

Employment and Macroeconomic Variables: Evidence from Malaysia, Philippines and Singapore

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Abstract

This study examines the meaningful relationship between employment and macroeconomic variables such as domestic capital, gross domestic product and government expenditure in three major ASEAN economies, namely Malaysia, Singapore and Philippines. Johansen (1991) cointegration method coupled with VECM (vector-error-correction model) testing procedure is employed to analyze the impact of the selected variables. The period of interest is 1970-2005 using annual data. The empirical results demonstrate mixed results whereby though cointegration could be detected for all three countries; in the case of Malaysia, the causality that could be detected are, capital granger causes employment and employment granger causes government expenditure, as for Singapore, trade granger causes capital and lastly for the case of Philippines, both income and trade granger causes government expenditure.

Keywords: Domestic Capital, Gross Domestic Product, Government Expenditure, Employment, Cointegration

1. Introduction

As in many developing countries, development strategies in ASEAN countries are influenced by the goal of achieving respectable economic growth, and ASEAN countries have been among the fastest growing economies in the world and they have been able to sustain this momentum over time. Employment is a very important issue in either developed or developing countries. Employment performance is powerfully influenced by macroeconomic policies; and public policy can mitigate the effects of those factors that are inevitable and remove the ones that are not. Too often national efforts at macroeconomic stabilization have reduced economic growth to rates that are too low to allow adequate employment growth, the study cautions. Phenomenon of lower employment or underemployment must have proper solution and attention since when the unemployment or in the other word employment declined, that can be burden to a nation.

In order to place the ensuring discussion of relationship between employment and output growth, it will be helpful at the outset review some key aspect of output growth and employment trend in the selected countries. Malaysia has maintained high and full employment from 1970's until 2005. This can be attributed to the almost continuous rapid expansion of the economy over the past three decade.(Note 1) In fact, in certain sectors of the economy, the demand for labour has been so great that there have shortages. Programmes to increase employment and overcome labour shortages have boosted employment opportunities. Employment growth slightly exceeds labour force growth and unemployment dropped, to 5.3 percent in 1980. In 1980, 41 percent of the labour force was in agriculture.

Manufacturing, construction and services have provided the bulk of the new employment. There has been a high level of Malay migration to cities; nevertheless, the Malay's share of employment in manufacturing has only, marginally in the past decade. Both the population and labour force growth rates will decline over the 1980s, but still remain high in comparison with other Asian developing countries.

The strong economic growth in 1997 (particularly during the first half of the year) enabled the rate of job creation to continue to outpace the rate of expansion of labour force. As a result, the labour market remained tight in 1997, with the unemployment rate declining to 2.5 percent. At this rate of unemployment, the Malaysia economy was virtually operating under full employment situation in 1996. As a result, there has been a growing reliance on foreign labour and upward pressure on wages. Particular measures were introduced to cope with unemployment in the wake of the financial crisis of 1997. These included the promotion of self-employment in organized petty-trading, farming and small business; persuading employers and industries to delay retrenchments in favour of pay-cuts, shorter working hours or shifts and part-time employment, and facilitating the mobility of workers.

As for Singapore, its economic strategy proved a success, producing real growth that averaged 8.0 percent from 1960 to 1999. During the early eighties, due to the world wide recession, manufacturing sector suffered the most in Singapore, however the economy picked up after the 1997 regional financial crisis, with a growth rate of 12.7 percent for 2000, but fell back in tandem with the economic slowdown in United States, European Union (EU) and Japan, as well as the worldwide electronics slumps. GDP shrunk again by 2.4 percent in 2001. The economy rebounded in 2002, expanding 3.4 percent when it posted 1.1 percent growth in 2003, due effect of Severe Acute Respiratory Syndrome (SARS) in the first half year. The economy expanded by 10 percent, followed with the boost up of employment rate growth to 11.4 percent in 2004. Driven by the growth in the world electronic demand and in economics of its major trading partners, the economy expended increase to 6.4 percent in 2005 and the employment growth rate also increase, to achieve full employment target in the country.

