Currency Volatility and Trade Factors Driving Housing Prices in India

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Abstract

This paper is an empirical analysis with the purpose of explaining the house prices in India as a function of exchange rates volatility and trade balance. The analysis is based upon an Indian house price index published by the Bank of International Settlements. The sample range of quarterly data stretches from 2009 thru 2017. Using a polynomial regression procedure, the findings suggest that housing prices in India can be interpreted as a function of the real effective exchange rate, the volatility of this exchange rate and the ratio of exports to imports.

1. Introduction

The study of housing market determinants gained momentum in recent years after the housing bubble and home price volatility seemed to be influenced by major macroeconomic factors. Prior to the 2008 financial debacle, studies of house price behavior exploited both microeconomic, macroeconomic and regional perspectives. Iacoviello and Minetti (2003) discovered that monetary policy exerted stronger effects on housing prices in countries marked by greater financial liberalization. Their study incorporated data from three countries, Finland, Sweden, and the United Kingdom. Higher levels of financial liberalization correlated with larger initial shocks from monetary policy in addition to longer response persistence. In general, housing prices received a boost from financial liberalization.

Berg (2003) discovered that high tech corridors experienced higher house price volatility than other regions. His research suggested house price insurance should be part of employee compensation packages in high-tech corridors.

The 2008 financial debacle furnished a unique opportunity to study the macroeconomic implications of a collapsing housing market. The bursting of the subprime housing bubble

raised the specter of another large asset market susceptible to bubble activity and capable of inducing large macroeconomic waves. Before the debacle, houses remained as a rare asset whose prices held stable or even increased during recessions. This tendency of house prices to only escalate suggested houses were safe investments. Developed countries conferred upon housing markets all the tools that invited speculators. Stock market speculators envied the small down payments, much lower than stock margin requirements, which allowed home buyers to commit little of their own money in purchasing a house or to even need personal capital as a prerequisite. Furthermore, the easy home equity loans cleared the path for converting capital gains from home ownership into collateral for riskier business loans or even consumer goods. Since houses are non-tradeable goods, exempt from foreign competition, house prices are not held in check by the importation of foreign-built houses.

The collapse of the sub-prime bubble sent the global economy into a long and lethargic recession. It focused the attention of researchers on the causes and repercussions of house price bubbles. Calza, Monacelli, and Stracca (2013) reported that house price response to changes in interest rates varied across European countries. Chen, Chou, and Wu (2013) laid out a scenario involving firms facing constrained credit from values of collateralized assets. In this scenario, economic shocks amplify fluctuations in asset prices with lasting effects on economic activity, including weak financial institutions. The future probably holds large boom-bust cycles in asset prices and prolonged intervals of slack real economic activity.

The objective of this research lies in analyzing linkages between important international variables and house prices in India. These macroeconomic variables include exchange rates trade deficits, GDP growth, interest rates and monetary growth. The literature section reviews studies relevant to linkages between housing and macroeconomic conditions. The next section describes

the dependent and independent variables and the hypotheses involving the expected relationships between these variables. This section ends with a regression equation incorporating these variables and hypotheses. Section four describes and evaluates the findings of the regression analysis. The last section summarizes and discusses implications.

2. Review of Literature

According to Obstfeld and Rogoff (2010) Asian countries saw a correlation between capital inflows and real estate prices for the years leading up to the East Asian Financial Crisis.

Adam, Kuang and Marcet (2011) started with a simple open economy pricing model of G-7 countries. For years 2001-2008, they focused on linkages between housing prices and macroeconomic conditions. The model predicted a positive relationship between current account deficits and housing prices. It also predicted a boom and bust dynamics triggered by real interest rates, but individual countries varied in the pattern. Housing booms were associated with growing consumption spending and current account deterioration. This model indicated that a smaller drop in domestic interest rates would have spared the U.S. of a housing bubble and led to smaller current account deficits.

Allen, Kenyon, and Natarajan, (2012) reported that U.S. house prices correlated positively to monetary policy but some U.S. regions experienced higher house price sensitivity to monetary policy than others.

