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Education Expenditure and Economic Growth: A Causal Analysis for Malaysia

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Abstract

This paper focuses on the long-run relationship and causality between government expenditure in education and economic growth in Malaysian economy. Time series data is used for the period 1970 to 2010 obtained from authorized sources. In order to achieve the objective, an estimation of Vector Auto Regression (VAR) method is applied. Findings from the study show that economic growth (GDP) positively cointegrated with selected variables namely fixed capital formation (CAP), labor force participation (LAB) and government expenditure on education (EDU). With regard to the Granger causality relationship, it is found that the economic growth is a short term Granger cause for education variable and vice versa. Furthermore, this study has proves that human capital such as education variable plays an important role in influencing economic growth in Malaysia.

Keywords: Malaysian, expenditure on education, economic growth, vector error correction model.

1. Introduction

It is widely acknowledged that, education is an important determinant factor of economic growth. Prominent classical and neoclassical economist such as Adam Smith, Romer, Lucas and Solow emphasized the contribution of education in developing their economic growth theories and models. The main theoretical approaches of modelling the linkages between education and economic performance are the neoclassical growth models of Robert Solow (1957) and the model of Romer (1990). Apart from the theoretical aspects, numerous empirical studies have focussed on the issue of education and economic development.

According to Ismail (1998), education is considered as a long term investment that leads to a high production for a country in the future. In fact, economists argued that advanced education sector will certainly lead successfulness of a country's economics and socials development. Therefore, most of the developed and developing countries emphasize the enhancement of educational sector. Malaysia has no exceptions in developing and enhancing its educational system in order to be a world class country (Ibrahmim and Awang, 2008). Malaysia's commitment in developing its educational sectors has been tremendous. This can be seen from Malaysia's annual budget allocation. Malaysia has allocated significant amount of budget for education sector and it keep increasing for each budget session. Figure 1 shows Malaysia's budget allocation for educational sector between 1970 and 2010. What can be learnt is that, from 1989 there have been consistent increases for Malaysia's educational budget allocations. Despite the financial turmoil that badly affected Malaysian economy in which had devaluated Malaysia currency in 1998, government's allocation for the educational sector has never been reduced. In fact it has been increasing. Emphasizing on educational sector has been successful as it plays important roles in achieving National development agenda and contributed to a country's economic growth. Sheehan (1971) has listed some direct benefit that country's gain from education. This includes increases in productivity, labors' income, country's economic growth and literacy rate. In addition, education could also improve efficiency of income allocation as well as labor's mobility and transfer in accordance to work demand of trained workers.

2. Literature Review

In this regard, there have been numerous cross-country studies, which have extensively explored whether the attainment of education can contribute significantly to the generation of overall output in economy. On the one hand, these macro studies continued to produce inconsistent and controversial results (Pritchett 1996). For example, Permani (2009) in his study on development strategy in East Asia concluded that this region give

greater emphasis to education. His study found that there is positive relationship between education and economic growth in the East Asia. In the meantime, there is bidirectional causality between education and economic growth.

Pradhan (2009) supported this finding and proved that education has high economic value and must be considered as a national capital. He suggested that this capital must be invested and his country, India, must capitalize this human capital development besides the physical capital that contributes to country's economic growth. Afzal *et al.* (2010) acknowledged that education has positive long-run and short-run relationships on economic growth in Pakistan. This is in line with findings from Lin (2003), and Tamang (2011) on their studies in Taiwan and India respectively. In addition Baldacci *et al*. (2004) documentation on 120 developing countries from 1975 – 2000 found that there are positive relationships in the long-run between educational expenses and economic growth.

In the meantime, Becker (1964) argued that a man would definitely invest in education as it will give him a promising return in the future. He assumed that, this rational decision will lead the individual to assure that the investment in education is efficient in terms of the cost, profits and opportunities cost that the person incurred while pursuing his education. Research by Lin (2004) on Taiwanese economy concluded that higher education has positive and significant impact on the country's economic growth. The author than compared the finding between disciplines and found that engineering and natural science played a vital role. Empirical studies on Uganda economy by Musila and Belassi (2004) showed that an increase of 1% average in educational expenses for each labour will lead into 0.04% rise in national short-run production and 0.6% rise in long term production. Nevertheless, finding by Kakar *et al.*, (2011) on their study in Pakistan concluded that there is no significant relationship between education and short-term economic growth but the educational development has impact in the country's long run economic growth. These findings demonstrated that government expenditure on education sectors does not only have a positive impact on a country's economic growth in a short run but in long run as well.