For the case of Philippines, the economy's modest growth is insufficient to provide opportunities for all those looking for work. Since the regional financial crisis in 1997-1998, employment grew more slowly than the labor. Consequently, the unemployment rate remained high at 11.4 percent in 2003, increasing to 12.1 percent in the first three quarters of 2004, the highest among countries in the Association of South East Asian Nations (ASEAN). At 17 percent, unemployment was more pronounced in Metro Manila in 2003 due to the migration of rural poor. An important safety valve is the overseas market for Philippines skilled. Eight million Philippines "about 10 percent of the population" work abroad in land and sea based jobs, remitting foreign currency equivalent to 8.8 percent of gross national product (GNP) in 2003. The demand for Philippines doctors, nurses and caregivers, for example, is especially strong from countries in North America and Europe with aging populations. However, when the Ramos President in 1992 introduced a broad range of economic reforms and initiatives designed to spur business growth and foreign investment, as a result, the Philippines saw a period of higher growth, but the Asian financial crisis triggered slowed economic development in the Philippines once again. While the administration of Ramos continued by President Estrada in 1998, the fiscal problems remain one of the economy's weakest point and its biggest vulnerability.

In what extent do changes in the Malaysia, Singapore and Philippines output growth rate explain the evolution of the employment sector? As we know employment performance is powerfully influenced by macroeconomic policies; and public policy can mitigate the effects of those factors that are inevitable and remove the ones that are not. Too often national efforts at macroeconomic stabilization have reduced economic growth to rates that are too low to allow adequate employment growth. (Note 2) Therefore, this study aims to examine the relationship between employment and output growth for Malaysia, Singapore and Philippines. Other control variables that will be used are such as domestic capital formation, government expenditure and trade.

2. Related Literature

More recent studies have been looking specifically into variables that are important in affecting employment growth. Several authors have estimated employment elasticities (a measure of the relationship between employment and economic growth) for a variety of nations. Padalino and Vivarelli (1997) showed the empirical evidence that fostering aggregate economic growth contributes to employment, especially in the short run. Walterskirchen (1999) found employment elasticities for the EU standing at 0.65 when employing a cross-country analysis of EU countries from 1988-98. Using data from 1970-98 for 7 countries plus the EU as a whole, employment elasticities ranged from 0.24 for Austria to 0.76 for Spain (the elasticity for the US was 0.53).

African Development Bank (1998), report claims that employment in Bostwana grew about 1.5 per cent between 1993 and 1995 whereas economic growth was averaging more than 6 per cent annual growth for the last decade. African Development Bank (1998), also reported that unemployment is estimated to be around 20 per cent of the

labour force. Resumption of economic growth in several African countries has not been matched by a faster growth of employment. ILO (1998), considers that labour force is growing much faster than employment creation, unemployment may rise confirming the view of jobless growth. Among those is the work of Boltho and Glyn (1995) which focuses on macroeconomic interventions and job creation. They found that in three out of four periods considered in their study, employment elasticity was around 0.5 and 0.6 and statistically significant. These results strongly suggest that increased positive economic growth rate can significantly pull up employment.

An International Labour Organization Report (1996) concluded that the responsiveness of employment growth to GDP growth has not declined in industrialized countries as a whole. However, a country-by-country analysis revealed mixed results with little relationship found in Germany, Italy and the UK in the 1990s, thus implying a jobless recovery. William Seyfried (2001) analyzed the relationship between economic growth, as measured by both real GDP and the output gap, and employment in the ten largest states from 1990 to 2003. Models are developed to estimate the employment intensity of economic growth as well as the timing of the relationship between employment and economic growth. Employment intensity is estimated to range from 0.31 to 0.61 in specific states with an estimate of 0.47 for the US as a whole. Catherine Saget (2000), investigates the relationship between growth and employment in the selected transition economies for 11 years. The main results show that there seems to be no relationship between output growth and the level of employment in the post-transition period for two countries: Bulgaria and Ukraine. The fact that both countries have one of the highest shares of unofficial economy in total output in the region is suggested as the main explanation behind the striking result.

