THE RELATIONSHIP BETWEEN STOCK RETURNS AND INFLATION: EVIDENCE FROM MALAYSIA AND INDONESIA

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ABSTRACT

This study explores the relationship between real stock returns and inflationary trends in the Malaysian and the Indonesian economies. It attempts to test for the relationship between real stock return and inflation in light of Fisher hypothesis that asserts the independence of real stock return and inflation and Fama's (1981) proxy effect framework which states that the negative real stock returns-inflation is indirectly explained by a negative real economic activity-inflation and a positive real stock returns-real economic activity relationships. The findings show that real stock returns are independent of inflationary trends in the Malaysian economy in accordance with the Fisher hypothesis, which implies that the Malaysian stock market is a good hedge against inflation. On the other hand, a negative relationship between real stock returns and inflationary trends is found in the case of Indonesia. However, the Fama's proxy hypothesis was found unable to explain in its entirety the negative relationship between real stock returns and inflation for the Indonesian case. In this context, a positive relationship between real economic activity and inflation and a negative relationship between real stock returns and real economic activity were recoeded, which is consistent with the Mundell-Tobin hypothesis.

INTRODUCTION

The question of stocks being a better hedge against inflation has been widely researched and documented.[1] The view that stocks retain real value regardless of inflation rate fluctuations is consistent with classical investment theories found in Day (1984) and Marshall (1992). However,

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[1] *A hedge investment is one that contains two or more components. As the market conditions change, the change in the value of one of these parts at least partially offsets the change in the other component; if the change in the two positions offsets each other exactly, it is a perfect hedge. For example buying a stock and selling short the same stock would create a perfect hedge because as the stock rises in value, the increase in the long position would be exactly offset by a fall in value of the short position (French, 1989, pp. 419).*

recent empirical studies in the developed countries have shown that expected inflation, unexpected inflation and changes in expected inflation were all negatively related to stock returns which appear contrary both to economic theory and common sense.[2]

According to the Fisher hypothesis, real stock returns are independent of inflationary expectations. This implies that nominal asset returns should be positively related to both expected and unexpected inflation. The Philips curve shows that a negative relationship between unemployment rate and the rate of inflation implies a positive association between inflation and real economic activity. Therefore, stock returns that were positively correlated with real economic activity, in turn, are expected to show positive association with inflation. The positive relation between stock returns and unexpected inflation suggest that common stocks are good hedges against unexpected inflation.

There are a number of theories to explain the negative real stock returns-inflation relationship. For example, Chatrath et al. (1997) have adopted Fama's (1981) model to explain the above relationship through a hypothesized chain of macroeconomic linkages that have their basis in the money-demand theory and the quantity theory of money. Geske and Roll (1983), Marshall (1992), Graham (1996), and Kaul (1987 and 1990) have investigated the role of the monetary sector in order to explain this perplexing negative relationship between stock returns and inflation. They found the relationship to vary over time in a systematic manner depending on the influence of money demand and supply factors. Hamburger and Zwick (1981) considered both monetary and fiscal policies.

Generally, research results have shown a negative real stock return-inflation relationship, implying the stock market is not a good hedge against inflation. However, Ram and Spencer (1983) adopt the Mundell-Tobin hypothesis as an alternative to Fama's proxy hypothesis in delineating the negative relationship between real stock returns and inflation. This study finds evidence that is simply the reverse of Fama's Proxy hypothesis. In Mundell-Tobin hypothesis, an increase in the expected rate of inflation causes portfolio substitutions from money to financial assets, which will reduce the real returns on such assets (for example, stocks). This reduction in real interest will stimulate real economic activity. Therefore, according to Mundell's hypothesis, *one would expect a positive relationship between inflation and economic activity and a negative relationship between real stock returns and*

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[2] *Among the studies on the developed countries includes Fama (1981; 1983; and 1990), Fama and Gibbons (1982), Geske and Roll (1983), Gultekin (1983a and 1983b), Kaul (1987 and 1990), Solnik (1973 and 1983), Boeckh and Coghlan (1982) and Malkiel, (1982).*

economic activity. [3]

Modigliani and Cohn (1982a) use the theory of rational valuation to explain the negative relationship between real stock returns and inflation. This theory contends that the low value of stocks during periods of high inflation resulted from the failure of investors to adjust corporate profits for the inflation premium components of interest expense (which they argue represents a return of capital rather than an expense) and from the capitalization of corporate profits at the nominal rate (rather than the theoretically correct real rate) of interest.

Wahlroos and Berglund (1986) also find a significant negative relationship when stock returns were regressed on the rate of inflation. Bulmash (1991) says that this negative stock returns-inflation relationship is indicated by the negative sloping curve where the steepness of the slope depends on the magnitude of money supply changes.

Day (1984) explained the relationship between real stock returns and inflation by using a multi-period economy with production. He finds that the expected real returns-expected inflation relationship depends on the form of the economy's production function and investor preferences. When the production function exhibits stochastic constant returns to scale, the negative relation between expected real returns and expected inflation is documented. Furthermore, Bulmash (1991) adopts the quantity of money equation: MV = PY to explain stock returns-inflation relationship.[4] He argues that if M (nominal money growth) does not accommodate changes in Y (output) as proxy of real economic activity, P (price) will go up because changes in nominal money supply signal changes in inflation, then Y will have to go down, thereby negatively affecting stock price.