Ferrero (2012) found that less robust borrowing constraints, low interest rates and dollar-pegged foreign exchange rates explained rising U.S. real house prices and widening current account deficits.

Kang, W. (2014) applied a Bayesian approach to quarterly data on daily dot-com stock prices and metropolitan housing prices. This approach extracted cycles and trends from non-stationary

panel data. The study found that empirically higher long-run growth positively correlated with greater cyclical volatility.

Miles (2014) discovered that long-term interest rates outweighed the federal funds rate in house price determination. A linkage existed between the federal funds rate and long-term interest rates, but the latter often displayed behavior independent of the federal funds rate. Over time the linkage between long-term interest rates and house prices remained consistent, but the linkage between long-term interest rates and the federal funds rate less certain.

Mantu Kumar Mahalik and Hrushikesh Mallick have conducted several studies on house prices in India. Mahalik and Mallick (2011) studied the dynamic causal relationships between Indian house prices and five determinants, real income, short-run real interest rates, real stock market index, real effective exchange rate, and real non-food bank credit. The study was based upon quarterly data ranging from 1996Q1 to 2007Q1. Applying a vector error-correction model to this data indicated that real income significantly and positively influenced housing prices while non-food bank credit adversely influenced it. Variability in housing prices mainly originated from shocks to the non-food bank credit.

Mallick (2011) studied for India the impact of monetary policy and other macro-economic variables on the construction sector activities growth and housing prices. For India this study found house prices positively correlated with domestic inflation but negatively correlated with the money supply.

Mallick and Mahalik (2015) conducted a study to explain regional house prices in India. Quarterly data on housing markets for 15 major cities in India entered into the study. The sample ranged from 2010Q1 to 2013Q4. The study discovered that speculative factors exerted less influence than fundamental factors such as stock market prices, non-food bank credit, foreign

direct investment, inflation, and a partial measure of wealth. The study summarized that a lack of market integration among various asset markets could explain why some variables such as the real effective exchange rate were unimportant, as well as speculation in general.

Alternatively, Mahalit and Mallick, (2016) concluded that speculative factors reflected in the historical growth of house prices overshadowed macroeconomic fundamentals in the determination of house prices. This study also used quarterly data, but in this case the sample ranged from 1995Q1 to 2013Q. For Mallick and Mahalit (2015) panel regression served as the basis of the data analysis. In Malick and Mahalit (2016), the data analysis made use of vector auto-regression.

3 The Data and Model

To examine macroeconomic factors that help explain housing prices in India the present study estimates a polynomial distributed lag regression equation. The housing price data are taken from the Bank of International Settlements database on residential property price statistics for most countries. Residential property prices indices for individual countries are available on the website of the Bank for International Settlements, (http://www.bis.org/statistics/pp.htm).The sample period for India ranges from 2009Q1 to 2017Q4. The data starts with the aftermath of the global financial crisis and continues through the mature phase of recovery. The growth rate of house prices acts as the dependent variable in the regression equation.

The independent variables are taken from the Saint Louis Federal Reserve Bank Fred and Economagic.com databases. Two monetary variables, M1 and M3 failed to produce statistically significant results. These monetary variables were dropped from the regression equation. This result is consistent with Mallick's (2011) reporting a negative correlation with the money supply. GDP growth for India was dropped from the equation after its coefficient tested statistically insignificant. An interest rate for government bonds was also dropped for statistical

insignificance.   The independent variables that added to the explanatory power of the equation were the real effective exchange rate and a ratio of exports to imports. These variables are combined to create an interaction variable. An interaction variable is the product derived from multiplying one variable by another variable. For example in the equation $Y = a + bXZ$, "a" and "b" are parameters, X and Z make up an interaction variable. The equation can be expressed equivalently as $Y = a + cZ$ where the coefficient "c" is a function of "X" as in $c = bX$. That is, we can interpret the equation $Y = a + bXZ$ as saying that the varying coefficient of Z is bX, and that it varies with X. In this analysis, one interaction variable is formed out of two independent variables. Neither of these independent variables are seasonally adjusted.

