STOCK PRICES AND INFLATION IN MALAYSIAN EQUITY MARKETS

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Abstract

A negative relationship between real return and inflationary trends in developed markets has been widely documented in Europe and US. This paper investigates this relationship in the light of the Generalized Fisher's Hypothesis (GFH) for Malaysian equity markets using quarterly data from 1987 :1 to 2006:1. The results from using both ARIMA and Ordinary least square (OLS) with White (1980) hetrocidasticity-consistent and White (1984) autocorrelation-consistent covariance matrix models provide evidence of the independence and positive relationship between stock returns-inflation relationships and hence, concluded that the GFH do hold in the Malaysian stock market. This in turn implies that common stocks provide an effective hedge against inflation.

1-Introduction

Fisher hypothesis states that real rates of returns on common stocks are independent of inflation rates. This argument has revived interest in the properties of financial assets as hedges against inflation. Spyrou (2004), Choudhry (2001) study find an evidence to support the Fisher Hypothesis. Jaffe and Mandelkar (1976), and Fama and Schwert (1977) used ex post data have all reported that common stocks in the U.S have been poor hedges against inflation. Nelson (1976) examined the relation between nominal stock returns and inflation using time series technique to estimate both expected and unexpected inflation. He showed that a negative relationship between nominal stock returns and both expected and unexpected inflation has prevailed over the period of January 1953 - June 1974 and concluded that the GFH does not hold in the US stock market.

Gultkin (1983a) used time series regressions, and three different techniques to estimate expected inflation that is contemporaneous inflation rates, ARIMA Model, and short -term interest rate to test the relationship between nominal stock returns and expected inflation in other countries besides the U.S. He finds the regression coefficient are predominantly negative and conclude that there is a consistent lack of positive relation between stock returns and inflation in most of the countries. In contrast to the previous studies which use expost data, Gultkin (1973,b) used data from the Livingston survey of expectation to test the fisher effect in its pure form as a model relating expected stock returns to expected inflation. He argues that the Livingston data allow him to test Fisher Equation directly to avoid bias due to problems in estimating expected stock returns and the expected inflation rate from the realized data. He finds that the GFH holds much better for ex ante realization. The implication of this finding is if the economists sampled are the Livingston survey are representative of the market, then in inflationary periods investors capitalize equity earning at correct real rate rather than at nominal rate. In explaining this troublesome phenomenon, economists have offered many explanations. A widely accepted explanation is Fama's (1981) proxy hypothesis framework.

Bulmash (1991) who used discriminant analysis, ARIMA and multiple regressions to re-examine the relations between stock prices, inflation, and money supply. His results suggest that stock returns are negatively affected by one - month lagged inflation. Real stock returns are positively

affected by concurrent changes in concurrent money supply M1 and one- month lagged M2. The findings for M1 and M2 suggest a dual effect. This duality suggest that money supply on one hand has a positive liquidity effect and on the other hand has negative effect due to raised expectations for counter cyclical policy by the federal reserve. He also finds that negative relation between stock returns and inflation even when money supply changes are included in the returns - generating equations.

James et al. (1985) employed a vector Auto - regressive moving average (VARMA) to identify and examine simultaneously the causal relationship among stock returns, real activity, the money supply and inflation. He argues that AVARMA model provides an unbiased test of Granger causality and also can detect feedback relationships between series being analyzed. Kaul and Seyhuan (1990) offered another version of the proxy effect hypothesis. They argue that the negative stock returns - inflation is a combined affect of a negative relationship between inflation variability and stock returns and a positive relationship between inflation variability and inflation rate. Lee (1998) examined the two versions of Fama's proxy - effect hypothesis in South Korea, Hong Kong, Taiwan, and Singapore. He extracts estimates for expected inflation, expected real stock returns and expected real economic activity from the fitted ARIMA models by employed the Box - Jenkins Method. On the other hand the estimates of inflation variability are obtained from the GARCH procedure. He finds that negative and statistically significant relationship between stock returns and inflation rate still persist for these four Pacific Basic Countries even after the effects of expected economic activity and inflation variability have been explicitly incorporated. Other researches such as Gultekin (1983a) and Gatrath (1997) also examine the relationship between stock returns and inflationary trends. they argue that using an ordinary least squares (OLS) with the White (1980), hetroscedasticity-consistent and the White and Domowitz (1984) autocorrelation – consistent covariance matrix technique is to compare and contrast his results with that of previous studies. His finding from the hetroscedasticty and autocorrelation corrected models provided similar evidence to that of developed economies.