This paper probes the following issues:

(i) The behavior of the Malaysian and the Indonesian stock markets whether they coincide with the findings in developed countries?

(ii) Are the Malaysian and the Indonesian stock markets in line with the Fisher hypothesis?

(iii) Are the stock markets of these countries a good hedge against inflation?

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[3] *Ram and Spencer. 1983. Stock Returns, Real Activity, Inflation, and Money: Comment. American Economic Review. 73: pp. 463.*

[4] *There are many explanations on this theory, for example, see Froyen, R. T. (1996). We find that under the condition assumed the price level varies: (1) directly as the quantity of money (M), (2) directly as the velocity of its circulation (V), and (3) inversely as the volume of trade done by it (T). The first of these relations it worth emphasis. It constitutes the Quantity Theory of Money.*

(iv) Does the Fama's proxy hypothesis explain the real stock returns-inflation relationship for these markets?

To answer the above questions, the paper does the following:

(1) Examine the relationship between real stock returns and inflationary trends both in the Malaysian and the Indonesian stock markets, thereby testing the generalized Fisher hypothesis that real stock returns are independent of inflationary expectations

(2) Test the Fama's Proxy hypothesis, which states that negative real stock returns-inflation relationship is indirectly explained by a negative inflation-real activity relationship and a positive real activity-stock returns relationship.

The findings of this paper are expected to have important consequences to policymakers, international fund managers and other institutional investors who seek to diversify into the Malaysian and the Indonesian stock markets.

The rest of this present paper is organized as follows: In the next section, we discuss the hypotheses, methodology and data, followed by results and conclusions.

STATEMENT OF THE HYPOTHESES

The study expects changes in inflation rates to have a significant negative relation on the stock returns, thereby contradicting the Fisher hypothesis. In other words, in line with the findings in other developed countries, we expect β_1 in equation (3. 1), β_2 and β_3 in equation (3. 2), (3. 3a), and (3. 3b) respectively to be negative and statistically different from zero. The negative stock returns-inflation relation is expected to be strong enough to be explained by the Fama's proxy hypothesis.

METHODOLOGY AND DATA

Testing Fisher Hypothesis

In this study, we divide inflation into three types: actual, expected, and unexpected inflation. Therefore, three econometric models are formulated to test the real stock return relationship to each type of inflation. The first model is between stock returns and actual inflation as in Graham's (1996), Chatrath et al's. (1997):

$$SR_t - INF_t = \beta_0 + \beta_1(INF_t) + \varepsilon_t \quad \text{.....(3. 1)}$$

Where SR_t and INF_t are the nominal stock returns and the actual/contemporaneous rate of inflation over period **t**, respectively. The difference, $SR_t - INF_t$ represents real (or inflation adjusted) returns and ε_t is the error random term.

The second model is between stock returns and expected inflation as in Kaul (1987), Chatrath et al. (1997), Gultekin (1983a and 1983b), Leonard and Solt (1986), Solnik (1983), and Wahlroos and Berglund (1986). The model is as follows:

$$SR_t - INF_t = \beta_0 + \beta_2 E(INF_t \mid \phi_{t-1}) + \varepsilon_t \quad \text{.....(3. 2)}$$

Where $E(INF_t)$ denotes the expected inflation rate at the time **t** and ϕ_{t-1} is the information set available to investors at the end of period **t-1.**

The third model presents tests of the relationship between stock return and both expected and unexpected inflation, as in Gultekin (1983a and 1983b), Geske and Roll (1983), Solnik (1983), Wahlroos and Berglund (1986), Chatrath et al. (1997), and Leonard and Solt (1986):

$$SR_t - INF_t = \beta_0 + \beta_2 E(INF_t \mid \phi_{t-1}) + \beta_3 \{INF_t - E(INF_t \mid \phi_{t-1})\} + \varepsilon_t \quad \text{....(3. 3a)}$$

However, model (3.3a) may be simplified as follows:

$$SR_t - INF_t = \beta_0 + \beta_2 E(INF_t \mid \phi_{t-1}) + \beta_3 UE(INF_t) + \varepsilon_t \quad \text{..... (3. 3b)}$$

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, $\{INF_t - E(INF_t \mid \phi_{t-1})\}$.

For the first two equations (3. 1) and (3. 2), the β_1 and β_2 coefficients equal to zero will be consistent with Fisher hypothesis, which states that real rate of returns on common stocks are independent of inflation rates implying that the stock market is a perfect hedge against inflation and expected inflation respectively. Meanwhile, the $\beta_2 = \beta_3 = 0$ in the equation (3. 3a) or (3. 3b) mean the asset in question is a perfect hedge against both expected and unexpected inflation.

