Real Stock Returns and Inflation in Pakistan

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This study examines the relationship between inflation rate and real stock return using Fama (1981) methodology on the basis of monthly data and annual data from 1972 to 2002. The Full Information Maximum Likelihood (FIML) is used to estimate the causal relationship between inflation rate and real stock returns. The empirical results indicate that when the real output growth rate is controlled the negative relationship between real stock return and inflation rate disappear. This result is consistent with Fama (1981) conjecture. However, the relationship between real returns and unexpected growth and unexpected inflation are negative and significant to be important findings.

Introduction

Inflation is one of the influential macroeconomic variables, which has negative impact on economic activity. It is calculated on the basis of price indices. These price indices are GDP deflator, consumer price index (CPI), and producer price index. The CPI is used to calculate inflation in Pakistan. Inflation decreases the value of money, which ultimately effect on investment. People purchase more durable goods, bonds, silver, gold, foreign currency and shares, which hedges against the inflation. The stock price depends on available economic and non-economic information. The economic information show up a change in interest rate, consumer price index, inflation rate, and price of oil. Non-economic information relates with political disputes, emergency in the country, and other circumstances. Market participants use this information in their decision-making. The market price works as a barometer to a consumer in deciding about the present versus future consumption.

Stock prices are determined by interaction of supply and demand in a market economy. The share price in Pakistan is based on KSE-100 index. This index measures the temperature of stock market i.e. heating and cooling and its trends can be measured by indices of market prices.

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The movements of major indices make portfolio decisions. KSE index began with a 50-share index. As market developed and turned into an emergent, a market representative index was needed. On November 1, 1991, in order to meet with growing trend & to give a more reflective index, the Karachi stock exchange revised the list of 50 companies to 100. This new index called “KSE-100”, with the base point of 1000. The KSE 100-index is a capital weighted index representing about 83% of market capitalization of exchange market. The composition of this index is revised periodically to reflect the changes that occur continuously as a result of enlisting of new companies and subsequent change in weighted of listed companies. The stock returns are calculated by the difference two log successive KSE-100 price index and the real stock return is calculated by difference between and stock returns and inflation.

Review of Literature

Several studies provide a negative relationship between real stock returns and inflation for US and European stock markets Linter (1975), Fama (1981, 1982), Fama and Schwert (1977), Geske and Roll (1983), and Caporale and Jung (1997) for US financial market and Wahlroos and Berglund (1986) and Asprem (1989) provide for European markets. Chatrath and Ramchander (1997) and Hu and Willett (2000) provide evidence for Indian financial market. The reason of this relationship is subject to the controversy. First causal interpretation is the variability hypothesis in which the relationship tests take place between inflation and stock prices Malkiel (1979) and Hendershott (1981).

In this hypothesis a rise in inflation generates a level of uncertainty, which lowers the stock returns. The increased in uncertainty causes to decrease the economic activity in future which lowers the expected output in future that finally results in decrease the current stock returns Friedman (1977). However, an empirical finding by Buono (1989) negates the variability of hypothesis regarding the negative relationship between stock returns and inflations. Hu and Willett (2000) examined the variability of hypothesis for Indian stock market and found strong relation evidence that higher inflation is more volatile and speed up inflation. Moreover, they argued that previous studies could not be supportive enough to this hypothesis due to serious methodological shortcomings problems with the previous tests of the variability of hypothesis.

Second causal interpretation is the proxy hypothesis, which is centrally focused by Fama (1981). According to Fama (1981) the relationship between returns and inflation is not true relation; it is only the proxy relationship between stock return and growth rate of real GNP with the inverse relationship between stock returns and inflation. It implies that high rate of inflation may decrease the demand for money that decreases growth in real activity. On the other side the increase in rate of inflation decrease the future expected profit, which ultimately impact the decrease in stock prices. This argument is supported to Fisher (1930)

hypothesis, which states that real returns are determined by real factors. Fama (1981) suggested that if the effect of real output growth is controlled the negative relation will disappear. Various studies examined the proxy hypothesis Nelson (1976), Linter (1975), Fama (1981, 1982), Fama and Schwert (1977), Geske and Roll (1983), Caporale and Jung (1997), Wahlroos and Berglund (1986) Asprem (1989) Chatrath and Ramchander (1997) and Hu and Willett (2000).

Feldstein (1980) examined another aspect of negative relation between inflation and stock returns. He considered the tax and depreciation charges in his model. Tax and depreciation charges increase the total cost after tax profit, which decrease the stock returns. Some studies do not support to Fama (1981) hypothesis e.g. Coate and Vanderhoff (1986) and Caporale and Jung (1997). Coate and Vanderhoff (1986) investigated the empirical evidence in support of Fama's views. They found that anticipated and unanticipated inflation were uncorrelated to actual and surprise output growths. Caporale and Jung (1997) provided same evidence against Fama's conjecture. They found that negative relationship between stock returns and inflation even controlling the output shock.

