

MKM227 Postgraduate Dissertation

Student Number:.....1332259.....

	Comments	Max Mark	Actual Mark
<p>Introduction</p> <p><i>Identification of a valid topic, research question and objectives framed to Masters Level standard with academic rationale developed, clear industry contextualisation of the research topic</i></p>	Supervisor Comments:	10%	
	2 nd marker Comments:		
<p>Critical Literature Review</p> <p><i>Depth and breadth of literature search, engagement with seminal authors and papers, evidence of a critical approach toward the scholarly literature</i></p>	Supervisor Comments:	25%	
	2 nd marker Comments:		

<p>Research Methodology</p> <p><i>Evaluation of research philosophies and perspectives. Justification of methodological approach, sampling strategy, data analysis and reliability and validity measures as applicable</i></p>	<p>Supervisor Comments:</p>	<p>15%</p>	
	<p>2nd marker Comments:</p>		
<p>Data Analysis and Interpretation</p> <p><i>Evidence of rigor in data analysis and interpretation procedures, identification of key patterns and themes in the research data, integration of academic theory into explanation of findings</i></p>	<p>Supervisor Comments:</p>	<p>35%</p>	
	<p>2nd marker Comments:</p>		

<p>Conclusions and Recommendations</p> <p><i>Research question and objectives addressed with implications to theoretical and managerial concepts considered. Recommendations provided for theory, practice and future research</i></p>	<p>Supervisor Comments:</p>	<p>10%</p>	
	<p>2nd marker Comments:</p>		
<p>Organisation, presentation and references.</p> <p><i>Well structured and ordered dissertation with correct use of grammar and syntax. In-text citation and bibliography conforming to "Cite Them Right"</i></p>	<p>Supervisor Comments:</p>	<p>5%</p>	
	<p>2nd marker Comments:</p>		

Total	First Marker Total	100%	
	Second Marker Total		
Supervisor General Comments:		Agreed Mark:	
2nd Marker General Comments:			

Supervisor's Name:

Signature:

2nd Marker's Name:

Signature:

How Does the UK Stock Market React to Changes in Macroeconomic Variables?

A dissertation submitted in partial fulfilment of the requirements of the Royal Docks Business School, University of East London for the degree of **MSc Finance & Risk**

[September 2014]

[11 796 words]

I declare that no material contained in the thesis has been used in any other submission for an academic award

Student Number: 1332259 Date: 09.09.2014

Dissertation Deposit Agreement

Libraries and Learning Services at UEL is compiling a collection of dissertations identified by academic staff as being of high quality. These dissertations will be included on ROAR the UEL Institutional Repository as examples for other students following the same courses in the future, and as a showcase of the best student work produced at UEL.

This Agreement details the permission we seek from you as the author to make your dissertation available. It allows UEL to add it to ROAR and make it available to others. You can choose whether you only want the dissertation seen by other students and staff at UEL (“Closed Access”) or by everyone worldwide (“Open Access”).

I DECLARE AS FOLLOWS:

- That I am the author and owner of the copyright in the Work and grant the University of East London a licence to make available the Work in digitised format through the Institutional Repository for the purposes of non-commercial research, private study, criticism, review and news reporting, illustration for teaching, and/or other educational purposes in electronic or print form
- That if my dissertation does include any substantial subsidiary material owned by third-party copyright holders, I have sought and obtained permission to include it in any version of my Work available in digital format via a stand-alone device or a communications network and that this permission encompasses the rights that I have granted to the University of East London.
- That I grant a non-exclusive licence to the University of East London and the user of the Work through this agreement. I retain all rights in the Work including my moral right to be identified as the author.
- That I agree for a relevant academic to nominate my Work for adding to ROAR if it meets their criteria for inclusion, but understand that only a few dissertations are selected.
- That if the repository administrators encounter problems with any digital file I supply, the administrators may change the format of the file. I also agree that the Institutional Repository administrators may, without changing content, migrate the Work to any medium or format for the purpose of future preservation and accessibility.
- That I have exercised reasonable care to ensure that the Work is original, and does not to the best of my knowledge break any UK law, infringe any third party's copyright or other Intellectual Property Right, or contain any confidential material.
- That I understand that the University of East London does not have any obligation to take legal action on behalf of myself, or other rights holders, in the event of infringement of intellectual property rights, breach of contract or of any other right, in the Work.

I FURTHER DECLARE:

- That I can choose to declare my Work “Open Access”, available to anyone worldwide using ROAR without barriers and that files will also be available to automated agents, and may be searched and copied by text mining and plagiarism detection software.
- That if I do not choose the Open Access option, the Work will only be available for use by accredited UEL staff and students for a limited period of time.

/cont

Dissertation Details

Field Name	Details to complete
Title of thesis <i>Full title, including any subtitle</i>	How Does the UK Stock Market React to Changes in Macroeconomic Variables?
Author <i>Separate the surname (family name) from the forenames, given names or initials with a comma, e.g. Smith, Andrew J.</i>	Olsen, Sissel
Supervisor(s)/advisor <i>Format as for author.</i>	Karathanasopoulos, Andreas
Author Affiliation <i>Name of school where you were based</i>	University of East London
Qualification name <i>E.g. MA, MSc, MRes, PGDip</i>	MSc
Course Title <i>The title of the course e.g.</i>	MKM227 Dissertation
Date of Dissertation <i>Date submitted in format: YYYY-MM</i>	2014-09
<i>Do you want to make the dissertation Open Access (on the public web) or Closed Access (for UEL users only)?</i>	Open <input checked="" type="checkbox"/> Closed <input type="checkbox"/>

By returning this form electronically from a recognised UEL email address or UEL network system, I grant UEL the deposit agreement detailed above. I understand inclusion on and removal from ROAR is at UEL's discretion.

Name: Sissel Olsen

Signature: *Sissel Olsen*

Date: ...09.09.2014.....

Abstract

The purpose behind this study is to find out whether there is a long term equilibrium relationship between the UK stock market and the macroeconomic variables. The stock market is represented by the Financial Times Stock Exchange (FTSE) 100 Share Index, and the macroeconomic variables included in the test, are CPI and unemployment. The data set includes data from January 1995 to June 2014 of the UK Consumer Price Index, UK unemployment rate, and the FTSE 100 index. To test for stationarity I used an augmented Dickey-Fuller (ADF) test, while a Johansen cointegration test is used to determine the long term equilibrium relationship. The result of the test is that both CPI and unemployment has a negative impact on the FTSE 100 index, however, the effect on stock prices from the unemployment rate is significantly higher than that of consumer prices. The result from the cointegration test indicates that the UK market is efficient, as the prices reacts to new information (changes in the macroeconomic variables).

Table of Contents

1 Introduction	1
1.1 Consumer Price Index - CPI	1
1.2 Unemployment.....	4
1.3 Stock Market	4
1.3.1 London Stock Exchange and FTSE 100.....	5
1.4 Market Efficiency.....	5
1.4.1 Weak-Form Efficiency.....	6
1.4.2 Semi Strong-Form Efficiency	6
1.4.3 Strong-Form Efficiency	7
2 Critical Literature Review	8
3 Research Methodology	14
3.1 Econometric Method.....	15
3.1.1 Time Series Analysis	16
3.1.2 Stationary and Nonstationary Variables.....	16
3.2 Dickey-Fuller	17
3.2.1 Dickey-Fuller Test with no Intercept and no Trend	18
3.2.2 Dickey-Fuller Test with Intercept and no Trend	18
3.2.3 Dickey-Fuller Test with Intercept and Trend	18
3.2.4 Augmented Dickey-Fuller test	20
3.2.5 Order of Integration	21
3.3 Optimal Lag Length Criteria for Cointegration Test	21
3.4 Johansen Cointegration Test	21
3.5 Alternative Approaches to Identifying Long Term Cointegration	23
3.5.1 The Engle-Granger Two-Step Modeling Method	23
3.5.2 The Engle-Yoo Three Step Modeling Method	23
3.5.3 The Saikkonen Method.....	23
4 Data Analysis	24
4.1 Stock Market – FTSE 100	24
4.2 Consumer Price Index.....	25
4.3 Unemployment.....	25
4.4 UVAR.....	26
4.5 Johansen Cointegration Test	26
4.5.1 Cointegration Test	27

5 Results 29

6 Conclusion 30

7 Recommendations 32

8 Bibliography 33

9 Appendices 40

 9.1 Appendix 1 40

 9.2 Appendix 2 41

 9.3 Appendix 3 42

 9.4 Appendix 4 43

 9.5 Appendix 5 44

1 Introduction

This paper, will concentrate around the hypothesized relationship between macroeconomic variables and the stock market. It will focus on the UK economy. It will build on the theory by John Maynard Keynes, that economic development is controlled by expectations and uncertainty about the future. Based on this, the expectations about future economic activity can be represented by the fluctuating prices in the stock market. With Keynes' theory in the background, this dissertation will try to identify macroeconomic variables as the indicators for expectations and uncertainty in a market.

Through theory and regression analysis, I will critically evaluate the possible changes in stock prices, caused by changes in the consumer price index and the unemployment rate, while trying to determine any correlations between the variables. Measures for the UK economy will be employed in the testing to put the research into a more realistic perspective, in a way that we can identify real life changes, and not just theoretical movements in the variables.

The last few years the world economy has started to rise again after the downturns of the financial crisis of 2008. Many governments has initiated actions to stimulate growth in the economy. These measures can be implemented through influencing the fiscal and monetary policy (Schmidt, no date). Schmidt further relates fiscal policy to taxes and government spending. Taxes and government spending can be altered in a way to steer the economy in the desired direction. Monetary policy, on the other hand, is related to money supply and the interest rate. This policy is usually controlled by a country's Central Bank, which is the Bank of England in the United Kingdom.

1.1 Consumer Price index - CPI

The best way to measure a countries inflation is to look at its Consumer Price index, CPI. The consumer price index, is a measure that takes the weighted average of all the prices in a pre-determined basket of goods, and converts it in to one measure. This measure is what we call the CPI (*Consumer Price Index – CPI*, 2014). The CPI takes the change in prices and averages them. It is sometimes referred to as “headline inflation” or “Harmonized Index of Consumer Prices (HICP). When the consumer price index is expected to fall, the inflation rate is expected to drop as well.

The pre-determined basket of goods is made up of a basket of 700 different goods and services. Transport stands for 16.2% of the total weight of the UK consumer price index, and is therefore the biggest category in the index. Other important categories includes housing,

water, electricity, gas and other fuels, this category stands for 14.4% of the total weight. Further, there is recreation and culture (13.4%), restaurants and hotels (11.4%), and food and non-alcoholic beverages (11.2%). In addition, the index includes miscellaneous goods and services (9.6%), clothing and footwear (6.5%), furniture, household equipment and maintenance (6.1%). The last 11.2% is split between the two categories alcoholic beverages and tobacco, and health, communication and education (*United Kingdom Inflation Rates, 2014*).

CPI is an often-used tool to identify periods of inflation or deflation. In the short term, an increase in the CPI often denotes periods of inflation, while the opposite; a decrease in the CPI often indicates periods of deflation. Inflation, or the inflation rate, shows the increase or decrease in the price level of goods and services (*Consumer Price Index – CPI, 2014*). If the inflation is up, it means that goods and services get more expensive, and a consumer will get a smaller amount of goods and services than he did before the inflation rate increased. If the inflation rate decreases, it is called deflation. In periods of deflation, a pound will buy a higher percentage of goods, compared to periods of inflation.

It is important to monitor and regulate the inflation rate. Because the rate is known to affect other factors, financial markets monitor the inflation rate so that they can predict or forecast the rate, and further see what will happen to other things in the market. For instance, they forecast changes, or movements, in recent housing prices by monitoring housing price indexes (Madura, 2012). Madura further lists oil prices, wage rates and gold prices as good indicators of inflation.

The Retail Prices Index (RPI) was the original measure of inflation in the UK. It originated in the first half of the 20th century, and was employed during the First World War to figure out how price changes affected the workers. From 1947 to 1955 it was known as the Interim Index of Retail Prices, but was renamed again in 1956. From 1956 to 1962 it was known as the Index of Retail Prices, until it was replaced by the General Index of Retail Prices (*Consumer Price Index (United Kingdom), 2014*).