This objective of this paper is to examine the relationship between stock returns and inflationary trends in Malaysian equity market. Such an examination is important in at least two respects. First, the consistent empirical rejection of the GFH for the equity market returns of several developed markets motivates the analysis of this hypothesis for emerging markets. Second, there is a growing need to address the question as to whether the Malaysian equity market provides an effective hedge against inflation. The Malaysian economy has recently witnessed an increasing openness to foreign investment. In doing so, there are several measures that have been adopted to attract a great deal of attention from developed economies such as Europe and US. While the performance of Malaysian equity market has been spectacular, there may be concerns regarding inflation.

2-Theoretical Underpinnings

Beside the traditional view that common stock represent claim on real asset and therefore should be an effective hedge against inflationary pressure, the availability of effective hedging mechanism for financial returns against inflation is of great importance for investors. Because increase in general price level erodes the purchasing power of the promised nominal cash flows unless these cash flows can be adjusted to the expected changes in the price level. This hedging mechanism is indicated either by positive or independent relationship between stock return and inflation. The well-known Fisher hypothesis has explained the independence and positive relationship between stock returns and inflation. Using the data set on most of the developed and emerging markets suggests several stories. Some studies find a negative relation between contemporaneous stock returns and inflation changes. Still others suggest that the relation between stocks and inflation masks a more fundamental relation between stock returns, real productivity, and money supply. Disagreements exist with regard to the proper models and measuring techniques. Earlier studies distinguished between expected and unexpected inflation. Some used proxies such as Treasury bill rates (Fama, 1981) and forecasts of inflation from the Livingston surveys for expected inflation (Pearce1984; Hasbrouk, 1984).

For unanticipated Inflation they get it by separating the actual inflation from the anticipated inflation, (Gultekin, 1983 a, b) and (Solnic, 1983).

3-The Fisher Effect Hypothesis

Many years ago, Irving Fisher expressed the nominal rate of interest on a bond as the sum of the real rate of interest and expected inflation (the rate of price change expected to occur over the life of instrument), more formally the nominal rate r is: -

$$1 + r = (1 + R)(1 + \alpha)$$

$$r = R + \alpha + R\alpha$$

Where R is the real rate, α is the rate of inflation per annum expected to prevail over the live of instrument. Where inflation is only moderate, the cross-product term, Rα, is small and is usually ignored in the equation. As a consequence, we have

$$r = R + \alpha$$

Traditionally, this equation is known as a Fisher effect which states that, lenders require a nominal rate of interest sufficiently high for them to earn an expected real rate of interest. In turn, the real rate required is a function of productive returns on real assets in our society plus a risk premium commensurate with risk of the borrower. The Fisher effect implies that if expected inflation rises by one percent, the nominal interest rate will rise by one percent as well. In other words, the effect is one-to-one. If r and α are the nominal rate and the expected inflation rate now, and ŕ and ά are those that prevail after a change in expected inflation, the Fisher effect suggests that ŕ – r = ά – α

According to this expression, the nominal rate of interest fully adjusts to changes in expected inflation; that is, the relationship of changes in nominal interest rates to changes in expected inflation is one-to-one. Put another way, he suggests that the nominal interest rate fully reflects the available information about the future values of the inflation rate, which in turn implies that the real rate of interest and inflation are largely independent of one another. On the basis

of this idea, he further argues that real returns are determined by real factors such as time preferences of the investor and the productivity of capital, which are independent of nominal variables such as money supply and inflation. This proposition whish is called the Fisher hypothesis can be generalized to all assets traded in efficient markets, such as stocks. Therefore the real rates of return on common stocks and expected inflation rates are independent and that nominal stock returns vary in one-to-one correspondence with expected inflation. Fisher proposition was rooted from his separation theorem that believes in the dichotomy of the real and monetary sectors of the economy, Copeland and Weston (1998).

4-Methodology

In achieving the objective of this paper, perhaps the most important implication of the model concerns the fundamental nature of the relation between real stock returns and inflation. For this purpose, this paper follows previous works on the assumption that the rate of return on stocks is the dependent variable, which responds to variations in the expected and unexpected components of inflation.