Pietro and Mauro (2002) estimated cyclical components of European employment growth by running cross-country regressions of employment on output growth. Countries are grouped according to their change in employment protection legislation. The author argues that high employment growth after 1995 reflects structural improvements in the functioning of labour markets in Europe. However, the evidence that the cyclical upswing in employment growth after 1995 may have been more pronounced than in earlier cyclical episodes due to decreased employment protection. Declines in job security reduce the costs of both hiring and firing decisions and this will likely lead to an increase in the speed of adjustment to shocks. In cyclical upswings, employment growth will be higher than before but conversely, employment growth will be slower during downturns. Empirical evidence supporting this hypothesis is scarce due to lack of suitable data.

3. Data and Methodology

The data for this paper are compiled from the published resources: Malaysia Government publication, particularly Central Bank of Malaysia, Annual Report, Economic Review, and various issues; international publications, namely, IMF publications, particularly, International Financial Statistics. Besides, the data cross checked with the data from the Asian Development bank. The data used for the paper are annually data and cover from the period 1975 to 2004. Employment (N) is measured as the number employed persons in the country. Output (Y) is represents by the real gross domestic product, private capital formation is used to measure capital (K), government expenditure (G) is measured by total government development and operational expenditure and total of export and import (XM) is measured by total export and import for the good and services in the selected counties. The output growth, capital, government spending and total of export and import data was in real term and the index form in which the base year chosen for the study are 2000=100.

In empirical economics macroeconomic variables comprises of non stationary series. Treating non stationary variables in empirical analysis is important so that the results of spurious regression can be avoided. According to the concept of cointegration, two or more non-stationary time series share a common trend, then they are said to be cointegrated. The theoretical framework highlighted are expressed as follows: the component of the vector $Y_t = (y_{1t}, y_{2t}, \dots, y_{nt})'$ are considered to be cointegrated of order d, b , denoted $Y_t \sim CI(d, b)$ if (i) all the component Y_t are stationary after n difference, or integrated of order d and noted as $Y_t \sim I(d)$. (ii) presence of a vector $\beta = (\beta_1, \beta_2, \dots, \beta_n)$ in such that linear combination $\beta Y_t = \beta_1 y_{1t} + \beta_2 y_{2t} + \dots + \beta_n y_{nt}$ whereby the vector β is named the cointegrating vector. A few major characteristics of this model are that the cointegration relationship obtained indicates a linear combination of non-stationary variables, in which all variables must be integrated of the same order and lastly if there are n series of variables, there may be as many as $n-1$ linearly independent cointegrating vectors.

Johansen's (1991) cointegration test is adopted to determine whether the linear combination of the series possesses a long-run equilibrium relationship. The numbers of significant cointegrating vectors in non-stationary time series are tested by using the maximum likelihood based λ_{trace} and λ_{max} statistics introduced by Johansen and Juselius (1990). The advantage of this test is that it utilises test statistic that can be used to evaluate cointegration relationship among a group of two or more variables. Therefore, it is a superior test as it can deal with two or more variables that may be more than one cointegrating vector in the system.

Prior to testing for the number of significant cointegrating vectors, the likelihood ratio (LR) tests are performed to determine the lag length of the vector autoregressive system. In the Johansen procedure, following a vector autoregressive (VAR) model, it involves the identification of rank of the $n \times n$ matrix Π in the specification given by:

$$\Delta Y_t = \delta + \sum_{i=1}^{k-1} \Gamma_i \Delta Y_{t-i} + \Pi Y_{t-k} + \varepsilon_t \quad (1)$$

where Y_t is a column vector of the n variables, Δ is the difference operator, Γ and Π are the coefficient matrices, k denotes the lag length and δ is a constant. In the absence of cointegrating vector, Π is a singular matrix, which means that the cointegrating vector rank is equal to zero. On the other hand, in a cointegrated scenario, the rank of Π could be anywhere between zero. In other words, the Johansen cointegration test can determine the number of cointegrating equation and this number is named the *cointegrating rank*.