Testing Fama's Proxy Hypothesis

As mentioned earlier, the Fama's proxy hypothesis says that the negative relationship between stock returns and inflation centers around the linkages between inflation and real activity, and between stock returns and real activity. The first proposition of Fama's proxy hypothesis—there is a negative relationship between inflation and real economic activity and the second proposition of Fama's proxy hypothesis—there is a positive association between real activity and stock returns can be individually tested by the following models:

$$INF_t = \alpha_0 + \sum_{i=-k}^{k} \alpha_i REA_{t+i} + \varepsilon_t \quad \text{(3. 4a)}$$

$$E(INF_t) = \alpha_0 + \sum_{i=-k}^{k} \alpha_i REA_{t+i} + \varepsilon_t \quad \text{(3. 4b)}$$

$$UE(INF_t) = \alpha_0 + \sum_{i=-k}^{k} \alpha_i REA_{t+i} + \varepsilon_t \quad \text{(3. 4c)}$$

$$SR_t - INF_t = \delta_0 + \sum_{i=-k}^{k} \delta_i REA_{t+i} + v_t \quad \text{(3. 5)}$$

Where REA_t is real economic activity that is proxied by the Growth in Industrial Production (GIP) and real Gross Domestic Product (GDP) for the Malaysian and the Indonesian economy respectively, while v_t represents the error random term. However, leading, contemporaneous, and lagging values of real economic activity are incorporated in the model.

In line with Chatrath et al. (1997), in models (3. 4a), (3. 4b), (3. 4c), and (3. 5) we incorporate both leads and lags of real economic activity due to lack of prior evidence pertaining to the relationship of real economic activity with inflation and real returns in the Malaysian and the Indonesian stock markets. Equations (3. 4a), (3. 4b), and (3. 4c) test the Fama's proposition (1). The negative relationship between inflation and real economic activity implies that some α_i's are significantly negative. Equation (3. 5) tests for Fama's proposition (2), where a positive relationship between real economic activity and real stock return implies that some δ_i's are significantly positive.

THE DATA

Fifteen years of quarterly changes in Consumer Price Index (CPI) are used as proxy for inflation and the Gross Domestic Product (GDP) is used as proxy for real economic activity for Indonesia .[5] Due to lack of similar data on the Malaysian economy, Growth in Industrial Production (GIP) is used as proxy for real economic activity in the case of Malaysia [6]. The data for Malaysian stock returns are calculated from the Kuala Lumpur Stock Exchange (KLSE) Composite Index whereas the Indonesian stock returns are computed from Jakarta Stock Exchange (JSX) Composite Index. [7] The quarterly non-seasonally adjusted data for the fifteen-year period from 1983: Q3 to 1998: Q2 are analyzed.

The stock returns are expressed as a percentage earned on a company's common stock investment for a given period and as a profitability ratio measuring how well equity capital is employed (Fitch et al. 1993). Nominal stock return is computed as follows:

$$SR_t = \text{Log}\{(V_t)/(V_{t-1})\} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3.9)$$

Where V_t is the index value of stock at the end of quarter t and V_{t-1} is the index value of stock for previous quarter-end, *t - 1*.

EXPECTED AND UNEXPECTED INFLATION FORECASTS. [8]

In the developed countries, researchers generally use the Treasury Bill rate as a proxy for expected and unexpected inflation. This could be acceptable because the inflation rates in those countries are relatively constant almost all the time. However, in emerging markets like Malaysia and Indonesia the inflation rates are relatively not constant. Similar to Fama and Gibbons (1982), Leonard and Solt (1986), Kaul (1990) and chatrath et al. (1997), we use *Auto-Regressive Integrated Moving Average* (ARIMA) model to estimate expected inflation; and the forecast errors as the unexpected component

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[5] *The data for the study are compiled from Datastream, Bank Negara Malaysia Quarterly Bulletin, and Statistical Bulletin of the Central Bureau of Statistics, the Republic of Indonesia.*

[6] *This index refers to the production of 64 industries selected from 23 major groups, covering 433 commodities (Bank Negara Malaysia: Monthly Statistical Bulletin, June 1998).*

[7] *The Kuala Lumpur Composite Index (KLCI) is a value weighted index that encompasses 100 stocks listed on Kuala Lumpur Stock Exchange (KLSE) until June 1998, whereas the Jakarta Composite Index (JCI) is an equally weighted index that covers 254 stocks listed on the Jakarta Stock Exchange (JSX).*

[8] *Interested readers may consult the Fama and Gibbons (1984) and Leonard and Solt (1986) for details on the different forecasting methods of inflation.*

of inflation.[9] Another reason for using ARIMA model in this study is that this particular model can detect large variability of inflation rates, therefore it can achieve a greater predictability of the realized inflation rate (Solnik, 1983).

EMPIRICAL RESULTS

The Test for Stationarity

In order to obtain credible and robust results for any conventional regression analysis, the data to be analyzed should be stationary (Pankratz, 1983; Harvey, 1990; Gujarati, 1995). Table 1 shows the Dickey-Fuller (DF) test statistics that test for the presence of unit root test (non-stationarity) for all time series data, which are analyzed in this study. In the test the null-hypothesis is $\delta = 0$, i.e. unit root exists. Failure to reject the null-hypothesis indicates no statistical evidence for stationary, while rejecting the null-hypothesis (accepting the alternative hypothesis) implies evidence for stationary.

