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Investigating the Relationship between Residential Construction and Economic Growth in a Small Developing Country: The Case of Barbados

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With the ongoing global financial crisis – which began with the collapse of the US sub-prime market in 2007 – the Barbadian economy is expected to contract in 2009. As a means of stimulating economic activity and providing job opportunities, the government has committed itself to completing 572 houses during the 2009/10 financial year. However, the arguments in favour of allocating more resources to residential construction have not been based on the existence of empirical analyses. This paper empirically investigates the relationship between residential construction and economic growth for Barbados. The historical data suggests that there is bi-directional causality between economic growth and residential construction. Hence, a policy that stimulates the housing market may boost economic activity.

Keywords

Residential construction; Growth; Granger causality; Barbados

1. Introduction

Should countries push housing as part of their development strategy? This question has generated a heated debate among economists and policy makers since the 1940s. Early critics believed that housing had an extremely high capital-output ratio compared to other types of investment and deemed housing as a "resource-absorber". As such, housing was not regarded as a feasible growth strategy, and a low priority was assigned to housing in National Development Plans.

Since then, housing experts have expressed strong views about the economic significance of housing. They maintained that residential construction is of profound importance to the national economy because of its strong linkages with other economic sectors (see Hirschman, 1958; World Bank, 1984; Bon and Pietoforte, 1990; Ewing and Wang, 2004). An increase in residential construction is often associated with increased employment and income for workers in the housing sector and in related sectors that provide goods and services associated with housing. Backed by empirical evidence, these academics were able to shatter the stereotypic image of housing. Indeed, several institutions, such as the World Bank and the UN, which initially opposed housing investment, have since become strong advocates of housing as an economic development tool.

Against this backdrop, the housing sector has generally played a leading role in the process of economic recovery from depression (see Arku, 2006). For instance, in Japan, public housing activities have been used to stimulate output and create employment during recessionary periods. Similar strategies have also been employed by the Unites States, Thailand and Singapore. Like policy makers in the aforementioned countries, the Barbados government appears to have fully recognised the economic significance of housing.

Historically, the tourism sector has been the main impetus for growth, accounting for over 10% of GDP and directly employing around 12% of the labour force. However, recent deteriorating global economic conditions – which began with the collapse of the US sub-prime market in 2007 – has significantly dampened demand from Barbados' major tourism source markets and, hence, put a strain on domestic activity. This situation is expected to persist throughout the remainder of 2009 and into 2010. In light of these developments, the government has committed itself to completing 572 houses during the 2009/10 financial year as a means of boosting real output and providing job opportunities, particularly for those in the construction sector. But, the arguments in favour of allocating more resources to residential construction have not been based on the existence of empirical analyses. To the best of the author's knowledge, no study of this nature has been done for Barbados or any Caribbean country. Furthermore, studies on

the housing market–macroeconomic relationship have been somewhat restricted to developed countries.

Of the very few studies that focus on developing countries, there appears to be little consensus on lead-lag relationship between housing and real gross domestic product (GDP). For instance, using quarterly data for the period 1970-2002 Kim (2004) found that housing is not a driver, but a follower of fluctuations in the Korean economy. In contrast, Hongyu et al. (2002) find bi-directional causality between housing investment and GDP for China. Hence, there is no clear-cut evidence on the issue as it relates to developing countries, and may suggest that the ability of residential construction to boost economic growth depends on the economy at hand. It is plausible to believe that the cross-country differences in the market structure of construction industries affect the dynamics of construction activities (see for instance Wang and Zhou, 2000; Wang et. al, 2000)

As such, this study seeks to investigate the impact of residential construction on economic growth in Barbados. Specifically, this paper attempts to answer the following questions: Is there a relationship between residential construction and output? And, if a relationship exists, what is the direction of causality between these two variables? In other words, this study examines the extent to which a housing promotion strategy is a relevant growth factor for Barbados. In general, the current literature suffers from a paucity of research on the macroeconomic effects of housing in small developing countries. Hence, by focusing on Barbados, this paper adds to the rather sparse body of knowledge on the effect of residential construction in developing countries and hopefully, would further empirical evidence on the housing –economic growth nexus in developing countries.

