THE RELATIONSHIP BETWEEN STOCK RETURN AND INFLATION IN NIGERIA

Taofik Mohammed Ibrahim

Department of Economics, University of Ibadan, Ibadan, Nigeria

Omosola M. Agbaje

Unique Venture Capital, Lagos, Nigeria

Abstract

This study examines the long-run relationships and dynamic interactions between stock returns and inflation in Nigeria using monthly data of the All Share Price Index from the Nigerian Stock Exchange and Nigerian Consumers Price Index from January 1997 to 2010. The analytical technique of Autoregressive Distributed Lag (ARDL) bound test as proposed by Pesaran and Pesaran (1997); and Pesaran et. al. (2001) was exploited. From the results, it is evident that there is the existence of a long run relationship between stock returns and inflation. The short run dynamic model also reveals that the speed of convergence to equilibrium is moderate implying that there is a short run relationship between stock returns and inflation. This is attributable perhaps to the instability of prices of stocks noticed over time.

Keywords: Stock Returns, inflation, Nigerian stock exchange, co-integration

Introduction

The advent of the oil boom in Nigeria in the early 1970's, has led to the instability of stock prices. This has been attributed to many factors such as: budget deficit monetization, inflow of foreign capital from crude oil sales and financial markets creation of excess private domestic credit.

Since early 1970's, inflation rates in Nigeria have been highly unstable; the high inflationary change was in excess of 30 percent. This is evident in the high correlation of money supply growth and high inflation due to the fact that real economic growth is less in real term to money growth. This can be observed from the growth in money supply and some

structural factors such as; supply shocks arising from famine, unfavorable terms of trade and devaluation of currency. Furthermore, Structural Adjustment Program (SAP) introduced by the government in the late 1980's also accounted for the increase in the price level in the economy. Consequently, inflation in Nigeria has overtime responded to structural changes. These changes can be characterized into four periods based on the pattern and events that occur in that period.

The first period of inflationary increase in Nigeria was noticed from 1974 to 1976; inflation increased by 30 percent. This inflationary pressure was as a result of the following: high cost of agricultural produce caused by drought in the Northern part of Nigeria, excessive oil revenue monetization, increase in wage rate based on the recommendation of the Udoji commission of 1974 and political instability.

The second period was from 1983 to 1985 when the inflation rate reached 40 percent. This period noticed a very little economic growth, The Nigerian government was under intense pressure from debtor groups to accept International Monetary Fund conditionality's of devaluation of the domestic currency because government debt has increased above 70 percent while excess money growth was around 41and 43 percent. This period also witnessed poor external trade performance CBN, (2006).

The third period was from 1987 to 1989 when the inflation rate hovered around 35 percent. During this period, the economy experienced high inflationary pressure brought about by fiscal expansion noticed in the 1988 budget, the debt for equity swap conversion method adopted by the Government of Nigeria and the drastic contraction in monetary policy, all accounted for this change that span through to the early 1990's.

Finally, the fourth period occurred between 1993 and 2000, as a result of fiscal deficit expansion which caused a 70 percent increase in the money supply with a knock-on effect on domestic credit to the private sector of the economy CBN, (2006).

Overall, inflation pressure can be largely attributed to structural factors such as; real income reduction caused by fluctuation in oil revenue, high nominal wages and debt obligation in the form of expansionary fiscal deficit. These invariably mean that over the years, fluctuation in commodity price is a normal feature of the Nigerian economy.

Price stability is essential in determining whether an economy is stable or not. Inflation which is the constant increase in price creates uncertainty in the economy; uncertainty makes both domestic and foreign investors unwilling to invest. In Nigeria inflation has led to increase in nominal interest rates which affect the value of interest payment of banks and financial institutions. Furthermore, determination of the problem

caused by inflation   depends upon the degree in which inflation is anticipated correctly or not. If inflation is anticipated correctly and the monetary authority is seen to be credible, the fluctuation in price would be managed effectively but if inflation is unanticipated, some economic agents will gain while others will lose. Unanticipated inflation impact negatively on saving ability of the citizens and as a result, low saving leads to a fall in the demand for stocks and equities as financial wealth. This decrease in demand causes the price of equities to fall thereby reducing returns on equities and stocks.