The Johansen Maximum likelihood test provides a test for the rank of Π , namely the trace test (λ_{trace}) and the maximum eigenvalue test (λ_{max}). Firstly, the λ_{trace} statistic test whether the number of cointegrating vector is zero or one. Then, the λ_{max} statistic test whether a single cointegration equation is sufficient. Both test statistics are given as follows:

$$\lambda_{\text{trace}}(r) = -T \sum_{i=r+1}^n \ln(1 - \hat{\lambda}_i) \quad (2)$$

$$\lambda_{\text{trace}}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (3)$$

where n is the number of separate series to be analysed, T is the number of usable observations and $\hat{\lambda}_i$ is the estimated eigenvalues.

3.1 Vector Error Correction Model (VECM)

Testing causality in the VECM framework is presently at the very forefront of econometric research (see Toda & Phillips, 1993). The underpinnings of this approach, however go back to Engle and Granger (1987), who demonstrated that once a number of variables (say, x_t and y_t) are found to be cointegrated, there always exists a correspondent error-correction representation, which implies that changes in the dependent variable are function of the level of disequilibrium in the cointegration relationship (captured by the error-correction term, ECT), as well as changes in other explanatory variable(s).

If we exploit the idea that there may exist comovements between employment of different countries and possibilities that they will trend together in finding a long run stable equilibrium, by Granger representation theorem, we may posit the following testing relationship, which constitute our VECM given by equation:

$$\Delta X_t = \sum A_i \Delta X_{t-i} + \sum \zeta_i \Theta_{t-i} + v_t$$

Where X_t is an $n \times 1$ vector of variables cointegrated of order r ; the A s are estimables parameters, Θ contains the r individual ECTs derived from r long run cointegrating vectors via the Johansen-Juselius (JJ) maximum likelihood procedure (Johansen, 1988; Johansen & Juselius, 1990); Δ is a difference operator, ε_t is a vector of impulses, which represent the unanticipated movements in X_t and $E(\varepsilon_t, \varepsilon'_t) = \Omega$, which is diagonal.

In addition to indicating the direction of causality among variables, the VECM approach allows us to distinguish between 'short run' and 'long run' forms of Granger causality. When the variables are cointegrated, in the short term, deviations from this long-run equilibrium will feed back on the changes in the dependent variable in order to force the movement towards the long-run equilibrium. The novelty of this technique can be illustrated in testing various economic issues, which elusive with respect to the causal direction. By example, this technique or formulation has also been used in mainstream macroeconomics analysis in order to test the causal chains implied by the major paradigms in macroeconomic theory (see Masih & Masih, 1995a).

3.2 Testing for Granger-Causality

The cointegration technique pioneered by Engle and Granger (1987), Granger (1986), and Hendry (1986) made a significant contribution towards testing Granger causality (Note 3). Granger causality is a technique for determining whether one time series is useful in forecasting another. Ordinarily, regressions reflect "mere" correlations, but Clive Granger, argued that there is an interpretation of a set of tests as revealing something about causality. A time series X is said to Granger-cause Y if it can be shown, usually through a series of F-tests on lagged values of X (and with lagged values of Y also known), that those X values provide statistically significant information about future values of Y . Two or more variables are said to be cointegrated, i.e., they exhibit long-run equilibrium relationships, if they share common trends (for an application of this technique in related disciplines, see Masih and Masih, 1995b, 1997).

This test is useful when we know that two variables are related but we don't know which variable causes the other to move. For example, most economies believe that increases in the money supply stimulate GDP, but others feel that increases in GDP eventually lead the monetary authorities to increase money supply.

As long as the two variables have a common trend, Granger causality must exist in at least one direction either unidirectional or bidirectional (Granger, 1986, 1988). According to Granger, a time series X_t is caused by another time series Y_t if the current value of X_t can be better predicted from past value of X_t and Y_t than from the past value of X_t alone. Essentially, Granger's definition of causality is framed in terms of predictability. The test works by first doing a regression of ΔY on lagged values of ΔY . Once the appropriate lag interval for Y is proved significant (t-stat or p-value), subsequent regressions for lagged levels of ΔX are performed and added to the regression provided that they 1) are significant in and of themselves and 2) add explanatory power to the model. This can be repeated for multiple ΔX 's (with each ΔX being tested independently of other ΔX 's, but in conjunction with the proven lag level of ΔY). More than 1 lag level of a variable can be included in the final regression model, provided it is statistically significant and provides explanatory power.

