The Long-Run Relationship between Inflation and Unemployment in Malaysia

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Abstract:

This paper investigates the long-run relationship between inflation and unemployment in the economy of Malaysia between 1972 and 2004. Basing my model off of an investigation by Fair (1997), this study will attempt to quantify the relationship between inflation rates, unemployment, wage rates, changes in production, and a measure of demand pressure. Using macro-level data from various sources, it is expected that the results will suggest periods of high inflation are directly related to high unemployment, decreased wage rates, lower production levels, and substantially weak demand pressures.

JEL Classification: E24, E31, E51

Keywords: inflation dynamics, unemployment dynamics, Phillips curve

1.0 INTRODUCTION

According to classical economic theory, the Phillips Curve illustrates the long-run tradeoff between unemployment and inflation. Simply stated, there is an inverse relationship between inflation and unemployment; as inflation rises, unemployment falls, and in order to lower inflation, unemployment must rise. Monetary and fiscal policies, however, can play a significant role in inflation, providing a sort of cushion in order for the rate at which prices rise to be slowed substantially while softening the increase in unemployment otherwise normally required within the model. Various other macroeconomic factors have also been shown in previous studies by Ray C. Fair (1996) and Karanassou, Sala, and Snower (2007) to significantly influence inflation rates.

In this paper, I aim to investigate the magnitude of the impacts of various macroeconomic factors on inflation rates. I will use historical macroeconomic data from Malaysia to develop a semi-log form regression equation which will forecast interest rates in the economy based on previous inflation, changes in production levels, salary changes, changes in consumption, and unemployment.

There are multiple reasons why I chose to investigate Malaysia in this study. The data available was the most complete and accurate available, making it more attractive than the other ASEAN nations. Also, Malaysia experienced an industrial revolution during the 1970s and 1980s, which makes for interesting macroeconomic activity as production shifts from agriculture to manufacturing. Finally, Malaysia for all intents and purposes is still a developing country, and its economy is therefore also developing on some level, which makes for a more interesting analysis since there were so many alterations in the mechanics of the economy over the investigation period.

In a study aimed at explaining the situation of the "Roaring Nineties," Karanassou, Sala, and Snower (2007) attempt to debunk the theory behind the Phillips curve, since during the nineties the United States experienced low inflation coupled with low unemployment. I feel that this phenomenon was an extremely rare occurrence, and in this study I am aiming to reassert the Phillips Curve theory, through the use of empirical data and regression analysis.

The rest of the paper is organized as follows: Section 2 gives a description of trends in the area, as well as a brief literature review. Section 3 outlines the empirical model. Data and estimation methodology are discussed in section 4. Finally, section 5 presents and discusses the empirical results. This is followed by a conclusion in section 6.

2.0 TRENDS

Background on Inflation Rates

Inflation rates have always been an extremely important issue in domestic economies. The rapid spread of globalization across markets has only intensified governments' interest in controlling inflation. The causes of the intensification are multifaceted. For one, inflation rates generally dictate what the minimum return domestic and foreign investors expect to receive in an economy. If inflation in an economy is high, investors will have higher expectations of returns. Conversely, if inflation is lower, investors will be satisfied with lower returns. Governments must therefore adjust interest rates through to meet the demands of investors.

As interest rates change, exchange rates will fluctuate as well. If interest rates are higher, there is a higher demand for sovereign debt such as treasury bills, inflating the value of the country's currency. On the other hand, if interest rates paid on sovereign debt are low, both foreign and domestic investors will be less likely to purchase these securities, devaluing the currency as a result. While it may seem as though a nation would prefer to have a higher demand for their debt, offering high interest rates directly leads to increased cost of debt. On somewhat of the same token, if there is no demand for debt, a nation may have difficulty repaying past debt and financing domestic projects required to be a catalyst for economic growth.