Furthermore, the prices of stock determine how effective and efficient the stock market allocates shares and equities based on preference and availability of market information. Increase or decrease in price of stock create uncertainty for the investors and in turn affect the demand and supply of stocks. Therefore, general increase in price level may affect people's potential investor's investment decision which has a negative impact on the total returns on stocks in the economy at large. This situation is prevalent in the Nigerian economy; therefore there is the need to examine the effect of inflation on stock returns and its implication on investment. The Fisher's hypothesis (Fisher's effect) suggests that stocks or equities hedge or evade inflation, empirical investigation suggest that inflation and stock returns are negatively related. This study will be looking at the relationship between inflation and stocks in Nigeria. The rest of the paper is structured as follows: section 2 is the sterilized fact of Nigerian stock exchange, section 3 is the review of existing literature, section 4 contains the analytical framework and methodology, section 5 is the presentation of empirical results and discussions while Section 6 is the concluding remarks.

Stylized Fact

One major commodity considered in this study is the capital market stock, i.e. The Stock market. Stocks listed in Nigeria are traded on the floor of the Nigerian Stock Exchange (NSE) while the Securities and Exchange Commission (SEC) is the apex regulatory body which oversees the activities and affairs of the major players on the floor of the Stock Exchange.

The Nigeria Stock Exchange was established in September 15, 1960 but commenced business on June 5, 1961 with 19 securities listed and traded on the Lagos Stock Exchange. Based on the recommendation of the Government Financial System Review Committee in 1976, the Lagos Stock Exchange was renamed and made part of the Nigerian Stock Exchange on December 5, 1977. The Nigerian Stock Exchange has nine branches established in major commercial cities in Nigeria. The main exchange of stocks of large enterprises is traded on the Nigerian Stock Exchange while small and medium scale enterprises are listed and traded

in the Second tier Securities Market (SSM). From 1963 to 1990, the Nigerian stock exchange witnessed an overwhelming increase in government stock which exceeded the equities of industrial companies; however this trend changed from 1991. The value of equities of industrial companies increased to billions of Naira, while government stock traded on the Nigerian Stock Exchange was worth millions of Naira this decrease continues till date, a development to the deregulation of the economy.

Despite the increase in market capitalization noticed in the economy at that period, the ratio of this increase in market capitalization to the Gross Domestic Product and Gross Fixed Capital Formation was still low. This increase was between 4.8% and 25.4% for gross domestic product while that of the gross fixed capital formation is between 28% and 55% from 1963 to 1990 (CBN, 2009). The ratio of market capitalization in the gross domestic product and gross fixed capital formation increased geometrically from 1990 to 1995. Although there was a decrease in the share of market capitalization in gross domestic product and gross fixed capital formation, the return on investment did not follow the same pattern. This decrease noticed at that period was caused by a banking crisis in which a total of 26 banks were liquidated in 1998. However, with the recapitalization of the banking sector in 2005, the industry remains the most active participant in the Nigerian stock market up till date. The trend in Nigeria Stock Exchange causes the price and return on stocks to be highly volatile.

Review of Existing literature

Basically, there are four major hypotheses discussing the relationship between inflation and stock returns. These theories are fisherian hypothesis, proxy hypothesis, tax-effect hypothesis and inflation hypothesis. Empirical studies on testing of these hypotheses have been mixed, and a consensus has not yet emerged. While studies like Pierre and Kwok (1992), Geske and Roll (1983), Floros (2002), Ugur (2005), Yeh and Chi (2009), Pesaran et al (2001), Den Haan (2000), Crosby (2001), Syros (2001), Roohi and Khalid (2002) among others have found a negative relationship between inflation and stock returns; Boudoukh and Richardson (1993), Graham (1996), Choudhry (2001), Patra and Posshakwale (2006) and Lee et al (2000) among others reported a positive relationship between these variables.