By using same approach in evaluating the impact of education on economic growth, a study on 55 developing countries carried out by Otani and Villanueva (1990) from 1970 to 1985 found that educational program and human capital investment such as vocational training and health training would increase a country's output and per capita income. Consequently, the countries would achieve high level of economic performances. The research demonstrated that human capital development contributes an annual average of 1% increase in developing countries' growth rate. This finding was supported by Trostel *et al.*, (2002) which found that achievement in human capital development that comprises two important elements, namely education and training, positively correlated with national income and productivity. According the author, the finding is consistent in all countries regardless of their stages in development.

Beside the contribution of education on national economic growth, it also plays significant in reducing income inequality, research done by Phillipe *et al.*, (2009), Kakar *et al.*, (2011) concluded that educational achievement and successfulness as well as human capital development would positively reduce income inequality. In general, there is a consensus among the researchers that education influenced economic growth by reducing poverty incidence, social imbalances as well as income equality. Moreover, it gives a positive impact to the poor and needy to improve their live. In this regards, Jung and Thorbecke (2003) suggested that education is a main instrument to alleviating poverty. It is argued that poverty alleviation can be achieved by giving education to the poor so that more job opportunities will be created, thus more income to the individual and a country. Yogish (2006) has also found that education is a promising investment to a country by producing skilled and high skilled labour force. This skilled and high skilled labour would definitely accelerate country's economic development and in consequence improve quality of life.

In spite of the positive finding on the effect of education and economic performances, several studies conversely demonstrated a different finding. De Meulmester and Rochet (1995), for example concluded that the relationship

between education and economic growth are not always positive. Some has also argued that education is simply an application and it is not meant to improve economy.

According to Blaug (1970) and Sheehan (1971), investment in education is just merely consumption. This is due to the fact that investment in acquiring knowledge or skills is for the individual interests only and does not contribute into the economic growth. To support this argument, empirical study by Devarajan *et al.*, (1996) on 43 developing countries showed that excessive government expenditure in education negatively correlated with the countries' economic growth. Moreover, Blis and Klenow (2000) argued that it was too weak to conclude that the education or school achievement significantly contributed the economic growth. This finding is based on their study among the 52 countries between 1960 and 1990.

In conclusion, based on the previous discussion, the effect of education on economic growth is arguable. Some might said it has positive effect and vice versa, despite the general believe that individual educational achievement will lead to job opportunities and job creations and at the same time improve people's life. Therefore, in this study, we seek to investigate long term relationship and causal relations between expenditure in education with Malaysian economic growth.

3. Data Description

A total of four variables had been used in the analysis. The definitions of each variable and time-series transformation are described in Table 1 and Table 2.

4. Theoretical Model

The model used in this paper is based on the aggregate production function.

$$Y = A.K^{\alpha}. L^{\beta}. H^{\gamma} \quad (1)$$

Y is output "A" is technological progress, "K" is capital stock, "L" is labour force, and "H" is used for Human capital. Human capital can be replaced with "E" where "E" is government expenditure on education. We can replace "H" with "E", and rewrite the equation as,

$$Y = A.K^{\alpha}. L^{\beta}. E^{\gamma} \quad (2)$$

Equation (2) given above, is used to develop the econometric model to determine the impact of education expenditure on economic growth. In accordance to statistical economics and economics characteristics, an appropriate model to explain equation (2) is through following non-linear model:

$$Y_t = A\, CAP^{\alpha}_t\ LAB^{\beta}_t\, EDU^{\gamma}_t \quad (3)$$

Where; Y= Output (Real Gross Domestic Product)

EDU= Government Expenditure on Education

CAP = Fixed Capital Formation

LAB = Labour Force Participation

t = Times

Since this equation is a non linear model, parameter values for A, α, β dan γ are not be able to be directly estimated. Therefore, it is suggested to amend the production function into log-linear model as follows:

$$\text{Ln } GDP_t = \ln A + \alpha \ln CAP_t + \beta \ln LAB_t + \gamma \ln EDU_t + e_t \quad (4)$$

