LEAD-LAG RELATIONSHIP BETWEEN

HOUSING AND GROSS DOMESTIC PRODUCT IN SARAWAK

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INTRODUCTION

Housing as a basic social need is one of the important components of the social sector. This recognition has led to the formulation of policies and programs aimed at ensuring that all Malaysians, particularly the low-income group, have access to adequate shelter and related facilities. Towards this end, housing programs have been undertaken by public sector agencies and the private sector to meet the needs of the population. *(Fifth Malaysia Plan,1986-1990)*

HOUSING PERFORMANCE DURING FOURTH MALAYSIAN PLAN (1981-1985)

A total of 923,300 units of houses were planned for construction during the Fourth Plan period. The target was formulated on the basis of population growth, backlog in fulfilling the need to replace dilapidated units. The public sector accounted for 398,600 units while the private sector accounted for 524,700 units.

During the Fourth Plan period, the total number of housing units constructed was about 406,100 units, as shown in Table 1, representing 44.0 per cent of the target. Of these, about 90,500 units were low-cost, 155,800 units medium and high-cost, 25,400 units institutional quarters, and 35,000 units settler houses. During the Fourth Plan the overall shortfall in the construction of housing units was 56.0 per cent. In detail the shortfall was 66.0 per cent for low-cost housing and 50.3 per cent for the medium and high cost program.

HOUSING PERFORMANCE DURING FIFTH MALAYSIAN PLAN (1986-1990)

During the Fifth Malaysia Plan, a total of 701,500 units were planned for construction, of which the public sector was targeted to build 21 per cent of 149,000 units and the private sector 79 per cent or 552,500 units. However, about 300,930 units were constructed during the Plan period. Of the total units completed, about 164,400 units were low-cost houses, 116,780 units medium-cost and 19,750 units high-cost. The public sector completed about 97,130 units or 65 per cent of its target, while the private sector, 203,800 units or 37 per cent of its target. Table 2 summarizes the achievement of the public and private sectors during the period.

SLOWDOWN IN HOUSING INDUSTRY

The construction sector, like other sectors of the Malaysian economy were affected in the economic slowdown in the eighties. Its double-digit growth rates of the early eighties shrunk to –14 percent in 1986. Construction GDP growth outperformed the overall GDP and GNP growth between the years 1980 and 1983. From 1984 onwards it performed worse than the two. In 1984, construction GDP growth dipped below the overall GDP and GNP growth. Construction growth rates for 1985 and 1986 were -8.4 percent and –14 percent respectively. In 1987, the construction GDP growth rate was –5.4 percent, an improvement over the last two years. Further improvement was recorded in 1988 with 2.7 percent growth. Again, double-digit growth was recorded in 1989 that was 11.6

percent. It soared again to 19.5 percent in 1990, the highest in the decade. Then it slipped to 14.6 percent in 1991. Table 3 and Figure 1 depicts the rates.

HOUSING PATTERNS

In the eighties especially 1986, the development of hotels, office blocks, shopping centers, upper bracket condominiums and bungalows are experiencing a dearth of demand. This has resulted in projects that were started being suspended and left uncompleted. Those that were started were left abandoned.

On the other hand, the demand for low cost or low medium cost houses remains to be satisfied. So we notice a shift in the development pattern of houses. While previously the emphasis of developers on commercial as upper bracket houses because of the profitability of such projects.

The drastic shift is due to a combination of factors the most compelling of which is the major effect of recession namely unemployment.

PROBLEM STATEMENTS

In December 1995, the U.S. Department of Commerce became the official source for the widely publicized composite indexes of leading, lagging and coincident indicators. The composite leading, coincident, and lagging indexes are the key elements in an analytic system designed to signal peaks and troughs in the business cycle. Historically, the cyclical turning points in the leading index have occurred before those in aggregate economic activity, while the cyclical turning points in the coincident index have occurred at about the same time as those in aggregate economic activity. The cyclical turning points in the lagging index generally have occurred after those in aggregate economic activity.

One of the components of the index of leading indicators is the index of new private housing units authorized by local building permits. As such, the rise of housing index will mean that the economy is going to reach the peak. A change in direction in a composite index does not signal a cyclical turning point unless the movement is of significant size, duration, and scope. In actual sense it is important to recognize that the timing of the leading index has been irregular and “false signals” are inevitable. The main value of the leading index is in signaling that either the risk of a recession has increased or that a recession may be coming to an end.

OBJECTIVES OF THE STUDY

Basically business indicators can serve three types people: those who want to know what’s happening with the economy, those that want to know what is about to happen with the economy, and those few who want to verify that what has happened with the economy did in fact happen.

Simply put, since the indicators have shown to be reliable in predicting the behavior or the economy, therefore the objective of this study is to empirically test the lead lag relationship of housing development with the Sarawak's economy. The study is important since housing activities can help in predicting what the economy in general is about to do. "Forewarned is forearmed".

The specific objectives included in this study are:

(i) To do a trend analysis between construction and GDP of Sarawak
(ii) To find out the lead or lag relationships between Housing and GDP of Sarawak
(iii) To use statistical techniques of unit root and cointegration tests inorder to confirm the long run relationship between housing types and GDP of Sarawak.

PAST STUDIES ON LEAD – LAG RELATIONSHIP

At first sight, housing is an integral part of national output. It is possible that expansion of housing activity is preceded by an increase in economic output, with the initial effect felt largely within the housing sector and only subsequently on the aggregate economy. If markets are interdependent, disturbances in one market will be transmitted to other markets. However, there have been few empirical studies of relationships between the housing sector and the aggregate economy. The issue of concern here is whether the housing sector and the aggregate economy are segmented or interdependent, and whether housing activity contributes to economic growth and or vice versa.

Granger Causality

Granger causality methodology is commonly applied to investigations on the relationships among money supply, stock prices and inflation, but no study has been done to test the linkages between the housing sector and the aggregate economy using this method in Malaysia. Only during recent study done by Tse and Ganesan (1997) employed Granger causality methodology to investigate the lead-lag relationships between the construction flow and the GDP in Hong Kong. Reviews of literature below are researches carried out on money supply, stock prices and exports.