Pierrel and Kwoks (1992) used a Vector-Autoregresive (VAR) model to estimate and tests the alternative versions of hypotheses that explain the relationship between these two variables. The study employs distributed lags in order to empirically arrive at a dynamic structure of inflation. Pierrel and Kwoks concluded that this dynamic structure conform to

Fama (1981), Benderly and Zwick (1985), and Geske et al (1983) hypothesis that suggests a negative relationship between inflation and return on stocks.

Yeh and Chi (2009) used Autoregressive Distributed Lag (ARDL) model to test the validity of the various Hypotheses that explain this relationship. The empirical result of this study of 12 OECD countries shows that these countries exhibit a short-run negatively significant co-movement between stock returns and inflation. Moreover, countries like Australia, France, Ireland and Netherland do not display a long-run relationship between the two variables in equilibrium. This result is consistent with the hypotheses of Fama (1981), Modigliani et al (1979) and Feldstein (1980) which suggested that an increase in inflation reduces real returns on stock. This result is also in line with Caporale and Jung (1997) and Rapach (2002). They argue respectively that there exist a negative significant effect of inflation on real stock returns after controlling for output shock and that inflationary trends do not erode returns on stocks.

Spyros (2002) used a Vector-Autoregresive (VAR) model to test Fisher's Hypothesis. His results reflect a contrary view that returns on stocks hedges inflation. This study shows that there is negative but not a statistically significant relationship between inflation and stock returns in Greece from 1990 to 2000.

In this same vein, Floros (2002) used a standard causality test to carry out the same study on Greece economy and concluded that inflation and stocks in Greece should be treated as independent variables because the result of the various test conducted show that there is no relationship between inflation and stock returns in Greece. Crosby (2001) investigates the relationship between inflation and stock returns in Australia from 1875 to 1996 and found out that the Australian economy does not experience permanent changes in inflation or stock returns. The result shows that there exist short-run negative relationships between these two variables that depend on the period of time that is considered.

On the contrary, Lee et al (2000) used the Auto-Regressive Integrated Moving Average (ARIMA) model to examine the impact of German hyperinflation in the 1920s on stock returns. This result of this study show that the hyperinflation in Germany in early 1920s cointegrates with stock returns. The fundamental relationship between stock returns and both realized and expected inflation is highly positive. They concluded that common stocks appear to be a hedge against inflation during this period. Choudhry (2001) in his study on the impact of inflation on stock returns in some selected Latin and Central American countries (Argentina, Chile, Mexico and Venezuela) from 1981-1996, also used an ARIMA model. His result reveals that there is one- to-one relationship between the current rate of nominal return

and inflation for Argentina and Chile. Their result also reveals that the lag values of inflation affect stock returns and this result infer that stocks act as a hedge against inflation.

Patra and poshakwale (2006) used the error correction model (ECM) to conduct a study on the impact of economic variables on market returns in Greece from 1990 to 1999. Empirical results show that some macroeconomic variable like money supply, inflation, volume of trade and exchange have both short-run and long-run relationship with a stock price in equilibrium in Greece while there was no short-run or long run relationship noticed between exchange rate and stock prices.

Ugur (2005) in a study on the effect of inflation on return on stocks in turkey from 1986 to 2000 reveal that expected inflation and real returns are not correlated. The results suggest there is a negative relationship between inflation and stock returns which may be caused by the negative impact of unexpected inflation on stock returns. This result did not contradict the Fisherian hypothesis because of the non correlation of inflation and real returns but the results is in line with the proxy hypothesis for a negative significant relationship exists between the two variables. Aperigis and Eleftheriou (2002) results also concurred that there is a negative link between inflation and stock returns in Greece than in interest rate and stock returns. Similar study like Adrangi et al (1999) and sellin (2001) also support the proxy hypothesis. Khil and Lee (2000) in their study on ten pacific countries and the US reveal that all the countries except Malaysia the negative relationship between inflation and stock returns.

The tax-effects Hypothesis which asserts that there is negative relationship between inflation and stock returns was tested by Geske and Roll (1983). Empirical result from the reveal that random negative or positive real shock affects stock returns which in turn, signal higher or lower unemployment and lower or higher corporate earnings. This has an effect on the personal and corporate tax revenue leading to increase or decrease in the treasury through borrowing from the public. The economy paid for this debt by expanding or contracting money growth and this would lead to higher or lower inflation. They concluded that random shocks on stock returns are both fiscal and monetary in nature in the U.S.A.