Based on the VAR regression method, the above-mentioned model has four variables and can be written as:

$$\begin{bmatrix} GDP_t \\ EDU_t \\ CAP_t \\ LAB_t \end{bmatrix} = \begin{bmatrix} A_1 \\ A_2 \\ A_3 \\ A_4 \end{bmatrix} + R(L) \begin{bmatrix} GDP_{t-1} \\ EDU_{t-1} \\ CAP_{t-1} \\ LAB_{t-1} \end{bmatrix} + \begin{bmatrix} et_1 \\ et_2 \\ et_3 \\ et_4 \end{bmatrix} \quad (5)$$

Where R is 4 x 4 matrix polynomial parameter estimators, (L) is lag length operators, A is an intercept and et is Gaussian error vector with mean zero and Ω is a Varian matrix.

5. Research Methodology

To properly specify the VAR model, we followed the standard procedure of time series analyses. First, we applied the commonly used augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests to determine the variables' stationarity properties or integration order. Briefly stated, a variable is said to be integrated of order d, written 1(d), if it requires differencing d times to achieve stationarity. Thus, the variable is non-stationary if it is integrated of order 1 or higher. Classification of the variables into stationary and non-stationary variables is crucial since standard statistical procedures can handle only stationary series. Moreover, there also exists a possible long-run co-movement, termed cointegration, among non-stationary variables having the same integration order. Accordingly, in the second step, we implemented a VAR-based approach of cointegration test suggested by Johansen (1988) and Johansen and Juselius (1990). Appropriately, the test provides us information on whether the variables, particularly measures of economic growth and human capital variables are tied together in the long run. Then the study proceeded with a Granger causality test in the form of vector error correction model (VECM). Granger causality test is performed to identify the existence and nature of the causality relationship between the variables. This is appropriate to identify relationships between variables because multiple causes simultaneously, especially if the variables involved in the created model more than two variables.

6. Empirical Results

Research finding from the aforementioned tests will be analysed accordingly. This begin with unit root test, co integration test and finally with the Vector Error Correction Model.

6.1 Integration Test

Integration analysis is carried out to evaluate the degree of stationary for each variable. This analysis is important to avoid spurious regression problem. This study requires same order of stationary for the time series data because it is pre-requisite in co-integration analysis and Granger causality version VECM.

Table 3 presents the results for the unit-root tests using Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests for the order of integration of each variable. For the level of the series, the null hypothesis of the series having unit roots cannot be rejected at even 5% level. However, it is soundly rejected for each differenced series. This implies that the variables are integrated of order I(1).

6.2 Lag Length Test

Based on the Vector Auto-regression, appropriate lag length selection is important in order to assure the research findings reflect real economic situation and importantly the findings are consistent with economic as well as econometric theories.

As shown in table 4, Final Prediction Error (FPE) criterion and Akaike Information Criterion (AIC) suggested that the selected lag length must be lag 3. Meanwhile Schwarz Infromation Criterion (SIC) and Hannan-Quinn Information Criterion (HQ) suggested lag length 1 and must be comply with smallest value for each criterion. Therefore, this research using lag 3 as suggested in Akaike Information Criterion (AIC) and in line with Adam and George (2008) and Yusoff *et al*. (2006). Lag length 3 will be used for co integration test and vector error correction model (VECM).

6.3 Cointegration Analysis

Having established that the variables are stationary and have the same order of integration, we proceeded to test whether they are cointegrated. To achieve this, Johansen Multivariate Cointegration test is employed. The results of the Johansen's Trace and Max Eigenvalue tests are shown in Table 5. At the 5% significance level the Trace test and the Max Eigenvalue test suggested that the variables are cointegrated with r = 2. Therefore, Cheung and

Lai (1993) suggested the rank will be dependent on the Trace test results because Trace test showed more robustness to both skewness and excess kurtosis in the residual, which implied that there are at least 2 cointegration vectors ($r \leq 1$) found in this model.