The first inflation target was set in 1992 when the UK switched from the Exchange Rate Mechanism. The inflation target was seen as a better way to steer the new macroeconomic policy, and it was drawn from the RPIX. RPIX is the RPI minus mortgage interest payments. It was argued that mortgage interest payments should not be included because interest rates were a tool for controlling inflation. The Treasury controlled the interest rate until 1997. Since 1997 it has been determined by the Bank of England. The Chancellor sets interest rates according to the target inflation. The initial target was 2.5% but has been reduced to 2% in later years. Once a month, there is a meeting where the committee examines the interest rate

to decide whether a change is needed. An open letter has to be written to the Chancellor if the inflation deviates from the target. In the letter, the Governor of the Bank of England has to explain how he is planning to get the inflation back at its target level (*Consumer Price Index (United Kingdom), 2014*).

The CPI collects information about all the prices in the basket, and takes the geometric mean of them to find the weighted average by taking the weighted mean of the prices. RPI, on the other hand, use the arithmetic mean, which makes it a higher value than the CPI. The reason for this is that rational consumers will buy less a good if the price has increased, and vice versa, they will buy more of a good if the price decreases. In addition, if prices move back towards their initial value, so will the CPI. This does not happen for the RPI (*Consumer Price Index (United Kingdom), 2014*). The 12 months prior to August 2008, the CPI changed by 4.8%. the corresponding value for the RPIX changed by 5.2%, while RPI changed by 4.8%. There are several weaknesses in the CPI. One is that compared to the RPI, it is considered a less effective measure of increase in price because it is so easy to manipulate, and that increases in the price level can be justified because they are below the inflation rate.

A countries inflation is directly related to the interest rate, exchange rate, consumption, investment and wage rate in a country. The inflation can be measured by looking at the evolvment in the Consumer Price Index. Inflation denotes a period of time with a persistent growth in the 'general' price level (Gleditsch and Vollar, 2012). If a nation experience an unusually high inflation, the uncertainty in the market will increase. This uncertainty will have an effect on future income, money worth and future price level. A common assumption in situations like this is that the activity in the market will slow down, the overall consumption in the market decrease, meaning businesses will make fewer investments, private lending will go down, etc. Because the level of expected income is more uncertain than earlier, the risk premium offered from investors is likely to increase. The uncertainty of the level of expected income as well as the increased risk premium all may imply falling stock prices.

On the other hand, an increase in the inflation rate might also lead to an increase in the consumption, because when money is worth less than before, people might want to consume more to avoid a further increase in the inflation rate. However, the first outcome is more probable as the increased uncertainty will make people act more carefully in the market, making the consumption and market value decrease.

For the nation relying on export and import, a high inflation might lead to a decreased competitiveness towards other nations. Because a high inflation in the UK will mean that you'll need more pounds to buy (import) goods from other countries, at the same time as the goods exported from the UK will be more expensive than earlier, making them more exposed

to being replaced by another cheaper and equivalent product. This will especially be a probable case if the prices in other, competing countries does not increase. This makes for the expectations that a higher CPI and higher inflation, will lead to lower stock prices, that is have a negative effect on the stock market.

At the end of July, the UK CPI was at 127.80, while the inflation rate was at 1.6%, both measures decreased from June, when the rates were 128.30 and 1.9, respectively (*United Kingdom Inflation Rate*, 2014).

1.2 Unemployment

Someone who is unemployed is someone who has been without work for a longer period of time and is actively looking for work but has not been able to find any (*Unemployment*, 2014).

The UK unemployment rate has been very high as an aftermath of the financial crisis, but is now starting to fall. The UK unemployment rate, or the proportion of economically active people unemployed, is at 6.6%, or 2.16 million people. Compared to 2011, when the UK had about 2.7 million unemployed people, today's rate is a lot lower. The UK unemployment rate started to rise in 2008 after the financial crisis started. Prior to this, the rate was steady at about 5 percent, or 1.6 million people. With other words, the unemployment rate is still not down at the rate it was prior to the financial crisis, but it is at its lowest in 6 years. Full employment is the goal and key-aim of the Governments long-term economic plan. The employment rate, is now at the same record rate of 2005, with 78 percent of men and 68 percent of women are employed, meaning the overall employment rate is up at 73.1 percent. (*UK unemployment falls to six year low of 2.12m*, 2014)

1.3 Stock Market

Stock markets, or equity markets, can be found all over the world. They are a part of the capital market in a country. A stock exchange is a place where companies can sell shares in their companies to gain equity. There are both buyer and sellers on a stock exchange, and investors can make money through the dividend paid by the company if a company is doing well. However, if the stock price decreases, the investor risks losing his investment if he sells his stocks at a loss (*Stock Market*, 2014). The stock market is usually divided into two markets: the primary market and the secondary market. New issues are sold on the primary market, while the secondary market includes all subsequent trading.

A stock index can be studied to find out how the stock market is performing. There are indices for the whole market or just for a part of it. World-known indices include the Nasdaq Index, Dow Jones Industrial Average, Standard and Poor's 500, and so on.

1.3.1 London Stock Exchange and FTSE 100

London Stock Exchange originated in 1773. From 1973 it was known as the Stock Exchange of Great Britain and Ireland, but later came to be London Stock Exchange, or LSE for short. It is the largest stock exchange in Europe and the primary stock exchange in the UK. The dominant stock index of the LSE is the Financial Times Stock Exchange (FTSE) 100 Share Index, also known as the 'Footsie'. It is made up of the one hundred top blue chip companies on the LSE (*London Stock Exchange – LSE*, 2014). A blue chip company is a company which is well-known for its high-quality goods or services. It is financially sound and known to 'weather downturns'. They usually perform well during times of recession, and are often considered less volatile compared to non-blue chip companies.

The FTSE 100 index is often used as a benchmark for the British market.

1.4 Market efficiency

Capital markets are important in modern economies. It is an important factor when studying macroeconomic variables and stock market. These markets are essential for economic development as they are responsible for transferring money from savers to borrowers. Market efficiency is important to stimulate economic growth and prosperity. Market efficiency is one of the major concepts in finance. An efficient market means that the stock prices reflect all available information in a market. If a market proves to be inefficient, that is it does not seem to be affected by changes in any of the variables, then it will not be possible to say anything about relations in the market. This kind of inefficiency might indicate that the changes in a market occurs because of irrational behavior from the investors (Graffer and Sandvik, 2011).

The efficient market hypothesis (EMH) states that a market is only efficient if the prices truly reflect the information available (Fama, 1970). Bodie et al. (2009) further stated that a new flow of information in a market would be the only thing that could change the prices. This information had to be unpredictable, otherwise, it would be part of the old information and be apparent in the stock prices. This can be seen as a reason as to why the stock prices follow a 'random walk'. Bodie et al. (2009) further states that the future prices should not be dependent of past prices in the market. This means that future prices might increase or decrease independent of its past prices increased or decreased. They further said that if

someone was able to predict the stock prices, this would imply that not all information was available in the market, and the market would not be as efficient as it should. It is common to divide market efficiency into three categories: weak-form, semi-strong form and strong-form efficiency. The type of efficiency is determined by how much information is available to the market.

- Weak form efficiency: Only information about former stock prices are available in the market.
- Semi-strong form efficiency: All public information is available in the market. Non-public information about businesses and the industry is not available in the market.
- Strong-form efficiency: All information is available in the market.

1.4.1 Weak-form Efficiency

Weak-form efficient markets are markets where former stock prices are the only available information (Helbæk and Lindset, 2007). Helbæk and Lindset (2007) further say that potential investors do not know anything about companies or industries except historical stock prices. Because past stock prices is the only available information, investors will buy when it looks like the prices are upward trending, and sell when the prices are dropping. This is because the investor thinks the price will continue to raise or fall, dependent on which of the trends they are identifying. It is obvious that not everyone can earn extra returns by using this forecasting method. Someone is bound to lose the same amount that someone is earning. They further state that according to the theory of weak-form efficiency this way of predicting future stock prices has no purpose. This way of predicting or forecasting future stock prices is called technical analysis. Because investors will buy and sell simultaneously, the stock prices will be forced to move in opposite directions, and it will be impossible to predict the future prices in a case like this because the prices are following a random walk.

1.4.2 Semi Strong-Form Efficiency

Semi-strong form efficient market, on the other hand, includes all public information about the companies and the industries (Helbæk and Lindset, 2007). In addition to past prices, public information includes statements about a company's financial status, like quarterly and annual reports, future income, patents and so on. It will not be possible to uncover additional information by analyzing a company, because all public information is already visible in the stock price (Graffer and Sandvik, 2011). If someone has nonpublic information about a

company or industry, and decides to invest based on this knowledge, it is called inside trading. Inside trading is illegal in most countries (Helbæk and Lindset, 2007). Most stock markets today are semi-strong efficient.

1.4.3 Strong-Form Efficiency

Furthermore, there are strong-form efficient markets. In these markets, all possible information is available for everyone. This is a situation where none of the investors can take advantage of knowing more about a company than other investors know, and this way earning higher returns. A capital market where no one can achieve higher returns by having more information than other investors is a perfect market (Helbæk and Lindset, 2007).

2 Critical Literature Review

Prior research into the subject give mixed results to whether macroeconomic variables has an effect on stock prices or not. One of the most studied variables is the inflation rate. Some studies show evidence of a negative relation between the rate of inflation and stock prices and stock returns, while other studies show no significant relation. For instance, Jain (1988) found that surprises in news about money supply and CPI had a significant effect on stock prices, whereas news about unemployment had no significant effect on stock prices. The effect was visible for about an hour. Another study finds that both expected and unexpected inflation has a negative effect on stock returns (Geske and Roll, 1983). Because changes in expectations related to inflation indicates a higher rate of monetary expansions, changes in Treasury borrowing and tax revenue. Rational investors identifies this, and adjust their prices and interest rates 'accordingly and without delay'. A third study points out that the negative relationship between inflation and stock returns, comes from the effect of the money demand-money supply relationship (Kaul, 1987). Nelson (1976) also found evidence of a negative relationship between inflation and stock returns. He concluded that higher returns could have been gained by using past rates of inflation to predict the market rather than using a buy-and-hold policy during the period studied.

Chen, Roll and Ross (1986) employed a different approach. They wanted to find out if risks in connection with innovations in the stock market was rewarded in the stock market. A version of the Fama-MacBeth (1973) technique was used in the study. They investigated interest rates, expected and unexpected inflation, industrial production, and the spread between high and low grade bonds. Their research concluded that several of the macroeconomic variables investigated could explain expected stock returns. Especially during times when unanticipated inflation and changes in inflation were highly volatile, there was a strong cointegration between the variables.

Furthermore, Fama and Schwert (1977) and Adams, McQueen and Wood (2004) all found evidence of a negative relationship. In addition, Adams, McQueen and Wood also expressed that if researchers use daily returns, there was a risk of missing the correlation between stocks and inflation news. Mandelbrot (1966) studied the relationship between stock prices and the 'triggering' variable. Another study found that interest rate changes and the following stock returns were asymmetrically related. While an increase in interest rates has a weak effect on stock returns, a decrease in interest rates led to twelve months of excess stock returns. Since interest rates are used to steer inflation, the result gives old research on inflation and stock returns a flow of new knowledge (Domian, Gilster and Louton, 2005).

Evans and S kyrud (2013) concluded that there was no significant effect on stock prices from an increase in interest rates. Solnik (2012) studied nine of the major stock markets in the world to find whether a relation between stock returns and expectations about inflation existed or not. The evidence he found reflected the Fisherian assumption that it does not exist a relationship between real returns and inflationary expectations. A study, which contradicts the Fisherian assumption, is that of Gultekin (1983). He gathered data from 26 different countries to investigate the relationship between stock return and inflation. Most of the countries showed signs of what he called a consistent lack of positive relation between returns and inflation.