Roohi and Khalid (2002) considered the Efficient Market Hypothesis and Rational Expectation Theory to investigate the effect of inflation on stock returns. Empirical results of the study suggest that the relationship between real stock returns, unexpected inflation and unexpected growth are negatively significant. They concluded that the control of real output growth makes the negative relationship between these two variables to disappear over time.

Theoretical Framework and Methodology
Theoretical Framework

The reviews of literature in section three reveal that there are basically four major hypotheses discussing the relationship between inflation and stock returns. These theories are fisherian hypothesis, proxy hypothesis, tax-effect hypothesis and inflation hypothesis. Considering the level of price instability in Nigeria over the period of our study, the study seeks to adopt fisherian hypothesis which suggest that stock hedges inflation. This based on the fact that the literature suggests that the price of a stock is a major determinant of stock returns which is affected positively by expected or unexpected inflation (consumer price index). This fisherian hypothesis is thus specified below:

$$\delta_t^R = \alpha_0 + \alpha_2 \pi_t + e_t$$

Where δ_t^R is the real returns, π is the actual inflation which is the combination of the unexpected and expected inflation. This definition of actual inflation is suggested by Hodrick-Prescott Filter (HPF) of 1997. While e is the error term that is distributed randomly and normally with zero mean and constant variance. This sign of α_2 determine if the specification is in line with the fisherian hypothesis. Thus; a significant and positive sign suggests that stock hedge inflation while a negative sign suggests the contrary.

Methodology

Based on the outcome of our theoretical framework which attempts to explain the relationship between real stock returns and inflation, we specify the model for estimation. A stock return represented by all share indexes (ASI) is the dependent variable while the explanatory variable is inflation represented by consumer indexes (CPI). This is represented in the functional form below:

$$ASI_t = f\left(CPI_t\right) \tag{1}$$

To empirically analyze the above functional form, the ARDL model specification is used to show the long-run relationships and dynamic interactions between stock returns and inflation using Autoregressive Distributed Lag (ARDL) cointegration (bound test). This method is adopted for this study for three reasons. Firstly, compared to other multivariate cointegration methods (i.e. Johansen and Juselius (1990), the bounds test is a simple technique because it allows the cointegration relationship to be estimated by OLS once the lag order of the model is identified. Secondly, adopting the bound testing approach means that pretest such as unit root is not required. That is the regressors can either I(0), purely I(1) or mutually cointegrated. Thirdly, the long-run and short run parameters of the models can be simultaneously estimated (Aregbeyen and Ibrahim (2012). Therefore Autoregressive

Distributed Lag (ARDL) bound test proposed by Pesaran *et al*. (2001) would be used to show the relationship between stock return and inflation in Nigeria from 1st of January 1997-31st of December 2010.

The ARDL model specifications of the functional relationship between stock return (ASI) and inflation (CPI) is:

$$\Delta \ln ASI = \alpha_0 + \beta_1 \ln ASI_{t-1} + \beta_2 \ln CPI_{t-1} + \sum_{i=1}^{k} \delta_{1i} \Delta \ln ASI_{t-i} + \sum_{i=1}^{k} \delta_{2i} \Delta \ln CPI_{t-i} + \varepsilon_t \qquad (2)$$

Where:

ASI = All Share Index

CPI = Consumer Price Index

K = lag length for the Unrestricted Error-Correction Model (UECM)

Δ = first differencing operator

ε = white noise disturbance error term

The first step in the ARDL approach is to estimate Equation (2) using the ordinary least square (OLS).The second is to trace the presence of cointegration by restricting the coefficients of lagged level variables estimated in equation (1) to be equal to zero. The null hypothesis is that there is no cointegration ($H_0 : \beta_1 = \beta_2 = 0$) against the alternative hypothesis of there is cointegration ($H_1 : \beta_1 \neq \beta_2 \neq 0$).