Table 1 below shows that the inflation rate for both Malaysia (INFM) and Indonesia (INFI) are stationary in the log level either with constant and no trend regression model or with constant and trend regression model. However, in the log level, the KLCI is stationary for the regression model with constant and no trend, but however the regression model with constant and trend is non-stationary. Therefore, to achieve stationary for KLCI data in both models, the first differences are taken.

The stock return for Indonesia (JCI), the real economic activity for Malaysia (REAM), and the real economic activity for Indonesia (REAI) are all non-stationary in the log level. Nevertheless, stationary is achieved through the first difference for both models.

ARIMA MODELS FOR EXPECTED AND UNEXPECTED INFLATION FORECASTS

As for the ARIMA models, we begin with the identification stage, i.e. identify the exact order of Auto-Regressive (AR) (p), Integrated (I) (d), and order of Moving Average (MA) (q).

The unit-root test results (Table 1) imply that the rate of inflation for both Malaysia and Indonesia are stationary at the log level, therefore the order of Integration is zero, I (0). In other words, for these we do not need to differentiate them again in order to arrive at stationary. Since the inflation series both for Malaysia and Indonesia are stationary, only the Auto-Regressive Moving Average (ARMA) (p, q) is

[9] *Otherwise known as Box-Jenkins (B-J), the ARIMA models owe their popularity to their tremendous success in forecasting time series. For example, Gujarati (1995) and Pankratz (1983) found that, in many cases, the forecasts obtained by this model are more reliable than those obtained from the conventional econometric modeling, particularly for short-term forecasts.*

implemented. After identifying the I (0), we determine the order of both Auto-Regressive (AR) and Moving Average (MA).

Through a diagnostic process, an ARMA (0, 7)[10] is found to be the best model in specifying expected and unexpected inflation for Malaysia. For Indonesia, on the other hand, the ARMA (5, 1)[11] is identified to best specify the inflation series. The goodness of these chosen ARMA models is shown by Modified Box-Pierce chi-square statistics where all residual from this model are insignificant. This indicates that the residuals from the chosen model are white noise.

Table 1: Dickey-Fuller Unit-Root Test

Variables	Log Level		First Differences	
	Constant and No Trend	Constant and Trend	Constant and No Trend	Constant and Trend
INFM	-2. 7773***	-4. 8482***	-	-
INFI	-4. 4222***	-4. 3708***	-	-
KLCI	-2. 8488***	-2. 7065	-3. 8944***	-4. 1780***
JCI	-2. 2914	-2. 2827	-3. 3160***	-3. 5138***
REAM	-1. 9573	-1. 1139	-6. 2535***	-6. 1601***
REAI	0. 9102	1. 9389	-3. 2577***	-3. 5317***

Note:

INFM and INFI are the rates of inflation for Malaysia and Indonesia computed, respectively from Consumer Price Index of Malaysia and Indonesia by log ($CPIM/CPIM_{t-1}$) and log ($CPII/CPII_{t-1}$). The Kuala Lumpur Composite Index (KLCI) and Jakarta Composite Index are used as proxy for stock returns for Malaysia and Indonesia, which are calculated by log ($KLCI/KLCI_{t-1}$) and log (JCI/JCI_{t-1}). Finally, REAM or log (IPI/IPI_{t-1}) and REAI or log (GDP/GDP_{t-1}) are the Industrial Production Index and Gross Domestic Product that are used as a proxies for the real economic activities for Malaysia and Indonesia, respectively.

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[10] *The ARMA (1, 7), ARMA (3, 7) are also found as fit models, which are indicated by the insignificance of their Box-Pierce chi-square statistics. This indicates that the residuals from the alternative models are also white noise. However, their R^2, Skewness and Kurtosis values are 0.2513, 1.00755 and 5.36855 for the former, and 0.3061, 1.22614 and 6.82950 for the latter. Based on the parsimony criteria, therefore, the ARMA (0, 7) is the best-fit model. Even though, the models are not as parsimony as Ibrahim's (1999c) ARMA (2, 2) model, however, based on the criteria explained earlier, our models are good and fit enough.*

[11] *Box-Pierce chi-square statistics are also computed for ARMA (1, 5), ARMA (2, 1), ARMA (2, 2), ARMA (2, 3), ARMA (3, 1), ARMA (3, 4), ARMA (4, 4), ARMA (5, 3), and ARMA (5, 3). Even though, their Skewness and Kurtosis values are around 0 and 3, but all these alternative models are not white noises because some of Box-Pierce chi-square statistics are found significant.*

*** represents significance at the 10% level.

The Dickey-Fuller test statistics for regression models with constant and no trend and with constant and trend are as follows:

$$\Delta\gamma_t = \delta_0 + \delta_1\gamma_{t-1} + \sum_{j=1}^{n} \tau_j \Delta\gamma_{t-j} + \nu_t$$

$$\Delta\gamma_t = \delta_0 + \delta_1\gamma_{t-1} + \delta_2 T + \sum_{j=1}^{n} \tau_j \Delta\gamma_{t-j} + \nu_t$$

In a Shazam's output. the optimal lag order is automatically set (Shazam: Users' Reference Manual, 1997).

