

HOUSE PRICE, STOCK PRICE AND CONSUMPTION IN SOUTH AFRICA: A STRUCTURAL VAR APPROACH

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Abstract

This paper compares the effects of real house price and real stock price shocks on consumption decisions in South Africa over the period 1966 to 2012 using a Structural Vector Autoregressive (SVAR) approach. The sample comprises quarterly, seasonally adjusted South African data on consumption, inflation, real house price, real stock price and the nominal Treasury bill rate. We find that a positive 1 percent shock in stock prices leads to about 0.05 percent increase in consumption, with the effect being short-lived, and declines after 4 quarters to become statistically insignificant. While, a 1 percent shock in house prices increase consumption by about 0.3 percent at around the 4th quarter, but thereafter declines and becomes negative from the 8th quarter. These results show that in South Africa, house prices play economically, but not statistically, a greater role than stock prices with respect to consumption expenditure.

Keywords: Consumption, House Price, Stock Prices, Structural Vector Autoregression

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1. Introduction

The aftermath of previous economic crises, like the East Asian crisis drastic mid- to late 90's and the recent financial crisis demonstrates that boom/bust cycles in asset prices (house and stock prices) can severely affect macroeconomic stability, especially output and price stability. As a result the role of the mortgage market in affecting and possibly amplifying the effect of changes in housing prices on consumption (Musso, Neri and Stracca 2011) has received increased attention from economists and policy-makers. This is also the case for stock market. Stocks and housing are considered as important wealth components for households. In South Africa for instance, non-housing wealth (housing wealth) equals 49.95 per cent (31.13 percent) of household's total assets and 61.59 per cent (38.41 per cent) of household's net worth in 2011 (Aye, et al., forthcoming). Therefore, any swings in these assets are expected to have major implications for consumer spending. Since consumption is a significant component of the GDP, the effects of house and stock prices on consumption serve as a key link between the asset market and economic activity. Therefore, understanding the implications of house price and

stock price dynamics on consumption is of considerable interest in addressing asset market issues and hence macroeconomic instability.

It is largely accepted that interest rate is not the only channel by which monetary shocks are transmitted to the real economy. Housing wealth and stock market wealth also play a central role in the transmission mechanism of real shocks to the economy. According to the European Central Bank (ECB, 2010), a variety of mechanisms exist through which asset prices can affect consumption spending. For example, a wealth effect working through consumers and a "q-effect"¹ working through businesses can affect asset prices. Housing bubbles, which arose in most developed and emerging-market countries prior to the financial crisis, led to unsustainable borrowing by homeowners to finance consumption against "seemingly" permanent increases in their equity holdings. If q increases as a result of an increase in equity prices, the firm can raise more capital by issuing new equity. This makes it more attractive for firms to raise new capital, thus increasing investment demand, which may, in turn,

¹Tobin's q equals the ratio of the stock market value of a firm to the replacement cost of its capital.

lead to higher prices for goods and services. Additional effects can stem from residential property prices, which, via higher wage demands by workers, may lead to increases in both the prices of goods and services and, therefore, consumer prices. Finally, movements in asset prices can significantly affect business and consumer confidence. Hence, a large number of researchers have attempted to quantify either the effect of house prices or stock prices using different econometric techniques and databases.²

However, a question of interest is that of determining which one of these two asset (housing or stock) prices has the largest effect on consumption. There is no straightforward or unanimous answer to this question. According to Mishkin (2007), 'the question of whether consumption is affected more by changes in housing wealth than changes in other sources of wealth is *inherently empirical*. (...) *the evidence is not clear cut*'. However, an understanding of the differential roles is important as this detects the extent of policy action to take in case of shocks to each asset prices. There are about three divergent views put forward in an attempt to explain whether there should be differences of impacts of these two assets on consumption (Mishkin, 2007). One is the life-cycle hypothesis of saving and consumption. It implies that all sources of an increase in wealth, whether originating from stock or real estate, should have *the same positive effect on consumption* due to the fact that in the long run, the marginal propensity to consume out of wealth is slightly higher than the real interest rate. However, this view, though embraced by the Federal Reserve Board in the U.S and others is not unanimous. Mishkin (2007) points out different alternative views challenging the life-cycle hypothesis.