Granger (1969) proposed a causality test. The Granger causality provides a means to infer causal relations among two variables reported in a time series. More specifically, this test is developed from the notion that X 'causes' Y if predictions of Y from all past information are superior to predictions of Y from past information exclusively of X, all other information in the universe (includes past values of Y) being used in any either case. Various procedures are used since the publication of Granger, Haugh (1977), Haugh and Box, Sims (1972), Pearce adopted this criterion in assessing lead-lag relationships between time series.

Unidirectional Causality

Sims (1972) has developed a distributed lag methodology that applied the Granger criterion to causality test to examine the use of a direct test for the existence of unidirectional causality. The test is of great importance since most of the efficient estimation techniques for distributed lags are invalid unless causality is unidirectional. According to Sims, the 'dynamic analogue' is exactly a model in which causation is unidirectional: if and only if causality runs one way from current and past values of some list of exogenous variables to a given variables, then in regression of the endogenous variable on past, current and future values of the exogenous variable, the future values of the exogenous variables should have coefficients insignificantly different from zero, as a group.

Sims applied this test to a bivariate system that is the aggregate quarterly data on U.S. current dollar GNP and money stock variables covering the period 1947-1969. The main empirical results indicated that causality is unidirectional from money to income, whereas it rejected the hypothesis that causality is unidirectional form income to money.

Economic Time Series

Pierce (1972) centers his study on an empirical specification of relationship between economic time series. Extension of time-series model procedures of Box and Jenkins (1976) reveal that numerous economic variables which are generally regarded as being strongly interrelated may with equal validity, based on recent empirical evidence, be regarded as independent or weakly related.

Difference between these results and the bulk of econometric literature are attributed to the failure of the latter to satisfactorily account for autocorrelation. The way the series related within this framework is closely connected with concept of causality between variable advance by Granger (1969).

Pierce has also exemplified this procedure on retail sales (RS) and currency in circulation (CC) where he concluded that there is unidirectional causality from retail sales to currency: evidently a rise in retail sales results in somewhat greater demand for currency. An empirical evidence was outlined in this study where Pierce applied this methodology to a number of monetary and other economic time series in U.S. using weekly data covering the period September 18, 1968, through April 10, 1974, consisting of 289 observations. The result was the hypothesis of independence could not be rejected at the 5 percent significance level and only a contemporaneous relationship was found. It is concluded that the "independence phenomenon" may be summarized by saying that predictions of many U.S. economic series, over recent sample periods, once effective use of their own pasts have been work, can be little improved by using, in addition, pasts values or other available series.

Stationary Time Series

Haugh (1977) has proposed a two-stage method for investigating the dependence of two covariance – stationary time series. It involves, first, fitting univariate models to each of the series, and then cross correlating the two residual series thereby obtained. The asymptotic distribution of lagged residual cross-correlation assumes the independence of the two series. A Monte Carlo study verifies the applicability of this distribution for series of length N=50, 100 and 200. Pairs of independent interest rate series were generated to check the independence of these two series. The series are, respectively, the A.A.A. Corporate Bond Rate and the Commercial Paper Rate (Y20, which were taken quarterly from 1953-70 (N=72). Significant individual lagged correlation occur at lag 0 and + 3. Hence, this indicates that Y1 may lead Y2 or that Y1 causes Y2.

Relationship between Exports and Growth of Manufacturing Industries

Chow (1987) has utilized Sims criterion to examine existence of causal relationship between the growth of exports of manufactured goods and development of manufacturing industries in selected developing countries during the 1980's and 1970's. The data consists of annual data on exports and manufacturing products from eight Newly Industrialization Countries (NICs) covering the decade of 1960's and 1970's. The empirical finding indicate that for most of the NIC's studied there is a strong causal relationship between export growth and industrial development. It was found that a bidirectional causalities in Brazil, Hong Kong, Israel, Korea, Singapore, and Taiwan. This reciprocal relationship indicates that they are neutrally inter-dependent in the development process. A unidirectional causality in Mexico where the causality runs from exports to the to the development of manufacturing industries but not the other way around. The causal process is less significant in either direction in Argentina, implying that the country can promote industrialization without relying on export growth. This is because the data in Argentina is less reliable due to her hyperinflation during the period under study. Chow's finding indicate that for most of the NICs showed a strong causal relationship between the export growth and industrial development. A majority of these countries exhibit bidirectional causalities between the growth of exports of manufactured goods and the development of manufacturing industries. Therefore, he concluded that in these countries the export growth and industrial developments are mutually beneficial and reinforce each other.

Relationship between Exports and GDP

Darrat, A.F. (1987) made a study of the export-led growth hypothesis holds that exports and economic growth are strongly associated and that the former causes the latter in a unidirectional manner. This hypothesis is reexamined using a causality technique proposed by White (1980). The remarkable growth story of the newly industrializing countries in Asia is cited. The test is applied on time-series data over the period 1955-1982 in the case of 4 Asian countries -- Hong Kong, Singapore, the Republic of Korea, and Taiwan, which are commonly referred to as Asia's newly industrializing countries. These nations are selected because they provide a good case study by which to evaluate

the role of exports in the economic development process. Therefore, time-series from these countries over the period 1955-82 were employed to test this export-led growth hypothesis. The data are taken from the International Financial Statistics for Korea and Singapore and from the World Bank's World Development Report 1980 and 1983 for Taiwan and Hong Kong. The results indicate that only in Korea does causality run from exports to economic growth in accordance with the export-led hypothesis. In the other 3 countries, the causal implication of the hypothesis is rejected. One similarity to the past studies in this paper is the significant and positive correlation between exports and economic growth.

Bahmani-Oskooee. M *et al.* (1991) used Akaike's optimal lag criterion in a Granger causality test, the causality tests between export growth and economic growth (and vice versa) is reexamined for 20 countries.

Previous time-series studies that have been concerned with the export-led growth hypothesis have used Sims, Granger, and more recently Granger-Akaike procedures to determine whether there is a causal relationship between export growth and economic growth. The studies have provided mixed conclusions. The issue is important for LDCs and deserves further attention, a need that is addressed in the study presented. After pointing out the weaknesses and drawbacks of all previous time-series studies, the question of causality between export growth and economic growth is reexamined by using the new techniques of cointegration and error-correction modeling. It is shown that in contrast to the results in previous studies, when the cointegrating properties of the time series are incorporated into the analysis, bidirectional causality between export growth and output growth receives strong empirical support in almost all countries in the sample. Furthermore, the results show that there is a long-run relation between real exports and real output in LDCs and that the relation is a positive one. The most important policy implication of the finding is that any export promotion strategy will contribute to economic growth in LDCs and vice versa.