Other studies looked at both the interest rate and inflation, as the one of Apergis and Eleftheriou (2002), who thought it was crucial to know whether it was the inflation rate or the interest rate that made stock prices change. Hence, they looked at the Greek economy from 1988 to 1999. They found indications that stock prices follow inflation rather than interest rates. Hasbrouck (1984) looked at stock returns in relation to inflation and economic activity. It turned out he could not explain the negative association between inflation and stock returns by looking at the relationship between inflation and economic activity. Gjerde and Sættem (1999) cannot explain stock returns by changes in inflation. They were not able to identify a correlation between the two variables, and therefore concludes that stock returns are not affected by changes in inflation over time. However, Bruland and Dalehaug (2008) identifies a significant association between inflation and stock returns in all of their models. They conclude that stock prices will decrease as a repercussion of an increase in inflation. Lauvsnes (2009) identifies an inverse relationship between unemployment and the stock market in both USA and Norway. This combined with the findings of Graffer and Sandvik (2011), indicate that an increase in the employment rate can be seen in association with better economic times. A rise in the unemployment rate, on the other hand, will indicate recession, or downturns in the economy, based on the assumption that the stock market can be seen as a representative of the economy as a whole. When people work they have more money to buy goods, however, they are also able to save more money than they could have if they were unemployed. Savings, for instance, can be invested in the stock market, giving higher stock prices, and again higher stock returns for the investors who choose to sell.

Other studies show strong evidence of a significant correlation between all macroeconomic variables and the stock market. Research proves that changes in macroeconomic variables or news about them has the biggest effect on stock prices and returns in bigger evolved open economies. While smaller economies does not show the same evidence of cointegration. Mookerjee and Yu (1997) tests for a relationship between macroeconomic variables and stock market in a small economy. They chose to study Singapore. Their results indicate that

most of the macroeconomic variables are cointegrated with the stock market. The result suggests potential inefficiencies in the long term. The variables are narrowed broad money supply, nominal exchange rates and foreign currency reserves. Äijö (2008) studied how planned US and UK macroeconomic news announcements affected the returns from the FTSE-100. He found indication that good news meant decreasing volatility while option-implied return distribution got less left-skewed and kurtosis increased. Bad news, on the other hand, meant an increase in volatility, a decrease in kurtosis and making option-implied return distribution more left-skewed. Aspren (2008) showed how imports, inflation, interest rates and employment are inversely related to stock prices. In his research, he investigates ten European countries, and also finds a high degree of similarity between the effects in some of the countries. He found that stock prices react strongest to changes in macroeconomic variables in Germany, the Netherlands, Switzerland and the United Kingdom. Hardouvelis (1987) discovered that the stock prices react primarily to news of monetary variables. He looked at 15 macroeconomic variables, and concluded that the stock prices of financial companies were mostly affected by monetary news. Nasseh and Strauss (2000) studied domestic and international economic activity in six European economies, and found after doing a Johansen cointegration test, that stock price levels are significantly related to industrial production, short- and long-term interest rates, foreign stock prices, among others.

Ibrahim (1999) took his study to an emerging market. He checked whether macroeconomic variables would have any effect on the Malaysian stock prices. His research found that the Malaysian market had informational inefficiency. Only three out of seven macroeconomic variables were cointegrated with Malaysian stock prices, these variables were consumer prices, credit aggregates and official reserves. In Korea, current economic activities can explain stock returns. Kwon and Shin (1999) did a cointegration test and Granger causality test from a vector error correction model, and found that the production index, exchange rate, trade balance and money supply are cointegrated with Korean stocks. On the other hand, they found that a stock price index could not be studied as a leading indicator for economic variables. This is contradictory to what previous studies has found. A research project of the Indian, Chinese, Brazilian and Russian economies concluded that emerging markets are inefficient when it comes to information (Gay, 2008). Rozeff (1974) used regression modeling to explain the stock market efficiency. He did this by looking at the money supply. He found that all available information was apparent in the stock prices. Ellison and Mullin (1997) studied how stock prices incorporate information. They claimed that information is revealed through a process of gradual public revelation. This process can be difficult to observe by a researcher. Fargher and Weigan (1998) discovered that small-firm returns and lagged large-

firm return were correlated. They declined over time, something he explained as an increase in the efficiency of capital markets. Green (2005). The level of information asymmetry in the government bond market is increased by the release of public information. Mukherjee and Naka (1995) studied the Japanese stock market, and concluded that it is cointegrated with several macroeconomic variables. According to Ederington and Lee (1993) the majority of the observed time-of-day and day-of-the-week volatility patterns could be explained by planned macroeconomic news announcements. Fair (2002) studied large 1- and 5-minute changes in the stock price of the S&P500. He identified sixty-nine event shocks in the price from 1982 to 1999. He compared tick data on the S&P500 and newswire.

After the reform in 1991, the effect on stock prices from foreign exchange rate and foreign exchange reserve was significantly greater. The affect from the other variables was insignificant. Further external factors, such as M2 and foreign exchange, had a positive influence on stock prices. While internal factors of a firm, such as an increase in either production or capital, turned out to have an insignificant effect on stock prices (Mohammad, Hussain, Jalil and Ali 2009). Another research, which contradicts other findings, are the one of Nieh and Lee (2001). They found that there was no significant relationship in the long run between exchange rates and stock prices. Furthermore, in the short run they found that currency depreciation decreases stock returns in the German financial market, while the Canadian and US markets, on the other hand, was affected positively the following day. The Japanese and Italian stock markets showed evidence of an increase in stock prices the following day as an effect of currency depreciation.

Carlsen (2000) wanted to find out if the type of politics could affect government popularity. For instance, by how they handled monetary policy. Hence, he studied government popularity in relationship with unemployment and inflation. His results showed that increasing unemployment had a negative effect on popularity of left governments in Canada. In the US, left governments gained popularity from high unemployment. In both the US and Canada he found that they were negatively affected by inflation, while UK and Australia were not. This can indicate that governments influence the inflation and unemployment rates in a way that they increase their popularity among citizens, especially around election times. Hence, governing party can influence a change in macroeconomic variables to gain popularity and more votes, giving them an advantage in the election. For instance, in the US where left governments gain popularity by having a high unemployment rate, they can neglect working on preventive measures to curb unemployment around the time of an election, and by this get more voters. Also in Sweden, the results pointed in the direction that unemployment, and especially unemployment in the manufacturing sector, and inflation had a significant impact

on popularity for the Social Democratic Party. The Social Democratic Party was the governing party in Sweden from 1967 to 1976. (Jonung and Wedensjö, 1979).

But how do an economy reach its goal of full employment? To achieve full employment Holt et al. (1971) suggested that the structure of the economy must change. The findings was based on their study of the unemployment-inflation dilemma. Their results indicate that monetary and fiscal policies can no longer be used to further decrease the unemployment rate. They suggest introducing more manpower programs. During economic expansions, expectations of an increase in unemployment has a positive effect on stock prices, while it has a negative influence during economic contractions (Boyd, Hu, Jagannathan, 2005).

According to McQueen and Roley (1993), news announcements about bigger real economic activity will cause a negative effect on a strong economy. The negative effect is caused by the relationship between discount rates and expected cash flows. They found that the increase in discount rates were larger than the corresponding increase in expected cash flows. If the increase in discount rates is larger than the increase in expected cash flows, from news announcements about bigger real economic activity, this will cause a negative effect on strong economies.

Pearce and Roley (1985) research how the macroeconomic variables, money supply, inflation, real economic activity, and the discount rate, influence stock prices on a daily basis. They observed that stock prices was affected by surprises related to monetary policy. However, they further learned that surprises related to inflation had no significant impact. Moreover, they did not find significant evidence that surprises had any affect the day after announcement.

A study by Maysami, Howe and Hamzah (2004) was done on Singapore's stock market. They chose to study Singapore's All-Share sector indices instead of the composite index. Their study showed evidence that many macroeconomic variables in the long and short run was cointegrated with Singapore's stock market and the property index. Chan, Gup and Pan (1997) used unit root testing and cointegration tests to study the relationship among stock prices in 18 national stock markets. Their study indicated weak-form efficiency in the world equity markets. Papapetrou (2001) used a VAR model to analyze the association between oil prices, stock prices, interest rates, real economic activity and employment. For the Greek market he failed to find proof of cointegration between stock returns, real activity and employment.

A more recent study, with a data set from 2008 to 2012 is on stock prices and exchange rates in EU and USA. Tsagkanos and Siriopoulos (2013) employed the structural

nonparametric cointegration regression for their research. Evidence showed there was cointegration between stock prices and exchange rates, however, only in the long run in the EU and short run for the US. A study by Cutler, Peterba, and Summers (no date), estimates the fraction of the variation in aggregate stock returns that can be attributed to news about macroeconomic variables. Similar to Roll (1988) the result of the research showed that only half of the variance in aggregate stock prices could be explained by publicly available economic news.

Nishat, 2004 found a significant relationship between industrial production and stock prices. The author examined macroeconomic variables and stock prices of the KSE 100 Index from 1974 to 2004. The correlation was found using the Granger causality test. A positive correlation was found between the American stock market and credit growth, employment and money savings, however, on the Norwegian market only credit growth and employment showed evidence of being cointegrated with the stock market. After running a vector autoregressive model, they were able to prove an inverse association between money savings and the Norwegian stock market. Both the American and Norwegian stock market seemed to have a positive relation to employment, which can indicate that more people working, leads to a rise in stock prices and the market in general (Graffer and Sandvik, 2011).

3 Research Methodology

Research methods are usually divided into two methods; quantitative and qualitative research. Quantitative research involves counts and measures of things, while qualitative research is collecting, analyzing and interpreting data by using methods such as in-depth interviews and focus groups (Anderson, 2006). Furthermore, qualitative research is more subjective than quantitative research. It can also be said that quantitative research methods seeks to determine the extent of a case, while we use qualitative research to look deeper into the case to get more detailed information about it (*Qualitative and Quantitative Research*, 2006).

In this dissertation, the goal is to look at the long-term relationship between UK CPI, unemployment and FTSE 100. To find how the variables move over time, I am going to use econometric methods, which is a quantitative research method. First, the case will be discussed in a philosophical perspective. This is to give the reader the chance to see the dissertation from my point of view; afterwards, the econometric methods will be introduced.

Ontology says something about our knowledge of reality, and how we interpret it. Ontology relates to questions such as the reality of a situation, is it real or is it an illusion? Is reality constructed by humans, that is, is reality subjective or objective? Does it exist independently of humans? (*Philosophies of Social Research – Positivist & Interpretivist Approaches & Methodologies*, 2013). Epistemology, on the other hand, is the study of human knowledge. What is the limits and the validity of our knowledge? How do humans know what they know? How is this communicated and what is its origin? (*Epistemology*, no date)

I believe that data can be measured, however, the measured data relies on interpretation, and reality exist independent of human interaction. Past knowledge is affecting what I am going to emphasize in my dissertation. My research method will be an interpretivist epistemology. We can divide this into three branches: pragmatism, critical realism and critical theory. I can relate my research to all three branches. However, this dissertation takes the stand of critical realism (*Positivism & Post-Positivism*, 2006). I believe it exist a reality independent of human interaction which can be measured by collecting data. Though, the conclusion of the measured data, or how it is being interpreted depends on the researcher. What the researcher know beforehand will affect the way data is interpreted. In addition, a researcher can make mistakes, or observations can be interpreted wrongly.

The research question of this dissertation is to research whether it exist a long term equilibrium relationship between consumer prices, unemployment and the London Stock

Exchange, and to identify changes in the stock market caused by changes in unemployment or consumer prices.

This research question is divided into three hypotheses:

1. There is a negative long term equilibrium relationship between consumer prices and stock prices
2. There is a negative long term equilibrium relationship between unemployment and stock prices
3. There is a negative long term equilibrium relationship between consumer prices, unemployment and stock prices.

I will try to answer my research question by testing data collected on the UK CPI, UK unemployment and the FTSE 100. Each test has its own hypothesis, which are going to help in leading to a conclusion about the three hypothesis' and the research question.

I started by downloading monthly data of UK unemployment and CPI, and FTSE 100. The sources the data has been collected from is sources used and discussed in class. I have downloaded the data series from the Bloomberg Terminal, Ycharts, and Yahoo! Finance, which are all well-known financial softwares and resources. Otherwise, textbooks and academic articles. Internet sources has been cross checked with textbooks to ensure the quality of the information.

Limitations to my research is that there are a lot more factors that can influence the stock market than the two I have chosen. I am only looking at UK rates, while it is possible that international rates also affect the UK market. Another limitation can be that I am only considering the FTSE 100 index; this index is representing the economically strongest and most stable companies. This means that my result might not be applicable to the smaller firms.