Accordingly, the computed F-statistic derived from the Wald test is then compared to the non-standard critical bounds values reported by Pesaran *et al*. (2001). If the computed F-statistic exceeds the critical upper bounds value, then the null hypothesis of no cointegration is rejected. If the computed F-statistic falls below the critical lower bounds value, then the alternative hypothesis of there is cointegration is accepted. However, in a situation where the computed F-statistic falls between the critical lower and upper bounds values, the order of integration of the variables under consideration is needed or else, meaningful conclusion cannot be reached about cointegration status.

Once cointegration relationship is established, the next step is to estimate the long-run coefficients using the ARDL approach and the short-run dynamic parameters using the error correction model and also selecting the orders of the model using the Akaike Information Criteria (AIC). The error correction model helps to capture the speed of adjustment among the variables affecting stock return (ASI) and inflation (CPI). The co-integrating long-run relationship was estimated using the specification below:

$$\ln ASI = \alpha_0 + \beta_1 \ln ASI_{t-1} + \beta_2 \ln CPI_{t-1} + \varepsilon_t \qquad (3)$$

153

The short-run dynamic model is specified thus:

$$\Delta \ln ASI = \alpha_0 + \sum_{i=1}^{k} \delta_{1i} \Delta \ln ASI_{t-i} + \sum_{i=1}^{k} \delta_{2i} \Delta \ln CPI_{t-i} + \delta_3 \varepsilon ct_{t-1} + \varepsilon_t \qquad (4)$$

Where:

εct_{t-1} = the error correction term lagged for one period

δ = the coefficient for measuring speed of adjustment in equation (4)

Sources of data

This study employed monthly data that covers the period 1st of January 1997-31st of December 2010 in Nigeria. The data is obtained from various issues of Central Bank of Nigeria Statistical Bulletin. The variables of interest are; stock returns (All share Index) and inflation (Consumer Price Index).

Presentation of Empirical Results

The result of the bound test for equation (2) is presented in Table 1. From the table, the computed F-Statistic is 5.8326. This value exceeds the upper bounds critical value of 4.78 at the 10% significance level and 5.73 for the upper bounds critical value for 5% significance level. This implies that stock returns (ASI) and inflation (CPI) are co-integrated.

Table 1: ARDL bound test result for equation (2)

	Equation 2
	K=3 (lag length)
Computed F-Statistic:	5. 8326
5% critical bound value Lower: Upper:	 4.94 5.73
10% critical bound value Lower Upper	 4.04 4.78

Notes: The critical values are extracted from Pesaran et al. (2001), unrestricted intercept and no trend with one regressor.

The above result reveals that there is co-integrating relationship between stock return and inflation. Therefore, equation (3) was estimated to show the long run relationship between stock return and inflation.

Table 2: Results of Long -run Relationship (equation 3)

Variable	Coefficients	Standard Error	T-Statistics	P-value
C	-0.3833	0.1643	-2.3332	0.0214**
LNASI(-1)	0.9472	0.0265	35.8064	0.0001*
LNCPI(-1)	0.1054	0.0447	2.3586	0.0200**

Notes (*) and (**) indicates 1% and 5% significance level respectively. R-squared: 0.99, Adjusted R-squared: 0.99, Durbin Watson Statistics: 1.91 and Prob (F-Statistic): 0.001.

The result of the long - run relationship between stock return and inflation in table 2 reveal that the estimated coefficient of inflation has a positive and significant impact on stock

returns. A 1% increase in inflation leads to approximately 0.94% increase in stock return (ASI).