These values represent long-term elasticity measures, due to logarithmic transformation of GDP, CAP, LAB and EDU in table 5. Thus the cointegration relationship can be re-expressed as table 6. The long-term equation shows that the GDP values are positively correlated and significant with the CAP variable. This finding is consistent with Ali *et al.*, (2009) which found that capital has postive relationship with GDP variable in Malaysia. This is due to the readiness of big capital amount that would lead into positive injection in economic growth (Solow, 1957).

In addition, abovementioned long term equation showed that there is a significant and positive relationship between long term labour force and GDP. Findings by Tamang (2011) and Kakar *et al.,* (2011) also concluded the same trend and acknowledged that labour force is highly affected a country's economic growth. It is also suggested that, the increasing number of labour force would improve efficiency and productivity of an economy. The directional relation between GDP and employment is consistent with other studies such as (Debendictis, 1997) which show similar result in British Columbia and Canada. Indeed, economic situation significantly affect the direction of labour demand.

It is interesting to note that, this research proved that there is positive and significant relationship between educational expenditure and GDP as suggested by previous studies such as Tamang (2011), Odit *et al*. (2010), Haldar and Mallik (2010) Rao and Jani (2009) and Jung & Thorbecke (2003). The researchers demonstrated that education play a vital role in a country's economic growth by producing skilled and knowledged work force. In consequence, improve country's income. On the whole, this research managed to demonstrate that government expenditure in education, work force participation and capital, to a greater extent, influence long run economic run particularly in Malaysia.

6.4 Vector Error Correction Model (VECM) Analysis

An examination of cointegration test, it is found that there is existence of long-run relationship between the variables in same order of homogeneity. Therefore, error correction term (ECT) was included in order to run Vector error Correction Model. Engle and Granger (1987) and Toda and Phillips (1993) proposed that the error-correction model is a comprehensive method to use in the test of causality when variables are cointegrated. Failure to do this would lead to model misspecification. Therefore, it is suggested to estimate Granger causal test in vector error correction model (VECM). The result is presented in Table 7.

Long run Granger causal relationship is identified in ECT-1 value for each variable. Having VECM tested, the result indicates that ECT-1 for the GDP variable is significant and have negative signs implying that the series cannot drift too far apart and convergence is achieved in the long run. This indicates that CAP, LAB, and EDU are long run granger causality for the GDP. In other words, GDP variable in the equation is able to correct any deviations in the relationship between GDP growth rate and the explanatory variables. The speed of adjustment of the error-correction term of -0.528 implies that the system corrects its previous level of disequilibrium by 52.8% within one period. Equally, 52.8% of previous year's GDP disequilibrium from the long run will be corrected each year.

Based on the Long run Granger causal relationship test, the coefficient on the ECT-1 in the CAP equation is -0.262 and significant at the 1% level. This means that 26.2 percent adjustment is needed in the long run. Thus, we can conclude that there is long run causality between investigated dependent variables (GDP, LAB, and EDU) and the independent variable (CAP). However, ECT-1 value for LAB and EDU are insignificant.

We then conducted a Wald test to investigate short run causal relationship. The result in the Table 7 suggests that CAP and EDU are the Granger causality of the GDP in the short run. This says that, in the short run GDP will be

only affected by capital and educational expenditure. While, insignificant coefficient of labour (LAB) indicates that this variable is not important for the GDP in the short run. In addition, GDP and CAP are the Granger causality for educational expenditure (EDU) in the short run. For further details, these finding are summarised in Figure 2.

7. Conclusion

This paper investigates the impact of government educational expenditure on economic growth in Malaysia for the period 1970-2010. By using vector auto regression (VAR) method, it has revealed that the GDP has a positive long run relationship with the fixed capital formation (CAP), labour force participation (LAB) and government expenditure on education (EDU). All these show a significant relationship. The results confirm that education has a long run relationship of economic growth. Better standards of education improve the efficiency and productivity of labour force and effect the economic development in the long run. Furthermore, in the short-run education granger cause economic growth and vice verse. This finding implies that education quality is essential to increase the country's economic growth and human capital abilities. Therefore, it is suggested that the government should increase the expenditure on education sector in order to improve the economic performances.