The fluctuation of foreign exchange rates, if large enough, can cause other major issues for an economy. When exchange rates are higher, it is easier to import goods, as they become relatively cheaper for consumers. However, if exchange rates are lower, imported goods become relatively more expensive, while imports will rise as foreign consumers will pay less for goods produced in the economy. If the difference between the value of total exported goods less total imported goods falls into the negative, it can be extremely detrimental; this is especially true in developing economies, such as the two being investigated in this paper.

The preceding is a broad explanation of interest rates, and what effects they have on an economy on a macro level. As can easily be seen, interest rates play an unbelievable role in the development and health of any economy, affecting interest rates, investment, borrowing, national debt, and foreign exchange rates, among other variables.

Monetary and Fiscal Policy

As mentioned in the preceding section, the government has a set of "tools," so to say, to help control inflation. Monetary and fiscal policy decisions afford the government the ability to influence many macroeconomic variables. Monetary policies involve changes to the supply of money or interest rates in an economy, while fiscal policies involve taxation and budgeting. Monetary and fiscal decision making is one of the most closely watched economic indicators, as many investors speculate on how the choices will affect other investment variables. While the use of monetary and fiscal policies can save an economy from all-out devastation such was the case in Brazil, there are also many possible costs which must be taken into consideration as well.

Adjustments to the supply of money are one of the biggest methods through which a government will control inflation. If inflation is low, a government can increase the money supply to devalue the currency slightly. In this case, there are "too many dollars chasing too few goods," causing prices in the economy to rise. On the other hand, if inflation is too high, a government can decrease the supply of money, slightly increasing the value of currency. This would obviously have the opposite effect, helping to bring prices, and therefore inflation down.

Increases or decreases in the supply of money can also affect an economy adversely. For instance, a reduction in the money supply, while lowering inflation, can also cause a shortage in the currency, leading to possible economic downturn. A sudden, large increase in the economy can have as negative an effect, if not more so, on the economy. Hyperinflation is possible if the increase in money supply is too large, and it is usually more difficult for governments to stabilize inflation following such an occurrence.

Changes in the federal funds rate, the major factor which controls interest rates in the economy, are another way in which governments can use monetary policy to control other macroeconomic variables. Interest rate changes are often done in anticipation of inflation, in order to control price levels, demand for currency, and the attractiveness of different

investments. When inflation is high, the government often must respond by raising interest rates. As mentioned earlier, this can be detrimental, as it increases the cost of financing sovereign debt. However, increasing the federal funds rate affects the risk free rate, a highly important variable in the calculation of an acceptable level of return on other investments such as corporate bonds and equity securities such as stocks.

Fiscal policies also help to control inflation in an economy. Tax cuts for instance act as a sort of "pseudo" increase to the money supply, as households essentially have more money. This can be a good thing in the short term, as most times tax returns are spent quickly, and can create a substantial increased blip in consumption. Tax increases in most cases have the opposite effect, and can actually lead households to increase savings to compensate for the reduction in refunds received.

The effects on inflation rates that such policy decisions influence are extremely difficult to anticipate and measure, largely due to implementation and recognition lags. An implementation lag is the time between when the decision is necessary and when the decision is made and policies are implemented. A recognition lag is the time between when a policy is implemented and the time it takes to see the effects in an economy. As can be easily disseminated from the situation in Washington DC, fiscal and monetary policy implementation lags are often very large due mostly to political differences.

The Phillips Curve

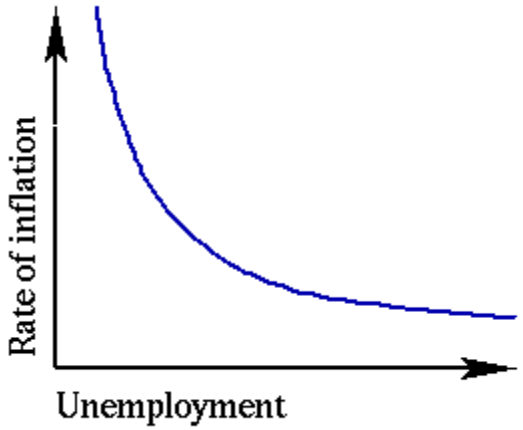

Figure 1 - Basic Phillips Curve [Source: Plus Magazine]

