

Revisiting the Interaction between the Nigerian Residential Property Market and the Macroeconomy

By

Ismail Ojetunde

Thursday, May 16, 2013

1

Introduction

- Residential property is a multi-dimensional commodity.
- It exerts profound influence on socio-economic and psychological well-being of individuals, households and socio-ethnic groups. For instance, the quality and nature of residential property stock in any area is an overt yardstick to measure the level of socio-economic development.
- Since residential property constitutes the bulk of any country's tangible capital, the study of residential price dynamics and macro economic developments are important for economic and social policies formulation at both local and national scales.

Thursday, May 16, 2013

2

Introduction (Cont'd)

- o Numerous theoretical and econometric studies have however investigated the relationship between residential price and the economy.
- o Earlier studies of this nature (as seen in table I) provided evidence on the link between property and the exogenous factors of the economy but have been considerably skewed to developed economies the United kingdom (Brooks and Tsolasco, 1999) and United States (McCue and Kling, 1994; Kling and McCue, 1987 & 1991; DiPasquale and Wheaton, 1996; Ling and Naranjo, 2003).
- o *Where lies such evidence in developing economies?*
- o In developing countries, such evidence is limited to India (Joshi, 2006; Vishwakarma and French, 2010).

Thursday, May 16, 2013

3

Introduction (Cont'd)

Table I. Classification of Studies Linking Property with the Economy.

S/N	Author/Year of Publication	Study area	Data type	Methodology	Significant Variables
1	Hoag (1980)	USA	Property specific variables, national and regional economic factors.	Regression Analysis.	Property specific variables, national and regional economic factors.
2	Hartzell <i>et al.</i> (1987)	USA	Appraised values from real estate fund.	VAR	Expected and unexpected inflation.
3	Chan <i>et al.</i> (1990)	USA	REITs and some pre-specified macroeconomic variables	Regression Analysis	Risk, unexpected inflation and term structure.
4	Kling and McCue (1991, 1987)	USA	Construction series from direct real estate assets.	VAR	Output, nominal interest rates, money supply and employment.
5	Giussani, <i>et al.</i> (1992)	Europe	Rental values and macroeconomic variables.	Regression Analysis	GDP
6	McCue and Kling (1994)	USA	REITs adjusted for stock influences and macroeconomic	VAR	Nominal interest rates, price, output and investment.

Introduction (Cont'd)

Table I. Classification of Studies Linking Property with the Economy.

S/ N	Author/Year of Publication	Study area	Data type	Methodology	Significant Variables
7	Lizieri and Satchell (1997a)	USA	REITs returns and equity returns adjusted for property influences.	VAR	Lagged values of the equity returns.
8	Lizieri and Satchell (1997b)	USA	REITs returns and real interest rates.	VAR	Real interest rates.
9	Ling and Naranjo (1997)	USA	REITs returns and macroeconomic variables.	VAR	Term structure, unexpected inflation, real treasury bill rate and growth in real capital consumption.
10	Brooks and Tsolacos (1999)	UK	REITs adjusting for stock influences and macroeconomic variables	VAR	Unexpected inflation, term structure of interest rate.
11	Ling and Naranjo (2003)	USA	Capital flows in present and past REITs returns and macroeconomic variables	VAR	Present and lagged REITs returns.
12	Joshi (2006)	India	Housing share prices and interest rates and credit.	VAR	Interest rates and credit growth.
13	Vishwakarim and French (2010)	India	REITs and macroeconomic variables.	VAR	Term structure of interest rate.
14	Ojetunde et al. (2011)	Nigeria	Direct Property Investment	VAR	GDP, Equity, Inflation

Introduction (Cont'd)

- In Nigeria, recent study by Ojetunde *et al.* (2011) has empirically discountenanced the assumption that residential property market in Nigeria is not coupled or linked with the economy.
- This research revisits the interaction between the economy and the operation of the residential property market by extending the study period (between 1984 and 2011) and improving on the data analysis approaches in Ojetunde *et al.* (2011) study.
- Unlike studies in developed economies which employed data on paper-backed securities, this study explore the use of nominal rents from direct property investment in the absence of time series data on property returns from the Nigerian Stock Market.