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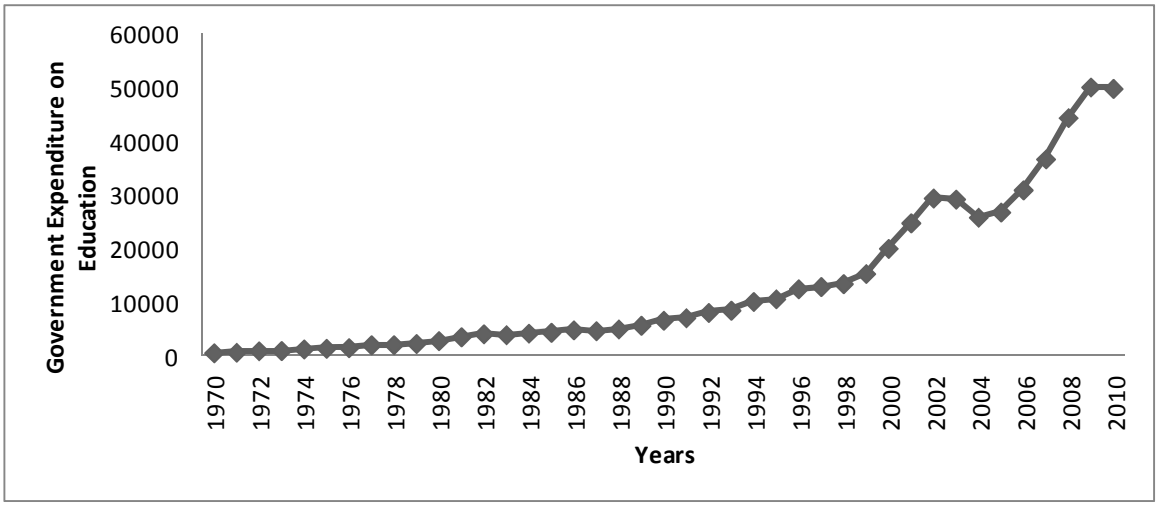


Source: Malaysian Economic Report, Various Years.

Figure 1. Malaysian Government Expenditure for Educational Sector as It total Management and Development Expenses, 1970 - 2010

Table.1. Definitions of Variables

No	Variable	Description	Duration	Source
1	Real Gross Domestic Product (GDP)	GDP used as the proxy for economic growth in Malaysia	Annually data from year 1970 to 2010.	Department of Statistics, Malaysia
2	Government Expenditure on Education (EDU)	EDU used as the proxy for human capital in Malaysia	Annually data from year 1970 to 2010.	Department of Statistics, Malaysia
3	Gross Fixed Capital Formation (CAP)	CAP used as the proxy for the net investment in an economy.	Annually data from year 1970 to 2010.	Department of Statistics, Malaysia
4	Labour (LAB)	LAB used as the proxy for the labour participation in Malaysia	Annually data from year 1970 to 2010.	Department of Statistics, Malaysia

Table 2. Time-Series Transformations

No	Time Series Data Transformation Variable	Description
1	$\Delta LNGDP = Log\left[\frac{GDP_{(t)}}{GDP_{(t-1)}}\right]$	Growth of Real GDP
2	$\Delta LNEDU = Log\left[\frac{EDU_{(t)}}{EDU_{(t-1)}}\right]$	Growth of Government Expenditure on Education
3	$\Delta LNCAP = Log\left[\frac{CAP_{(t)}}{CAP_{(t-1)}}\right]$	Growth of Fixed Capital Asset.
4	$\Delta LNLAB = Log\left[\frac{LAB_{(t)}}{LAB_{(t-1)}}\right]$	Growth of Labour Participation.

Table 3. Augmented Dickey Fuller (ADF) and Phillip Perron (PP) Unit Root Test

Test	Augmented Dickey Fuller (ADF)				Phillip Perron (PP)			
Variable	Level		First Difference		Level		First Difference	
	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Intercept	Trend & Intercept	Intercept	Trend & Intercept
LNGDP	-1.967 (0)	-2.109 (0)	-5.807* (0)	-6.256* (0)	-2.005 (1)	-2.114 (1)	-5.795* (2)	-6.256* (1)
LNCAP	-1.482 (0)	-1.731 (0)	-5.588* (0)	-5.679* (0)	-1.489 (1)	-1.770 (1)	-5.588* (1)	-5.679* (0)
LNLAB	-2.411 (2)	-2.163 (2)	-5.138* (1)	-5.761* (1)	-1.095 (0)	-1.803 (2)	-6.677* (1)	-7.895* (5)
LNEDU	-1.508 (3)	-3.435 (8)	-3.969* (2)	-4.165**(2)	-2.155 (6)	-3.385 (6)	-5.335* (6)	-5.579* (7)

