook for emerging market stocks in a lower-growth world, Vanguard Research, September 2013

DIERMEIER JEFFREY J , IBBOTSON ROGER G. AND. SIEGEL LAURENCE B , The Supply of Capital Market Returns, Financial Analyst Journal, March/April 1984, 74 - 80

DIMSON, E., P. MARSH AND M. STAUNTON "Economic Growth and Stock Market Performance", Chapter 3 of Global Investment Returns Yearbook, London Business School and ABN Amro (pp 41-58), 2005

DIMSON, E., P. MARSH AND M. STAUNTON AND MAUBOUSSIN MICHAEL Credit Suisse Global Investment Returns Yearbook 2013

DIMSON, E., P. MARSH AND M. STAUNTON AND MAUBOUSSIN MICHAEL, Credit Suisse Global Investment Returns Yearbook 2014

DIMSON, E., P. MARSH AND M. STAUNTON, "Economic Growth", *Credit Suisse Global Investment Returns Yearbook*. Zurich: Credit Suisse AG, 2010

DIMSON, E., P. MARSH AND M. STAUNTON, Global Investment Returns Sourcebook 2012, Zurich: Credit Suisse Research Institute, 2012

DIMSON, E., P. MARSH AND M. STAUNTON, Triumph of the Optimists: 101 Years of Global Investment Returns, 2002, Princeton University Press, Princeton

DOWRICK, S., AND D.T. NGUYEN; "OECD Comparative Economic Growth 1950-85: Catch-Up and Convergence", *American Economic Review*, 79, 5, 1010-1030; 1989

FAUGÈRE CHRISTOPHE AND JULIAN VAN ERLACH , University at Albany and Nexxus Wealth Technologies Inc, . The Equity Premium: Consistent with GDP Growth and Portfolio Insurance, Eastern Financial Association The Financial Review 41 (2006) 547—564

GOETZMANN WILLIAM N., IBBOTSON ROGER G., Essays and Explorations, Yale School of Management, oxford university press, 2006

HOLGER SANDTE, Chief Economist, WestLB Mellon Asset Management KAG, Stock markets vs GDP Growth: a complicated Mixture, July, 2012

HÖRDAHL PETER, PACKER FRANCK , Understanding Asset Price: an overview, BIS Paper 34, March 2007

IBBOTSON ASSOCIATES. *Stocks, Bonds, Bills, and Inflation 2001 Yearbook*, Ibbotson Associates, 2001.

IBBOTSON ROGER G., PH.D., CHEN PENG, PH.D., CFA , Stock Market Returns in the Long Run: Participating in the Real Economy (Forthcoming Financial Analyst Journal) July 9, 2002

IBBOTSON, ROGER G., AND REX A. SINQUEFIELD. "Stocks, Bonds, Bills, and Inflation: Year-By Year Historical Returns (1926-1974)," *The Journal of Business,* vol.49, no. 1 (January), 11-47, 1976a

IBBOTSON, ROGER G., AND REX A. SINQUEFIELD. "Stocks, Bonds, Bills, and Inflation: Simulations of Future (1976-2000)," *The Journal of Business,* vol. 49, no. 3 (July): 313-338, 1976b.

IBBOTSON, ROGER G., JEFFREY J. DIERMEIER, AND LAURANCE B. SIEGEL. “The Demand for Capital Market Returns: A New Equilibrium Theory,” *Financial Analyst Journal*, vol. 40, no. 1 (January/February): 22-33, 1984

LEVINE ROSS , Stock Markets: A Spur to Economic Growth, *Finance & Development / March 1996*

LEVINE ROSS AND ZERVOS SARA , Stock Market Development and Long-Run Growth , Policy Research Working Paper 1582, The World Bank Policy Research Department Finance and Private Sector Development Division March 1996

MAURO PAOLO , Stock returns and Output Growth in Emerging and Advanced Economies, IMF Working Papers, May 2000

MEHRA, RAJNISH, AND EDWARD PRESCOTT.. “The Equity Premium: A Puzzle,” *Journal of Monetary Economics*, vol. 15, no. 2, 145-161, 1985

MIAN SAJID NAZIR, MUHAMMAD MUSARAT NAWAZ AND USMAN JAVED GILANI Relationship between economic growth and stock market development, *Full Length Research Paper*, African Journal of Business Management Vol. 4(16), pp. 3473-3479, 18 November, 2010

MILLER, MERTON, AND FRANCO MODIGLIANI.“ Dividend policy, Growth and the Valuation of Shares,” *Journal of Business*, vol. 34, no. 4 (October): 411-433, 1961.

MROCZEK MAGDALENA, Unraveling The Supply-Side Equity Risk Premium, A Professional Development Journal For The Consulting Disciplines, January/February 2012

MSCI BARRA , Is There a Link Between GDP Growth and Equity Returns? Reasearch Bulletin| May 2010

MSCI BARRA “What Drives Long-Term Equity Returns?”, MSCI Barra Research Bulletin, 2011

MSCI BARRA, What Drives Long Term Equity Returns?, MSCI Barra Research Bulletin, January 2010

O’NEILL, J., A. STUPNYTSKA AND J. WRISDALE, “Linking GDP Growth and Equity Returns”, Goldman Sachs Asset Management Monthly Insights, 2011

O'NEILL, J., AND A. STUPNYTSKA, "The Long-Term Outlook for the BRICs and N-11 Post Crisis", Goldman Sachs Global Economics Papers 192, 2009

PATATOUKAS PANOS N., On the "great disconnect" between stock returns and GDP growth forecast errors: Implications for interdisciplinary capital markets research in accounting, August 20, 2014

RITTER JAY R. , University of Florida, Gainesville FL 32611-7168, United States, Economic growth and equity returns, Pacific-Basin Finance Journal 13 (2005) 489– 503

RITTER JAY R., is economic good for investors? Journal of applied corporate finance, Morgan Stanley Pubblication, summer 2012

SHILLER, ROBERT J. *Irrational Exuberance*, Princeton University Press 2000, Princeton, NJ, 2000

SIEGEL JEREMY J. , Stocks for the Long Run, 1998, Second edition, McGraw-Hill

SIEGEL, JEREMY J. "The Shrinking Equity Risk Premium," Journal of Portfolio Management, vol. 26, no. 1 (Fall):10-17, 1999

WADE KEITH , Chief Economist And Strategist, SCHRODERS ANJA MAY, Uk Strategic Solutions, GDP growth and Equity returns, SCHRODERS ECONOMICS, March 2013

SITOGRAPHY

http://research.stlouisfed.org/fred2/

https://it.finance.yahoo.com/

http://www.spindices.com/

http://www.econ.yale.edu/~shiller/data.htm

https://it.wikipedia.org/wiki/Pagina_principale

http://www.irrationalexuberance.com/

https://ycharts.com/

http://www.federalreserve.gov/

https://ideas.repec.org/