4. Empirical Results

In this study, the mainly objective of this paper is to test the relationship between employment and output growth in the ASEAN-3 countries namely Malaysia, Singapore and Philippines. We shall first employ the unit root test to determine the selected series are stationary or not. The unit root test using the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) test. The series variables include the employment, real growth domestic product, capital, government expenditure and total of export and import. If the series are not stationary then we proceed to test the long run relationship among these variables using the Johansen-Juselius (1990) multivariate cointegration technique. The VECM approach allows us to distinguish between 'short run' and 'long run' forms of Granger causality. We shall briefly discuss these techniques as a below. Lastly, the Granger causality test is used to analyze which variable precedes or leads the other.

4.1 Unit Root Test Results

The result of unit root test for Malaysia, Singapore and Philippines are given in Table 1, Table 2 and Table 3 respectively. LN is a employment, LY is a real gross domestic product, LK is a gross fixed capital formation, LG is a government expenditure and LXM is a total of export and import.

4.2 Johansen Cointegration Test Results

While the unit roots tests reveal the common integrational properties of the model variables, it is possible that those variables share a common trend. Or, in other word, the variables are said cointegrated. Having established that the series are integrated of order one, e.g. $I(1)$, we proceed study the long run behavioral relationship among variables. One method to see whether there are any relationships among the variables in the long run is cointegration test. Cointegration test are employed to capture the long run co-movement or long run equilibrium relationship among the variables. The multivariate cointegration procedure suggested by Johansen (1991) and Juselius (1990) is employed in this study to examine the existence of long run relationships among the variables in the model. The results of the trace and eigenvalue test for Malaysia are presented in Table 4. The result of the trace test supports the existence of two cointegrating vector in the employment. Looking at the maximal eigenvalues, the null of non cointegration is again rejected at 1% level, which indicates the existence of two integrating vector in the system. Based on the results reported in Table 5, seem to have straightforward interpretation for cases of Singapore. The result of the trace test supports the existence of two cointegrating vector in the employment. The results of the trace and eigenvalue test for Philippines are presented in Table 6. The result of the trace test supports the existence of two cointegrating vector in the employment. Looking at the maximal eigenvalues, the null of non cointegration is again rejected at 1% and 5% level, which indicates the existence of two integrating vector in the system.

4.3 Results of Granger Causality

Table 7 shows the Granger causality relationship for Malaysia which estimate the ECM term in the VECM for various variables in the series. For Malaysia, only government expenditure could affect the employment growth and the error term is significant at 5%. Any changes in the government fiscal policies will affect to the employment growth. In the output, government expenditure and total of export and import equation, none of the variables could affect the output growth, government expenditure and total of import and export. The error correction term is not significant at 5 % level. One of the variables that could affect the capital equation is employment. The error correction term also significant at 5 % level. Causality test for Malaysia show that government expenditure will cause the employment growth and employment growth will cause the capital. The causality shows the unidirectional relationship between the variables. In the case of Singapore, the causality results show that none exist in the all of the

equation except for total of import and export equation. This equation show the unidirectional causality detected from capital to total of export and import. Although no causality detected in the error term is significant at 5 % level for output growth and capital.