Stock Return and Inflationary Trend

Based on Graham's (1996) and Chatrath et al's. (1997) study, Fisher hypothesis for stock returns can be expressed into the joint hypothesis: (1) stock markets are efficient and (2) real stock returns in the market and the expected inflation rate vary independently of each other. In the Graham's and Chatrath's framework, the GFH may be tested in the form,

$$SR_t - INF_t = \beta_0 + \beta_1 (INF_t) + \varepsilon_t \qquad (1)$$

Where SR_t and INF_T are the nominal stock returns and the actual contemporaneous rate of inflation over period t, respectively. The difference between $SR_t - INF_t$ represents real (or inflation adjusted) returns and ε_t is the error random term. However, financial assets such stocks and bonds constitute claims to real assets, and traditionally have been considered to possess the ability to hedge against expected and unexpected inflation as well. Thus, it is common practice to extend the relationship in equation (1) by decomposing the inflation rate as in equations (2) and (3), following Kaul (1987), Chatrath et al. (1997), Gultekin (1983a and 1983b), Leonard and Solt (1986), Solnik (1983), and Wahlroos and Berglund (1986).

$$R_t - INF_t = \beta_0 + \beta_2 E(NF_t | \Phi_{t\_1}) + \theta_t \qquad (2)$$

Where $E(INF_t)$ denotes the expected inflation rate at the time t, E represents the mathematical expectation operator and Φ_{t-1} is the information set available to investors at the end of period t-1.

$$SR_t - INF_t = \beta_0 + \beta_2 E(INF_t / \Phi_{t-1}) + \beta_3 (INF_t - E(INF_t / \Phi_{t-1})) + \varepsilon_t \quad (3)$$

Equation (3) can be simplified to the following model:

$$SR_t - INF_t = \beta_0 + \beta_2 E(INF_t / \Phi_{t-1}) + \beta_3 UE(INF_t) + \varepsilon_t \qquad (4)$$

Where the unexpected inflation rate which is represented by $UE(INF_t)$ is defined as the difference between actual inflation rate and expected rates of inflation, $(INF_t - E(INF_t / \Phi_{t-1}))$. For the first two equations (1) and (2), the β_1 and β_2 coefficients equal to zero will be consistent with Fisher hypothesis, which states that real rates of returns on common stocks are independent of inflation rates. In other words, it implies that the stock markets provide hedge against inflation and expected inflation respectively. Meanwhile, the $\beta_2 = \beta_3 = 0$ in the equation (3) or (4) mean the financial asset in question is a perfect hedge against both expected and unexpected inflation.

5-Empirical analysis

The empirical analysis is carried out using quarterly times data for stock prices measured by the Kuala Lumpur Stock Exchange (KLSE) Composite Index (1980=100), prices(P) defined by the consumer price index (1980=100), and income (y) measured by Industrial Production index (1980=100). The period investigated with quarterly data is 1987 to 2006:1. All variables were in natural logarithm and obtained from Bloomberg for stock price. CPI and IPI were obtained from various issues of international financial statistics year book (IFS) of the International Monetary Fund.

Appropriate tests have been developed by Dickey and Fuller (1981) to test where a time series has a unit root. The results, reported in table 1, which shows that the null hypothesis of a first-order non-stationary process is rejected at the 5 percent level for all five variables (i.e. real returns, inflation rate, expected inflation, unexpected inflation, and real activity). Therefore, it could be concluded that all the five variables are said to be integrated of a zero order I (o) i.e. are stationary process on the level. To obtain expected and unexpected components of inflation (INF_T) an autoregressive moving average $ARIMA\ (p,d,q)$ model suggested by Box and Jenkins (1976) is implemented.

Table (1) ADF Unit Root Tests with Intercept and a linear trend

Level		Variables
τ	μ	
-5.9545**	-5.8377**	RR
-5.7156**	-5.6417**	AINF
-6.3310**	-6.2698**	EINF

-5.8571**	-5.7607**	UINF

Notes: (*) and (**) denotes significant levels at 1% and 5% respectively (Mackinnon, 1996). The null hypothesis of unit root tests is that the series contains unit root (non-stationary) against the alternative hypothesis of no unit root (stationary). μ is the model with constants, and τ is the model with constants and linear trend. RR is real stock return. AINF is inflation rate. EINF and UINF are expected and unexpected inflation forecast by constructing ARINA (p d q) models.