As mentioned in this study's introduction, the Phillips Curve illustrates a theory which states that there is a long-run tradeoff between inflation and unemployment. Simply stated, in order to decrease unemployment, it is necessary for a country to experience a period of high inflation, holding all other variables constant. Conversely, if a country aims to decrease inflation, it is necessary to tolerate a higher rate of unemployment for a period of time. However, the weakness pointed out by various other studies including the aforementioned Fair (1997) and Karanassou, Sala, and Snower (2007) is that the Phillips Curve theory largely ignores other macroeconomic variables which have been proven to significantly impact inflation rates. Therefore, I aim to compensate for these supposed missing variables using proxies for demand, real increases in wage rates, and changes in production.

Generally speaking, while the Phillips Curve may contain weaknesses that many economists have recognized, it is still a widely accepted theory which many economists rely on to aid in the development and implementation of economic policies. It is important to note, however, that the Phillips Curve will only hold true holding all other variables constant. This is the key to many economic theories, and I believe it is the reason authors have attempted to disprove the Phillips Curve.

Literature Review

According to traditional economic theory, unemployment below the natural rate translates to an increase in inflation in an economy, and vice-versa. This is depicted in the development of the Phillips Curve, and a tradeoff between employment and inflation is established. According to Gordon (1981), the economic downturn which took place in the 1970's turned the Phillips Curve, along with Keynesian economic theory, on its head. This was due to the fact that the economy was experiencing stagflation, high inflation coupled with high unemployment. Karanassou, et al (2007) looked into the decade known as the "roaring nineties" in the same fashion, however this period was different in that the US was experiencing high employment coupled with low inflation.

However, Gordon (1981) goes on to explain that the Phillips Curve and Keynesian theories have not necessarily been debunked, but underdeveloped. He asserts that inflation also depends on inertia, supply and demand shocks, and the influence of exchange rates. Gordon

(1981) also claims that inflation can be explained without the use of studies in wage behavior, as other economists had studied previously. Karanassou, et al (2007) are in agreement with Gordon when they state that monetary supply levels directly influence the level of inflation in an economy as well, however this is usually a lagged effect. In the end, Gordon finds that short lags in the money supply can be substituted for the unemployment rate, suggesting that the two variables are correlated so highly that they are interchangeable.

References

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3.0 DATA AND EMPIRICAL METHODOLOGY

3.1 Definition of Variables

$$\boldsymbol{\pi_t = \beta_0 + \beta_1 \pi_{t-1} + \beta_2 \lambda_t + \beta_3 \omega_t + \beta_4 \gamma_t + \beta_5 \mu_t + \varepsilon}$$

π_t is the log of the inflation rate in Malaysia for period *t*. This variable represents the overall rise in prices in the Malaysian economy during the period, and is shown to be a product of a number of independent variables. The data used for inflation in the economy of Malaysia is the Consumer Price Index, which measures the change in prices of a market basket of goods which represents many different sectors of the economy.

Independent variables consist of five variables obtained from various sources. π_{t-1} is the log of the inflation rate in Malaysia for period $t\text{-}1$, in this case the average inflation rate for the previous year. λ_t is the change in production in the economy, discounted by the change in the size of the labor force in that period. ω_t is the change in real wages in the economy, measured using the total salaries and wages paid, discounted by both the inflation rate and the change in the size of the labor force in that period. γ_t is the change in consumption in the economy, measured using final household consumption expenditure per capita, discounted by the inflation rate for that period. Finally, μ_t is the log of the unemployment rate in the economy during that

period. A breakdown of variables, along with definitions and sources, can be found in Appendices A and B.

