

The Effect of Monetary Policy on Real House Price Growth in South Africa: A Factor Augmented Vector Autoregression (FAVAR) Approach

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- Kasai and Gupta (2008) use a three-variable SVAR to investigate the effectiveness of monetary policy on house prices in South Africa and find the presence of the *home price puzzle*
- CPI appears to increase in response to an “exogenous” increase in the short-term interest rate
- Identify the effects of one shock, to monetary policy, when the SARB looks at a lot more than just output and inflation
- Potential explanation the SARB sees an increase in the price of materials, and reacts in advance. Just looking at output and inflation, we do not see what the SARB reacted to

- The recent literature (Stock and Watson, 2004; and Rapach and Strauss, 2007, 2008, Das et al. 2008a, b, 2009) gives evidence of the fact that numerous economic variables are potential predictors of house price growth.
- Carlino and DeFina (1998, 1999), and Vargas-Silva (2008b) show that that the impact of monetary policy on the US economy differs according to regions
- Iacoviello (2002), McCarthy and Peach (2002), Iacoviello and Minetti (2003, 2008), Kasai and Gupta (2008) and Vargas-Silva (2008a) for analyses of the effect of monetary policy shocks on house price in the US, Europe and South Africa.

- Let Y_t be a $M \times 1$ vector of observable economic variable assumed to drive the dynamics of the economy
- The conventional approach involves estimating a VAR, a SVAR, or other multivariate time series model using Y_t alone.
- Further assume that F_t is a $K \times 1$ vector of unobserved factors that summarizes additional important information, such as potential output not fully captured by Y_t
- F_t can also represent theoretical concepts such as price pressures, credit conditions, or even economic activity that are a combination of economic variables which cannot be represented by one particular series

The FAVAR (cont.)

- Assume that the joint dynamics of (F'_t, Y'_t) are given by the following equation:

$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \Phi(L) \begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + v_t \quad (1)$$

- where $\Phi(L)$ is a conformable lag polynomial of finite order p and v_t is the error term with zero mean and covariance matrix Q
- Equation 1 is a standard VAR. However, the difficulty here, compared to standard VARs, is that the vector of factors F_t is unobserved
- The proper estimation of the model entails the use of factor analysis, as proposed by Stock and Watson (1998)
- Assume X_t is related to both the observed variables Y_t and unobserved factors F_t as follows:

$$X_t = \Delta^f F_t + \Delta^y Y_t + e_t \quad (2)$$

The FAVAR (cont.)

- Consider a simple backward-looking model of Rudebusch and Svensson (1999)



$$\pi_t = \delta\pi_{t-1} + \kappa(y_{t-1} - y_{t-1}^n) + s_t \quad (3)$$



$$y_t = \phi y_{t-1} - \psi(R_{t-1} - \pi_{t-1}) + d_t \quad (4)$$



$$y_t^n = \rho y_{t-1}^n + \eta_t \quad (5)$$



$$s_t = \alpha s_{t-1} + v_t \quad (6)$$



$$R_t = \beta\pi_t + \gamma(y_t - y_t^n) + \varepsilon_t \quad (7)$$

The FAVAR (cont.)

- Equations (3)-(7) can be written as $(F'_t, Y'_t)' = (y_t^n \ s_t \ \pi_t \ y_t \ R_t)'$
- If both the CB and the econometrician observe all variables, $Y'_t = (y_t^n \ s_t \ \pi_t \ y_t \ R_t)'$ and F'_t is an empty set
- One possibility is $Y'_t = (\pi_t \ y_t \ R_t)'$ and $F'_t = (y_t^n \ s_t)'$, we use FAVAR instead of VAR
- In reality the CB and the econometrician only observe the policy instrument, i.e. $Y_t = R_t$ and $F'_t = (y_t^n \ s_t \ \pi_t \ y_t)'$
- In this paper, we follow a realistic framework by assuming that the central bank and the econometrician observe only the monetary policy instrument, TB , i.e., $Y_t = TB_t$.

The FAVAR (cont.)

- The reduced form VAR, based on Equation 1, then has the following structural form:

$$\Gamma(L) \begin{bmatrix} \hat{F}_t \\ Y_t \end{bmatrix} = u_t \quad (3)$$

- Given this, we compute the IRFs of \hat{F}_t and Y_t as follows:

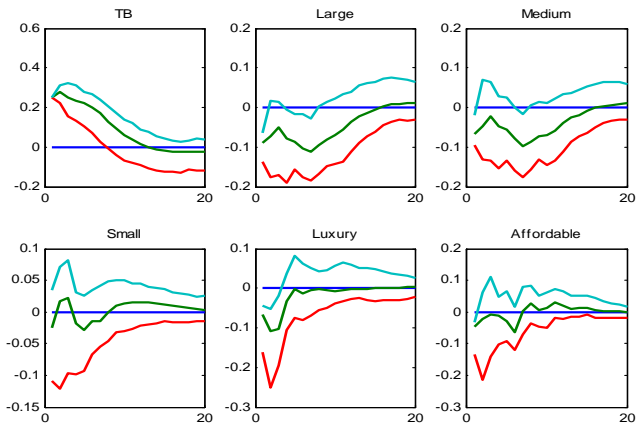
$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \Psi(L) u_t \quad (4)$$

- Given that X_t is estimated by $\hat{X}_t = \hat{\Delta}^f \hat{F}_t + \hat{\Delta}^y Y_t + e_t$, based on Equation 2, the IRFs of are given by:

$$\hat{X}_t = \begin{bmatrix} \hat{\Delta}^f & \hat{\Delta}^y \end{bmatrix} \begin{bmatrix} \hat{F}_t \\ Y_t \end{bmatrix} = \begin{bmatrix} \hat{\Delta}^f & \hat{\Delta}^y \end{bmatrix} \Psi(L) u_t \quad (5)$$

- Besides the real house price of the five segments of the housing market, the FAVAR is estimated based on 241 other quarterly series of South Africa
- The data cover real, nominal, and financial sectors, and intangible variables, such as confidence indices variables
- The sample period contains data from 1980:01 to 2006:04.
- Following Bernanke et al. (2005), we divide the data set into two categories, *slow moving* and *fast moving*
- All series are seasonally adjusted and transformed to induce stationarity.
- The Bai and Ng (2002) approach proposes five static factors, while Bai and Ng (2007)
- The choice of 3 lags based on the unanimity of Final Prediction Error (FPE) criterion and the Akaike Information Criterion (AIC).

Empirical Results



Empirical Results (Cont.)

Categories	Variance Decomposition	R^2
Large-Middle-Segment	0.0192	0.6679
Medium-Middle-Segment	0.0092	0.5897
Small-Middle-Segment	0.0045	0.1022
Luxury	0.0488	0.1147
Affordable	0.0039	0.3653

- Overall, the results show that real house price growth responds negatively to a positive monetary policy shock, no *home price puzzle*
- This result points to the benefit gained by using a large information set
- Not surprisingly, the reaction of real house price growth rate is found to differ across the five housing categories
- Specifically, we find the luxury, the large-middle- and the medium-middle segments to experience the biggest negative impacts
- However, unlike the two middle-segments, the effect on luxury housing recovers back to its original level much faster
- The small-middle-segment and affordable housing witness small and short-lived negative effects