The first independent variable is the interaction variable. It centers on the growth rate of the real effective exchange rate. This variable is available from the Federal Reserve Bank of Saint Louis Fred data base. The volatility of this exchange rate variable is measured by squaring its growth rate. The volatility measure is a key variable in the interaction variable. High volatility for the real effective exchange rate reflects the inflow and outflow of hot money that is likely involved in underwriting riskier mortgages. The ratio X/M also enters into the interaction variable. The varying coefficient of the exchange rate growth is a function of the product of X/M and the volatility of growth in the exchange rate (X/M)*V. The volatility measure, as a squared number, always bears a positive sign that amplifies the value of the estimated coefficient. Again X/M always bears a positive sign that also amplifies the absolute value of the estimated coefficient. The coefficient of the real effective exchange rate growth is expected to be positive, indicating capital inflows are putting upward pressure on housing prices.

The second independent variable is the ratio of Exports to Imports (X/M). This variable is available from the Economagic.com database. If monetary tightening or rising interest rates

trigger capital inflows, the negative impact on housing prices will be moderated. Capital inflows are reflected in a trade deficit. Therefore this variable is hypothesized to bear a negative coefficient.

The X/M variable enters the picture for two reasons. Firstly, a significant excess of exports over imports is offset by an inflow of capital. Trade deficits are financed by capital inflows. Therefore the coefficient for X/M should be negative to the extent that X/M is inversely related to capital flows.   Obstfeld and Rogoff (2010), Adam, Kuang, and Marcet (2011), and Mallick and Mahalik (2015) cited capital inflows, current account deficits and direct foreign investment, as factors influencing house prices. The ratio X/M always is a positive number and inversely related to these other balance of payments measures. Secondly, and contrarily, rising interest rates may increase exchange rates, leading to an influx of inexpensive imports. These lower cost imports reduce the amount house prices must fall to hold overall inflation in line with monetary growth. The exchange rate coefficient should bear a positive sign. Multiplying the exchange rate growth variable by the ratio X/M means the exchange rate coefficient is a varying coefficient, and that it varies directly with X/M. If the exchange rate coefficient is positive, then it becomes more positive as X/M rises, indicating that rising exchange rates have a stronger positive impact on house prices. This stronger positive impact on house prices indicates higher exchange rate are reflect larger inflows of capital without an influx of inexpensive imports.

To analyze the influence the above variables exercise on house prices in India, the following regression equation, Equation 1, is estimated:

(1) $HP_t = a + c(X_t/M_t) * V_t) * EX_t + \sum_{j=0}^{j=2} bj(X_{t-j}/M_{t-j}) + U_t$

Where:
HP_t = House prices in India
a = constant

EX_t = Growth in Real Effective Exchange Rate for the Rupia
b_j = coefficient for X_{t-j}/M_{t-j}
$c*(X_t/M_t)*V_t$ = estimated varying coefficient for EX
X_{t-j}/M_{t-j} = Ratio of Exports to Imports for India
j = range of lagged values entering estimation.
t = time
U_t = Residual

The c coefficient is a function of X_t/M_t and V_t.

4 Data Analysis

Equation 1 is estimated as a least squares regression with a polynomial distributed lag for the

interest rate variable Table 1 reports the results.

Table 1—Polynomial Distributed Lag Regressions of the Dependent Variable against
X/M and Exchange Rate Variables.

Dependent Variable	Constant	Exchange Rate Rate Growth	Sum of Lagged Coefficients on X/M	R^2	Durbin-Watson
HP_t	0.1281 (2.40)**	.0000012 (1.81)*	-0.00163 (2.09)**	0.18	2.15

*All regressions were performed with Eviews 10 software.