3.1 Econometric Methods

In my dissertation, I want to look at the long-term relationship between two macroeconomic variables and the stock market, I will do this by looking at the CPI and unemployment in relationship with the FTSE 100 index. By running a cointegration test on the collected data, it is possible to determine whether such a relationship exists or not.

I am going to use the econometrics software Eviews to test the data and to estimate the model. The analysis is done by running a Dickey-Fuller test on the variables to determine stationarity, furthermore, a UVAR – unrestricted vector autoregression model must be done

to find the appropriate lag size, and then a Johansen cointegration test can be done to determine if there really is a long term cointegration equation for the three variables.

3.1.1 Time Series Analysis

Time series analysis, is an analysis that looks at how a variable, or several variables, behave over time. Time series analysis can be of interest for many researchers. For instance, it can be important to macro economists wanting to learn more about the behavior of international and national economics, finance economists studying and forecasting the stock market, and to agricultural economists who need to forecast supply and demand (Hill, Griffiths and Lim, 2008). To carry out time series analysis, historical data about the variables is necessary. For instance, a look at various indicators of economic performance and studying their historical data, meaning how they vary over time, we can forecast growth in GDP or inflation.

In this part, concepts of stationary and nonstationary variables and cointegration are being discussed. Using nonstationary data can have 'severe consequences', and if any of the data used in this dissertation are nonstationary, this part of it will look at methods to overcome it.

3.1.2 Stationary and Nonstationary Variables

When dealing with regression modeling it is important to know the difference between stationary and nonstationary variables. If we include nonstationary variables in the regression models, it can have severe consequences for the result. For example, nonstationary variables may give the impression of a relationship between variables that is not in relation with each other. This means that we might reach the wrong conclusion by using nonstationary variables. Usually we will reject or accept a hypothesis based on the test scores and critical values generated by the collected data. If nonstationary data is used in the regression, this means that the test statistic will not follow the usual t-distribution, which again means that the result, or the drawn conclusion, of such a regression would be wrong. In 95 percent of the cases with a sample size of 500, the ratio should be between ± 2 , according to Brooks (2008). He further explains how by using nonstationary data in regression modeling, the t-ratio has been higher/lower than ± 2 in 98% of the cases, instead of in only 5% of the cases when using stationary data. This shows how important it is to use stationary variables. The conclusion is, that to get a reliable result, it is important to use stationary variables in regression modeling (Gleditsch and Volla, 2012).

For a time series, y_t , to be stationary, the three following conditions need to be true

- | | |
|--|----------------------------------|
| (1) $E(y_t) = \mu$ | (Constant mean) |
| (2) $var(y_t) = \sigma^2$ | (Constant variance) |
| (3) $cov(y_t, y_{t+s}) = cov(y_t, y_{t-s}) = \gamma_s$ | (Covariance depends on s, not t) |

Equation 1 means that the variable needs to have a constant mean. This implies that for a variable to be stationary it needs to have the property of mean reversion, it cannot fluctuate away from the mean over time (Griffith, Hill, Lim, 2008). Equation 2 tells us that the variable must have a constant variance. Having a constant variance means that the residuals must be homoscedastic. Equation 3 shows us how the covariance or autocorrelation between two variables can only depend on the time lags, and has to disappear when the lag length increases. This means that the correlation between the two variables y_{t-1} and y_{t-2} , has to be the same as the correlation between y_{t-2} and y_{t-3} . Furthermore, the correlation between y_{t-1} and y_{t-3} needs to be equal to the correlation between y_{t-2} and y_{t-4} . Other relationships that needs to be held for this equation to hold, is that y_{t-1} and y_{t-3} must be smaller than y_{t-1} and y_{t-2} (Gleditsch and Vollan, 2012). This means, that a time series, y_t , is said to be stationary if its mean and variance for all values, and for every time period, is constant over time. It is also stationary if its covariance depends on the length of time, and not the actual times at which the variables are observed (Griffiths, Hill and Lim, 2008). The variables are stationary by taking the 1st difference, but not when their at level. Because the one on level form does not seem to have any form of mean reversion. It follows a random walk.

Regression analysis made of nonstationary time series are said to be spurious. The result of a spurious regression will tell us that a correlation exist between variables, when it is not true. This is because the least squares estimator and the least squares predictor 'do not have their usual properties, and the t-statistics are not reliable' (Griffiths, Hill and Lim, 2008).

Macroeconomic variables often tend to be nonstationary, it is therefore important to be certain when dealing with such variables. Since this dissertation sets to look at CPI and unemployment, it is of utmost importance that we check for stationarity.

3.2 Dickey-Fuller

The Dickey-Fuller test is a unit root test for stationarity. There are many tests that let us test for stationarity, but the most common one for determining whether a series is stationary or nonstationary is the Dickey-Fuller test. We usually define three variations of the test:

3.2.1 Dickey-Fuller Test with no Intercept and no Trend

We start with an AR(1) process:

$$y_t = \rho_1 y_{t-1} + v_t$$

Where $|\rho| < 1$ indicates stationarity. If $\rho = 1$, the process is a nonstationary random walk process $y_t = y_{t-1} + v_t$. ρ is examined to test for stationarity. The null hypothesis is that $\rho = 1$, meaning that the variable is nonstationary, while the alternative hypothesis is that the variable is stationary, that is $\rho < 1$. This test is called a unit root test for stationarity.

$$y_t = \rho_1 y_{t-1} + v_t$$

$$y_t - y_{t-1} = \rho_1 y_{t-1} - y_{t-1} + v_t$$

$$\Delta y_t = (\rho - 1)y_{t-1} + v_t$$

$$\Delta y_t = \gamma y_{t-1} + v_t \quad (a)$$

The error term, v_t , are independent random errors with zero mean and constant variance, σ^2 . Further, $\gamma = \rho - 1$ and $\Delta y_t = y_t - y_{t-1}$. The null and alternative hypothesis' can now be stated as

$$H_0: \rho = 1 \leftrightarrow H_0: \gamma = 0$$

$$H_1: \rho < 1 \leftrightarrow H_0: \gamma < 0$$

3.2.2 Dickey-Fuller Test with Intercept and no Trend

The second Dickey-Fuller test includes a constant, α .

$$\Delta y_t = \alpha + \gamma y_{t-1} + v_t \quad (b)$$

The time series is nonstationary if the null hypothesis is not rejected, and stationary if it is rejected.

3.2.3 Dickey-Fuller Test with Intercept and Trend

The third Dickey-Fuller test included both a constant, α , and a trend, λt .

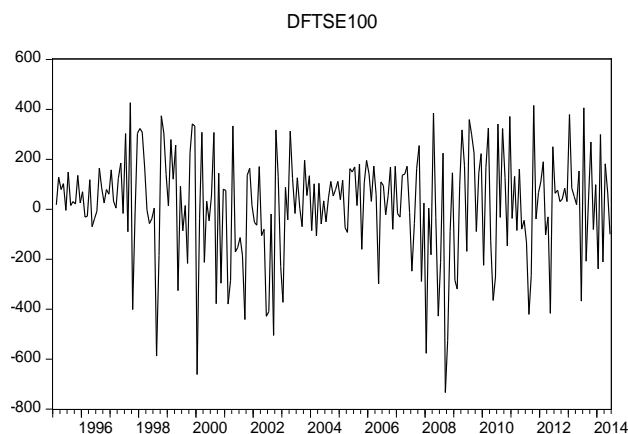
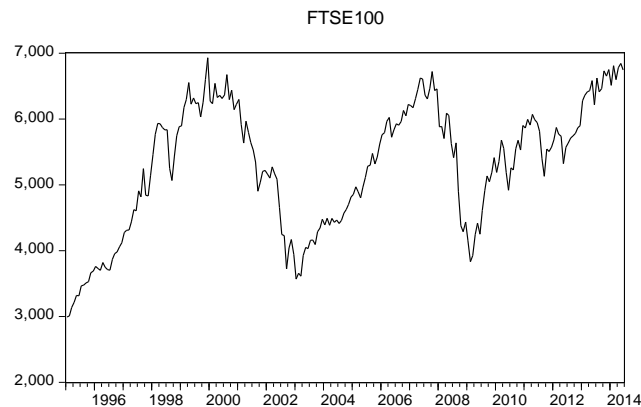
$$\Delta y_t = \alpha + \gamma y_{t-1} + \lambda t + v_t \quad (c)$$

The trend coefficient is included when the time series is trending, for instance upward sloping or downward sloping.

If we do not reject the null hypothesis, the series is nonstationary, and if we accept it, it is stationary.

To determine which of these three test are chosen, we can look at the graph for the time series to see whether it is trending or has a constant or the combination of no trend and no constant. An easy way to determine this is

1. Equation (a) is chosen if it seems to be wandering or fluctuating around a sample average of zero.
2. Equation (b) is chosen if it is wandering or fluctuating around a nonzero sample average.
3. Equation (c) is chosen if the series seems to have a linear trend.



The two graphs depict the FTSE 100 (top) and the growth rate of the FTSE 100 (bottom). The first graph, clearly shows a behavior of irregular ups and down (a random walk), while the graph depicting the growth rate of the stock prices are fluctuating around a constant mean. The stock prices can therefore be classified as stationary.

When the test is run in Eviews, the t-statistic for the hypothesis that $\gamma = 0$ is examined. This t-statistic is called a tau, τ , statistic because it no longer has the same t-distribution as regular t-distributions. That means it has to be compared to specially generated critical values. The addition of the constant term and the time-trend term means that new critical values has to be generated because they alter the behavior of the time series (Hill, Griffiths and Lim, 2008). Professor David Dickey and Professor Wayne Fuller originally determined these critical values, but in later years, they have been regenerated. The critical values of a Dickey-Fuller test are more negative than normal t-statistics. This means that for the null hypothesis to be rejected the tau statistic have to take on larger, negative values than usual. If $\tau \leq \tau_c$, the null hypothesis is rejected, and it means that the series is stationary. If $\tau > \tau_c$, we accept the null hypothesis.

3.2.4 Augmented Dickey-Fuller Test

Furthermore, we have the Augmented Dickey-Fuller (ADF) test. This test can be used in case the error term is autocorrelated. Autocorrelation, or serial correlation, happens when a series is correlated with past or future values of it self (*Autocorrelation*, 2013). There is a possibility of autocorrelation if an earlier model did not have enough lag terms. Lags are needed 'to capture the full dynamic nature of the process.' (Griffiths, Hill and Lim, 2008, p.337)

The augmented Dickey-Fuller test with a constant:

$$\Delta y_t = \alpha + \gamma y_{t-1} + \sum_{s=1}^m a_s \Delta y_{t-s} + v_t$$

Where $\Delta y_t = (y_{t-1} - y_{t-2})$, $\Delta y_{t-2} = (y_{t-2} - y_{t-3})$, etc.

When $\gamma = 0$, the time series is nonstationary and has a unit root. When employing a Dickey-Fuller test to determine stationarity, its most common to go for the Augmented Dickey-Fuller test (ADF) to ensure there is no autocorrelation in the errors.

Other standard tests for unit roots can be Phillip-Perron's (PP) test (Phillips and Perron, 1988), Dickey-Fuller Generalized Least Squares (DF-GLS) test (Elliot, et al., 1996) and KPSS test.

3.2.5 Order of Integration

A stationary series is said to be integrated at level zero, it can be written as $I(0)$. If a series is stationary when taking the first difference, it is called integrated of order 1, or $I(1)$. A rule of thumb is that a series is classified by the order of integration by the minimum number of times it must be differenced to make it stationary (Griffiths, Hill and Lim, 2008).

3.3 Optimal Lag Length Criteria for Cointegration Test

One of the weaknesses of the Johansen cointegration test is that it is very sensitive to the number of lags chosen to run the test. Therefore, it is very important that we select the correct number of lags, and to do this we can run an Unrestricted Vector Autoregressive (UVAR) test. A UVAR model can be employed to determine the optimal lag selection for cointegration. There are many ways of interpreting this model, but one way is to look at the Akaike Information Criterion (AIC). By looking at this value, it is possible to choose the number of lags needed for the cointegration test to be correct. When we run an unrestricted VAR test, we use nonstationary time series data.