However, there is a test that takes into consideration their magnitudes as group (The Ljung –Box statistic) and later modified Box – pierce statistic. Box – Pierce Q – statistic was computed for inflation series. Since the inflation series is integrated of a zero order I (0), we consider only $ARMA\ (p,q)$ process rather that $ARIMA\ (p,d,q)$. Then, the second step is to determine the tentative model. In determining the best model it is important to find the order of both auto-regression $AR(p)$ and moving average $MA(q)$ and compute BOX Pierce Q statistic. There are at least three valid criteria to decide whether the model is correctly specifying the INF_T series. First, insignificancy of modified Box _Pierce Q statistic indicates that the residuals from these models are awhile noise. Secondly, the model should be parsimonious in its simplest form. Finally, the values of skewness and kurtosis which explain the normal distribution of choosing model should be around 0 and 3. Based on the first and second criteria an ARMA (1.1) is found to be the tentative model in specifying the INF_T series in Malaysia. The fitted observations and the forecast error terms from the ARMA model are proxies for $E\ (INF_T)$ and $U\ (INF_T)$, respectively. As is indicated by the results in table 1, the two decomposed inflation series are found to be stationary in the level. Table 2 reports results from constructing $ARIMA\ (p,d,q)$ models.

The result of table 2 shows that the null hypothesis of a first-order non-stationary process is rejected at the 5 percent level for all five variables (i.e. real returns, inflation rate, expected inflation, unexpected inflation, and real activity). Therefore, it could be concluded that all the five variables are said to be integrated of a zero order I (o) i.e. are stationary process on the level. Table 3 reports the results for the objective of the study that is to test the real stock returns – inflationary trends. Hence, testing generalized Fisher hypothesis that real stock returns are independent of inflationary trends. Table (3) Panel A shows that most of the diagnostic statistics

associated with three regressions above are satisfactory. The exception is the Jarque-Bera statistic for normality. As we know this test is very useful for picking up ‘outliers’ i.e. observations with large residuals. To get ride of this problem in the absence of any reason of why this should be so, Tomas (1997) argues that we must either live with it or, somewhat arbitrarily, include dummy variable(s) to allow for these absrevations. In order to be consistent with our models, the second criterion should be taken for this study hence (Panel B) below report the test results with Dummy variables.

Table (2) modified Box – Pierce statistics associated with P-value

P-value	Q	log	P-value	Q	Log	P- value	Q	Log
.812	31.11	41	.889	12.72	22	.091	2.86	3
.799	32.38	42	.908	13.03	23	.230	2.94	4
.829	32.40	43	.855	15.17	24	.308	3.60	5
.811	33.83	44	.815	16.89	25	.455	3.65	6
.824	34.35	45	.737	19.28	26	.596	3.68	7
.849	34.44	46	.704	20.79	27	.719	3.69	8
.872	34.49	47	.744	20.96	28	.809	3.74	9
.860	35.82	48	.788	20.97	29	.879	3.75	10
.883	35.82	49	.824	21.04	30	.921	3.85	11
.892	36.30	50	.857	21.05	31	.953	3.87	12
.911	36.30	51	.886	21.05	32	.959	4.35	13
.924	36.45	52		21.05	33	.966	4.76	14
.923	37.39	53		21.05	34	.965	5.42	15
.935	37.47	54		21.20	35	.939	6.88	16
.933	38.51	55		21.77	36	.961	6.88	17
.944	38.61	56		21.77	37	.945	8.14	18
.953	38.71	57		21.85	38	.921	9.56	19
.961	38.78	58		25.98	39	.893	11.03	20
.969	38.83	59		29.58	40	.874	12.26	21
.974	38.92	60						