Granger causality based on the VECM clearly shows for Philippines. the causality shows the total of export and import will cause the employment growth by the unidirectional relationship but the error correction term is not significant at this level. In the output growth equation, the unidirectional causality detected in the government expenditure where is significant at 1%. No causality detected in the capital and government expenditure equation. One of the variables also detected the unidirectional causality in the total of export and import equation which is government expenditure. The error correction term in this model is not significant. As we recall, the main objective of this paper are to investigate the long run relationship between employment and economic growth as well as to measure the employment elasticity with regard to selected macroeconomics variables such as output, capital, government expenditures and total of export and import. Having the properties of the time series involved in this study, the Johansen cointegration test can be preceded in purpose to determine the existence of long run relationship between the variable. Clearly, the Johansen test concludes the existence of at least one cointegration vector for aggregate data models for Malaysia, Singapore and Philippines. As for the Granger causality test, we could safely conclude that in the case of Malaysia, the causality that could be detected are, capital granger causes employment and employment granger causes Government expenditure, as for Singapore, trade granger causes capital and lastly for the case of Philippines, both income and trade granger causes Government expenditure.

5. Conclusions

It has also been argued separately in this paper that the employment problem can best be addressed with a growth revival strategy. There are a few policy lessons that need to be further explored and constitute areas in which follow-up work is urgent. First, an attempt must be made to minimize sources of macroeconomic instability that arise from the actions of government itself. Second, trade policy has to be reassessed in the light of maximizing gains for the country given its production structure, as opposed to hoping that market signals on their own will transform and diversify the production structure. There is obvious room here for expanding the revenue base for government without adversely impacting output.

Trade clearly has the potential to create jobs. In practice there is often factual evidence that lower trade barriers have been good for employment. But the picture is complicated by a number of factors. There is strong evidence that trade boosts economic growth, and that economic growth means more jobs. It is also true that some jobs are lost even when trade is expanding. But a reliable analysis of this poses at least two problems. First, there are other factors at play. For example, technological advance has also had a strong impact on employment and productivity, benefiting some jobs, hurting others. Second, while trade clearly boosts national income (and prosperity), this is not always translated into new employment for workers who lost their jobs as a result of competition from imports. The picture is not the same all over the world. The average length of time a worker takes to find a new job can be much longer in one country than for a similar worker in another country experiencing similar conditions. In other words, some countries are better at making the adjustment than others. This is partly because some countries have more effective adjustment policies. Those without effective policies are missing an opportunity.

The focus of government expenditure should be on growth-enhancing and demand-generating activities that have a strong re-distributive side. Greater unemployment and poverty will place severe pressure on governments' budgetary targets, given the fragile financial position of many countries. Policy makers should focus on measures to secure and spread the recovery and ensure that faster growth yields the maximum number of decent work opportunities, reduces unemployment and poverty and restarts employment growth. A "pro jobs" policy involving fiscal and other measures to "jumped up" growth and stimulate employment is essential. This must be accompanied by an incentive structure for the private sector that's favour the choice of employment creation. The policy makers also need to focus on reducing the vulnerability of developing countries and the poorest members of society to external shocks. The countries should adopt "pro-poor" policies to help women and men secure productive decent work in conditions of freedom, security and human dignity. The growing employment crisis can be address through pro-jobs and pro-poor policies.

Lastly and most critically, a central aim of the government should be to produce and develop a new breed of *employment-friendly alternative adjustment programmes*. These must examine the feasibility of expansionary macroeconomic policies in Malaysia, Singapore and Philippines and be used as working documents for negotiation with donors, carrying explicit improvements on social indicators as part of their short and medium-run goals.

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Notes

Note 1. This period of growth was interrupted in 1985, in the wake of a global recession and in 1998, following an attack of Malaysia ringgit. See Government of Malaysia, Sixth Malaysia Plan, 1991-1995(Kuala Lumpur, National Printing Department)

Note 2. International Labor Organization, World Employment Report, 2000

Note 3. Causality is a subject of great controversy among economists (see, for example, Zellner, 1988). Interested readers could refer to a supplementary issues of the Journal of Econometrics, September-October,1988, that includes studies discussing this issue.