Serletis, A. (1992) investigate empirically the relationship between export growth and gross national product (GNP) growth is examined using Urquhart's (1988) annual Canadian data from 1870 to 1985. In particular, an investigation is conducted into whether knowledge of past export growth improves the prediction of future GNP growth beyond predictions based solely on past GNP growth, which is the definition of Granger causality. The time-series variables are evaluated empirically, and the causality tests are supplemented with cointegration tests. Causality models for export growth, import growth and GNP growth revealed that expanding the export growth information set to include either past GNP growth data or past import growth data does not increase the predictability of export growth. On the other hand, export growth was shown to have predictive content when used in conjunction with past GNP growth data to predict future GNP growth as well as when used in conjunction with past import growth data to predict future import growth. The findings also suggest that the growth of GNP and export growth are independent and support the export-led growth strategy in that expansion in exports promotes the growth of national income.

Bahmani-Oskooee, M and Alse, J (1993) after pointing out the weaknesses and drawbacks of all previous time-series studies, the question of causality between export growth and economic growth is reexamined by using the new techniques of cointegration and error-correction modeling. It is shown that in contrast to the results in previous studies, when the cointegrating properties of the time series are incorporated into the analysis, bidirectional causality between export growth and output growth receives strong empirical support in almost all countries in the sample. Furthermore, the results show that there is a long-run relation between real exports and real output in LDCs and that the relation is a positive one. The most important policy implication of the finding is that any export promotion strategy will contribute to economic growth in LDCs and vice versa.

Ghartey, E.E. (1993) developed a vector autoregression model to examine the causal relationships between exports and economic growth in Taiwan, the US, and Japan. The method of Hsiao (1979) is employed in finding the direction of causation. Wald and likelihood ratio tests confirm that export growth causes economic growth in Taiwan, economic growth causes exports growth in the US, and a feedback causal relationship exists in Japan. In an attempt to resolve this feedback causal relationship, terms of trade or capital stock is added, but they all proved futile. However, pair wise causality test among all of the variables indicates that only terms of trade unidirectionally causes exports growth in Japan. Capital stock does not cause either exports or economic growth in the country. Modern trade theorists policies that argue that economic performance or intra-industry trade is the basis of exports growth is found to be credible in the US, while traditional export-led growth theorists policies are found to be appropriate in Taiwan. In Japan, the feedback causal relationship between exports and economic growth does not align it to any particular policies. However, the fact that changes in its terms of trade cause exports growth indicates that devaluation policies or imposition of tariffs do improve its export performance, which is consistent with modern trade theorists' policies.

Henriques *et al.* (1996), investigated the export-led growth hypothesis for Canada by constructing a vector autoregression (VAR) in order to test for Granger (1969) causality between the following variables: real Canadian exports, real Canadian GDP, and real Canadian terms of trade. Two principal results emerge from the analysis. First, real Canadian exports, real Canadian terms of trade, and real Canadian GDP are co-integrated. This implies that there exists a long-run steady state among these 3 variables. Second, evidence is found that a one-way Granger causal relationship exists in Canada whereby changes in GDP precede changes in exports.

Relationship between Construction and GDP

Tse and Ganesan (1997) applied Unit root tests and Granger causality methodology to investigate lead-lag relationships between construction activity and aggregate economy. Several studies proposed that a decrease in construction activity causes a fall in income and employment (e.g. Hillebrandt, 1985). Using data from Hong Kong, results suggest strongly that the GDP tends to lead the construction flow and not vice versa. A change of GDP initially will affect demand for construction projects, then housing and credit

availability, and then the level of construction output. It has been argued that short term growth rates of construction activities tend to exhibit much greater fluctuations than the aggregate economy. The finding is contrary to the view that construction is more volatile than the GDP. The different volatility of GDP and of construction flows is not significantly different from zero in the whole period 1983-1995. However, the results show that the construction volatility after 1990 is smaller than that in the period 1983-1989, a result that is particularly important for policy makers in that it is the macroeconomic policy of government that affects output, and influences the construction activity, and not vice versa.

METHODOLOGY

DATA COLLECTION

This study will be using secondary data from the state of Sarawak. The focus here is finding out the type of relationship that exists between GDP and houses. GDP is the total value of goods and services produced within a given period after deducting the cost of goods and services used up in the process of production but before deducting allowances for the consumption of fixed capital. GDP is valued at purchasers' values. As such, time series on actual unit of houses including type of houses are a more precise measurement rather than the value of the houses. Houses will be classified according to the following definitions :

Detached House
A separate house which does not share a common wall with another house.

Semi-detached house
One of two houses which share a common wall but separate access to the outside.

Terrace, row or link, townhouse
Houses built in rows of three or more with each house having a common wall or walls adjoining with the next house. This category also includes cluster houses that are attached to one another in various ways in either at the front or at the back but not in the form of terrace houses. The only difference is that different occupants are occupying each floor and each has it own separate access to the outside.

Longhouse
Refers to a house that is raised off the ground and has a common corridor in front. It is commonly found in the interior areas of Sabah (including Wilayah Persekutuan Labuan) and Sarawak.

SOURCES OF DATA

This study will mainly analyse the trend between houses been constructed and GDP. All the data were obtained from the various publications of the Department of the Statistics of Malaysia. The main publications are the Population and Housing Census of Malaysia

1991 "State Housing Report Sarawak" and the various issues of "Yearbook of Statistics Sarawak. Since the data from 1987 to 1997 is not available, the study employs data from 1981 to 1991. Figures in this report are based on the 1991 Census returns processed on a 100 per cent basis. Units of houses constructed in the report refer to actual units completed during the year. Major renovations done to the housing units and completed in that year are also included as units constructed.

FRAMEWORK OF ANALYSIS

Trends Analysis
The graphical method is used in the trend analysis. The simplest method of determining the trend values of a times series is to draw through the data a line graph that describes the underlying, long term movement in the series and ignores the movement of a cyclical nature that reverse after a short period.