The other criteria for the fitness of a model are indicated by the computed values of Skewness and Kurtosis. The values for these should be around 0 and 3 for normal distribution of the chosen model.[12] If we look at these criteria, our results are not much departing from the normal or ideal values of 0 and 3. For ARMA (0, 7), the computed values of Skewness and Kurtosis are 0.9704 and 5.4504, whereas for ARMA (5, 1), the computed values of Skewness and Kurtosis are 0.3216 and 4.6233. Finally, based on normality test of Jarque-Bera (J-B) test, we find the J-B values of 28.0391 and 7.9806 for ARMA (0, 7) and ARMA (5, 1), respectively, which asymptotically do not reject the normality assumption for our ARMA models.

Having identified the appropriate *p*, *d* and *q* values, estimation and forecasting steps are performed.

[12] *Gujarati, D. N. 1995. Basic Econometrics. 3rd Edition. New York: McGraw-Hill, Inc, pp. 773.*

Table 2: ARMA Models for Expected Inflation

Parameters	Expected Inflation For Malaysia	Expected Inflation For Indonesia
AR (1)	-	0. 62186* (4. 732)
AR (2)	-	-0. 37192** (-2. 408)
AR (3)	-	-0. 14992 (-0. 9334)
AR (4)	-	-0. 12087 (-0. 7847)
AR (5)	-	-0. 25141** (-1. 926)
MA (1)	-0. 14231 (-1. 027)	0. 96824* (49. 11)
MA (2)	-0. 31463* (-2. 640)	-
MA (3)	-0. 21840*** (-1.707)	-
MA (4)	-0. 47687* (-4. 718)	-
MA (5)	-0. 23637** (-2. 150)	-
MA (6)	-0. 53808* (-4. 909)	-
MA (7)	0. 18355*** (1. 369)	-
Constant	0. 00946* (3. 423)	0. 03135* (5. 007)
R^2	0. 2365	0. 4768
Skewness	0. 9704	0. 3216
Kurtosis	5. 4504	4. 6233
J-B	28. 0391	7. 9806
D-W	1. 9372	2. 1482

Note:

J-B indicates the Jarque-Bera test for normality, whereas **D-W** refers to Durbin-Watson *d* test.

The numbers in the parentheses are t-statistics for testing the null-hypotheses that the coefficients are equal to zero.

*, **, *** indicate significance at the 1%, 5%, and 10% respectively.

ARMA (0, 7) Model for Malaysia : $Y_t = \phi + \beta_0 \varepsilon_t + \beta_1 \varepsilon_{t-1} + \beta_2 \varepsilon_{t-2} + \ldots + \beta_7 \varepsilon_{t-7}$.

ARMA (5, 1) Model for Indonesia: $Y_t = \mu + \alpha_1 Y_{t-1} + \alpha_2 Y_{t-2} + \ldots + \alpha_5 Y_{t-5} + \beta_0 \varepsilon_t + \beta_1 \varepsilon_{t-1}$

THE REAL STOCK RETURNS AND INFLATIONARY TRENDS

Table 3 below provides the test results for the relationship between real stock returns and inflation, thereby testing the generalized Fisher hypothesis, which states that real stock returns are independent of inflationary expectations.

Table 3: The Real Stock Returns and Inflationary Trends for Malaysia and Indonesia

Country	Model	Constant	INF_t	$E(INF_t)$	$UE(INF_t)$	R^2	F	D-W
Malaysia	1	-1.7925 (-1.035)	11.743 (0.0833)	- -	- -	0.0001	0.968	2.0660
	2	-1.8740 (-0.6966)	- -	34. 970 (0.1381)	- -	0.0004	0.651	2.0750
	3	-1. 9521 (-0.7113)	- -	43.123 (0.1666)	39.020 (0.2012)	0.0012	0.439	2.0938
Indonesia	1	-1.1251 (-1.995)**	-2.7736 (-2.515)*	- -	- -	0.1015	5.430*	1.9537
	2	-1.3639 (-2.116)**	- -	0.28295 (0.1577)	- -	0.0005	2.245	2.1442
	3	-1.2972 (-2.284)**	- -	0.37773 (0.2387)	-5.9598* (-3.963)	0.2394	7.165*	2.2422

Note:

The numbers in the parentheses are the t-statistics for testing the null-hypothesis that the coefficients are equal to zero. Whereas D-W refers to Durbin-Watson *d* test

*, **, *** represent a level of significance of 1% , 5%, and 10%, respectively.