Table 1. Results of Unit Root Test for Malaysia

Variable in Levels	Stationary Around a Non-Zero Mean and a Linear Trend		Variable in First Differences	Stationary Around a Non-Zero Mean	
	ADF (Lag)	P-P		ADF (Lag)	P-P
N	-2.955001	-2.997034	Δ N	-5.160169*	-5.931681*
Y	-2.815792	-2.932453	Δ Y	-4.390739*	-4.510967*
K	-2.439273	-1.696206	Δ K	-3.586345**	-3.558515**
G	-2.089235	-2.193364	Δ G	-4.829551*	-4.827443*
XM	-2.413898	-1.809412	Δ XM	-3.936000**	-3.744295**

Notes : * (**) and *** denotes rejection of the hypothesis at 1%(5%) and 10% significant level.

Table 2. Results of Unit Root Test for Singapore

Variable in Levels	Stationary Around a Non-Zero Mean and a Linear Trend		Variable in First Differences	Stationary Around a Non-Zero Mean	
	ADF (Lag)	P-P		ADF (Lag)	P-P
N	-2.694783	-2.479843	Δ N	-4.331023*	-4.071425*
Y	-0.907167	-0.907167	Δ Y	-4.107779*	-4.026031*
K	-2.725148	-1.253628	Δ K	-3.252992***	-4.765342* ^a
G	-2.37018	-2.434988	Δ G	-5.798257*	-5.967863*
XM	-2.382231	-1.833571	Δ XM	-3.546960**	-3.3159424***

Notes : * (**) and *** denotes rejection of the hypothesis at 1%(5%) and 10% significant level.

Table 3. Results of Unit Root Test for Philippines

Variable in Levels	Stationary Around a Non-Zero Mean and a Linear Trend		Variable in First Differences	Stationary Around a Non-Zero Mean	
	ADF	P-P		ADF	P-P
N	-2.824266	-2.635551	Δ N	-5.428930*	-6.909841*
Y	-0.951141	-1.594245	Δ Y	-5.160117*	-6.497101*
K	-2.846802	-2.492654	Δ K	-4.395725*	-4.572732*
G	-2.543691	-1.811305	Δ G	-3.395762***	-3.362362***
XM	-2.003279	-1.985063	Δ XM	-4.667866*	-4.746599*

Notes : * (**) and *** denotes rejection of the hypothesis at 1%(5%) and 10% significant level.

Table 4. Johansen's Test for the Number of Cointegration Vectors for Malaysia

Tests				
	Maximal Eigenvalue		Trace	
Null	Statistic	5% critical value	Statistic	5% critical value
N				
$r = 0$	59.55061**	33.46	123.4424**	68.52
$r \leq 1$	37.46881**	27.07	63.89174**	47.21
$r \leq 2$	16.99895	20.97	26.42293	29.68
$r \leq 3$	8.116855	14.07	9.423980	15.41
$r \leq 4$	1.307125	3.76	1.307125	3.76

Notes : *(**) denotes rejection of the hypothesis at the 1%(5%) level. r denotes the number of the cointegrating vector.

Table 5. Johansen's Test for the Number of Cointegration Vectors for Singapore

Tests				
	Maximal Eigenvalue		Trace	
Null	Statistic	5% critical value	Statistic	5% critical value
N				
$r = 0$	55.20184**	33.46	104.4502**	68.52
$r \leq 1$	22.47932	27.07	47.21*	54.46
$r \leq 2$	18.96538	20.97	26.76904	29.68
$r \leq 3$	4.442186	14.07	7.803663	15.41
$r \leq 4$	3.361476	3.76	3.361476	3.76

Notes : *(**) denotes rejection of the hypothesis at the 1%(5%) level. r denotes the number of the cointegrating vector.

Table 6. Johansen's Test for the Number of Cointegration Vectors for Philippines

Tests				
	Maximal Eigenvalue		Trace	
Null	Statistic	5% critical value	Statistic	5% critical value
N				
$r = 0$	44.21088**	33.46	107.6999**	68.52
$r \leq 1$	28.22896*	27.07	63.48900**	47.21
$r \leq 2$	24.05860	20.97	35.26004	29.68
$r \leq 3$	7.562122	14.07	11.20144	15.41
$r \leq 4$	3.639319	3.76	3.639319	3.76

Notes : *(**) denotes rejection of the hypothesis at the 1%(5%) level. r denotes the number of the cointegrating vector.