The first alternative view argues that the effects of changes in housing wealth on consumption should be *more important* than those emanating from equities and other assets. The main reason for this thinking is the fact that housing wealth is spread more evenly over the population than stock market wealth. Another argument put forward is that given the lower volatility of house prices compared to stock market prices, changes in housing wealth last longer than changes in equity wealth, with the consequence that housing wealth should have a *bigger effect* than stock market wealth on consumption. The second view argues that because increases in stock market valuations are more clearly related than changes in housing wealth to future economic growth, increases in housing wealth may have a *smaller effect* on

consumption than increases in stock market wealth. And as a result of the much larger share detained by older people in the stock market wealth relative to housing market wealth, the effect of stock markets on consumption may be *more important* than those of housing wealth as older people have a higher marginal propensity to consume out of wealth.

The differential impacts of stock and house prices have been investigated empirically by a number of researchers. These include Dvornak and Kohler (2003), Ludwig and Sløk (2004), Case, Quigley and Shiller (2005), Mishkin (2007), Peltonen, Sousa and Vansteenkiste (2008) and Sousa (2009) among others.³ These studies are mainly conducted for developed countries. From this body of empirical evidence, it appears that the differential consumption effect of housing wealth and stock market wealth is inconclusive. Some studies report effects that are not statistically different in the long run; others report results supporting the view that increases in housing wealth have a larger effect on consumption than increases in stock market wealth; and finally other studies report that increases in stock market prices have a larger impact on consumption when compared to increases in housing prices.

Despite these divergent evidences, we are not aware of any study analysing the differential roles of stock and house prices in South Africa. As far as South Africa is concerned, there are several studies focusing on the impact of either house prices or stock prices on consumption. Das, Gupta and Kanda (2011), Neube and Ndou (2011), Simo-Kenge, Gupta and Bittencourt (forthcoming), Peretti, Gupta and Inglesi-Lotz (forthcoming) and Aye et al. (2012) are the most recent South African papers investigating the impact of either housing prices or stock prices on consumption. For instance, Das et al. (2011), used the Phillips, Wu and Yu (2011) unit root test and the Error Correction Model (ECM) to test for housing bubbles and their effect on consumption. They conclude that there is an asymmetric relationship between house prices and consumption, where consumption reacts considerably to rapid increase in house prices but barely reacts to a rapid decline. Simo-Kengne et al. (forthcoming) used a panel data technique with a vector autoregressive model and Cholesky decomposition scheme to evaluate the effect of house price shocks on consumption from 1996 to 2010. Their findings corroborate that of Das et al., (2011). Peretti et al., (forthcoming) used a Time Varying VAR to investigate the relationships between interest rates, growth in house prices and growth in consumption and found that the effect on consumption of a positive house shock persisted for more than a year. As in Peretti et al., (forthcoming), Aye et al., (2012) also used a Time Varying VAR to examine the relationships between interest rates,

²For detailed international literature reviews on studies analyzing the effect of stock prices on consumption see Ludvigson and Steindel (1999), Dynan, and Maki (2001), Millard and Power (2004). Similarly, for studies on house prices and consumption see Campbell and Cocco (2007), Attanasio, Blow, Hamilton and Leicester (2009), Attanasio, Leicester and Wakefield (2011), and Iacoviello (2011).

³More international studies can be found in the cited papers as well as in Paiella (2007).

growth in stock prices and growth in consumption. Stock prices were found to have a positive relationship with consumption with the most significant effect of a positive stock price being observable at the one quarter horizon. However, none of these studies examined the relative roles of stock and house prices on consumption in South Africa. Against this background, our study attempts to add some additional empirical evidence in the body of research about the differential effect of housing versus stock market wealth. We focus on South Africa given our familiarity with the structure of the economy. We compare the effects of real house price and real stock price movements on consumption decisions in South Africa over the period 1966:Q2 to 2012:Q1 using a Structural Vector Autoregressive (SVAR) model. We identify the model using both short-run and long-run restrictions. Our results show that house prices have a larger impact on consumption than stock prices with the later having a short-lived albeit significant effect. This is consistent with that of Case et al., (2005). Note that, Das et al., (2011), discussed above, besides analyzing the role of house prices on consumption, also indicated that real stock prices affect consumption significantly both in the short- and long-runs. However, this study did not analyze/compare the dynamics (future path) of consumption following a shock in the asset prices. Also, since the paper was dealing with the effect of housing bubbles on consumption, it was more concentrated on examining the effect of house price acceleration or deceleration rather than real house price returns. Hence clearly, it is not possible to compare the magnitudes of the effect of real housing and stock returns on consumption from the work of Das et al., (2011).