No study has been available regarding to the relationship between inflation and real stock return with reference to Pakistan so far This paper investigates the relationship between real return and inflation with reference to Karachi stock market during 1972 to 2002. The study provides the primary investigation regarding to hypothesis, which apply in Pakistan stock market. Regression of stock returns on the inflation variables are estimated after removing in the relationship between real activity and inflation. The results provide support for Fama hypothesis. The rest of the paper is organized in such that second section describes the econometric methodology and related issues followed by data in section three. The empirical findings and interpretation are presented in section four. Section five provides the concluding remarks.

Econometric Methodology

This study based on the combination of efficient market hypothesis and rational expectation theory. The efficient market hypothesis suggests that stock markets are "informationally efficient." That is, any new information relevant to the market is spontaneously reflected in the stock prices. A consequence of this hypothesis is that past prices cannot have any predictive power for future prices once the current prices have been used as an explanatory variable. In other words the change in future prices depends only on arrival of new information that was unpredictable today hence it is based on surprise information. Another consequence of this hypothesis is that arbitrage opportunities are wiped out instantaneously. The rational expectation hypothesis postulates that an unbiased expectation of a variable is formed on the basis of all available information. It implies that both efficient market and rational expectation theory, only surprise information could cause change in stock prices.

This study tests the proxy hypothesis between stock return and growth rate of real GNP with the inverse relationship between real stock returns and inflation. It implies that high rate of inflation may decrease the demand for money that brings down the level of growth in real activity. This hypothesis tests for a significant relationship between inflation and stock prices by estimating of the following system of equations.

$$GNP_t = \alpha_1 + \alpha_2 GNP_{t-1} \alpha_2 GNP_{t-2} + \varepsilon_{ti} \quad (1)$$

$$INF_t = \beta_1 + \beta_2 INF_{t-1} + \beta_3 INF_{t-2} + \beta_4 INF_{t-3} + \varepsilon_{2i} \quad (2)$$

$$SP_t = \gamma_1 + \gamma_2 GNP_t + \gamma_3 INF_{t_t} + \gamma_4 \varepsilon_{1i} + \gamma_5 \varepsilon_{2i} + \zeta_1 \quad (3)$$

Where GNP_t is growth rate of real GNP_t, INF_t is the growth rate of consumer price index and SP_t is growth rate of real stock exchange price index, and ε_{1i}, $\varepsilon_{2i,}$ and ξ_{3t} are disturbance terms. OLS method has not been used because the regression containing generated regressors yield an inconsistent covariance matrix estimator. Full Information Maximum Likelihood (FIML) used to estimate the above equations. Full Information Maximum Likelihood (FIML) estimates the likelihood function under the assumption that the contemporaneous errors have a joint normal distribution. Provided that the likelihood function is correctly specified, FIML is fully efficient.

Data

The data used in this study is monthly and yearly covered from 1972 to 2002. The annual data for inflation, stock prices index, and GNP are taken from various issues of International Financial Statistics (IFS). The index based on 1995-96 prices. The monthly data for inflation, stock prices index, and GNP are taken from various issues of Pakistan economic survey and annual report of state bank of Pakistan Because of non-availability of monthly data on GNP, industrial production indices are used as a proxy for GNP (Baum, Calagyan and Ozkan 2002). The return is calculated by the difference of two successive log prices. The real return is calculated by the subtraction of inflation from stock returns.

Estimation and Interpretation of Results

Table 1 and 4 show the relationship between real growth rate and its two years lag periods of monthly and annually data respectively. It indicates that one-year lag period is positive and significant and two years lag period is negative and insignificant on real growth in monthly data. However, the relationship between real growth rate and its two years lag periods of annually data is positive and insignificant. It indicates that the effect of information is present in monthly data especially in the lag period of first month. Whereas annually data doesnot provide any evidence about information because information is absorbed in yearly data. By these relations the unexpected growth rate is calculated which

these relations later use in determination of real stock returns. Table 2 exhibits the relationship between inflation and its three years lags period on the basis of monthly data. The result shows the positive and insignificant impact of lags period on inflation. Table 5 indicates the relationship between inflation and its three years lags period on the basis of annually data. The result shows the positive and significant impact of lags period on inflation. It observes that inflation trend has systematic pattern in Pakistan's economy which is because of two observe phenomena, an anticipated increase in price of oil and switchover from fixed exchange rate to flexible exchange rate. Due to these factors, the domestic currency goes down in value and contribute to increase the price of intermediate commodities (Pakistan import intermediate commodity), which speed up the inflation.

The negative relationship between real returns and unexpected components of inflation is more clearly explained in terms of relationship between real returns and inflationary trend in both monthly data and annual data. Table 3 and 6 indicate the same i.e. that unexpected output growth has negative and significant effects on real stock prices at one percent in monthly as well as annually basis. Actual output growth is also positive and significant in annually data and insignificant in monthly data. It indicates that the role of information, which has significant role in monthly data, has zero effect. However, anticipated inflation has positive and insignificant impact on stock prices. An unanticipated inflation has negative significant impact on stock prices at ten percent in both data. One interesting result found that after controlling for the effects of output growth, the inverse relationship between inflation and real stock prices disappear at basis which is consistent with efficient market theory and Fama's (1981) conjecture. However, in the monthly data the negative relationship is found between inflation and real stock prices after controlling for the effects of output growth which is consistent to Caporale and Jung (1997) findings and against Fama's (1981) conjecture. The negative associations between real stock returns and the unexpected components of inflation are found to persist, despite a two-step estimation that controls for the inflation and real activity relationship.