* Significant at 1% level of confidence, ** Significant at 5% level of confidence

Table 4. *Lag Length Test*

Lag Length Test	Final Prediction Error (FPE)	Akaike Information Criterion (AIC)	Schwarz Information Criterion (SIC)	Hannan-Quinn Information Criterion (HQ)
0	1.42e-11	-7.948363	-7.687133	-7.856268
1	1.83e-17	-21.53798	-19.70937*	-20.89331*
2	1.70e-17	-21.77176	-18.37577	-20.57451
3	5.48e-18*	-23.36515*	-18.40178	-21.61533

Note: * is a minimum selected lag.

Table 5. Cointegration Test

Model	Null Hypothesis	Statistical Trace	Critical Value (5%)	Maximum Eigen	Critical Value (5%)	Results
Lag Length: 3#	r ≤ 0	81.992*	47.856	48.098*	27.584	Statistical Trace and Maximum Eigen values showed a two cointegration vectors.
	r ≤ 1	33.893*	29.797	23.987*	21.131	
	r ≤ 2	9.906	15.494	9.879	14.264	
	r ≤ 3	0.027	3.841	0.027	3.8414	

* Significant at 5% level of confidence, Critical level obtained from Osterwald-Lenum (1992)
#: Lag length based on AIC value

Table 6. Cointegration Relationship

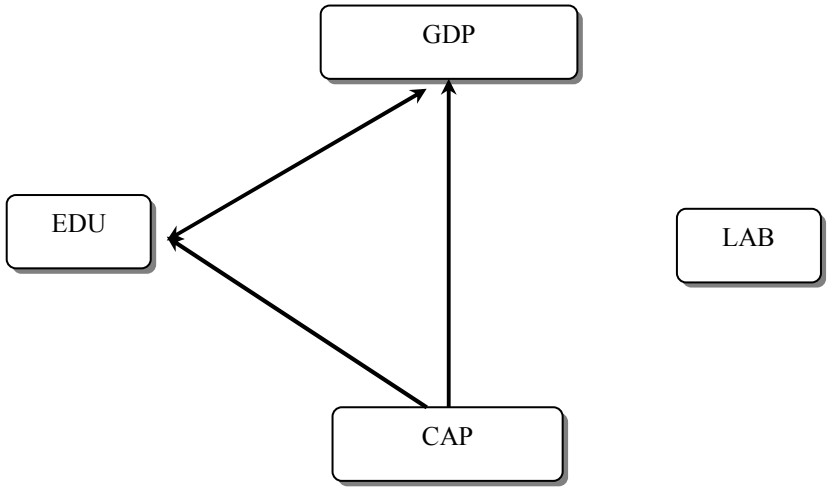
Dependent Variable (LNGDP)	Independent Variables			
	LNCAP	LNLAB	LNEDU	C
coefficient	0.074103*	1.497097*	0.444067*	6.134861
t-value	2.90791	7.20036	8.60160	

* Significant at 1% level of confidence

Table 7. Vector Error Correction Model (VECM)

Dependent Variables	Independent Variables - Chi-Square Value (Wald Test)				t statistic
	ΔLNGDP	ΔLNCAP	ΔLNLAB	ΔLNEDU	Ect-1
ΔLNGDP		11.243* (0.010)	3.175 (0.365)	8.874* (0.031)	-0.528 [-2.607]
ΔLNCAP	4.518 (0.210)		5.508 (0.138)	0.818 (0.845)	-0.262 [-3.248]
ΔLNLAB	1.195 (0.754)	2.486 (0.477)		1.412 (0.702)	0.149 [0.975]
ΔLNEDU	27.900* (0.000)	25.260* (0.000)	2.270 (0.518)		0.223 [0.616]

* 1% significant level, ** 5% significant level, *** 10% significant level, ( ) probability and [ ] t value



Direction:
→ Unidirectional Causality ↔ Bidirectional Causality

Figure 2. Granger Causality Relationship