The regression of Equation 1 produced an R-Square of 0.18. Regression equations made up

of percentage change variables often have a low R^2. The Durbin-Watson statistic of 2.15 suggest

the absence of first order serial correlation at the 5% level of significance.   A perfect number for

the Durbin-Watson is 2.00, but 2.15 is relatively close. The first row of Table 1 displays the

regression coefficients for each explanatory variable. The second row displays the t-statistic for

the estimated coefficient above it. A t-statistic almost or above 2.00 suggests a coefficient

significantly different from zero at the 5.0% level of statistical significance. A positive constant term is statistically significant at the 5.0% level.

The estimated coefficient for the percentage change in the exchange rate variable bears a positive sign, which is in accord with its hypothesized sign. The coefficient is statistically significant at the 7.9% level of significance. It is not statistically significant at the 5.0% level but is at the 10% level, which is more than strongly suggestive of a positive relationship. The estimated coefficient is a function of X/M, and V. To be exact it is a function of (X/M)*V. V stands for volatility and is the square of the percentage change in the exchange rate. Both X/M and V are always positive, and their product must be positive. A rising exchange rate, to the extent that it reflects capital inflows, acts to boost house prices. A rising exchange rate also tends to increase imports relative to exports, since it makes imports less costly at home, and exports more costly in foreign markets. Both imports and exports are tradable goods whereas houses are non-tradable goods. The role played by X/M suggest that rising exchange rates act to primarily boost housing prices when the rising exchange rates are not fueling an influx of inexpensive imports and dampening exports. Rising exchange rate volatility also amplifies the impact of rising exchange rates on house prices in India. Higher volatility suggest that the rising exchange rate is likelier the result of hot money flowing in and out of domestic financial markets rather than longer-term trends in imports and exports. Therefore, house prices receive the strongest impetus when both X/M and V are high, and the least impetus when both are low. It takes both moving in a strong direction to see the strongest impact on house prices.

The sum of the distributed lag coefficients for the X/M variable bears a negative sign, indicating that Indian house prices are inversely correlated with the trade balance. This finding is in accord with the hypothesis and exactly what is expected. When exports are rising faster than

imports, reflected in shrinking capital inflows, less funds are available to finance mortgages. A falling value of X/M indicates capital inflows are offsetting the effects of tighter credit conditions domestically. The t-statistic sum of the distributed lag coefficient for the interest rate variable stands at 2.09. This summed coefficient is statistically significant at the 4.4% level of statistical significance.

5 Concluding Thoughts

This research argues houses price in India are mainly driven by the exchange rates and trade balance when these variables are changing under the right conditions. The right conditions are reflected in the relationship between exports and imports. Monetary tightening tends to reduce prices, but the more prices fall in one area the less they must fall in other areas to keep overall inflation in line with monetary growth. A tighter monetary policy puts downward pressure on prices for two reasons. Firstly, rising interest rates tend to raise the exchange rate of domestic currency, reducing the costs of imports. Secondly, rising interest rates reduce the demand for durable goods like houses whose purchase requires significant financing. Thus, overall prices fall including house prices.

Exchange rates enter the picture through the relationship between exchange rates and capital flows. Capital inflows can soften the impact of monetary tightening and higher interest rates on house prices. Again, if the rising exchange rates mainly have the effect of increasing imports relative to exports, domestic economic conditions suffer, and housing markets receives little stimulus from added capital inflows to finance a trade deficit. If however, exchange rates rise in the face of rising exports relative to imports, the domestic economy prospers and housing receives the maximum stimulus from capital inflows. Therefore, the impact of capital flows on house prices is rising when the ratio of exports to imports is rising.

The impact of exchange rates on house prices increases as exchange rates experience higher volatility. Volatile exchange rates indicate the inflow and outflow of hot money, the type of inflowing capital that is less discriminating about the types of mortgages it underwrites. House prices receive a boosts because riskier borrowers qualify for mortgages.

A housing bubble is likelier to occur when these conditions are met: (1) Low interest rates, (2) Rising exports relative to imports, (3) Rising exchange rates amid low domestic interest rates. The latter results from growing inflows of capital looking for higher returns within an environment of low interest rates.

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