3.2 Data

The study uses annual data from 1972 to 2004. The majority of the data was obtained from the World Bank's World Development Indicators database. Other sources of data include Malaysia's Bureau of Statistics, the United Nations UNdata service, and the International Labour Office's Department of Statistics Database. Summary statistics for the data are provided in Table 1.

4.0 EMPIRICAL RESULTS

The results of this study are in some ways astounding. First and foremost, I must begin by recognizing the fact that the constant obtained from the regression analysis does not appear to be statistically significant, with a p-value of .61. However, I feel that the resulting R^2 and Durbin Watson statistics show that the regression is in fact accurate. The following is a breakdown of interpretations of the independent variables investigated in this study, as well as the typical tests of regression analyses.

INFLATIONT_1LOG (π_{t-1}) - As discussed in the *Trends* section of this study, there are theories which state that inflation carries inertia. The positive coefficient for INFLATIONT_1LOG supports this inflation inertia theory, and the p-value of .0011 proves that current inflation rates depend greatly upon the previous period's inflation.

DISCCHANGEINPROD (λ_t) – While not being significant at any statistical level, this variable did prove to be important in the regression analysis. With a p-value of .27, the change in the level of production in an economy appears to have a relatively small effect on inflation rates. The positive coefficient attributed to the change in the level of production in the economy is rather unexpected, as periods of high inflation are generally coupled with decreases in production. However, I feel that this may be attributed to an increase in production due to increases in consumer prices, as companies would be willing to produce more goods when prices are higher.

FULLDISCSALCHANGE (ω_t) – The change in salaries in Malaysia discounted for inflation also does not appear to have a significant effect on inflation rates. However, with a p-value of .22, its effect on inflation rates is stronger than that of the change in the level of production. The negative coefficient attributed to the changes in salaries in Malaysia is somewhat unexpected, as classical economists would assert that wages would have to increase with inflation, in order to sustain consumption in an economy.

CHANGECONSDISC (γ_t) – The real change in consumption in Malaysia, discounted by the inflation rate in the period, appears to have a highly significant effect on inflation rates. With a p-value of 0.02, it is the second most significant independent variable in the regression analysis. The negative coefficient for this variable is also slightly unexpected, as increased demand typically causes inflation rates to rise.

UNEMPLOYMENTLOG (μ_t) – The log of the unemployment rate in Malaysia in the current period does not meet the typical 90% statistical significance level. At the same time, it does come relatively close to the threshold, and therefore its effects cannot merely be dismissed. The positive coefficient for the variable proves that high unemployment does in fact cause deflationary pressures within the economy, as both the log of the unemployment rate in percentage and the log of the inflation rate in percentage are both negative.

R^2 – The R^2 of the regression is relatively low, at 62%. However, inflation rates are extremely difficult to predict, and therefore I believe that the regression is well fit and adequately accurate.

Durbin-Watson Test Statistic – The Durbin-Watson Test Statistic for the regression is 1.78, falling above the upper limit for K=5, N=28 of 1.62, at 1% significance. This proves that the regression satisfies the requirement that there is no evidence of serial correlation.

Table 2: Regression Results

Dependent Variable: INFLATIONLOG
Method: Least Squares
Date: 04/18/10 Time: 23:09
Sample (adjusted): 1972 2004
Included observations: 28 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
INFLATIONT_1LOG	0.556949	0.147872	3.766416	0.0011
DISCCHANGEINPROD	1.807675	1.600509	1.129437	0.2709
FULLDISCSALCHANGE	-1.890950	1.503808	-1.257441	0.2218
CHANGECONSDISC	-1.295018	0.505341	-2.562663	0.0178
UNEMPLOYMENTLOG	0.288358	0.175427	1.643755	0.1144
C	-0.372220	0.726366	-0.512442	0.6134

R-squared	0.619560	Mean dependent var	-3.237973
Adjusted R-squared	0.533096	S.D. dependent var	0.565957
S.E. of regression	0.386720	Akaike info criterion	1.125179
Sum squared resid	3.290156	Schwarz criterion	1.410651
Log likelihood	-9.752506	Hannan-Quinn criter.	1.212451
F-statistic	7.165554	Durbin-Watson stat	1.781216
Prob(F-statistic)	0.000410		