Descriptive Analysis
Descriptive Analysis utilises statistical measures in order to describe the various parameters of the variables. The selected items are:

Correlation Analysis
Correlation study is being used so as to know how close are the relationship between GDP and the type of houses.

Unit Root Test Of Stationarity
Unit root typically the ADF test is based on the following formulation:

$$\Delta Y_t = \mu - \delta T + \alpha Y_{t-1} + \sum_{i=1}^{n} \beta_i \Delta Y_{t-I} + u_t \qquad (1)$$

where $\Delta Y_t = Y_t - Y_u$, μ is a drift term and T is the time trend with the null hypothesis H_0: $\alpha = 0$ and its alternative hypothesis H_1: $\alpha \neq 0$, n is the number of lags necessary to obtain white noise and u is the error term. The simpler Dickey-Fuller (DF) test removes the summation term. However, the implied *t* statistic is not the Student *t* distribution, but instead is generated Monte Carlo simulations (Engle and Granger, 1987,1991). Note that failing to reject H_0, implies the time series is non-stationary. If the series contains a unit root, the t ratio for δ should be consistent with the null hypothesis of a single unit root or $\delta = 0$. The hypothesis is rejected if the t value is smaller than the critical γ value at 10% significance level obtained from Dickey and Fuller (1979). However SHAZAM Version 7.0 (1992) provides the appropriate critical values together with the analysis output.

The null hypothesis and alternatives applied in the unit root test are:

H_o: Y_t is nonstationary, Y_t do contain a unit root

H_a: Y_t is stationary, Y_t do not contain a unit root

Cointegration test

Cointegration test requires the two variables exhibit the same order of nonstationary or integrated in the same order. Engle and Granger (1987) propose that if a linear combination of two difference stationary time series is stationary, the series are cointegrated. Assuming that each series is integrated with same order or same level of unit root, the cointegration tests can be applied using ordinary least square (OLS) regression equation.

The null hypothesis and the alternative in cointegration test are:

Ho: Y and X are not cointegrated

Ha: Y and X are cointegrated

If the DW test statistic exceeds the critical values, the null hypothesis of non-cointegration is rejected. This implied that the residual is stationary and the variables are cointegrated which implied presence of a long run relationship.

Lead or Lag Relationship between GDP and Type of Houses.

Unavailability of a longer time period of study prevented the use of causality test. The lead and lag relationship are analysed as follows:

1. Lead or lag relationship between Gross Domestic Product and Detached
2. Lead or lag relationship between Gross Domestic Product and Semi Detached
3. Lead or lag relationship between Gross Domestic Product and Terrace
4. Lead or lag relationship between Gross Domestic Product and Longhouse

RESULTS OF THE STUDY

Trends Analysis

Relationship between GDP and Detached (Figure 2)

It appeared that the cycle of both variables synchronized in terms of peak and trough. With the growth in GDP from 1981-82 to 1982-83, sharp increase was recorded for units of detached constructed. The number of units increased steadily in 1983-84, 1984-85 (its highest) though no positive growth was recorded for these two periods. When GDP dip to its lowest, units of detached also decrease dramatically from its highest to the lowest in 1986-87. Later in 1987-89, units constructed went in hand with the GDP except a slight dip in 1989-91.

Conclusion: There is a close relationship between GDP and Detached house.

Relationship between GDP and Semi-Detached (Figure 3)

In response to the rise in GDP from 1981-83, the units constructed declined steadily. As the GDP declined in 1983-85, there was a steady climbing of units constructed. When the GDP dropped further, the units constructed experienced its deepest dip from 1984-85 to 1986-87. Corresponding with increase in GDP in 1987-89 the units shot up and reached its second highest peak in 1989-90. Again the units constructed declined drastically during 1990-91 despite the positive growth in GDP.

Conclusion: Strong relationship existed between GDP and Semi-detached

Relationship between GDP and Terrace (Figure 4)

The units constructed had a sharp dip form 1981-82 when GDP was increasing whereas in period 1983-84 when GDP suffered setback, units of terrace constructed shot to high level. This trend did not repeat itself where GDP was dropping and units constructed also declining in 1984-86. The upturn in GDP in 1987-88 also saw increase in units of terrace constructed. As GDP climbed steadily up in 1988-91, units of terrace constructed fluctuate.

Conclusion: Some relationship can be established between GDP and Terrace.

Relationship between GDP and Longhouse (Figure 5)

From 1981-82 the construction of longhouse began to drop despite an increase in GDP. Downturn in GDP in 1983-84 saw number of longhouses shot up to 50% record high. This situation did not last where mark decrease in unit of longhouse starting 1984-86 though GDP was moving downward. Increase in units constructed was experienced in1986-87 where GDP dip to its low. Subsequently, from 1987 onward to 1991 units of longhouse fluctuated.

Conclusion: GDP growth did not have any relationship to the longhouse.

DESCRIPTIVE ANALYSIS

The results of descriptive analysis with respect to types of houses are shown in Table 4.

Mean

Mean is the measures of central tendency that is, a measure of the center of the distribution. It shows the center of the data in the sense that it is a balance point of data. From the list the mean for terrace is the highest with value of 19.51 and followed by longhouse with value of 3.09 mean. The means in descending order are *semi-detached* (2.55) and *detached* (1.13) .

Median
Median shows the middle value when the data are ranked. From the table the results for each housing unit are significantly different. The median between detached and semi-detached are quite close with 0.90 and 1.02 respectively. The mean for terrace is the highest with 3.54. The only median with negative value of -0.02 is the longhouse.

Mode
Mode is obtained form a collection of data by selecting the score that occurs most frequently. From the list , we found that there is no mode for all the different type of housing units.

Standard Deviation
Standard deviation measures the dispersion or variation among the data. From the list we find that terrace has the highest value. It shows that the data are spread further apart. The standard deviation of terrace is 46.64. Following behind the terrace is the longhouse with value of 23.46 and then detached with 23.30. Whereas the semi-detached is 20.07 in value. This small standard deviation shows that the data are closer compared with the terrace.

Range
Range measures the variability. Range is the different between the highest value and the lowest value. The impact of the range is the same as in standard deviation except that it can be insensitive to substantial differences in data variation. The larger range suggests greater variation or dispersion in their process and the smaller range suggest close variation or dispersion in their process.