After selecting a maximum number of lags, a UVAR can be run on the time series data. We can look at the test value of AIC for each number of lags. Then the lowest AIC value can be chosen, and the number of lags corresponding to that value is the optimal lag selection.

3.4 Johansen Cointegration Test

The Johansen Cointegration test, is named after the Danish statistician and econometrician, Søren Johansen, and is a way to test for cointegration of several $I(1)$ variables. The test allows for more than one cointegrating relationship, and is therefore said to be more applicable than the Engle-Granger method.

Once again, to avoid spurious regressions, nonstationary time-series variables should not be used when checking for cointegration, but if they are nonstationary $I(1)$ variables, they can be used. For instance, a common expectation when y_t and x_t are $I(1)$ variables, is that their difference or any linear combination of them, like $e_t = y_t - \beta_1 - \beta_2 x_t$ is stationary $I(0)$, then y_t and x_t are cointegrated. When two, or more, variables are said to be cointegrated, it means that it exists a long term relationship between the variables, or said otherwise the variables share similar stochastic trends (Griffiths, Hill and Lim, 2008). Furthermore, they never differ too much from each other when e_t is stationary. This is done by running a Dickey-Fuller test

to check whether the least squares residuals $\hat{e}_t = y_t - b_1 - b_2x_t$ are stationary. Said otherwise, if the residuals are stationary, it means that y_t and x_t are cointegrated. If the residuals are nonstationary, there is no cointegration between y_t and x_t . In this case if it looks like there is some sort of regression relationship between y_t and x_t , the relationship is said to be spurious.

The test equation for determining stationarity of the residuals is

$$\Delta\hat{e}_t = \gamma\hat{e}_{t-1} + v_t$$

Where $\Delta\hat{e}_t = \hat{e}_t - \hat{e}_{t-1}$

This regression has no constant term. This is because the mean of the regression residuals is zero. We use the τ -statistic in this case too. However, the critical values will be different from earlier because the testing is based on the estimated values of the residuals. Extra terms, $(\Delta\hat{e}_{t-1}, \Delta\hat{e}_{t-2} \dots)$ can be added to the right hand side of the equation if there is not enough lags to get rid of the autocorrelation in v_t .

The residuals, \hat{e}_t can be derived from the following three equations, based on whether there is a constant term, a constant term and a trend term, or neither.

$$(1) \hat{e}_t = y_t - bx_t$$

$$(2) \hat{e}_t = y_t - b_2x_t - b_1$$

$$(3) \hat{e}_t = y_t - b_2x_t - b_1 - \delta_t$$

The critical value used in the test, depends on which of these three equations the residuals are derived from (Griffiths, Hill and Lim, 2008).

The null and alternative hypothesis' are as follows:

H_0 : series are not cointegrated \leftrightarrow residuals are nonstationary

H_1 : series are cointegrated \leftrightarrow residuals are stationary

H_0 is rejected when $\tau \leq \tau_c$, and accepted if $\tau > \tau_c$

3.5 Alternative Approaches to Identify Long Term Cointegration

There are many regression models that can be used to find the long term relationship between variables. This section will look at some alternatives to the regression method chosen for this dissertation.

3.5.1 The Engle-Granger Two-Step Modeling Method (EGM)

The EGM was invented by Engle and Granger in 1987, and has been very popular for cointegration testing. One of the reasons is that the cointegrated regression is relatively easy to model. It can be done in two steps. First, estimate a long term relationship by OLS, $C_t = \beta Y_t + u_t$ and test for stationarity. If the null hypothesis is rejected, because a long term relationship exists, a short term relationship, $\Delta C_t = \alpha_1 \Delta Y_t + \alpha_2 (C - \beta Y)_{t-1} + \varepsilon_t$ by OLS should be estimated. However, there are two major disadvantages of the EGM; there is an efficiency problem with the estimates from the long term relationship, and the significance of the parameters of the cointegrated vector is difficult to interpret (Utkulu, no date).

3.5.2 The Engle-Yoo Three-Step Modeling Method (EYM)

This regression method was proposed to overcome the biggest disadvantages of the two-step EGM. It was proposed by Engle and Yoo in 1991. They included a third step in the model which corrects the parameter estimates. This means that standard t-test can be applied (Utkulu, no date).

3.5.3 The Saikkonen Method

Lags, leads and differences has been added in order to estimate alternative cointegration tests. Saikkonen used OLS to compute a new asymptotically efficient estimator. He employed the same test equation as the long term regression equation of the EGM, he added the two coefficients ΔY_{t-1} and ΔY_{t+1} . They were meant as time domain corrections.

$$C_t = \beta_1 + \beta_2 Y_{t-1} + \beta_3 \Delta Y_{t+1} + e_t$$

The stationary information is increased to distinguish the asymptotic inefficiency of the OLS estimator. The increase in stationary information may improve the asymptotic efficiency. This is because the relevant error covariance matrix is reduced (Utkulu, no date),

4 Data Analysis

Data is usually divided into primary data and secondary data. Primary data is original data collected by the researcher for the research at hand, however it can also be used in future studies. It is usually data collected for the first time. For instance the data can be collected by using questionnaires. Secondary data, on the other hand, is collected by someone other than the researcher, and was originally meant for another purpose. However, this data is being reused in the current study. Using secondary data in a study is often cheaper, time saving and easier. This can be data from a book or a database. The data used in this study is secondary data. It has primarily been collected from Bloomberg, Ycharts and Yahoo Finance.

The data collected is monthly data from January 1995 to June 2014, of the stock index FTSE-100 and the two macroeconomic variables, Consumer Price Index (Inflation) and unemployment. It is 702 observations combined, or 234 observations for each of the variables. The data stops at June 2014 because there was not more recent data on the UK unemployment rate. Unemployment rate data is download from Bloomberg (2008 to 2014) and from ycharts.com (1995-2008). The CPI rate is downloaded from ycharts.com, while the FTSE 100 data is downloaded from finance.yahoo.com.

4.1 Stock Market – FTSE 100

The UK stock market is here represented by the FTSE 100 index. As mentioned earlier this is an index of the 100 strongest blue chip companies in the UK. The historical data is downloaded from Yahoo! Finance. The data series consists of the monthly closing price of the last day of each month from January 1995 to June 2014. The result of the Dickey-Fuller test (see Appendix 1) and the graph of the index is that the first difference of the index is stationary, while the index at level can be classified as integrated of order 1. At level the τ -statistic of the series is -2.130, and the 5% critical value for tau, τ_c , is -2.874. As mentioned earlier, the null hypothesis of nonstationarity is rejected if $\tau \leq \tau_c$. If this is not the case, the null hypothesis is accepted, and further testing needs to be done. As $-2.130 > -2.874$, the null hypothesis of nonstationarity is accepted, and we need to take the first difference to try to make this variable stationary. After taking the first difference, the new tau statistic is -8.937. This means that $-8.937 < -2.874$ and the null hypothesis can be rejected. Now the variable can be used at level form in the models, because it is made stationary by taking the first difference, it is a I(1) variable.

The graph (Appendix 1) of the FTSE 100 index displays a behavior of wandering up and down. It has no visible trend or pattern. The change in a variable, Δy_t , is the same as taking the first difference of the same variable. By plotting the changes in a graph it is clear that the changes in FTSE 100 is fluctuating around a constant value. And from this we know that we can say that the FTSE 100 is a stationary variable.

4.2 Consumer Price Index

As mentioned earlier, the Consumer Price Index, CPI, is a weighted average of all the prices in a previously determined basket of consumer goods.

The data series is downloaded from Ycharts (*UK Consumer Price Index, 2014*), which is an online financial terminal, where investors can find information about stocks, indexes, etc. The data series consists of monthly CPI rates from January 1995 to June 2014. The result of the Dickey-Fuller test (Appendix 2) and the interpretation of the graph, shows that the CPI rate can be made stationary by taking the first difference, and is therefore, integrated at order one, $I(1)$. The CPI test can be employed at level form in the models.

The tau value for the CPI rate is 2.70, which is clearly bigger than the 5% critical value for tau, -2.874. By taking the first difference, the tau statistic gets a lot smaller, and is now -10.167. As $-10.167 < -2.874$, the null hypothesis is rejected, meaning the variable is stationary.

The graph for the CPI seems to display an upward trending behavior, and the change in CPI shows signs irregular up and down, that is it seems to be fluctuating around a constant mean. This means that by looking at the graph of the CPI, it looks like it is stationary.

4.3 Unemployment

The unemployment rate shows the fraction of the working population that is unemployed. As defined earlier, someone who is unemployed is someone who has been without work for a longer period of time, but is actively looking for work. The data series for unemployment is gathered from both Bloomberg and Ycharts. The Bloomberg Terminal is a platform for financial tools and resources. It contains up to date stock prices, financial statistics and news, etc. It was only possible to download data about the unemployment rate from January 2008 to June 2014 in Bloomberg, therefore, data from January 1995 to December 2014 is gathered from Ycharts (*UK Unemployment Rate, 2014*). The results of the Dickey-Fuller test,

and the intuition of the graph, indicates that the time series can be made stationary by taking the first difference, and is therefore integrated at order 1. This means that the variable can be used in the models.

The test statistics from the unit root test can be seen in Appendix 3. The tau value for the unemployment rate is -1.931, while the critical tau value is -2.874. But by taking the first difference, the series becomes stationary because the new tau value is -5.445, and $-5.445 < -2.874$. The unemployment rate becomes stationary by taking the first difference, and hence, is said to be integrated of order 1. Taking a look at the graph for the unemployment rate, it seems to be wandering up and down, with no pattern or trend. The first difference of a variable is the same as the change in a variable, and the time series of the changes in the unemployment rate seems to be fluctuating around a constant value. By looking at the graph of the change in unemployment, we can determine that the unemployment rate seems to be a stationary variable.

4.4 UVAR

The Unrestricted Vector Autoregression is employed to find the optimal number of lags for the Johansen cointegration test. The lowest value of the Akaike Information Criterion, is at 13 lags, hence, this is the number of lags that is employed in the following cointegration test. Other lag length criteria can be the Modified AIC and the Schwarz Information Criterion (SIC). The AIC values from the UVAR can be seen in Appendix 4.

4.5 Johansen Cointegration Test

The Johansen cointegration test is used to test the cointegration, or the long-term relationship between the FTSE 100 index, consumer prices and the rate of unemployment. The characteristics of integration and cointegration is unaffected is not significantly affected across different levels of aggregation of time series (Marcellino, 1999). This he interpreted as if unit roots exist for annual time series, then they also have to exist for quarterly series. Further, it can be said that if cointegration exist between two annual series, then it also has to exist for the quarterly series.

Instead of using theoretical and empirical facts, the assumption of unit roots is often made from a point of convenience because it can sometimes be difficult to distinguish between a unit root and a close alternative (Hjalmarsson and Österholm, 2007). Over time, many economists has chosen the close alternative, a near-integrated process, as a way to

describe time series. A near integrated process often deviate from the unit root (Hjalmarsson and Österholm).

4.5.1 Cointegration Test

Johansen cointegration test between the two macroeconomic variables, Consumer Price Index and the unemployment rate, and the FTSE 100 includes 13 lags in the test, leaving 220 observations after adjustments. The null hypothesis of the test is that there is no cointegrated equation, meaning there is no long run association between the variables. The interpretation of the model can be found by looking at the two unrestricted cointegration rank tests: Trace test and Maximum Eigenvalue Test. We accept or reject the null hypothesis based on the test statistics from these tests.

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.
None *	0.095175	31.47893	29.79707	0.0317
At most 1	0.034465	9.476000	15.49471	0.3232
At most 2	0.007968	1.759909	3.841466	0.1846

The probability of the trace test is 3.17% which is less than 5%. This means that just by looking at the probability we can reject the null hypothesis of no cointegration. Hence, there is one cointegrated equation, meaning the variables move together over time. The trace test statistic can also be used to determine whether to reject the null hypothesis. If the trace test statistic is bigger than the 5% critical value, then the null hypothesis can be rejected. In this model, the trace test statistic is 31.479. This value is bigger than the 5% critical value of 29.797. The null hypothesis is therefore, rejected, and the trace test tells us that there is at least one cointegrated equation, or that the FTSE 100 stock index is correlated with CPI and unemployment in the long run.