The rest of the paper is organized as follows: in Section 2, the data is explained while Section 3 outlines the econometric model utilised. The main results of the SVAR analysis are summarized in Section 4. Finally, Section 5 concludes the study and makes recommendations for further research.

2. Data

We use quarterly, seasonally adjusted South African data on inflation, real house price, real stock price, consumption and nominal interest rate over the period 1966:1 to 2012:2. Data on CPI, the three months Treasury bill rate, the Johannesburg All Share Stock Index were obtained from International Monetary Fund's (IMF's) International Financial Statistics (IFS) database. The house price data was obtained from the amalgamated Bank of South Africa (ABSA). While, the data on total consumption expenditure at constant 2005 prices was obtained from the Quarterly Bulletin of the South African Reserve Bank (SARB). Nominal house price and stock price data were deflated by the CPI to obtain their real counterparts. Inflation was computed as the quarter-on-quarter percentage change in the CPI. Based on all the standard unit root tests,

namely, Augmented Dickey-Fuller (1981) (ADF), Phillips-Perron (1988) (PP), Dickey-Fuller test with generalized least squares detrending (DF-GLS), the Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) (1992) test; the Elliot, Rothenberg, and Stock (ERS) (1996) point optimal test, the Ng-Perron (2001) modified versions of the PP (NP-MZt) test and the ERS point optimal (NP-MPT) test, real consumption expenditure (*Cons*), real stock (*rsp*) and house prices (*rhp*), and the inflation rate (π) were found to be non-stationary, so the first three variables were converted to their corresponding growth rates, while, the inflation rate was first-differenced. The nominal interest rate (i) was found to be stationary at the 10 percent level of significance using ADF, DF-GLS, ERS, NP-MZ_t and NP-MP_T tests, and hence, was used in levels.⁴ The stable⁵ VAR is estimated based on three lags, as was unanimously suggested by all the popular lag-length tests, namely, the sequential modified LR test statistic, the Akaike information criterion, the Schwarz information criterion. Accounting for stationarity and lags, our effective sample period start from 1967:1.

3. Methodology

This study aims at assessing the existence of spillovers from changes in house prices and stock prices on consumption in South Africa. The analysis is based on a structural vector autoregressive model (SVAR). A VAR is a theory-free econometric model used for capturing the evolution and the interdependencies between multiple time series. The variables included in a VAR are all treated as endogenous; and the evolution of each variable is described as a linear function of its past lags and the lags of the other variables included in the model. However, to identify the different shocks in the VAR, we impose restrictions on the parameters of the model, as well as, order the variables appropriately, which is what we discuss below. Let Z_t be the (5x1) vector of the macroeconomic variables mentioned above. The variables are ordered as follows:

$$Z_t = [\Delta\pi_t, \Delta Cons_t, \Delta rhp, \Delta rsp, i_t]$$

Assuming that Z_t is invertible, it can be written in terms of its moving average (ignoring any deterministic terms)

$$Z_t = B(L)v_t \quad (1)$$

where v_t is a (5x1) vector of reduced form residuals assumed to be independent and identically distributed, $v_t \square iid(0, \Omega)$, with positive semi definite covariance matrix Ω . $B(L)$ is the (5x5)

⁴ These results are available upon request from the authors.

⁵ The constant parameter VAR is found to be stable as all roots were found to lie within the unit circle.

matrix polynomial in the lag operator L , $B(L) = \sum_{j=0}^{\infty} B_j L^j$. The innovations v_t will be expressed as linear combinations of the orthogonal structural disturbances (\mathcal{E}_t), i.e. $v_t = S\mathcal{E}_t$, where S is the (5x5) contemporaneous matrix.

Equation (1) can then be expressed in terms of its structural shocks as

$$Z_t = C(L)\mathcal{E}_t \quad (2)$$

where $B(L)S = C(L)$.