The Data

- The data were extracted from two distinct sources:
 - Registered Estate Surveying and Valuation firms (Aggregation of residential rental price data based on available letting evidence in most parts of Nigeria)
 - National Bureau of Statistics (National economic data as varied as Gross Domestic Product (GDP) in real terms, short-term interest rates, inflation and exchange rates.
- The sample data in annual frequency covers the period 1984 to 2011 with a total of 28 observations.
 - Table 2 reports a summary of the descriptive statistics of the data sample.

Thursday, May 16, 2013

7

The Data

Table 2: Descriptive Statistics of the Sample Data (1984- 2011).

Variable Name	Description	Mean	Std. Dev.	Min.	Max.
RESDRENT	Nominal residential property rents in Nigerian currency (Naira)	53299	61698.53	700	182022
INFLATN	Inflation rates (%)	22.05	18.22	5.4	72.8
EXCHAG	Exchange rates of Nigerian currency (Naira) to US\$1	66.45	60.75	0.7649	153.89
INTEREST	Short term -Interest rates (%)	18.54	4.55	9.25	29.08
GDP	Gross Domestic Product in real terms (expressed in Millions of Naira)	446974	177712	227255	885273

Thursday, May 16, 2013

8

Methodology (Cont'd)

- The methodology consists of four different approaches:
 - Pair-wise correlation between residential rent (a property market variable) and macro economic variables;
 - Vector autoregression (VAR) employed for the period 1984 to 2011 in order to investigate the relationship between residential property market (using RESDRENT as proxy) and macroeconomic variables (INFLATN, EXCHAG, GDP).
 - Cointegration test (Applied to the VAR variables to test the existence of any long run equilibrium relationship)
 - Granger causality tests (were applied to the estimated VAR coefficients to determine the variable(s) IF ANY in the model which impact significantly on the future values of each of the variables in the system).
- Cointegration and granger causality tests are within the vector autoregression (VAR) framework.

Thursday, May 16, 2013

9

Methodology (Cont'd)

- A vector autoregressive model is a systems regression model in which the variance or current values of the dependent variables can be explained in terms of the different combinations of their *own lagged values* and the *lagged values of other variables* as well as *their uncorrelated error terms*.
- The reduced form of the estimated VAR model is expressed as:

$$Y_t = \beta_0 + \sum_{i=1}^k \beta_i Y_{t-i} + U_t$$

Thursday, May 16, 2013

10

Methodology (Cont'd)

- Where $Y_t = (\text{RESDRENT}, \text{INFLATN}, \text{EXCHAG}, \text{INTEREST}, \text{GDP})$ is a vector of variables determined by k lags of all variables in the system;
- U_t is a 5×1 vector of the stochastic error terms (impulses or innovations or shocks)
- β_0 is a 5×1 vector of constant term coefficients,
- β_i are 5×5 matrices of coefficients on the i th lag of Y
- k represents the number of lags of each variable in each equation.
- Therefore the equation (is a vector of 5 variables) postulates for instance, that current RESDRENT is related to its own lag or past values, as well as the lag of the other four variables (INFLATN, EXCHAG, INTEREST, GDP).

Thursday, May 16, 2013

11

Methodology (Cont'd)

- Estimation of a parsimonious VAR model presuppose the:
- Absence of unit roots (non stationary) within these series.
 - The examination of the inverse roots of the autoregressive polynomial however reveals that the absence of non-stationary in all VAR variables, since none of the roots has a modulus greater than one and none lies outside the unit circle.
- Selection of appropriate lag length?
 - Avoids specification errors and
 - Problem of multicollinearity and consumption of many degrees of freedom

Thursday, May 16, 2013

12

Methodology (Cont'd)

- By following Lutkepohl, (1991) the appropriate length(number) of the distributed lag is determined using the information criteria technique.
- The selection of the lag values of multivariate versions of the information criteria is based on that which minimise the value of the five information criteria.
- The choice of an accurate VAR model is therefore one with two lagged terms of each variable as seen in Table 3.