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.
None *	0.095175	22.00293	21.13162	0.0376
At most 1	0.034465	7.716091	14.26460	0.4083
At most 2	0.007968	1.759909	3.841466	0.1846

The Maximum Eigenvalue test has a probability of 3.76%. As this value is lower than 5%, the null hypothesis can be rejected. Moreover, the Maximum Eigenvalue statistic of the test is 22.003, while the 5% critical value is only 21.132. This means that based on this test the null hypothesis is rejected as well, because there is a long run cointegrated equation.

We can also look at a different statistic: the statistic of the error term. In the trace test, the test statistic is 32.32%, while it is 40.83% in the maximum eigenvalue test. Both of these values are more than 5%, hence we cannot reject the null hypothesis, meaning there is an error term.

As both the trace test and the maximum eigenvalue test rejects the null hypothesis of no cointegration between the variables, the final result of the test is that it is a long term equilibrium correlation, or relationship between the variables.

Finally, we find the long run model, i.e. the long term cointegrated equation. FTSE 100 is set as the dependent coefficient, as we would like to observe the changes in this value based on changes in the two other variables. The long term relationship between FTSE 100, unemployment and inflation (here represented by consumer prices) can be written as

$$1FTSE100_t = (-172.517)CPI_t - (1529.330)UNEMPLOYMENT_t + e_t$$

(57.4588) (481.073)

Where the numbers in parenthesis is the standard errors of the coefficients. The standard errors give us the average distance of which the actual observation differs from the average.

In the long run both CPI and unemployment has a negative effect on FTSE 100. This makes sense because when unemployment increases a bigger fraction of the population gets less money, which means they most likely will not save and invest as much as earlier. Consumer prices increase, that is inflation increase, and people get less for 1 pound. Earlier studies also proved a negative relationship. My research shows there is an inverse relationship between stock prices and both CPI and unemployment.

5 Results

There was several models presented from the UK stock market in the last chapter. The stock market is represented in all of the models by the FTSE 100 stock index, and is compared with data on the UK unemployment rate and the UK consumer price index. In the introduction of this dissertation three hypothesis' were generated.

1. There is a negative long term equilibrium relationship between consumer prices and stock prices
2. There is a negative long term equilibrium relationship between unemployment and stock prices
3. There is a negative long term equilibrium relationship between inflation, unemployment and stock prices.

The results from the cointegration test is that the null hypotheses of no cointegration is rejected for both the trace test and the maximum eigenvalue test. This means that we can identify a long term equilibrium relationship between the variables.

Based on the results from the cointegration test, all three dissertation hypotheses can be accepted, as there is a long term equilibrium relationship between CPI, unemployment and FTSE 100. This means that they move together in the long run.

The long term cointegrated equation has been identified:

$$1FTSE100_t = (-172.517)CPI_t - (1529.330)UNEMPLOYMENT_t + e_t$$

(57.4588) (481.073)

If CPI increases by 1, then the corresponding decrease in stock prices will be a fall in prices equal to 172.517. If CPI decreases by 1 unit, then stock prices will increase by 172.517. If unemployment is increased by 1 unit, the FTSE 100 index price will be reduced by 1529.330, and if the unemployment rate decreases, the FTSE 100 index price will increase by the same value. From the equation, we can identify a significant negative effect on stock prices from changes in both consumer prices and unemployment.

6 Conclusion

The goal of this dissertation is to find out whether it exist a long term equilibrium relationship between stock prices, CPI and unemployment in the UK. In the introduction of the dissertation, the following three hypothesis for the research was generated:

1. There is a negative long term equilibrium relationship between consumer prices and stock prices
2. There is a negative long term equilibrium relationship between unemployment and stock prices
3. There is a negative long term equilibrium relationship between inflation, unemployment and stock prices.

Many researchers beforehand has found an inverse association between stock prices, unemployment and inflation in the long run, for instance Fisher, (NEVN FLERE + ÅRSTALL) Graffer and Sandvik (2011), Lauvsnes ().

The long term cointegration equation for the three variables is

$$1FTSE100_t = (-172.517)CPI_t - (1529.330)UNEMPLOYMENT_t + e_t$$

(57.4588) (481.073)

Since consumer prices is the best way to measure a countries inflation, we can say that if inflation increases when CPI increases, stock prices will decrease. This means that stock prices will decrease as a repercussion of an increase in inflation. The negative impact from inflation is significant, however, it is not as significant as the effect from a shift in the unemployment rate, it is still significant. From previous literature, the result of this came as no surprise. The literature was a bit conflicting around whether a negative or no relationship would be found in the long run, but the end result of a long run inverse relationship between stock prices and consumer price seems to be a correct result. An increase in inflation can lead to a higher level of uncertainty in the market. The higher level of uncertainty will lower the economic activity in the market. People will borrow less, consumption will decrease, firm-specific spending will decrease, and so on.

From the long term equilibrium cointegration equation we can see that the negative effect from a rise in the unemployment rate is significantly higher than an increase in inflation. From this, we can draw the conclusion that it is important to prevent an increase in the unemployment rate because the impact on stock prices is of such a huge extent. Based on the research of Graffer and Sandvik (2011), Lauvsnes (2009) and others, it is reasonable to assume that my results from the cointegration test is correct. Lauvsnes found a positive long

term correlation between employment and stock returns, while Graffer and Sandvik found a negative correlation between unemployment and stock prices. It is intuitive that when the unemployment rate increases then employment has to decrease, and if unemployment decreases then the employment rate has to increase, unless the reason for the decrease in unemployment is because of death or other reasons for a person not to be regarded as unemployed or employed anymore.

When stock prices increase, stock returns will increase for investors who sell their stocks at the higher price.

The long term equilibrium relationship between stock prices and macroeconomic variables shows that the market is efficient, because it is apparent from the long term equilibrium cointegration equation that it reacts to changes, and these changes can be identified as new information in the market. The stock market has to react to this new information, and this is reflected in the new price. It is reasonable to believe that the market reacts instantaneously to the new information, as it is intuitive that signs of, for instance, a change that will reflect negatively in stock prices, will influence a rational investor to pull his money out of his investments to protect his funds. This might be the reason that stock prices decrease. Moreover, if a lot of people sell their stocks at the same time, the price will decrease rapidly.

To summarize, we found a long run equilibrium relationship between stock prices, CPI and unemployment. This means that the changes in either the consumer price or the unemployment rate, will affect the FTSE 100 index price. In efficient markets, prices reacts instantaneously to changes or expectations of changes in the market. This is because investors do anything to protect their investments. Based on this knowledge we can define the UK market as efficient.

7 Recommendations

If we do not want to see too many changes in stock prices, it is important to keep consumer prices and the unemployment rate at steady rates. On the other hand, if the goal is to increase prices by changing macroeconomic variables, then the unemployment rate or the consumer price index can be decreased. It is important to prevent unemployment from rising because it can imply a worse economic situation. It is important that governments know what stimulates change in the unemployment rate and consumer price index. What they can do to prevent this, or how they can stimulate it to shift in the direction they want it to. However, it is important to know how changes in these variables affect other factors in a country.

It is important to initiate actions to prevent unemployment. This can be done through job training programs, making education cheaper and more available for people, youth programs to get young people out in work, more trainee programs and internships especially in association with education. Retraining for elderly or people unable to work because of sickness or disabilities.

As an increase in unemployment seems to increase prices and stock returns, governments could give more financial support to businesses wanting to expand to create more jobs. Companies who create growth by hiring more employees should be awarded through, for instance, lower taxes. However, some unemployment is necessary to create a demand for workers to stimulate the economy through companies expanding and generating more jobs.

The inflation rate should be kept low and stable to not create too many changes in the stock price. By keeping it on its targets, the interest rate can be kept stable, removing a lot of uncertainty in the market, and there will be less risk involved with lending and borrowing.

Bibliography

Books:

Brooks, C. (2008). *Introductory Econometrics for Finance*. 2nd ed. Cambridge University Press

Helbæk, M. and Lindset, S. (2007). *Finansiering og Investering – Kort og Godt*. 2nd ed. Oslo: Universitetsforlaget.

Griffiths, B., Hill, C., and Lim, G. (2008). *Principles of Econometrics*. 3rd ed. Hoboken: John Wiley & Sons, Inc.

Madura, J. (2012). *Financial Institutions & Markets*. 10th ed. South-Western, Cengage Learning.

Web pages:

Autocorrelation (2013)

Available at: http://www.ltrr.arizona.edu/~dmeko/notes_3.pdf (Accessed: 1 September 2014)

Blue Chip (2014) Available at: <http://www.investopedia.com/terms/b/bluechip.asp> Accessed: 27 August 2014

Consumer Price Index – CPI (2014) Available at:

<http://www.investopedia.com/terms/c/consumerpriceindex.asp> (Accessed: 1 July 2014)

Consumer Price Index (United Kingdom) (2014) Available at:

http://en.wikipedia.org/wiki/Consumer_Price_Index_%28United_Kingdom%29
(Accessed: 25 August 2014)

Epistemology (no date)

Available at: <http://www.merriam-webster.com/dictionary/epistemology> (Accessed: 25 August 2014)

London Stock Exchange – LSE (2014)

Available at: <http://www.investopedia.com/terms/l/lse.asp> (Accessed: 25 August 2008)

Philosophies of Social Research – Positivist & Interpretivist Approaches & Methodologies (2013) Available at: <http://www.slideshare.net/clairtupling/positivist-interpretivist> (Accessed: 25 August 2014)

Positivism & Post-Positivism, (2006).

Available at: <http://www.socialresearchmethods.net/kb/positvsm.php> (Accessed: 25 August 2014)

Qualitative and Quantitative Research (2006).

Available at: https://www.icoe.org/webfm_send/1936 (Accessed: 15 August 2014)

Stock Market (2014) Available at: <http://www.investopedia.com/terms/s/stockmarket.asp>
(Accessed: 25 August 2014)

UK Consumer Price Index (2014)

Available at: http://ycharts.com/indicators/uk_consumer_price_index_nsa (Accessed: 20 July 2014)

UK unemployment falls to six year low of 2.12m, (2014) Available at: <http://www.bbc.co.uk/news/business-28325361> (Accessed: 25 August 2014)

UK Unemployment Rate (2014) Available at: http://ycharts.com/indicators/uk_unemployment_rate (Accessed: 20 July 2014)

Unemployment (2014) Available at: <http://www.investopedia.com/terms/u/unemployment.asp> (Accessed: 25 August 2014)

United Kingdom Inflation Rates (2014) Available at: <http://www.tradingeconomics.com/united-kingdom/inflation-cpi> (Accessed: 25 August 2014)

Articles:

Adams, G., McQueen, G., and Wood, R. (2004). The effects of inflation news on high frequency stock returns. *The Journal of Business*. Volume 77(3). Available at: <http://www.jstor.org/stable/10.1086/386530?Search=yes&resultItemClick=true&&searchUri=%2Faction%2FdoAdvancedResults%3Fq1%3D%26amp%3Bq4%3D%26amp%3Bq6%3D%26amp%3Bf5%3Dall%26amp%3Bc1%3DAND%26amp%3Bla%3D%26amp%3Bq5%3D%26amp%3Bq0%3Dstock%2BReturns%252C%2BReal%2BActivity%252C%2BInflation%252C%2BAnd%2BMoney%252C%2B%26amp%3Bpt%3D%26amp%3Bf0%3Dall%26amp%3Bf6%3Dall%26amp%3Bc6%3DAND%26amp%3Bc3%3DAND%26amp%3Bc5%3DAND%26amp%3Bwc%3Don%26amp%3Bq3%3D%26amp%3Bf1%3Dall%26amp%3Bq2%3D%26amp%3Bc2%3DAND%26amp%3Bc4%3DAND%26amp%3Bed%3D%26amp%3Bf4%3Dall%26amp%3Bf3%3Dall%26amp%3Bf2%3Dall%26amp%3Bsd%3D%26amp%3Bisbn%3D%26amp%3Bacc%3Don> (Accessed at 6 September 2014)

Äijö, J. (2008), *Impact of US and UK macroeconomic news announcements on the return distribution implied by FTSE-200 index options*. *International Review of Financial Analysis*. Volume 17(2). PP. 242-258 Web page: <http://dsmgt310.faculty.ku.edu/SuppMaterial/EpistAssumpt.htm>