Table 7. Granger Causality Tests for Malaysia

Dependent variable	Wald Test					
	$\Delta \ln N$	$\Delta \ln Y$	$\Delta \ln K$	$\Delta \ln G$	$\Delta \ln XM$	ECT_{t-1}
$\Delta \ln N$		0.287218 (0.8662)	5.922307 (0.0518)**	4.833725 (0.0892)	0.123086 (0.9403)	-0.194681 ^a (-3.08267)
$\Delta \ln Y$	4.641029 (0.0982)		0.935015 (0.6266)	0.487272 (0.7838)	0.065290 (0.9679)	0.169762 (0.83706)
$\Delta \ln K$	2.738031 (0.2544)	0.644082 (0.7247)		1.611624 (0.4467)	0.165783 (0.9205)	0.038198 (0.08973)
$\Delta \ln G$	5.693168 (0.0580)**	0.011198 (0.9944)	1.545074 (0.4618)		0.054027 (0.9733)	-0.050097 (-0.24039)
$\Delta \ln XM$	5.059739 (0.0797)	0.055669 (0.9725)	4.060905 (0.1313)	4.030296 (0.1333)		-0.040270 (-0.11423)

Notes : *(**) denotes rejection of the hypothesis at 1%(5%) significant level

^a The values in parentheses are the test statistic values

Numbers in the parentheses are the t-value for the null

Table 8. Granger Causality Tests for Singapore

Dependent variable	Wald Test					
	$\Delta \ln N$	$\Delta \ln Y$	$\Delta \ln K$	$\Delta \ln G$	$\Delta \ln XM$	ECT_{t-1}
$\Delta \ln N$		0.603937 (0.7394)	1.736063 (0.4198)	0.307523 (0.8575)	0.045774 (0.9774)	-0.437649 (-1.92883)
$\Delta \ln Y$	2.816780 (0.2445)		1.103870 (0.5758)	0.047888 (0.9763)	2.148845 (0.3415)	-0.740656 ^a (-2.26038)
$\Delta \ln K$	2.340930 (0.3102)	3.224185 (0.1995)		1.328581 (0.5146)	7.186026 (0.0275)**	-1.654448 ^a (-4.20477)
$\Delta \ln G$	1.382289 (0.5010)	1.235967 (0.5390)	0.213580 (0.8987)		0.642712 (0.7252)	0.003245 (0.00503)
$\Delta \ln XM$	0.785353 (0.6752)	2.957294 (0.2279)		0.330025 (0.8479)		1.523854 (-0.25075)

Notes : * (**) denotes rejection of the hypothesis at 1%(5%) significant level

^a The values in parentheses are the test statistic values

Numbers in the parentheses are the t-value for the null

Table 9. Granger Causality Tests for Philippines

Dependent variable	Wald Test					
	$\Delta \ln N$	$\Delta \ln Y$	$\Delta \ln K$	$\Delta \ln G$	$\Delta \ln XM$	ECT_{t-1}
$\Delta \ln N$		0.336452 (0.8452)	0.072432 (0.9644)	0.343136 (0.8423)	1.363786 (0.5057)	0.150165 (1.49624)
$\Delta \ln Y$	1.164473 (0.5586)		0.878646 (0.6445)	0.801603 (0.6698)	0.365377 (0.8330)	-0.021845 (-0.16209)
$\Delta \ln K$	2.459910 (0.2923)	0.135666 (0.9344)		1.312339 (0.5188)	3.246469 (0.1973)	0.363356 (0.71994)
$\Delta \ln G$	1.59951 (0.4494)	12.01025 (0.0025)*	3.998559 (0.1354)		8.040575 (0.0179)**	-0.140120 (-0.54327)
$\Delta \ln XM$	6.601273 (0.0369)**	1.651541 (0.4379)	2.684282 (0.2613)	2.271632 (0.3212)		0.302098 (1.16807)

Notes : * (**) denotes rejection of the hypothesis at 1%(5%) significant level

Numbers in the parentheses are the t-value for the null