Table3. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-945.6704	NA	3.95e+25	73.12850	73.37044	73.19817
1	-841.9993	159.4941*	9.71e+22	67.07687	68.52852*	67.49489
2	-809.6437	37.33328	7.02e+22*	66.51106*	69.17242	67.27743*

13

Methodology (Cont'd)

- Granger causality tests **ONLY** reveal the association among the variables.
 - *NOT* whether variance or change in value of a particular variable has a positive or negative effect on other variables in the VAR system.
- Therefore **VARIANCE DECOMPOSITION AND IMPULSE RESPONSE FUNCTION (IRF)** were estimated to examine the strength of such relationships within the VAR system
- The estimated variance decomposition of RESDRENT, is the proportion of the variance in RESDRENT that can be explained by its own shocks and shocks to other variables.

Thursday, May 16, 2013

14

Methodology (Cont'd)

- The forecast error variance (S.E) for an four (4) period forecast horizon within the *ESTIMATED VARIANCE DECOMPOSITION* determines the proportion of RESDRENT for current and future periods (1, 2,3 and 4) which is accounted for by innovations to INFLATN, EXCHAG, INTEREST and GDP.
- *THE IMPULSE RESPONSE FUNCTION* traces out the response of RESDRENT in the VAR system to shocks in the error terms in VAR equation to the extent that, if in the RESDRENT equation increases by one standard deviation, such change or shock will change RESDRENT in the current and future periods

Thursday, May 16, 2013

15

Results

Table 4. Pair-wise Correlations of Variables at Zero Lag.

Pairwise correlations at zero lag					
	GDP	INFLATN	EXCHAG	INTEREST	RESDRENT
GDP	1				
INFLATN	-0.31	1			
EXCHAG	0.85	-0.38	1		
INTEREST	-0.04	0.30	-0.02	1	
RESDRENT	0.91	-0.34	0.91	-0.15	1

- First, residential property rents are strongly and positively correlated with *real GDP and exchange rates* fluctuations in Nigeria.
- Secondly, there are negative but weak correlations between residential property rents *and short-term interest rates* as well as between residential property rents and *inflation rates*.

Thursday, May 16, 2013

16

Results (Cont'd)

- Based on Johansen (1988) cointegration test (the trace and max tests) the null hypothesis of four cointegrating vectors at 5% level is rejected as the trace statistics are greater than the critical values.
 - *Interestingly, this signifies that residential rent, GDP, inflation, exchange and interest rates have long run equilibrium relationship during 1984 and 2011.*
- The granger causality test reveals that:
 - *All macro economic variables with the exception of inflation forecast residential property rent (RESDRENT) as all the lag coefficients of each of the macroeconomic variables are statistically significant (p-values are less than 5%) in the residential property rent equation.*

Thursday, May 16, 2013

17

Results (Cont'd)

- Granger causality test further reveals that:
 - *Though both the short -term interest rates and exchange rates like other macroeconomic variables have significant effects in the residential property rents, there is evidently 'no reverse significant' of residential property rents on these two macroeconomic variables (p-values are 0.2677 and 0.2838 respectively).*
 - *These results suggest that these two macroeconomic variables (short-term interest rate and exchange rate) 'granger cause' residential property rents.*
 - *As a corollary these two macroeconomic variables have useful information for predicting residential property rents over and above the past values of other macroeconomic variables in the VAR model.*
 - *Residential property rents which also significant in the real GDP equation implies the existence of feedback relationship between real GDP and residential property rents.*

Thursday, May 16, 2013

18

Results (Cont'd)