Anderson, J., 2006. Qualitative and Quantitative Research. *Grants & Evaluation Office*. PP. 1-3. Available at: https://www.icoe.org/webfm_send/1936

Apergis, N. and Eleftheriou, S. (2002). Interest rates, inflation, and stock prices: the case of the Athens Stock Exchange. *Journal of Policy Modeling*. Volume 24(3). PP. 231-236. Available at: <http://www.sciencedirect.com/science/article/pii/S0161893802001059> (Accessed at 6 September 2014)

Asprem, M. (1989), *Stock prices, asset portfolios and macroeconomic variables in ten European countries*. *Journal of Banking and Finance*. Volume 13(4-5). PP. 589-612. Web page: <http://www.sciencedirect.com/science/article/pii/0378426689900320>

Boyd, J. H., Hu, J., and Jagannathan, R. (2005). The stock market's reaction to unemployment news: Why bad news is usually good for stocks. *The Journal of Finance*. Volume 60(2). PP. 649-672. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6261.2005.00742.x/abstract?deniedAccessCustomisedMessage=&userIsAuthenticated=false> (Accessed at 6 September 2014)

Bruland, K. A. and Dalehaug, N. (2008). Realøkonomi og aksjemarked i Norge: overordnet sammenheng og historisk utvikling, 1996-2007. *Master Thesis*. Available at: <http://brage.bibsys.no/xmlui/handle/11250/168049> (Accessed: 25 August 2014)

Carlsen, F. (2000). Unemployment, inflation and government popularity – are there partisan effects? *Electoral Studies*. Volume 19(2-3). PP. 141-150. Available at: <http://www.sciencedirect.com/science/article/pii/S026137949900044X> (Accessed at 6 September 2014)

Cavanagh, C., Elliott, G. and Stock, J. (1995). Interference in models with nearly integrated regressors. *Econometric Theory*. Volume 11(5). PP. 1131-1147

Chan, K. C., Gup, B. E. and Pan, M. S. (1997). International stock market efficiency and integration: a study of eighteen nations. *Journal of Business Finance & Accounting*. Volume 24(6). PP. 803-813. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/1468-5957.00134/abstract> (Accessed: 6 September 2014)

Chen, N.F., Roll, R., and Ross, S. A. (1986). Economic forces and the stock market. *The Journal of Business*. Volume 59(3). PP. 383-403. Available at: <http://www.jstor.org/discover/10.2307/2352710?uid=3738744&uid=2134&uid=2483973473&uid=2&uid=70&uid=3&uid=2483973463&uid=60&sid=21104660568333> (Accessed at 6 September 2014)

Cutler, D. M., Poterba, J. M., and Summers, L. H. (no date). What moves stock prices? *Streetwise – The Best of the Journal of Portfolio Management*. PP. 56-64. Available at: http://www.google.no/books?hl=no&lr=&id=o20jglECxf8C&oi=fnd&pg=PA56&dq=macroeconomic+stock+prices&ots=pkhlLPunH7&sig=bXLvK44hpOCf_KpfXZaRFZkpm8Y&redir_esc=y#v=onepage&q=macroeconomic%20stock%20prices&f=false (Accessed at 6 September 2014)

Domian, D. L., Gilster, J. E., and Louton, D. A. (2005). Expected inflation, interest rates, and stock returns. *The Financial Review*. Volume 31(4). PP.809-830. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6288.1996.tb00898.x/abstract> (Accessed at 6 September 2014)

Ederington, L. H. and Lee, J. H. (1993). How markets process information: news releases and volatility. *The Journal of Finance*. Volume 48(4) PP.1161-1191. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6261.1993.tb04750.x/abstract> (Accessed at 6 September 2014)

Elliott, G. (1998). On the robustness of cointegration methods when regressors almost have unit roots. *Econometrica*. Volume 66(1). PP. 149-158. Available at: <http://www.nber.org/papers/t0130> (Accessed 6 September 2014)

Ellison, S. F. and Mullin, W. P. (1997). Gradual incorporation of information into stock prices: empirical strategies. *The National Bureau of Economic Research*. NBER Working Paper No. 6218. Available at: <http://www.nber.org/papers/w6218> (Accessed 6 September 2014)

Elliott, G., Rothenberg T. J. and Stock, J. H. (1996). Efficient tests for an autoregressive unit root. *Econometrica*. Volume 64(4). PP. 813-836.

Evans, R. and Skyrud, C. (2013). Effekten av sentralbankens renteendringer på aksjekursen til banker i hjemlandet: en event-studie. *Master Thesis – Bergen Open Research Archive*. Available at: <http://brage.bibsys.no/xmlui/handle/11250/170068> (Accessed at 6 September 2014)

Fama, E. F. and MacBeth, J.D (1973) Risk, return, and equilibrium: empirical tests. *Journal of Political Economy*. Volume 81(3). Available at: <http://www.jstor.org/discover/10.2307/1831028?uid=3738744&uid=2&uid=4&sid=21104669174643> (Accessed: 27 August 2014)

Fama, E. F. and Schwert, G. W. (1977). Asset return and inflation. *Journal of Financial Economics*. Volume 5(2). PP. 115-146. Available at: <http://www.sciencedirect.com/science/article/pii/0304405X77900149> (Accessed at 7 September 2014)

Fair, R. C. (2002). Events that shook the market. *The Journal of Business*. Volume 75(4). Available at: <http://www.jstor.org/stable/10.1086/341640> (Accessed at 6 September 2014)

Fargher, N. L. and Weignad, R. A. (1998). Changes in the stock price reaction of small firms to common information. *Journal of Financial Research*. Volume 1(Spring). PP. 105-121. Available at: <http://ideas.repec.org/a/bla/jfnres/v21y1998i1p105-21.html> (Accessed 6 September 2014)

Geske, R. and Roll, R. (1983). The fiscal and monetary linkage between stock returns and inflation. *The Journal of Finance*. Volume 38(1). PP. 1-33. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6261.1983.tb03623.x/abstract> (Accessed at: 6 September 2014)

Gjerde, Ø. And Sættem, F. (1999). Causal relations among stock returns and macroeconomic variables in a small, open economy. *Journal of International Financial Markets, Institutions and Money*. Volume 9(1). PP. 61-74. Available at: <http://www.sciencedirect.com/science/article/pii/S1042443198000365> (Accessed: 28 August 2014)

Gleditsch, H. J. and Vollan, H. A. (2012). Langsiktige likevektsforhold mellom makroøkonomi i Norge og USA. *Master Thesis*. Available at: http://brage.bibsys.no/xmlui/bitstream/handle/11250/140804/Vollan_HA.pdf?sequence=1 (Accessed: 15 August 2014)

Graffer, E. and Sandvik, M. A. K. (2011). Langsiktige likevektsforhold ved New York Stock Exchange og Oslo Børs. *Master Thesis*. PP. 1-105. Available at: http://brage.bibsys.no/xmlui/bitstream/handle/11250/140756/1/Graffer_E.pdf (Accessed at 6 September 2014)

Green, T. C. (2005). Economic news and the impact of trading on bond prices. *The Journal of Finance*. Volume 59(3). PP. 1201-1234. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6261.2004.00660.x/abstract?deniedAccessCustomisedMessage=&userIsAuthenticated=false> (Accessed at 6 September 2014)

Gulnik, N. B. (1983). Stock market returns and inflation: evidence from other countries. *The Journal of Finance*. Volume 38(1). PP. 49-65. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6261.1983.tb03625.x/abstract> (Accessed at 6 September 2014)

Hjalmarsson, E. and Österholm, P. (2007). Testing for cointegration using the Johansen methodology when variables are near-integrated. *IMF Working Paper*. PP. 1-19. Available at: <https://www.imf.org/external/pubs/ft/wp/2007/wp07141.pdf> (Accessed at 6 September 2014)

Hardouvelis, G.A. (1987), *Macroeconomic information and stock prices*. Journal of Economics and Business. Volume 39(2). PP. 131-140. Web page: <http://www.sciencedirect.com/science/article/pii/0148619587900129>

Hasbrouck, J. (1984). Stock returns, inflation, and economic activity: the survey evidence. *The Journal of Finance*. Volume 39(5). PP. 1293-1310. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6261.1984.tb04908.x/abstract> (Accessed at 6 September 2014)

Holt, C. C., MacRae, C. D., Schweitzer, S. O., and Smith, R. E. (1971). *The Unemployment-Inflation Dilemma: A Manpower Solution*. Urban Inst., Washington DC. [Online]. Available at: <http://eric.ed.gov/?id=ED074260> (Accessed at 6 September 2104)

Ibrahim, M. (1999). *Macroeconomic variables and stock prices in Malaysia: An empirical analysis*. Journal of East Asian Economic Association. Volume 13(2). PP. 219-23. Web page: <http://onlinelibrary.wiley.com/doi/10.1111/1467-8381.00082/abstract>

Jain, P. C. (1988). Response of hourly stock prices and trading volume to economic news. *Journal of Business*. Volume 61(2). Available at: <http://www.jstor.org/discover/10.2307/2352901?uid=3738744&uid=2&uid=4&sid=21104659824803> (Accessed at: 6 September 2014)

Jonung, L. and Wadensjö, E. (1979). The Effect of unemployment, inflation and real income growth on government popularity in Sweden. *The Scandinavian Journal of Economics*. Volume 81(2). Available at: <http://www.jstor.org/discover/10.2307/3439969?uid=3738744&uid=2&uid=4&sid=21104659566973> (Accessed at 6 September 2014)

Kaul, G. (1987). Stock returns and inflation: The role of the monetary sector. *Journal of Financial Economics*. Volume 18(2). PP. 253-276. Available at: <http://www.sciencedirect.com/science/article/pii/0304405X87900419> (Accessed at 6 September 2014)

Kwon, C.S. and Shin, T.S. (1999). Cointegration and causality between macroeconomic variables and stock market returns. *Global Finance Journal*. Volume 10(1). PP.71-81. Available at: <http://www.sciencedirect.com/science/article/pii/S104402839900006X> (Accessed at 5 September 2014)

Mandelbrot, B. (1966). Forecasts of future prices, unbiased markets, and “martingale” models. *The Journal of Business*. Volume 39(1). PP.242-255. Available at: <http://www.jstor.org/discover/10.2307/2351745?uid=3738744&uid=2134&uid=2483973473&uid=2&uid=70&uid=3&uid=2483973463&uid=60&purchase-type=article&accessType=none&sid=21104660568333&showMyJstorPss=false&seq=1&showAccess=false> (Accessed at 6 September 2014)

Maysami, R. C., Howe L. C, and Hamzah, M. A. (2004). Relationship between macroeconomic variables and stock market indices: Cointegration evidence from stock exchange of Singapore’s All-S sector indices. *Jurnal Pengurusan* 24. PP. 47-77. Available at: http://www.ukm.edu.my/penerbit/jurnal_pdf/Jp24-03.pdf (Accessed at: 6 September 2014)

McQueen, G. and Roley, V. V. (1993). Stock Prices, news, and business conditions. *Oxford Journals – The Review of Financial Studies*. Volume 6(3). PP. 683-707. Available at: <http://rfs.oxfordjournals.org/content/6/3/683.short> (Accessed at 6 September 2014)

Mohammad, S. D., Hussain, A., Jalil, M. A, and Ali, A. (2009). Impact of macroeconomics variables on stock prices: Empirical evidence in case of KSE (Karachi stock exchange). *European Journal of Scientific Research*. Volume 38(1). PP. 96-103. Available at: www.researchgate.net/publication/202329264_Impact_of_Macroeconomics_Variables_on_Stock_Prices_Empirical_Evidence_in_Case_of_KSE/file/5b0950e45b76dae18e57dd954b1b8620.pdf (Accessed at 5 September 2014)

Mookerjee, R. and Yu, Q. (1997). *Macroeconomic variables and stock prices in a small open economy: The case of Singapore*. Pacific-Basin Finance Journal. Volume 5(3). PP. 377-388. Web page: <http://www.sciencedirect.com/science/article/pii/S0927538X96000297>

Mukherjee, T. K. and Naka, A. (1995), *Dynamic relations between macroeconomic variables and the Japanese stock market: An application of a vector error correction model*. Journal of Financial Research. Volume 18(2). PP. 223-237. Web page: <http://ideas.repec.org/a/bla/jfnres/v18y1995i2p223-37.html>