The above regression results are obtained from the following models:

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

Model 2. $SR_t - INF_t = \beta_0 + \beta_2 E(INF_t \mid \phi_{t-1}) + \varepsilon_t$

Model 3. $SR_t - INF_t = \beta_0 + \beta_2 E(INF_t \mid \phi_{t-1}) + \beta_3 UE(INF_t) + \varepsilon_t$

For Malaysia, the coefficients for actual inflation (INF_t), expected inflation $E(INF_t)$, and unexpected inflation $UE(INF_t)$ are all insignificant. This result is contrary to recent findings, which found a negative relationship between real stock returns and inflation. It implies that real stock returns are independent of inflationary trends as suggested by the Fisher hypothesis. These results are also supported by the very low coefficient of determination (R^2), which measures the proportion or percentage of the total variation in real stock returns explained by inflation. The independence of real stock returns on inflation is also supported by the insignificance of the F-statistics.

The above result supports the findings of Kaul (1987) for USA and Canada for the period 1926 to 1940 where he found independence of real stock returns on actual inflation. Gultekin (1983a) also obtained similar results for the UK, Austria, France, Norway, Peru, and Sweden for the period June 1947 to December 1979.

As for Indonesia, the actual inflation coefficient (Model 1) is found to be negative and significant at the 1% level of significance. This indicates that real stock returns are not independent of actual inflation, which is consistent with the Fama's hypothesis. As for expected and unexpected inflation, only the unanticipated portion of inflation is negatively significant at the 1% level with real stock returns (Model 3). Hence, unlike the findings for the Malaysian stock market that supports the Fisher hypothesis, the Indonesian stock market does not. This is because actual inflation and unexpected inflation are negatively related to real stock returns. This finding is similar to the findings of Chatrath et al. (1997) and Sonik [13] (1983) for Indian and Canadian economy in particular. It is also in line with the latest evidence for the Pacific Basin countries [14] provided by Lee (1998) and the evidence for several developed countries in general [15] (Gultekin, 1983a).

The Durbin-Watson (D-W) d statistics in Table 3 are all insignificant; hence we do not reject the null-hypothesis of having no auto-correlation among the disturbance terms.[16]

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[13] *In providing international evidence, his study analyzed nine countries' economy, i.e. USA, Japan, UK, Switzerland, France, Germany, Netherlands, Belgium, and Canada for the period from January 1971 to December 1980. Except for Canada, all other countries showed negative relationship between real stock returns and expected and unexpected inflation.*

[14] *In this study, Lee (1998) investigates four Pacific Basin countries, that is Hong Kong, Singapore, South Korea, and Taiwan*

[15] *In comparing with other previous findings, we have to be alert of different types of data used. In general, results are weaker with monthly and quarterly data than with annual data. One explanation for these weaker results is high volatility of most variables in the short run. Most importantly, monthly and quarterly data may capture the effects of economic variables on contemporaneous rather than future inflation (Park, 1997)..*

[16] *A simple way to test for serial correlation is by referring to the rule of thumb, where if d is found to be close to 2 in application, one may assume that there is no first order auto-correlation, either positive or negative. See Gujarati, D. N. 1995, pp. 423. Our results are around this number.*

The R^2 of model (3) where real stock returns are regressed on both expected and unexpected inflation gives the highest R^2, which is 0. 2394, while the lowest (R^2=0.0005) is given by model (2) where real stock returns are regressed on expected inflation. This may indicate the importance of separating inflation into expected and unexpected inflation. In comparing the impact of actual and expected inflation on the real stock returns for both countries, it is interesting to note that the Indonesian real stock returns are more dependent on the actual and unexpected inflation rather than expected inflation whereas the Malaysian real stock returns are not dependent on actual, expected, or unexpected inflation. Therefore, unlike the Malaysian stock market that provides a perfect hedge against inflation, the Indonesian stock market is not a good hedge against inflation. The different rate of inflation volatility between these countries could have accounted for these different results.

It should be noted that the present study as well as those preceding it exhibit rather low R^2 in most of the stock return-inflation models; nominal or real. Bulmash (1991) noted that even adding other economic factors such as industrial production, money supply, real economic activity, and differences in interest[17] produced low R^2.

The finding for the Indonesian stock market, however, supports the findings by Boeckh and Coghlan (1982). It is risky to assume that the problems of inflation are somehow separate from the real side of the economy. In discussing the effects of inflation on the stock market, the economic consequences of reducing or increasing inflation are generally ignored. Inflation results from pressures created within the economic system and cannot be considered in isolation.[18]

TESTS FOR FAMA'S PROXY HYPOTHESIS

Testing the First Proposition of the Fama's Proxy Hypothesis: *A Negative Relationship between Inflation and Real Economic Activity*

Table 4 below reports the results for the first Proposition of the Fama's proxy hypothesis for the Malaysian economy, which tests the presence of negative relationship between inflation[19] and real economic activity. Earlier, we found the Malaysian stock market proved to be a good hedge against inflation as suggested by the Fisher hypothesis (Table 3), which contradicts the Fama's proxy effect. Therefore,

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[17] *As proxies for unexpected inflation as in Fama (1981).*

[18] *Boeckh, A. J and Coghlan, R. T. 1982. "An Overview of the Impact of Inflation on the Stock Market" in Boeckh, A. J and Coghlan, A. J (Ed). "The Stock Market and Inflation". Homewood, Illinois: Dow Jones-Irwin, pp. 19*

[19] *It is important to note that, the Fama's proxy effect deals only with the "actual inflation" and real economic activity, and does not deal with the other types of inflation; expected and unexpected inflation (see Fama, 1981 and other studies that tested this particular hypothesis, such as Chatrath et al. 1997).*

the results from the regression of inflation on real economic activity (Table 4) do contradict the Proposition (1) of the Fama's proxy effect. It contradicts because real stock returns are positively related to real economic activity instead of being negatively related. However, the Indonesian stock market, which provides some support for the negative relationship between real stock returns and both actual and unexpected inflation in Table 3 does not support Proposition (1) of the Fama's hypothesis.