From the table, we find that the different between the highest value and the lower value for terrace with the maximum value of 114.92 and minimum value of –35.41 is 150.33. Subsequently is the longhouse with the range of 73.42. Detached has the range of 68.97 whereas semi-detached has 66.06 for its range.

THE UNIT ROOT TEST RESULTS

The main objective in this test is to confirm the non-stationary characteristic of the series. For this purpose the Augmented Dickey-Fuller (ADF) is conducted. This is a prerequisite for the Engle and Granger's (1987) in the cointegration test.

The results of the unit root tests in the level specification are shown in Table 5. to Table 7. According to the Table 5, for the non-linear trend case, the t-test statistics under ADF for GDP and SD and L are –1.2556, -2.3896 and –2.2920 These values exceed the critical value of -2.86 at a 5 percent level of confidence. So we are unable to reject the null hypothesis.

In conclusion, under the ADF unit root tests, t-tests statistics for Gross Domestic Product, Detached, Semi detached and Longhouse are negative and will fall below the 1 percent significant level except for Terrace. So we are unable to reject the null hypothesis of unit root for the Gross Domestic Product and any types of the houses with an exception of Terrace in Sarawak. Therefore we can imply that the series are not stationary.

When we test the data by using the difference series the results exhibit a totally different situation where the t-statistics value clearly reject the null hypothesis of presence of a unit root. It can be proven from the Table 7 of the t-statistics are significant at the 10 percent, 5 percent and 1 percent level with the critical value of –2.57, -2.86 and -3.46 respectively.

After the fourth difference is applied on the series, we obtain a state of stationary for the series and a higher order of difference is not necessary. Achieving a stationary series of data is important before we can proceed to the cointegration test. If data is not stationary or not integrated of the same order, the two series cannot to be cointegrated.

In brief, the ADF unit root test shows that the variables containing a unit root, non-stationary and integrated of the order four.

THE COINTEGRATION TEST RESULTS

A linear trend may exist between any two combination of the variables after each variable is found to be non stationary. If so the two variables can be said to be cointegrated. The main purpose of Engle-Granger Cointegration Test is to examine whether a long-term relationship exists which lead them to move together in the long run for GDP, D, SD, T and L. In other words, the test is for an equilibrium relationship between the two variables. We can say that the two variables are integrated if they are cointegrated.

So tests for cointegration between GDP and different type of houses are performed by examining hypothesis that there is a non-stationary linear combination of these two variables.

The results are shown in the Table 8 and Table 9. For the period of analysis, we can reject the null hypothesis at 10% for SD/GDP, 5% level for D/GDP and 1% for T/GDP. As the result show that when there is non-linear trend, the ADF value for D/GDP and T/GDP fall in the rejection area with 5% level where the value are -3.0402 and –4.7330 (ADF).

Besides non-linear, we also consider the trend of the cointegration among the variables. Drawing from the result we can reject the null hypothesis for D/GDP, T/GDP and L/GDP because the values fall in the rejection area at 10 percent, 5 percent and 1 percent. The ADF value for D/GDP is -2.6983. For L/GDP the value is –2.9152 whereas the value is –5.2630 for T/GDP.

This strongly suggests that a long run equilibrium exist between T and GDP even though each of two series are non stationary individually because T is cointegrated with GDP. Long run equilibrium also exists between D and GDP at 10 percent level.

LEAD OR LAG RELATIONSHIP BETWEEN GDP AND THE TYPE OF HOUSES

By using the lead or lag relationship, six different scenarios are made and the respective correlations are found for each type of houses. The focus will be on the houses that have the correlation coefficient that is closest to 1. This is because the correlation coefficient that is closest to 1 has strong and close relationship.

Lead or lag Relationship between GDP and Detached

The summarized correlation coefficients are found in Table 10.

From the correlation coefficient of the respective scenarios in lead and lag analysis there is either no lead or lag relationship (Case 1) between the GDP and Detached or GDP lead Detached by 1 year and so on as indicated in the Table.

Based on Case 5, the correlation coefficient of 0.4005 for the case GDP lag Detached is not convincing enough to imply that Detached is leading the economics.

Lead or lag Relationship between GDP and Semi Detached

The summarized correlation coefficients are found in Table 11.

There is a substantial strong relationship between GDP and Semi Detached in Case 4. From the coefficient correlation of –0.5766 and also from the graphical results, the conclusion that can be drawn is GDP lead Semi Detached by 3 years.

Lead or Lag Relationship between GDP and Terrace

The summarized correlation coefficients are shown in Table 12.

From the correlation coefficient of the respective scenarios and from the graphical results, the conclusion is that there is GDP lead Terrace by 1 year. Therefore there is a good reason to believe that GDP precedes Terrace which means the economics is actually driving the Terrace construction.

Lead or Lag Relationship between GDP and Longhouse

The summarized correlation coefficients are shown in Table 13.

Drawing the conclusion from the scenarios, it is believed that the GDP lead the Longhouse by 3 years. Among all the scenarios, Case 4 has the highest correlation of -0.5853. Therefore there is a good reason to believe that GDP lead Longhouse by 3 years.

SUMMARY AND CONCLUSION

Introduction

The main purpose of this study is to analyse the impact of changes in certain type of houses namely detach, semi detach, terrace and longhouse with respect to the Sarawak economic growth. An aggregate of all types of residential houses is not adopted, as changes in certain type of houses will be evened up by other stagnant residential properties. Therefore the fluctuation is smoothened.

The specific objective of this study is to provide the early warning signals of an acceleration or deceleration in the economic growth. Equipped with the knowledge of which housing project can spur the nation's economic will afford the nation to direct all their efforts towards revising the economics or maintaining the growth.

Based on the analysis of results, the following conclusions are obtained:

1. Relationship between Gross Domestic Product and Detached

- It appeared that the cycle of both variables are synchronized in terms of peak and trough.
- There is a long term relationship as shown in the cointegration test. (at the 5 % significance level)
- There is weak correlation between GDP and Detached
- No direct or inverse relationship of any kind exists between GDP and Detached.
- This is because real income of the high-income group is not much affected by the rise or decline in GDP.