To identify S , the elements in \mathcal{E}_t are normalized so that they all have unit variance. The identification of the matrix S is necessary for deriving the MA representation in (2) as $B(L)$ is obtained from a

$$\begin{pmatrix} \Delta\pi_t \\ \Delta Cons_t \\ \Delta rhp_t \\ \Delta rsp_t \\ i_t \end{pmatrix} = B(L) \begin{pmatrix} S_{11} & 0 & 0 & 0 & 0 \\ S_{21} & S_{22} & 0 & 0 & 0 \\ S_{31} & S_{32} & S_{33} & 0 & S_{35} \\ S_{41} & S_{42} & S_{43} & S_{44} & S_{45} \\ S_{51} & S_{52} & S_{53} & S_{54} & S_{55} \end{pmatrix} \begin{pmatrix} \mathcal{E}_t^\pi \\ \mathcal{E}_t^{cons} \\ \mathcal{E}_t^{rhp} \\ \mathcal{E}_t^{rsp} \\ \mathcal{E}_t^{MP} \end{pmatrix} \quad (3)$$

Additional recursive restrictions are imposed in the form of placing three zero restrictions in the fourth column to ensure that inflation, consumption and house prices react with a lag to stock prices shocks while real stock prices can respond immediately to all variables (no zeros in the fourth row) and such that real asset prices respond immediately to monetary policy.

An examination of the first three rows of the S matrix provides us with 8 contemporaneous restrictions (indicated by the zeros). The system is still short of two restrictions. Following Bjørnland and Jacobsen (2010), two assumptions are imposed. First, a monetary policy shock can have no long-run effects on real stock prices and secondly, a monetary policy shock can have no long-run effects on consumption.

When applied to the relevant lag coefficient of the moving average representation of the vector of

$$\begin{aligned} B_{21}(1)S_{15} + B_{22}(1)S_{25} + B_{23}(1)S_{35} + B_{24}(1)S_{45} + B_{25}(1)S_{55} &= 0 \\ B_{41}(1)S_{15} + B_{42}(1)S_{25} + B_{43}(1)S_{35} + B_{44}(1)S_{45} + B_{45}(1)S_{55} &= 0 \end{aligned} \quad (5)$$

The system is now just identifiable as the zero contemporaneous restrictions allow for the identification of no-zero parameters above the interest rate equation; the remaining parameters can uniquely be identified using the long-run restrictions depicted in (5). Given the zero contemporaneous restrictions, (5) reduces to

reduced form estimation. The ordering of the orthogonal structural shocks is as follow: $\mathcal{E}_t = [\mathcal{E}_t^\pi, \mathcal{E}_t^{cons}, \mathcal{E}_t^{hp}, \mathcal{E}_t^{sp}, \mathcal{E}_t^{MP}]$, with $\mathcal{E}_t^\pi, \mathcal{E}_t^{cons}, \mathcal{E}_t^{hp}$ and \mathcal{E}_t^{sp} being aggregate supply, aggregate demand, housing demand, equity demand and monetary policy shock.

The standard closed economy literature recommends that the monetary policy shocks are identified by assuming that macroeconomic variables do not react simultaneously to policy variables, while a simultaneous reaction from the macroeconomic environment is allowed for. This is made possible by placing consumption and inflation above the interest rate in the ordering and imposing two zero restrictions on the appropriate coefficients in the fifth column in the S matrix, as follows:

economic variables Z_t , these assumptions lead to the following equalities:

$$\sum_{j=0}^{\infty} C_{25,j} = 0 \text{ and } \sum_{j=0}^{\infty} C_{45,j} = 0 \quad (4)$$

There are at present enough restrictions to identify and orthogonalise all shocks. Writing the long run expression of $B(L) = C(L)$ as

$$B(1)S = C(1); \quad \text{where} \quad B(1) = \sum_{j=0}^{\infty} B_j \text{ and}$$

$C(1) = \sum_{j=0}^{\infty} C_j$ indicate the (5x5) long-run matrix of $B(L)$ and $C(L)$ respectively.