5.0 Conclusion

In summary, I believe that I have somewhat reasserted the claims behind the Phillips Curve using the Malaysian economy as an example. The results in this paper imply that not only does inflation carry inertia, but also that inflation and unemployment are in fact inversely related. The most startling finding in the study, in my opinion, is the positive coefficient for changes in production levels. As asserted in the empirical results section of the study, I attribute the positive coefficient to the simple price/output model which states that companies produce more when

prices are higher. Finally, the results of the regression analysis show that an increase in consumption does not imminently lead to inflation, at least in the same period.

Appendix A: Variable Description and Data Source

Acronym	Description	Data Source
INFLATIONT_1LOG	Natural logarithm of the previous period's inflation	World Bank
DISCCHANGEINPROD	% Change in value added, discounted by current period's inflation rate and % growth in labor force	Malaysia Bureau of Statistics
FULLDISCSALCHANGE	% Change in total salaries and wages paid, discounted by current period's inflation rate and % growth in labor force	Malaysia Bureau of Statistics
CHANGECONSDISC	% Change in household final consumption per capita, discounted by current period's inflation rate	World Bank
UNEMPLOYMENTLOG	Natural logarithm of the current period's unemployment rate	International Labour Office/United Nations/World Bank

Appendix B: Variables and Expected Signs

Acronym	Variable Description	What it captures	Expected sign
INFLATIONT_1LOG	Natural logarithm of the previous period's inflation	Inflation inertia	+
DISCCHANGEINPROD	Change in value added, discounted by current period's inflation rate and change in labor force	Real changes in production	-
FULLDISCSALCHANGE	Change in total salaries and wages paid, discounted by current period's inflation rate and change in labor force	Real changes in nominal wages	+
CHANGECONSDISC	Change in household final consumption per capita, discounted by current period's inflation rate	Real changes in consumption per capita, acts as a proxy for changes in demand	+
UNEMPLOYMENTLOG	Natural logarithm of the current period's unemployment rate	Current period's unemployment rate	+

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
INFLATIONT_1LOG	28	-3.27300283	0.611634	-4.605170	-1.771957
DISCCHANGEINPROD	28	0.176553	0.145488	-0.055342	0.700172
FULLDISCSALCHANGE	28	0.170921	0.164468	-0.093556	0.759213
CHANGECONSDISC	28	0.113575	0.192786	-0.407549	0.673320
UNEMPLOYMENTLOG	28	-3.092411	0.439926	-3.912023	-2.317652

Table 2: Regression Results

Dependent Variable: INFLATIONLOG
Method: Least Squares
Date: 04/18/10 Time: 23:09
Sample (adjusted): 1972 2004
Included observations: 28 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
INFLATIONT_1LOG***	0.556949	0.147872	3.766416	0.0011
DISCINCREASEINPROD	1.807675	1.600509	1.129437	0.2709
FULLDISCSALCHANGE	-1.890950	1.503808	-1.257441	0.2218
CHANGECONSDISC**	-1.295018	0.505341	-2.562663	0.0178
UNEMPLOYMENTLOG	0.288358	0.175427	1.643755	0.1144
C	-0.372220	0.726366	-0.512442	0.6134

R-squared	0.619560	Mean dependent var	-3.237973
Adjusted R-squared	0.533096	S.D. dependent var	0.565957
S.E. of regression	0.386720	Akaike info criterion	1.125179
Sum squared resid	3.290156	Schwarz criterion	1.410651
Log likelihood	-9.752506	Hannan-Quinn criter.	1.212451
F-statistic	7.165554	Durbin-Watson stat	1.781216
Prob(F-statistic)	0.000410		

Note: *** and ** denote significance at the 1%and 5% significance levels, respectively.

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