2. Relationship between Gross Domestic Product and Semi Detached

- Strong relationship existed between GDP and Semi-detached during 1985-90.
- At 10 % significant level there exists the long term relationship as presented by the cointegration test
- Correlation of 0.6 which suggests a strong correlation exists
- There is a direct relationship between GDP and semi detached. GDP lead semi detached by 3 years.
- In other words, GDP precedes the semi detached

3. Relationship between Gross Domestic Product and Terrace

- Some relationship can be established between GDP and Terrace.
- At 1 % significant level we can conclude that long term relationship exists
- Correlation of 0.5 may does suggest close relationship between GDP and terrace
- GDP lead terrace by l year

4. Relationship between Gross Domestic Product and Longhouse

- GDP growth did not have any dynamic relationship to the units of longhouse.
- Cointegration of 5 % significant level shows that long term relationship exists
- Close correlation of 0.6 also exhibited between GDP and longhouse
- GDP lead longhouse also by a period of 3 years.

CONCLUSION

The findings of this study have a number of implications. Type of houses like semi detached, terrace and longhouse are actually have a lagged effect to the Sarawak GDP. However detached has no lead or lag relationship with GDP. All the houses except for detached display positive co-movement with the GDP.

In other words, fluctuations in GDP have a significance relationship to the number of terrace, semi detached and longhouse constructed in Sarawak. Implication here will be that construction of terrace especially will top up when GDP is growing. Detached is found not to have any significant lead or lag relation which mean buyers are not influenced by the GDP in making the buying decision.

The main intention of this research to be descriptive. It therefore limits the scope of the study to further analyze the relationship between the type of houses and Sarawak economic growth. It is hope that future study that address the lead and lag Sarawak economic growth and type of houses will confirm the results of this study. Further research in this area would be useful and beneficial to the economy and can further contribute to the planning of economic growth.

From this study, the government should pay more attention to induce the GDP growth. This is because based on the study, we find that the terrace, semi detached and longhouse are highly sensitive to changes in the GDP. Implicitly it also proves that government policies of improving the overall living standard of Sarawak people are successful. Medium size income group mostly owns the terrace houses.

BIBLIOGRAPHY

Bahmani-Oskooee, M. (1991). ***Exports, growth and causality in LDCs. A re-examination***. Journal of Development Economics, Vol. 36, pp.405-415.

Bahmani-Oskooee, M and Alse, J (1993). ***Export Growth and Economic Growth: An Application of Cointegration and Error-Correction Modeling.*** The Journal of Developing Areas, Vol.27, July, pp. 535-542.

Bank Negara Malaysia Annual Report (1981-1991). Published by Bank Negara Malaysia.

Chow, C.Y. (1987). ***Causality Between Export Growth And Industrial Development.*** Journal of Development Economics, Vol.26, pp.55-63.

Darrat, A.F. (1987). ***Are exports an engine of growth? Another look at the evidence.*** Applied Economics, Vol.19, pp.277-283.

Fifth Malaysian Plan 1986-1990. Published by National Publication Malaysia Berhad. Kuala Lumpur.

Ghartey, E.E. (1993). ***Causal relationship between exports and economic growth: some empirical evidence in Taiwan, Japan and the US.*** Applied Economics, Vol.25, pp.1145-1152.

Granger, C.W.J. (1969). ***Investigating Causal Relation by Econometric Models and Cross-Spectral Methods.*** Econometrica, Vol.37, No.3 pp 424-438

Henriques *et al.* (1996). ***Export-led growth or growth-driven exports? The Canadian Case.*** Canadian Journal of Economics, Vol: 29 Iss: 3, Aug 1996 pp: 540-555

Haugh, L.D. (1976). ***Checking the Independence of Two Covariance-Stationary Time Series : A Univariate Cross-Correlation Approach.*** Journal of the American Statistical Association, Vol.71, June, pp.378-385.

Housing and Property. (1981). The Present state of the Housing Market. August/September, pp.2-4. Published by Housing Developers' Association.

Housing and Property. (1985). The Construction Sector in 1985. November/December, pp7-9. Published by Housing Developers' Association.

Housing and Property. (1989). A Brief Review of Construction Sector Performance and Broad Property Sector Financing in Malaysia in the 80's. Vol. 8.89. Published by Housing Developers' Association.

Liau, V.Y. (1992). ***Lead-lag relationships between broiler prices at the retail, wholesale ad ex-farm levels in Peninsular Malaysia.*** Universiti Pertanian Malaysia.

Lui W.L. (1988). ***Causality among selected oils and fats prices.*** Universiti Pertanian Malaysia.

Malaysia Annual Economic Report 1990/91. Published by Finance Ministry of Malaysia.

Population And Housing Census of Malaysia 1991: State Housing Report Sarawak. Published by Department of Statistics Malaysia.

Pierce, D.A. (1977). ***Relationships - and the lack Thereof - Between Time Series with Special Reference to Money and Interest Rates.*** Journal of the American Statistical Association, Vol.72, March, pp.11-12.

Serletis, A. (1992). ***Export growth and Canadian economic Development.*** Journal of Development Economics, Vol. 38, pp. 133-145.

Sim, C.A. (1972). ***Money, Income and Causality.*** The American Economic Review, Vol.62, pp.540-552.

Sixth Malaysia Plan 1991-1995. Published by National Publication of Malaysia Berhad. Kuala Lumpur.

Tse and Ganesan. (1997). ***Causal relationship between construction flows and GDP: evidence from Hong Kong.*** Construction Management and Economics, Vol.15, pp.371-376.

Yearbook of Statistics Sarawak (1981-1991). Published by Department of Statistics Malaysia.

Table 1
MALAYSIA: PUBLIC AND PRIVATE SECTOR HOUSING PERFORMANCE, 1981-85
(Units)

	Units Planned.	*Number of units completed.*					*Total.*
Program	***1981-85***	***1981***	***1982***	***1983***	***1984***	***1985*** [1]	***1981-85***
Public sector	**398,570**	**31,010**	**43,480**	**35,050**	**44,480**	**47,880**	**201,900**
Public low-cost housing	176,500	12,900	20,100	11,500	12,590	14,220	71,310
Housing in land schemes	110,010	8,930	10,220	5,780	5,740	4,310	34,980
Institutional quarters and other staff accommodation	58,500	3,660	4,000	5,850	5,390	6,550	25,450
Medium and high-cost housing	53,560	5,520	9,160	11,920	20,760	22,800	70,160
Private sector	**524,730**	**37,600**	**44,330**	**37,710**	**38,600**	**45,930**	**204,170**
Private developer low-cost housing	90,000	5,800	4,860	1,820	4,150	2,540	19,170
Private developer medium and high-coat housing	259,470	11,690	19,270	15,980	15,020	23,670	85,630
Co-operative societies	25,260	1,170	1,270	980	500	650	4,570
Individuals and groups	150,000	18,940	18,930	18,930	18,930	19,070	94,800
Total	**923,300**	**68,610**	**87,810**	**72,760**	**83,080**	**93,810**	**406,070**

Source: Ministry of Housing and Local Government.
Note: [1] Estimates.