Skewness 6.01522, Kurtosis 47.91660

In all equations 1, 2 and 3 the coefficients are statistically insignificant. The hypotheses that the inflationary trends variables (actual, expected and unexpected) have no effect on the stock market were tested using t-test for models 1 and 2 and F-Test for model 3. The tests are reported in the lower half of table 3. The hypothesis that the coefficients on actual and expected inflation are equal to zero for models 1 and 2 clearly cannot be rejected. In addition to that the hypothesis that the coefficients on expected and unexpected components of inflations are jointly equal to zero also clearly cannot be rejected. It indicates that actual inflation and both components do not affect stock returns on the Kuala Lumpur Stock Exchange (KLSE), which implies that real returns are independent of inflationary trends. Thus, the results show strong supports for generalized Fisher hypothesis. Moreover, the results suggest that Malaysia equity market is an effective hedge against erosion of purchasing power due to increase in the price level. These results are also supported by the low coefficient of determination (R^2). The Durbin Watson $D-W$ test in table 3 (panel B) shows that the null hypothesis of no (positive or negative) autocorrelation among the disturbance terms cannot be rejected at 5 percent level significance. The results clearly indicate the independence of real returns and inflationary trends (i.e. actual inflation, expected and unexpected

component of inflation) for Malaysia. Therefore, we can conclude that, the data at hand have strongly supported generalized Fisher hypothesis.

Table 3(A) Test results of generalized Fisher hypothesis: without dummy

$D-W$	R^2	β_7	β_6	β_5	β_4	β_3	β_2	β_1	β_0	
1.97	0.0054	-	-	-	-	-	- 0.8202		0.00164	1
1.97	0.0031	-	-	-	-	-	5.969	-	-0.0421	2
1.94	0.0230	-	-	-	-	1.513	5.813	-	-0.0406	3

Notes: Newey–West standard errors in parentheses, p-values in brackets.*Denotes statistical significance at 1% level. ** Significance at the 5% level. *** Significance at the 10% level.

Table 3(B) Test results of generalized Fisher hypothesis: with dummy

$D-W$	R^2	β_7	β_6	β_5	β_4	β_3	β_2	β_1	β_0	
1.74	0.35	0.485*	-	-0.4796*	-0.572*	-	-	0.6318	0.0215	1
1.50	0.33	-	**0.330** **(-2.54)**	-0.4875* (-3.744)	-0.573* (-4.74)	-	3.678 (0.3699)	-	-0.0037 (-0.038)	2
1.67	0.30	-	-	-0.4821* (-3.605)	-0.566* (-4.24)	1.436 (1.422)	4.159 (.407)	-	-0.0123 (-0.1246)	3

Notes: Newey–West standard errors in parentheses, p-values in brackets.*Denotes statistical significance at 1% level. ** Significance at the 5% level. *** Significance at the 10% level.

6-Conclusions

The effectiveness of common stocks as an inflation hedges to which they can be used to reduce the risk of an investors real return stems from uncertainty about the future price level has been widely documented for developed economies. Belief in GFH to return on stocks has suffered

considerable erosion in recent years. The well-documented negative relationship between real return and inflationary trends in developed markets has been established. This paper investigated the GFH in Malaysian equity market. Ordinary least square (OLS) with White (1980) hetrocidasticity-consistent and White (1984) autocorrelation-consistent covariance matrix is implemented. Our empirical results reveal that the real stock returns generally are found to be independent of inflationary trends. The acceptance of this hypothesis implies that common stock which reflects claim on real financial assets is an effective hedge against inflationary pressure.

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أسعار الأسهم والتضخم في البورصة الماليزية

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المستخلص

العلاقة السالبة بين العائد الحقيقي ومعدلات التضخم في الأسواق المتقدمة وثق لها على نطاق واسع في أوربا والولايات المتحدة الأمريكية . الورقة المقدمة اختبرت هذه العلاقة على ضوء فرضية "فيشر" وتعميمها على أسواق الأسهم بماليزيا . استخدمت الدراسة المقدمة معلومات ربع سنوية لمدة ٢٠ عاماً ، للفترة من الربع الأول ١٩٨٧م إلى الربع الأول ٢٠٠٦م . النتائج المتحصلة من الدراسة من خلال استخدام نموذج ARIMA وطريقة المربعات الصغرى المعدلة ، دعمت فرضية "فيشر" وأشارت إلى أن الأسهم الجماعية توفر سياج حماية فاعل ضد التضخم بأنواعه المختلفة في البورصة الماليزية .

Short Bio.

Dr. Elgilani Eltahir Elsharief received his M. Sc and PhD degrees in Finance from Universiti Putra Malaysia, he is working at Colleage of Business Studies , Sudan University of Science and Technology.

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