Nasseh, A. and Strauss, J. (2000), *Stock prices and domestic and international macroeconomic activity: a cointegration approach*. The Quarterly Review of Economics and Finance. Volume 40(2). PP. 229-245. Web page: <http://www.sciencedirect.com/science/article/pii/S106297699900054X>

Nelson, C. R. (1976). Inflation and rates of return on common stocks. *The Journal of Finance*. Volume 31(2). Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6261.1976.tb01900.x/abstract> (Accessed at 6 September 2014)

Nieh, C.C. and Lee, C.F. (2001). Dynamic relationship between stock prices and exchange rates for G-7 countries. *The Quarterly Review of Economics and Finance*. Volume 41(4). PP. 477-490. Available at: <http://www.sciencedirect.com/science/article/pii/S1062976901000850> (Accessed at 6 September 2014)

- Papapetro, E. (2001). Oil price shocks, stock market, economic activity and employment in Greece. *Energy Economics*. Volume 23(5). PP. 511-532. Available at: <http://www.sciencedirect.com/science/article/pii/S0140988301000780> (Accessed: 20 August 2014)
- Pearce, D. K. and Roley, V.V (1985). Stock prices and economic news. *NBER Working Paper*. No. 1296. Available at: <http://www.nber.org/papers/w1296> (Accessed at 6 September 2014)
- Phillips, P. and Perron, P. (1988) Testing for a unit root in time series regression. *Biometrika*. Volume 75. PP.335-346. Available at: <http://biomet.oxfordjournals.org/content/75/2/335.short> (Accessed: 5 August 2014)
- Roll, R. (1988). The stochastic dependence of security price changes and transaction volumes: implications for the mixture-of-distributions hypothesis. *The Journal of Finance*. Volume 3. PP. 541-566). Available: <http://www.ingentaconnect.com/content/bpl/jofi/1988/00000043/00000003/art00003> (Accessed: 20 August 2014)
- Rozeff, M. S. (1974). Money and stock prices: Market efficiency and the lag in effect of monetary policy. *Journal of Financial Economics*. Volume 1(3). PP. 245-302. Available at: <http://www.sciencedirect.com/science/article/pii/0304405X74900208> (Accessed at 6 September 2014)
- Schmidt, M. (no date). *A Look at Fiscal and Monetary Policy*. Available at: <http://www.investopedia.com/articles/economics/12/fiscal-or-monetary-policy.asp> (Accessed at 6 September 2014)
- Solnik, B. (2012). The relationship between stock prices and inflationary expectations: the international evidence. *The Journal of Finance*. Volume 38(1). PP. 35-48. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1540-6261.1983.tb03624.x/abstract> (Accessed at 6 September 2014)
- Tsagkanos, A. and Siriopoulos, C. (2013). A long-run relationship between stock price index and exchange rate: A structural nonparametric cointegrating regression approach. *Journal of International Financial Markets, Institutions and Money*. Volume 25. PP. 106-118. Available at: <http://www.sciencedirect.com/science/article/pii/S1042443113000164> (Accessed at 6 September 2014)
- Utkulu, U. (no date) How to estimate long-run relationships in economics: An overview of recent developments. Available at: http://www.google.no/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB0QFjAA&url=http%3A%2F%2Fwww.deu.edu.tr%2Fuserweb%2Futku.utkulu%2Fdosyalar%2FHow_to_estimate.DOC&ei=vO8OVKXfKcb8ygO8oYH4AQ&usq=AFQjCNFiayqr72xtsjwct5yGcrV4XSc_a_Q&bvm=bv.74649129,d.bGQ (Accessed: 2 September 2014)

Appendix 1

Dickey-Fuller test - FTSE 100

Null Hypothesis: FTSE100 has a unit root

Exogenous: Constant

Lag Length: 2 (Fixed)

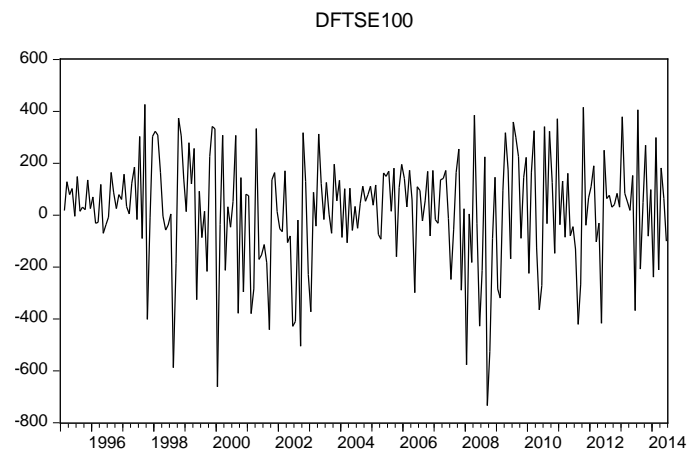
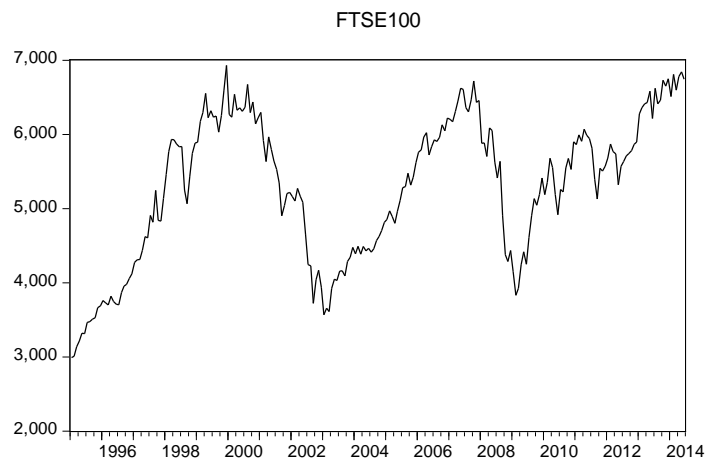
	t-Statistic
<hr/>	
Augmented Dickey-Fuller test statistic	-2.130076
Test critical values:	
1% level	-3.458594
5% level	-2.873863
10% level	-2.573413

Null Hypothesis: D(FTSE100) has a unit root

Exogenous: Constant

Lag Length: 2 (Fixed)

	t-Statistic
<hr/>	
Augmented Dickey-Fuller test statistic	-8.937343
Test critical values:	
1% level	-3.458719
5% level	-2.873918
10% level	-2.573443



Appendix 2

Dickey-Fuller test - CPI

Null Hypothesis: CPI has a unit root

Exogenous: Constant

Lag Length: 2 (Fixed)

	t-Statistic
<hr/>	
Augmented Dickey-Fuller test statistic	2.701742
Test critical values:	
1% level	-3.458594
5% level	-2.873863
10% level	-2.573413

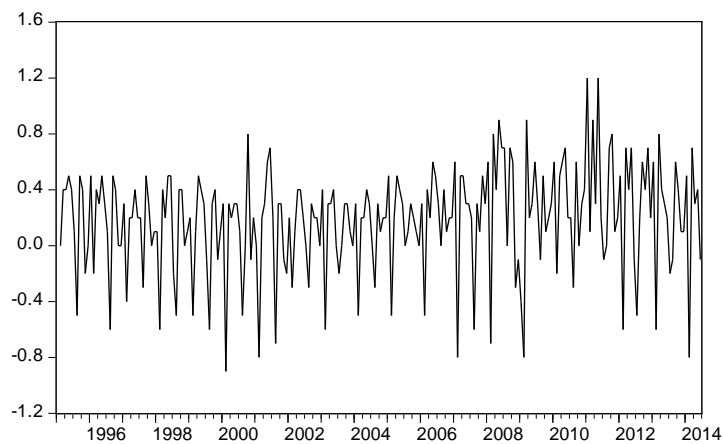
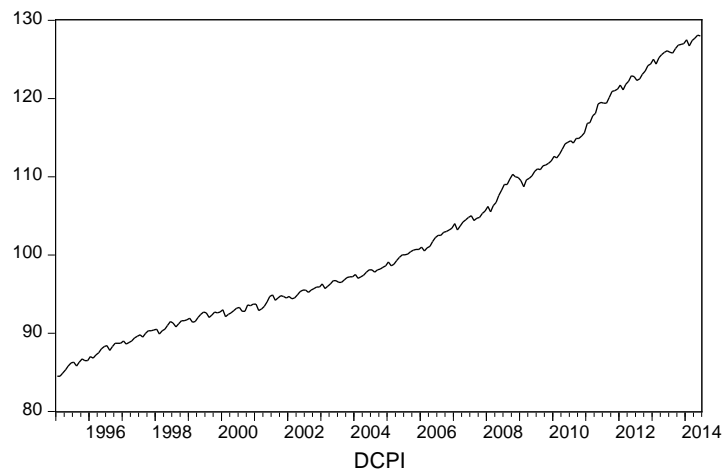
Null Hypothesis: D(CPI) has a unit root

Exogenous: Constant

Lag Length: 2 (Fixed)

	t-Statistic
<hr/>	
Augmented Dickey-Fuller test statistic	-10.16696
Test critical values:	
1% level	-3.458719
5% level	-2.873918
10% level	-2.573443

CPI



Appendix 3

Dickey-Fuller test - Unemployment

Null Hypothesis: UNEMPLOYMENT has a unit root

Exogenous: Constant

Lag Length: 2 (Fixed)

	t-Statistic
<hr/>	
Augmented Dickey-Fuller test statistic	-1.931081
Test critical values: 1% level	-3.458594
5% level	-2.873863
10% level	-2.573413

Null Hypothesis: D(UNEMPLOYMENT) has a unit root

Exogenous: Constant

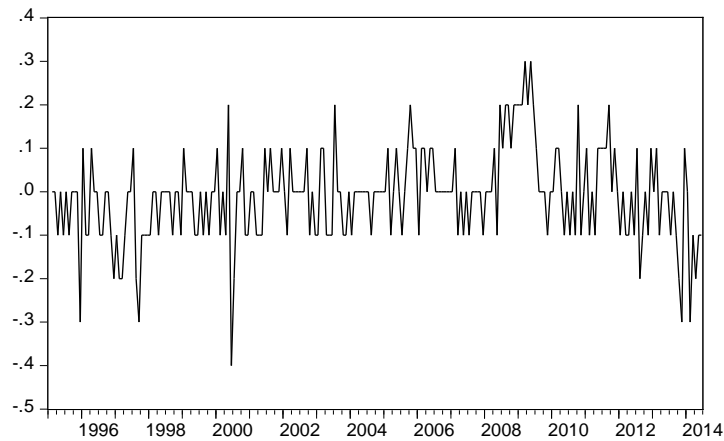
Lag Length: 2 (Fixed)

	t-Statistic
<hr/>	
Augmented Dickey-Fuller test statistic	-5.445066
Test critical values: 1% level	-3.458719
5% level	-2.873918
10% level	-2.573443

UNEMPLOYMENT



DUNEMPLOYMENT



Appendix 4**UVAR**

LAGS	AIC
1	12.71542
2	12.71959
3	12.71793
4	12.73092
5	12.72387
6	12.72743
7	12.66018
8	12.68852
9	12.70493
10	12.70681
11	12.74450
12	12.72257
13	12.30238
14	12.33639
15	12.37973
20	12.60373
25	12.62974
30	12.64214
35	12.63328

Appendix 5

Johansen Cointegration test

Sample (adjusted): 1996M03 2014M06
 Included observations: 220 after adjustments
 Trend assumption: Linear deterministic trend
 Series: FTSE100 CPI UNEMPLOYMENT
 Lags interval (in first differences): 1 to 13

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.095175	31.47893	29.79707	0.0317
At most 1	0.034465	9.476000	15.49471	0.3232
At most 2	0.007968	1.759909	3.841466	0.1846

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.095175	22.00293	21.13162	0.0376
At most 1	0.034465	7.716091	14.26460	0.4083
At most 2	0.007968	1.759909	3.841466	0.1846

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

Normalized cointegrating coefficients (standard error in parentheses)		
	FTSE100	CPI
UNEMPLOYMENT	1.000000	-172.5173
T		-1529.330
	(57.4588)	(481.073)

Long run cointegrated equation ↑