Table 4: Testing the First Proposition of the Fama's Proxy Hypothesis for the Malaysian and the Indonesian Stock Markets

Country	Model	Real Economic Activity: Coefficients' Sum of Lead-Lag Specification					
		{-3. 3}	{-5. 5}	{-7. 7}	{-9. 9}	{-11. 11}	FPE
Malaysia	1	0. 000635* [7. 583]	0. 001412* [5. 207]	-	0.004227* [13. 137]	0.003396* [14. 673]	0.004122* [19.123]{-7.7}
	2	0.001161* [26.783]	0.000332* [25 .910]	-	0.002229* [18. 910]	0.002294* [12. 884]	0.001755* [28.279]{-7.7}
	3	0.000232 [1. 391]	-0.001302 [1. 140]	-	-0.000325 [2. 240]	0.00328** [3. 048]	0.001138* [3. 343]{-7.7}
Indonesia	1	0.0010107 [0. 892]	-0. 000112 [0. 545]	0. 003723 [1. 009]	0.000833 [1. 129]	-0. 00781 [0. 943]	0. 000811*** [2.497]{-1.1}
	2	0.0002198 [0. 754]	0.0009063 [0. 451]	-0.00222 [0. 465]	-0.002559 [0. 698]	-0.024011 [1.729]	0.0003588 [0. 399]{-1.1}
	3	0.0012936 [0. 626]	0.0025448 [0. 439]	-0.000093 [0. 827]	0.013337 [1. 510]	0.044585 [1. 480]	0.01983 [1.834]{-12.12}

Note:

The numbers in |.| are the F-statistics used for testing the null hypothesis that the coefficients' sum of lead-lag specification is equal to zero. The numbers in {.} show the optimal lead-lag length based on the Akaike's (1969) Final Prediction Error criteria. These numbers of leading and lagging values of real economic activity, for example, {-3.3} indicates that three leads and lags plus one contemporaneous value are incorporated in the model.

*, **, *** denote significance at the 1%, 5%, and 10% level respectively

$$\textbf{Model 1. } INF_t = \alpha_0 + \sum_{i=-k}^{k} \alpha_I \, REA_{t+i} + \varepsilon_t$$

$$\textbf{Model 2. } E(INF_t) = \alpha_0 + \sum_{i=-k}^{k} \alpha_I \, REA_{t+i} + \varepsilon_t$$

$$\textbf{Model 3. } UE(INF_t) = \alpha_0 + \sum_{i=-k}^{k} \alpha_I \, REA_{t+i} + \varepsilon_t$$

In the first-three rows of Table 4 above, the FPE-based specification models show that actual, expected and unexpected inflation are regressed on seven leading, contemporaneous, and lagging values of real economic activity for the Malaysian stock market. Meanwhile, for the Indonesian stock market, one leading, contemporaneous, and lagging values of real economic activity are incorporated into the first and second model. Then, unexpected inflation is regressed on twelve leading, lagging, and one contemporaneous values of real economic activity. The optimal lead-lag lengths that are incorporated in the model are based on the Akaike's (1969) Final Prediction Error (FPE) criterion[20] so as to avoid the inefficiency and biased parameter estimates from arbitrarily chosen lead-lag lengths.[21]

Table 4 shows that, in long-time period, there is a positive relationship between actual inflation and real economic activity for both the Malaysian and the Indonesian stock market. It is shown by the positive sum of lead-lag coefficients and significant F-statistics. In the case of Malaysia, the significant positive relationship between actual and expected inflation with real economic activity (Model 1 and 2) is not only given by the FPE {-7. 7} model, but all the lead-lag combination models, which are all significant at the 1% levels of significance. In general the FPE-based model compared to the other arbitrarily chosen lead-lag combination models show the highest F-Statistics.[22] These significant positive relationships are also supported by regressing unexpected inflation on real economic activity.