Table 7: Variance Decompositions for Residential Property Rent

Period	FORECAST ERROR VARIANCE (S.E)	EXCHAG	GDP	INFLATN	INTEREST	RESDRENT
1	15.19901	0.000000	0.000000	0.000000	0.000000	100.0000
2	22.19551	6.951051	18.91081	0.023707	0.001505	74.11293
3	28.63879	9.285895	18.61029	0.087174	0.205616	71.81102
4	34.27057	14.10323*	17.31054*	0.485487	0.360693	67.74005

- ****The forecast error variance (S.E) for four (4) years shows that real GDP and Exchange rate together forecast 31.4% of the variance in residential property rents.**

Thursday, May 16, 2013

19

Results (Cont'd)

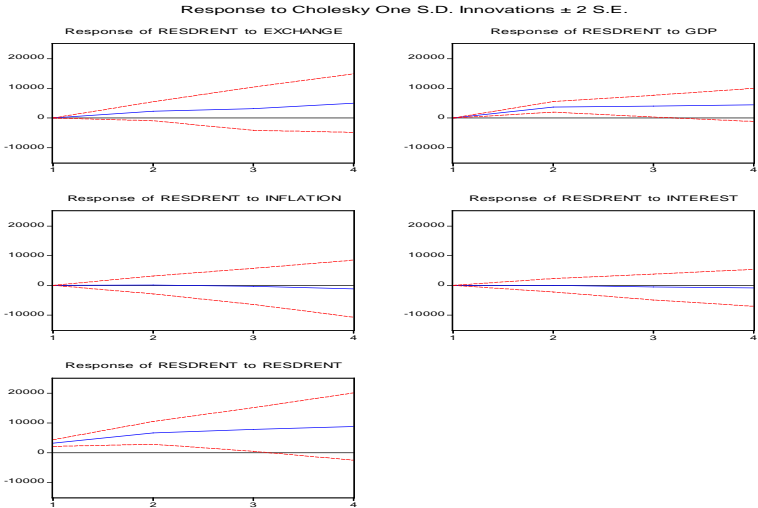


Fig.3. Responses of Residential Property Rent to Shocks in Macroeconomic Variables.

Thursday, May 16, 2013

20

Results (Cont'd)

- The Impulse Response Function (IRF) as depicted in fig. 3 shows that:
 - *Shocks to short-term interest rates have a negative significant impact on residential property rents, with the shocks getting a bit pronounced after period two.*
 - *Shocks or innovations in inflation is negative but not significant and the shocks die away instantly even at year zero.*
 - *Increase in real GDP and exchange rates have significant positive effects on residential rents. In this case, rents appear to settle down quickly to a steady rising state after period one due to shocks of exchange rate and in the second period year to shocks of real GDP.*

Thursday, May 16, 2013

21

Conclusions

- *Empirical evidence based on this study from Nigeria implies that exogenous influences GDP (17.3%) and Exchange rate(14.1%) of the economy account for 31.4% of the variation within the residential property market.*
- *. In addition, the feedback mechanism between GDP and residential property rents, means that these two variables are determined contemporaneously and by implication depicts a somewhat limited integration of the Nigerian residential property market with the economy.*
- *The one to two period(s) response shocks of interest rate, real GDP, and exchange rate show a relatively slow adjustment of the market to the ever changing macroeconomic events in Nigeria. Such responses are exogenous and make long run equilibrium within the residential property market almost elusive.*

Thursday, May 16, 2013

22

Conclusions (Cont'd)

- *This study further confirmed that the interaction between Nigerian property market and the macroeconomy using econometric analysis rather than adhoc methodologies purged with simple trend interpolations is plausible.*
- *The existence of analysis of this nature in Nigeria will in the end aid useful property market analysis in a market fraught with poor property market data.*

Thursday, May 16, 2013

23

THANK YOU

Thursday, May 16, 2013

24