Given the ordering of our selected variables in the VAR, the long-run restrictions $C_{25}(1) = 0$ and $C_{45}(1) = 0$ implies respectively:

$$\begin{aligned} B_{23}(1)S_{35} + B_{24}(1)S_{45} + B_{25}(1)S_{55} &= 0 \\ B_{43}(1)S_{35} + B_{44}(1)S_{45} + B_{45}(1)S_{55} &= 0 \end{aligned}$$

4. Results

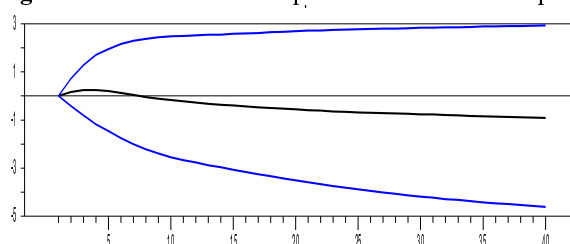
Besides the five variables, and five constants corresponding to the five equations, the VAR included three dummy variables corresponding respectively to the financial liberalization (1985:1), the implementation of the inflation targeting policy (2000:1), and the financial crisis (2007:1-2009:4). As we are interested only on the effect of the asset price shocks on consumption, we present below the results of these two shocks on consumption. The responses are graphed with probability bands represented as 0.16 and 0.84 fractiles, which is the Bayesian simulated distribution obtained by Monte Carlo integration with 2500 replications, using the approach for just-identified systems. The draws are made

directly from the posterior distribution of the VAR coefficients.

Impact of a House Price shock

The figure below depicts the response to a 1 percent shock applied to house prices. Consumption responds positively initially before declining and finally turns and remains negative after 8 quarters. We observe that a 1 percent shock to house prices increases consumption by 0.3 percent within the first 4 quarters. However, the fact that the zero line is encompassed in the confidence interval limits is a clear indication that the effect of house price shock on consumption is statistically insignificant.

Figure 1. Effect of a house price shock on consumption

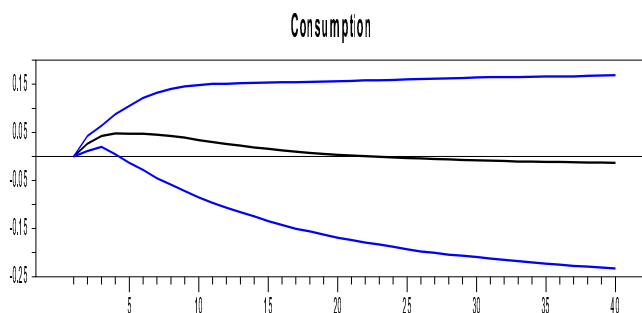


Impact of a Stock Price Shock

Given a 1 percent shock in stock prices, consumption significantly increases by about 0.05 percent to reach its peak after 4 quarters. Beyond that horizon, the

effect on consumption gradually decreases to the extent that it becomes statistically insignificant and eventually dies out.

Figure 2. Effect of a stock price shock on consumption



Comparing the effects of the two shocks, it is clear that stock prices have a smaller effect on consumption than house prices. A shock to stock prices produces a significant and longer lasting positive response in consumption, than a shock to house prices with the latter having a positive, but statistically insignificant and short lived positive effect.

The main reason for the difference in the impact of house prices and stock prices on consumption may be explained by the fact that in South Africa, housing ownership is more evenly spread over the population than stock market wealth. Furthermore, as suggested by economic theory, if the marginal propensity to consume out of wealth is lower among the rich, then changes in housing wealth will have greater impact on consumption compared to changes in stock prices. An

additional reason may be that house prices are less volatile than stock market prices, this can explain why the overall impact of changes in house prices last longer than that of changes in stock market prices.

5. Conclusion

In this paper, the differential roles of house prices and stock prices on consumption behaviour in South Africa are examined. The effects of house prices shocks are studied using a SVAR over the period 1966:1 to 2012:2. The SVAR system was identified by using a VAR model as the baseline and by imposing a combination of short and long-run restrictions.

Our study finds that a 1 percent shock in stock prices leads to about 0.05 percent increase in

consumption. The effect is short-lived and declines after 4 quarters becoming statistically insignificant thereafter. Given a 1 percent shock in house prices, consumption increases for 4 quarters (reaching a maximum of about 0.3 percent) and thereafter declines and becomes negative after the 8 period. These results show that house prices have a bigger impact on consumption than stock prices, though the effect of stock prices is statistically significant, while that of house prices is not. In the future, it would be interesting to use a time-varying VAR model to analyze and compare the wealth effects emanating from the two asset prices, since this would allow us to gauge the importance of stock and house prices over time.

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