The remainder of this paper is structured as follows. Section 2 provides a brief description of the data and econometric methodology employed. This is followed by the empirical results (section 3) and finally, section 4 concludes.

2. Data and Econometric Approach

The main objective of this paper is to investigate the causal relationship between residential construction and economic growth. The data set employed consists of quarterly data on housing units constructed and real GDP for the period 1990:1 to 2008:2. Observations on the number of housing units constructed are proxied by the number of electrical inspections for new housing and are obtained from the Government Electrical Engineering Department, while data on real GDP (base year 1974) are obtained from the Central Bank of Barbados. All variables are expressed in natural logarithms.

To test the existence of causality, the Granger causality test developed from the seminal paper of Granger (1969) is employed. Basically, this test seeks to ascertain whether or not the inclusion of past values of a variable *x* do or do not help in the prediction of present values of another variable *y*. If variable *y* is better predicted by including past values of *x* than by not including them, then, *x* is said to Granger-cause *y*. For this purpose, the following vector autoregressive model of lag order m, VAR (*m*), is utilized:

$$Y_t = \alpha_1 + \sum_{i=1}^{m} \lambda_{1i} X_{t-i} + \sum_{i=1}^{m} \gamma_{1i} Y_{t-i} + \delta_1 Z + \varepsilon_{1t} \quad (1)$$

$$X_t = \alpha_1 + \sum_{i=1}^{m} \gamma_{2i} Y_{t-i} + \sum_{i=1}^{m} \lambda_{2i} X_{t-i} + \delta_2 Z + \varepsilon_{2t} \quad (2)$$

where Y_t represents economic growth, X_t represents residential construction and Z is a set of seasonal dummies exogenously included to capture any seasonal effects. A test of joint significance of the lagged values constitutes the Granger causality test. More specifically, residential construction is said to Granger-cause economic growth if some $\lambda_i \neq 0$ in equation 1. By the same logic, economic growth is Granger-causing residential construction if one or more $\gamma_i \neq 0$.

An important issue here is the choice of the optimal lag length as all inference in the VAR is naturally based on the chosen lag order, i.e. the number of lags chosen in the above equations have a significant impact on the decision to reject or accept the null hypothesis. Hence, the Schwarz Information Criterion (SIC) is employed to determine the optimal lag length *m*.

3. Empirical Results

It is well documented that Granger causality tests require the use of stationary variables, i.e. variables integrated of order zero (see Granger and Newbold, 1974; and Huang, 1995). Thus, as a preliminary step to the analysis, the order of integration of the variables is determined. Two standard unit root tests are employed—the augmented Dickey-Fuller (ADF) test by Dickey and Fuller (1979, 1981) and the KPSS test by Kwiatkowski et al. (1992). Under the ADF test, the series is assumed to be non-stationary. Hence, failure to reject the null hypothesis implies that the time series has a unit root. Conversely, the KPSS test assumes that the series is stationary under the null against the alternative of non-stationarity of the series (or a unit root).

Table 1 presents the results of the ADF and KPSS unit root test, which implies that the residential construction variable is stationary - I(0), but real GDP is difference- stationary - I(1). Therefore, to investigate the causal

relationship, the VAR is estimated using the logged first differences of real GDP i.e. real economic growth[1].

Table 1 Unit Root Tests

Variable	*ADF*		*KPSS*		*Decision*
	Level	**1st Difference**	**Level**	**1st Difference**	
REAL GDP	-2.063	-2.884***	0.131*	0.180	I(1)
Residential	-7.040***	NA	0.105	NA	I(0)

Notes: ***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively

Prior to testing for causality, the optimal lag order in the VAR model must be chosen. The maximum number of lags is set at 10. The SIC suggests lag 2 as an optimal lag selection for the VAR model. Causality test results are presented in Table 2.