Table 2
MALAYSIA: PUBLIC AND PRIVATE SECTOR HOUSING PERFORMANCE, 1986-90
(Units)

Program	*Targeted*				*Completed*			
	Total	*low cost*	*medium cost*	*High cost*	*Total*	*low cost*	*medium cost*	*high cost*
PUBLIC SECTOR								
Public Low-Cost Housing	42,880	42,880	-	-	26,172	26,172	-	-
Sites and Services Scheme	2,920	2,920	-	-	-	-	-	-
Housing in Land Schemes	57,500	57,500	-	-	32,056	31,827	229	-
Institutional Quarters and other Staff Accommodation	27,000	4,400	22,500	100	11,284	5,882	5,116	286
Commercial Agencies	18,700	13,200	5,400	100	27,614	10,451	16,009	1,154
Sub-total	149,000	120,900	27,900	200	97,126	74,332	21,354	1,440
PRIVATE SECTOR								
Ordinary Low-Cost Housing	130,400	130,400	-	-	4,937	4,937	-	-
Special Low-Cost Housing Program (SLCHP)	240,000	240,000	-	-	83,940	83,940	-	-
Medium-Cost Housing	146,000	-	146,000	-	89,741	-	89,741	-
High-Cost Housing	23,600	-	-	23,600	17,701	-	-	17,701
Cooperative Societies	12,500	3,700	6,300	2,500	7,483	1,187	5,687	609
Subtotal	552,500	374,100	152,300	26,100	203,802	90,064	95,428	18,310
Total	**701,500**	**495,000**	**180,200**	**26,300**	**300,928**	**164,396**	**116,782**	**19,750**

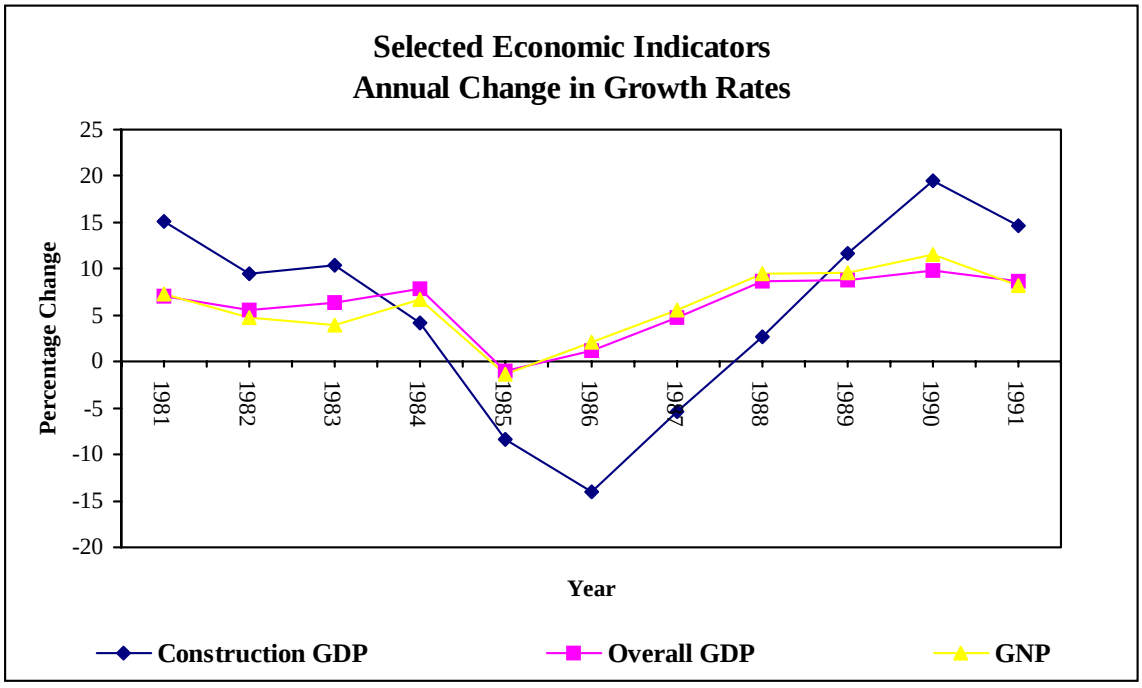
Source: Ministry of Housing and Local Government.

Table 3

Selected Economic Indicators: Annual Percentage Change											
	1981	***1982***	***1983***	***1984***	***1985***	***1986***	***1987***	***1988***	***1989***	***1990***	***1991***
Construction GDP	15.1	9.5	10.4	4.2	-8.4	-14	-5.4	2.7	11.6	19.5	14.6
Overall GDP	7.1	5.6	6.3	7.8	-1.0	-1.2	4.7	8.7	8.8	9.8	8.7
GNP	7.3	4.7	3.9	6.7	-1.4	2.1	5.5	9.5	9.6	11.5	8.2

Source: Housing and Property volume 8.89 and Economic reports (various issues)

Figure 1



Source: Housing and Property volume no.8.89

TABLE 4 : RESULTS OF DESCRIPTIVE ANALYSIS FOR TYPE OF HOUSES

Type of Housing Unit	*Mode*	*Average*	*Median*	*Maximum*	*Minimum*	*Range*	*Standard Deviation*
Detached	#N/A	1.13	0.90	38.04	-30.93	68.97	23.30
Semi-detached	#N/A	2.55	1.02	33.94	-32.12	66.06	20.07
Terrace	#N/A	19.51	3.54	114.92	-35.41	150.33	46.64
Longhouse	#N/A	3.09	-0.02	42.53	-30.89	73.42	23.46