Conclusion

This study examines the relationship between inflation rate and real stock return using Fama (1981) methodology. It is found that when the real output growth rate is controlled the negative relationship between real return disappear. This result is consistent with Fama (1981) conjecture. However, the relationship between real returns and unexpected growth and unexpected inflation are negative and significant to be important findings.

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Table 1.
Real growth rate regression (Monthly data) 1972-2002

Variable	Coefficients	Standard Error	t-Statistics	p-values
Constant	0.009	0.012	0.70	0.480
GNP(-1)	0.251	0.095	2.62	0.010
GNP(-2)	-0.046	0.132	-0.35	0.720

The dependent variable is the growth in the real output. The regressions were estimated using full information maximum likelihood. The value of R^2 = 0.059.

Table 2.
Inflation rate regression (Monthly data)1972-2002

Variable	Coefficients	Standard Error	t-Statistics	p-values
Constant	0.005	0.002	2.75	0.006
Inflation(-1)	0.099	0.154	0.64	0.523
Inflation(-2)	0.088	0.136	0.64	0.519
Inflation(-3)	0.128	0.088	1..45	0.148

The dependent variable is the rate of inflation. The regressions were estimated using full information maximum likelihood. The value of R^2 = 0.105

Table 3.
Real stock return regression (Monthly data) 1972-2002

Variable	Coefficients	Standard Error	t-Statistics	p-values
Constant	0.008	0.001	0.09	0.920
GNP	0.122	0.086	1.40	0.161
E_1	-0.143	0.051	-2.80	0.006
Inflation	-1.195	0.912	-1.31	0.192
E_2	-1.288	0.812	-1.98	0.106

The dependent variable is the growth in the real Karachi stock price index. rate of inflation. The regressions were estimated using full information maximum likelihood. The value of R^2 = 0.123

TABLE 4.
Real growth rate regression (Annual data) 1972-2002

Variable	Coefficients	Standard Error	t-Statistics	p-values
Constant	0.043	0.015	2.870	0.007
GNP(-1)	0.162	0.168	0.970	0.340
GNP(-2)	0.109	0.230	0.480	0.640

The dependent variable is the growth in the real output. The regressions were estimated using full information maximum likelihood. The value of R^2 = 0.053.

Table 5.
Inflation rate regression (Annual data)1972-2002

Variable	Coefficients	Standard Error	t-Statistics	p-values
Constant	0.036	0.017	2.18	0.039
Inflation(-1)	0.872	0.104	8.36	0.000
Inflation(-2)	-0.315	0.132	-2.37	0.026
Inflation(-3)	-0.001	0.120	-0.002	0.948

The dependent variable is the rate of inflation. The regressions were estimated using full information maximum likelihood. The value of R^2 = 0.64

Table 6.
Real stock return regression (Annual data) 1972-2002

Variable	Coefficients	Standard Error	t-Statistics	p-values
Constant	-0.800	0.396	-2.01	0.054
GNP	12.320	5.216	2.36	0.026
E_1	-14.179	5.106	-2.77	0.011
Inflation	1.178	1.608	0.73	0.471
E_2	-1.580	0.873	-1.81	0.082

The dependent variable is the growth in the real Karachi stock price index. rate of inflation. The regressions were estimated using full information maximum likelihood. The value of R^2 = 0.41

Inflation During The 1990s

Prices remained volatile during the decade of the 1990s, ranging between 5.7 percent and 13.0 percent mainly because of decelerating economic growth, expansionary monetary policies, output set-backs, higher duties and taxes, a depreciating Pak Rupee, frequent adjustments in the administered prices of gas, electricity and POL products, etc. The changes introduced in the economy added a major element of distortion in economic relations with an inevitable pressure on prices, GDP growth and the performance of the large-scale industrial sector. The pressure on prices intensified in 1994-95 when inflation went up to 13 percent. Both the food and non-food inflation contributed to the persistence of double digit inflation, averaging 12.2 and 10.7 percent respectively against the overall CPI inflation of 11.4 percent during 1990-97. However, the inflation rate has started to decline over the last three years (1998-2000) because of an improved supply position, strict budgetary measures and depressed international market prices. The inflation rate which was at 5.7 percent in 1998-99, has been reduced to 3.6 percent in 1999-2000 and further to 3.1 percent in 2002-03 (the lowest in the last three decades). This low level of inflation has been achieved as a result of strict fiscal discipline, the lower monetization of the budget deficit, an output recovery, a reduction in duties and taxes, and appreciation of exchange rate.