Unlike the Malaysian case where all the three types of inflation play a significant positive role in determining the real economic activity, for the Indonesian case, only actual inflation and real economic

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[20] *The least value of Akaike's (1969) Final Prediction Errors (FPE) is considered as the optimal lead-lag length. It is computed by the formula:* $\rho^2\{N+K\}/\{N-K\}$. *Where* ρ^2 *denotes variance, N is the number of observation, and K is the number of explanatory variables excluding the constant term.*

[21] *In case of choosing too large lag length, the estimated parameters are inefficient due to the inclusion of irrelevant variables, while incorporating too small the lag length, the estimated coefficients will be biased due to the omission of important variables (Ibrahim. 1999c, pp. 6). Another weakness of including arbitrary lead-lag lengths is that, it generally yields insignificant F-statistics (Ibrahim. 1999a, pp. 11).*

[22] *Ibrahim (1999a) found similar results.*

activity are positively related (Table 4). This long run finding indicates that the positive relationship between actual inflation and real activity is in contradiction with the Fama's proxy effect. However, this fact may be consistent with either the Mundell-Tobin hypothesis or the Philips' curve model.

Testing the Second Proposition of the Fama's Proxy Hypothesis: *A Positive Relationship between Stock Returns and Real Economic Activity*

Table 5 below gives the results of the regression between real stock returns and real economic activity. For the Malaysian case, the FPE based specification model {-1. 1} shows significant positive relationship at the 1% significant level. The lead-lag combinations of {-3. 3} and {-5. 5} are also significantly positive at the 5% level. This result however is not inconsistent with the Fama's proxy effect of proposition (2). However, the positive relationship between inflation and real economic activity and the positive relationship between real stock returns and real economic activity show some consistencies with the explanation of conventional macroeconomic theories of the Philip's curve.

Meanwhile, the Indonesian stock market indicates the reverse. Based on the FPE based specification model {-12. 12} in Table 5, a significant negative relationship between real stock returns and real economic activity is depicted as shown by significant F-statistics at the 5% level. This is inconsistent with the second proposition of Fama's proxy hypothesis.

Table 5. Testing the Second Proposition of the Fama's Proxy Hypothesis for the Malaysian and the Indonesian Stock Markets.

Country	Real Economic Activity: Coefficients' Sum of Lead-Lag Specification					
	{-3. 3}	{-5. 5}	{-7. 7}	{-9. 9}	{-11. 11}	FPE
Malaysia	1. 9788**	2. 1674**	2. 0844	-0. 69395	-0. 50455	1. 1928*
	[2. 406]	[2. 280]	[1. 418]	[0. 581]	[0. 443]	[4. 601] {-1. 1}
Indonesia	-0. 08588	-0. 19341	-0. 1612	-0.2503	-0. 20632	-0. 23450**
	[1. 168]	[1. 256]	[0. 839]	[1. 671]	[1. 372]	[2.635]{-12. 12}

Note:

The numbers in [.] are the F-statistics used for testing the null hypothesis that the coefficients' sum of lead-lag specification is equal to zero. The numbers in {.} show the optimal lead-lag length based on the Akaike's (1969) Final Prediction Error criteria. These numbers of leading and lagging values of real economic activity, for example, {-3.3} indicates that three leads and lags plus one contemporaneous value are incorporated in the model.

*, **, *** denote significance at the 1%, 5%, and 10% level respectively.

$$\textbf{Model 1. } SR_t - INF_t = \alpha_0 + \sum_{i=-k}^{k} \alpha_i REA_{t+i} + \varepsilon_t$$

The study finds that there is a positive relationship between inflation and real economic activity and negative relationship between real stock returns and real economic activity for Indonesia. These results are inconsistent with the Fama's proxy hypothesis. Nevertheless, this result seems to be in line with Mundell-Tobin hypothesis which says that the negative relationship between real stock returns and inflation is directly explained by the positive inflation-real activity and by the negative real stock returns-real activity relationship. This result thus supports Ram and Spencer's (1983) work that criticized the Fama's proxy hypothesis.[23]

[23] *It is important to know that, in their study, Ram and Spencer (1983) employs a different inflation equation derived from a Fisher-Philips relationship, different but equally plausible variables to represent real activity, and have used stock returns equations of much the same character as Fama's 1981) study (see Ram and Spencer, 1983, pp. 463)*

CONCLUSIONS

The well-documented negative relationships between real stock returns and inflationary trends in the developed countries are not supported by the findings for the Malaysian economy. The real stock returns are found to be independent of inflationary trends as suggested by the Fisher hypothesis, which implies that. the real stock returns is a good hedge against inflation. However, for the Indonesian economy a negative relationship between real stock returns and both actual and unexpected inflation were found.

In an effort to explain the negative relationship between real stock returns and inflation, the study examined both propositions of the Fama's proxy effect framework, which centers around a negative relationship between inflationary trends and real economic activity and a positive relationship between real stock returns and real economic activity. For Malaysia a positive real economic activity-inflation and a positive real economic activity-real stock returns relationship were recorded which contradict Fama's proxy effect but however are in line with the conventional macroeconomic Philips' curve theory. As for Indonesia, the Fama's proxy effect fails to explain the negative relationship between real stock returns and inflation. A positive relationship between inflationary trends and real economic activity and the negative relationship between real stock returns and real economic activity that are opposite of both of Fama's propositions were found. These results are, however, in accordance with the Mundell-Tobin hypothesis, which says that the negative real stock returns-inflation relationship is directly explained by a positive relationship between inflation and real economic activity and a negative relationship between real stock returns and real economic activity.

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