Table 3: Results of Error Correction Models

Variable	Coefficients	Standard Error	T-Statistics	P-value
C	0.0063	0.0056	1.1138	0.2677
ΔLNASI(-1)	-0.1361	0.0905	1.5036	0.1354
ΔLNCPI(-1)	0.4379	0.2582	1.6962	0.0926**
ECM(-1)	-0.0611	0.2672	-2.2868	0.0241*

Note: (*) and (**) indicates 5% and 10% significance level respectively

The above result indicates that the error correction coefficient estimated at -0.0611 (0.0241) is statistically significant, has correct sign and suggests a moderate speed of convergence to equilibrium. This implies that there is a long run causal relationship between inflation and stock returns. The result also shows that at a significance level of 10%, a change in one period lagged value of inflation ($\Delta \log CPI_{t-1}$) has a positive and statistically significant effect on changes in stock returns ($\Delta \log ASI_t$). This means that the inflation value of a previous month, has a positive influence on the changes noticed in stock returns in the current month. Although, the one period lagged value of stock returns($\Delta \log ASI_{t-1}$) is positive, but it is statistically insignificant.

It is necessary to check for the stability of the stock return function. This is because of the importance of the stability of the stock return function for investor to know when to invest and the major factors affecting their portfolio investment. Therefore it necessary to test whether the estimated stock return ARDL equation has shifted over time. This is presented in figure 1 and 2. As can be observed from Figures 1 and 2, the CUSUM and CUSUM Square parameter stability tests indicate that the parameters are stable during the sample period (1970-2010).
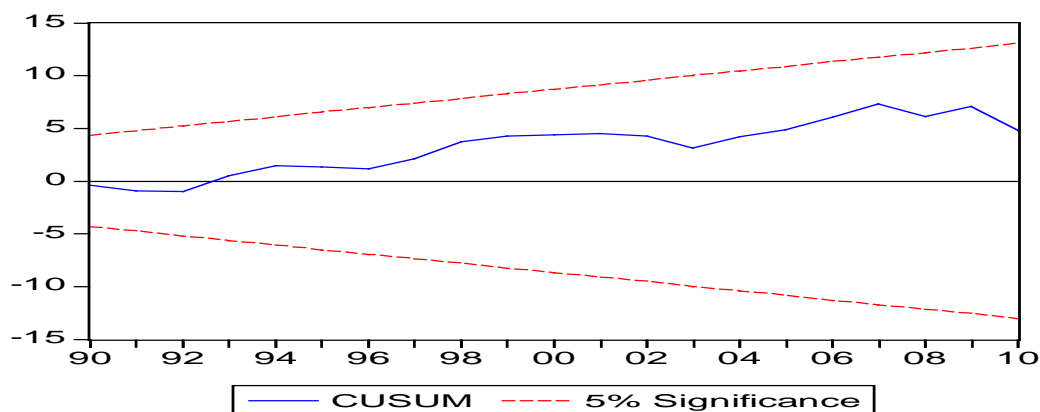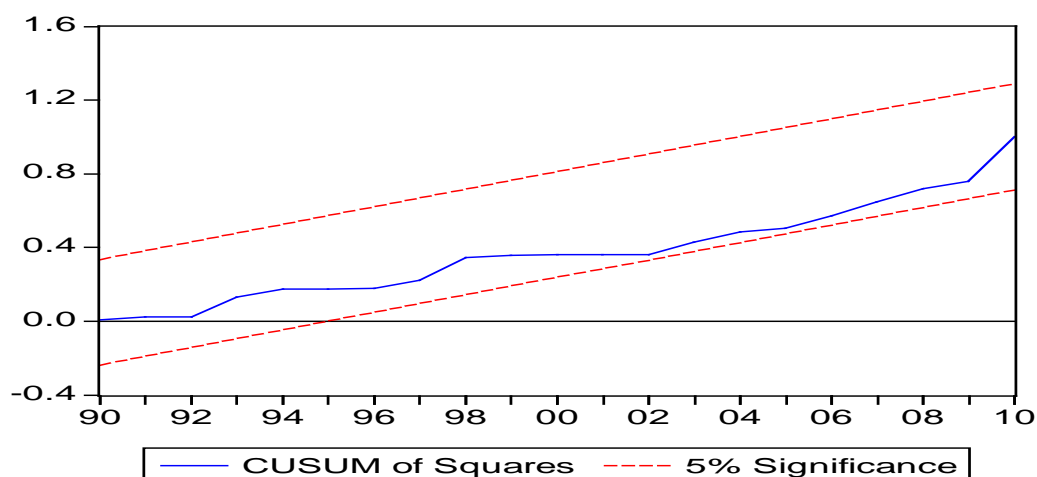
Figure 1