Table 2 Granger Causality Test

Causality	*Lag Length*	χ^2 *Statistic*	*P-Value*
Residential $\not\rightarrow$ Economic Growth	1	3.793*	0.051
Economic Growth $\not\rightarrow$ Residential	1	3.123*	0.077
Residential $\not\rightarrow$ Economic Growth	2‥	11.327***	0.004
Economic Growth $\not\rightarrow$ Residential	2‥	6.924**	0.031
Residential $\not\rightarrow$ Economic Growth	3	13.952***	0.003
Economic Growth $\not\rightarrow$ Residential	3	7.365*	0.061

Notes: 1. The notation Residential $\not\rightarrow$ Real GDP represents the null: Residential Construction does not Granger-cause Real GDP. A similar interpretation follows for the reverse test.

2.***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively. ‥ denotes the optimal lag length.

[1] It should be noted that the ARDL bounds testing approach, which allows for the mixture of I (1) and I (0) variables, was applied to test for the presence of cointegration. However, the F-statistic was below the lower critical bounds value, implying no cointegration. Hence, the author proceeded with the standard methodology and differenced the I (1) variable.

From the χ^2-statistics, the null hypothesis that residential construction does not cause or precede economic growth is certainly rejected. This implies that, historically, there has been causality running from residential construction to the aggregate economy, and thereby justifies the Government's intention to intervene in residential construction activity. The Granger causality test also lends support to the growth-driven residential construction hypothesis, i.e. the housing sector is largely influenced by income; during expansionary periods individuals appear to build more new homes while recessionary episodes are associated with a reduction in residential construction.

As a robustness check, the lag length is allowed to vary. The results are substantially the same as before: bi-directional causality exists between residential construction and economic growth. The model is also subjected to a battery of diagnostic tests (see Table 3). These tests imply that the model is well-behaved: the errors appear to be normally distributed non-heteroscedastic and free of autocorrelation.

Table 3 Diagnostic Tests

Test	*Test Statistic*	*p-value*
VAR Residual Heteroscedasticity Test (without cross terms)	$\chi^2 = 33.670$	0.484
VAR Residual Heteroscedasticity Test (with cross terms)	$\chi^2 = 101.415$	0.138
VAR Residual Normality Test (Jarque Bera)	$\chi^2 = 6.291$	0.178
VAR Residual Serial Correlation LM Test (lags 1 to 10)	LM = 1.590	0.812
	LM = 1.064	0.900
	LM = 2.964	0.564
	LM = 5.266	0.261
	LM = 3.074	0.546
	LM = 3.628	0.459
	LM = 5.107	0.277
	LM = 5.682	0.224
	LM = 3.750	0.441
	LM = 1.730	0.785

4. Concluding Remarks

Economists and policy makers have long emphasised the economic significance of the construction sector to national output. Of the various types of construction activity, this paper focuses on residential construction as housing is increasingly being considered a leading contributor to economic growth. This paper employs Granger-causality tests to investigate the lead-lag

relationship between residential construction and economic growth for Barbados. The empirical results suggest that historically, there has been bi-directional causality exists between residential construction and economic growth.

Taken at face value, our results imply that a macroeconomic policy implemented to boost residential construction should be capable of mitigating the negative spill-over effects of the deteriorating global economic environment. However, there are a few points note. First, the estimated VAR model is of linear form. As such, one cannot determine whether the finding of bi-directional causality exists throughout the sample period, only in an economic boom or in the bust. Furthermore, even in the event that the relationship holds throughout the sample, it is not clear whether residential construction has a direct impact on real GDP. It could be that the movements of construction activities and economic growth are driven by some underlying factor. Hence, the results presented in this paper are more so indicative rather than conclusive.

Finally, it should be noted that too much investment in housing could lead to macroeconomic instability. In a small developing economy such as Barbados there are limited natural resources and, hence, the country depends heavily on goods from abroad. In fact, on average, over 60% of construction materials are imported. Therefore, an increase in housing – a non-traded good – is associated with an increase in imports and, by extension, a possible rise in the current account deficit. In the absence of sufficient capital inflows, this could lead to a decline in the net international reserves. Given the country's fixed exchange rate regime, policy makers should carefully ration the amount allocated to the housing strategy in order to avoid significant reserve losses.

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