TABLE 5

AUGMENTED DICKEY-FULLER (ADF) TESTS FOR UNIT ROOT ON GDP, DETACHED, SEMI DETACHED, TERRACE AND LONGHOUSE WITH ASSUMPTION OF NO LINEAR TREND IN DATA GENERATION

	Pseudo t-statistic
Index	**ADF**
Level:	
GROSS DOMESTIC PRODUCT	-1.2556
DETACHED	-3.0320
SEMI DETACHED	-2.3896
TERRACE	-4.9991
LONGHOUSE	-2.2920

H_0: X_t contains a unit root or it is stationary. Reject H_0 if the pseudo t statistics is significantly negative
Critical values are as follows for the different significant levels: -2.57(10%), -2.86(5%) and -3.46 (1%)

TABLE 6
AUGMENTED DICKEY-FULLER (ADF) TEST FOR UNIT ROOT ON GDP, DETACHED, SEMI DETACHED, TERRACE AND LONGHOUSE WITH ASSUMPTION OF LINEAR TREND IN DATA GENERATION

	Pseudo t-statistics
Index	**ADF**
Level:	
GROSS DOMESTIC PRODUCT	-0.97352
DETACHED	-2.8060
SEMI DETACHED	-2.2785
TERRACE	-6.1407
LONGHOUSE	-2.7353

H_0: X_t contains a unit root or it is stationary. Reject H_0if the pseudo t statistics is significantly negative
Critical values are as follows for the different significant levels: -3.13(10%), -3.42(5%) and -3.97(1%)

TABLE 7
AUGMENTED DICKEY-FULLER (ADF) TEST FOR UNIT ROOT ON GROSS DOMESTIC PRODUCT, DETACHED, SEMI DETACHED, TERRACE AND LONGHOUSE WITH ASSUMPTION OF NO LINEAR TREND IN DATA GENERATION (FOURTH DIFFERENCE)

	Pseudo t-statistics
Index	**ADF**
Fourth Differences:	
GROSS DOMESTIC PRODUCT	-2.8852
DETACHED	-3.6362*
SEMI DETACHED	-4.4181*
TERRACE	-8.5913*
LONGHOUSE	-5.7590*

H_0: X_t contains a unit root or it is stationary. Reject H_0 if the pseudo t statistics is significantly negative
Critical values are as follows for the different significant levels: -2.57(10%), -2.86(5%) and -3.46 (1%)
* Denotes significant at the 1% level

TABLE 8

DICKEY FULLER TEST RESULTS FOR COINTEGRATION OF DETACHED, SEMI DETACHED, TERRACE AND LONGHOUSE WITH ASSUMPTION OF NON-LINEAR TREND IN THE DATA GENERATION

	Pseudo t-statistics
Index	**ADF**
Variables:	
GDP/D	-1.2081
D/GDP	-3.0402**
GDP/SD	-1.4517
SD/GDP	-2.7734*
GDP/T	-1.1533
T/GDP	-4.7330***
GDP/L	-1.3343
L/GDP	-2.3166

Critical values for ADF and PP are as follows for the different significant levels: -2.57(10%), -2.86(5%) and -3.46(1%)

* Denotes the significant level at 10%

** Denotes the significant level at 5%

*** Denotes the significant level at 1%

TABLE 9

DICKEY FULLER TEST RESULTS FOR COINTEGRATION OF DETACHED, SEMI DETACHED, TERRACE AND LONGHOUSE WITH ASSUMPTION OF LINEAR TREND IN THE DATA GENERATION

	Pseudo t-statistics
Index	**ADF**
Variables:	
GDP/D	-0.78361
D/GDP	-2.6983*
GDP/SD	-1.1296
SD/GDP	-2.5687
GDP/T	-0.82117
T/GDP	-5.2630***
GDP/L	-1.1052
L/GDP	-2.9152**

Critical values for ADF and PP are as follows for the different significant levels: -2.57(10%), -2.86(5%) and -3.46 (1%)

* Denotes the significant level at 10%

** Denotes the significant level at 5%

*** Denotes the significant level at 1%

TABLE 10

LEAD OR LAG RELATIONSHIP BETWEEN GROSS DOMESTIC PRODUCT AND DETACHED

Case	GDP lead or lag Detached	No. of Years of lead or lag	Correlation Coefficie
1	No lead nor lag	0	0.070000
2	GDP lead Detached	1	-0.398020
3	GDP lead Detached	2	0.064482
4	GDP lead Detached	3	-0.320000
5	GDP lag Detached	1	0.400471
6	GDP lag Detached	2	0.322838
7	GDP lag Detached	3	-0.163720

TABLE 11

LEAD OR LAG RELATIONSHIP BETWEEN GROSS DOMESTIC PRODUCT AND SEMI DETACHED

Case	*GDP lead or lag Semi Detached*	No. of Years of Lead or Lag	*Correlation Coeffici*
1	No lead nor lag	0	0.145451
2	GDP lead Semi Detached	1	0.027420
3	GDP lead Semi Detached	2	-0.418800
4	GDP lead Semi Detached	3	-0.576640
5	GDP lag Semi Detached	1	0.535015
6	GDP lag Semi Detached	2	0.323196
7	GDP lag Semi Detached	3	-0.268110

TABLE 12

LEAD OR LAG RELATIONSHIP BETWEEN GROSS DOMESTIC PRODUCT AND TERRACE

Case	GDP lead or lag Terrace	No. of Years of Lead or Lag	*Correlation Coefficie*
1	No lead nor lag	0	-0.009880
2	GDP lead Terrace	1	0.535829
3	GDP lead Terrace	2	0.293336
4	GDP lead Terrace	3	-0.043040
5	GDP lag Terrace	1	0.235630
6	GDP lag Terrace	2	-0.183470
7	GDP lag Terrace	3	-0.445630

TABLE 13

LEAD OR LAG RELATIONSHIP BETWEEN GROSS DOMESTIC PRODUCT AND LONGHOUSE

Case	GDP lead or lag Longhouse	No. of Years of Lead or Lag	*Correlation Coefficie*
1	No lead nor lag	0	-0.081140
2	GDP lead Longhouse	1	-0.475060
3	GDP lead Longhouse	2	-0.368570
4	GDP lead Longhouse	3	-0.585350
5	GDP lag Longhouse	1	0.475288
6	GDP lag Longhouse	2	0.285471
7	GDP lag Longhouse	3	0.211801