Figure 2

Conclusion

The aim of this study was to test the relationship between stock returns and inflation in Nigeria. This study adopted the ARDL bounds testing co-integration approach to investigate the long run and short run dynamics between stock returns and inflation. The results show that there is a co-integration relationship between stock returns and inflation. The results also indicate that inflation has a positive and significant effect on stock returns (ASI). This implies that that inflation is a vital macroeconomic variable that influence the flow of investment and determines the direction and changes noticed in return on stocks in Nigeria overtime. Therefore, this study affirms the proposition of the Fisherian hypothesis which stated that inflation has a positive effect on stock returns.

References:

Ajayi, S. I., & Ojo, O. O. (2006). *Money and Banking, second edition, .* Ibadan, Nigeria: Daily Graphic Ltd.

Bakshi, G., & Chen, Z. (1996). Inflation, Asset Prices, and the Term Structure of Interest Rates in monetary economics. *The review of financial studies Vol. 9, No. 1* , 241-275.

Balduzzi, P. (2008, December 16). *Stock returns, Inflation and the" proxy hypothesis"; a New looks at the data (june1994).* Retrieved August 10, 2010, from SSRN: http://ssrn.com/abstract=1298811

Berument, H., & Jelassi, M. M. (2002). The Fisher hypothesis: a multi-country analysis. *Applied Economics, Vol 34* , 1645-1655.

Bodie, Z. (1976). Common stocks as a hedge against inflation. *Journal of finance, Vol 31* , 459-470.

Caporale, T., & Jung, C. (1997). Inflation and real stock prices. *Applied financial economics Vol, 7* , 265-266.

Crosby, M. (June, 2001). Stock returns and inflation. *Australia economics papers* , 156-165.

Fama, E. F. (1981). Stock Returns, Real Activity, Inflation, and Money. *The American Economic Review Vol, 71 no4* , 545-565.

Floros, C. (2004). Stock returns and inflation in Greece. *Applied Econometrics and international Development Vol, 4-2* , 55-68.

Geske, R., & Roll, R. (1983). The Fiscal and Monetary Linkage Between Stock Returns and Inflation. *The Journal of Finance, Vol. 38, No. 1* , 1-33.

Gultekin, B. (1983). Stock Market Returns and Inflation: Evidence from Other Countries. *The Journal of Finance, Vol. 38, No. 1* , 49-65.

Hasan, S. (2008). Stock returns , inflation and interest rates in the United Kingdom. *The European Journal of finance, 14* , 687-699.

Jones, C., & Wilson, J. (2006). The impact of inflation measure on the real returns and Risk of U.S stocks. *The financial review Vol, 41* , 77-94.

Jung, C., Shambora, W., & Choi, K. (2007). The relationship between stock returns and Inflation in four European markets. *Applied economics letter Vol, 14* , 555-557.

Lee, K .YSS. (2008). Causal relationship between stock returns and inflation. *Applied Economic letters Vol, 15* , 125-129.

Lee, S., Tang, D., & Wong, M. (2000`). Stock returns during German hyperinflation. *The Quarterly review of economics and finance Vol, 40* , 375-386.

Madsen, J. B. (2005). The Fisher hypothesis and the inflation and supply shocks interaction Between share returns. *Journal of International Money and Finance Vol, 24* , 103-120.

Patra, T., & Poshakwale, S. (2006). Economic variables and stock market returns; evidence from The Athens stock exchange. *Applied financial economics Vol, 16* , 993-1005.

Spyros, I. (2001). Stock returns and inflation; evidence from emerging markets. *Applied economics letter Vol, 8* , 447-450.

Uchendu, 0. (2001). Inflation Targeting: A Monetary Policy Management Framework For The Attainment Of Price Stability In Nigeria. *CBN Economic & Financial Review, VOL. 38 No. 2*.

Ugur, S., & Ramazan, S. (2005). Inflation, Stock Returns, and Real Activity in Turkey. *The Empirical Economics Letters Vol, 4 (3)* , 181-192.