WORKING PAPER NO: 477

HOUSING PRICE INDICES IN INDIA

Charan Singh
RBI Chair Professor
Economics & Social Science
Indian Institute of Management Bangalore
Bannerghatta Road, Bangalore – 5600 76
Ph: 080-26993818
charansingh@iimb.ernet.in

Housing Price Indices in India[1]

Abstract

The housing activity in the country, high already, is expected to further accelerate in the next few years, mainly because the government has already announced that it is committed to provide a house for all by 2022. The increased activity will impact the housing markets as a change in the house price affects the households' perceived lifetime wealth and hence influences the spending and borrowing decisions of households. Further, house price gains increase housing collateral and hence housing credits. The potential two-way link between bank lending and house prices give rise to mutually reinforcing cycles in credit and real estate markets. The increasing dominance of the sector necessitated setting up of a mechanism which could track the movement of prices in the residential housing segment. Therefore, it becomes necessary to prepare an accurate measure of aggregate house price, despite limited availability of data, in order to understand the behavior of housing markets and their influence on the economy. To understand about house prices, it is important to understand about housing indices. In India, NHB and RBI construct and release an index each, RESIDEX and HPI, respectively. In case of both the indices there are a number of problems.

Key words: Housing Indices, housing prices, RESIDEX. HPI, Housing, Real Estate, monetary policy.

2

In India there is a lack of scholarly work on real estate markets. However, the housing activity in the country, high already, is expected to further accelerate in the next few years, mainly because the government has already announced that it is committed to provide a house for all by 2022. To encourage housing activities, the government is extending incentives such as easier flow of FDI, inclusion of slum development in the list of Corporate Social Responsibility (CSR) activities and additional tax incentive on home loans to encourage people, especially the young, to own houses. The government has also proposed to set up a Mission on Low Cost Affordable Housing to be anchored in the National Housing Bank (NHB) with an allocation of Rs. 4,000 crore for NHB with a view to increase the flow of cheaper credit for affordable housing to the weaker segment. To further encourage this, projects which commit at least 30 per cent of the total project cost for low cost affordable housing will be exempted from minimum built up area and capitalisation requirements, with the condition of three year lock-in. The government has also proposed to increase the allocations for the year 2014-15 to Rs. 8,000 crore for NHB with a view to expand and continue to support rural housing in the country.

A change in the house price affects the households' perceived lifetime wealth and hence influences the spending and borrowing decisions of households. An increase in the house price raises the value of the housing variable relative to construction costs; hence a new construction is profitable when house price rise above the construction costs. Residential investment is, therefore, positively related with house price increase. House prices may also affect bank lending and vice versa. Further, house price gains increase housing collateral and hence housing credits. The potential two-way link between bank lending and house prices give rise to mutually reinforcing cycles in credit and real estate markets. These indicate that house prices may affect economic activity through private consumption of households, residential investment and credit allocation of the financial systems.

Over the last few years, housing and real estate has emerged as a major area for creation of both physical and financial assets and it is a fast expanding component of the service sector and constitutes an increasing proportion of national wealth. The increasing dominance of the sector necessitated setting up of a mechanism which could track the movement of prices in the residential housing segment. However, information on house prices is not easily accessible; lack of transparency in the residential property market and limited availability of price information pose significant challenges for identifying the nature of real estate price dynamics and their relationship with financial stability and monetary policy. Therefore, it becomes necessary to prepare an accurate measure of aggregate house price, despite limited availability of data, in order to understand the behavior of housing markets and their influence on the economy.

Housing indices help to gauge the housing prices reflecting a balance between demand and supply of houses in any country. This paper intends to conduct a detailed examination about different housing price indices in India. The paper is organised in six sections. In Section II, a brief review of literature on general housing issues as well as those related to housing index are discussed. The details of the housing index in India and their computation is explained in section III. A cross-country experience, spanning advanced and emerging countries, separately, is presented in Section IV. A comparison of the select city indices in India is made in Section V. Finally, conclusions and recommendations are offered in Section VI.

Section II: Brief Review of literature

House prices are an important determinant of household sector's gross and net wealth and thereby of consumption and savings. In many countries, including India, house property is the household's largest asset, and price developments in housing markets can impact growth directly but mainly through credit channel since real estate can serve as collateral for consumer borrowing (Kiyotaki and Moore, 1997; and Bernanke and Gilchrist, 1999). Furthermore, housing cycles can influence the economic activity through wealth effects on consumption and private residential investments mainly due to changes in profitability and the impact on employment and demand in property related sectors.

The decision to purchase a house is a policy decision of the households to demonstrate a different kind of life (Shiller, 2007). The increase in home ownership has its origin in housing boom which has been evident in Australia, Canada, China, France, India, Italy, Korea, Russia, Spain, UK and the USA (Shiller, 2007).

If house prices are not aligned with the fundamentals they can threaten the economic and financial stability of the country mainly because of the macro-financial linkages, as recent empirical evidence from the US and some countries in Europe demonstrates. One of the most important causes of financial crises was collapses in real estate prices, either residential or commercial or both (Reinhart and Rogoff, 2009). There have been cases where such collapses have taken place after bubbles in the real estate prices and both, the financial sector and the real economy are adversely affected after the bubble bursts. The current crisis can be taken as another example, wherein decline in the real estate prices led to a drastic drop in the securitized asset prices in 2007. Further, the instability which followed impacted the balance sheets of many financial institutions as was predicted by Feldstein (2007). The financial crisis then got carried forward to the real sector.

Housing sector is impacted by both, monetary and fiscal policy, macro prudential norms and labour policy prevalent in the economy (Hilbers et.al. 2008). To explain the global financial crisis, a generally

accepted argument was that the loose monetary policy and excessive availability of credit were the causes for the real estate bubble in these countries. As argued by Taylor (2008), levels of interest rates were lower than in previous U.S recession relative to the economic indicators captured by the 'Taylor rule'. The low interest rates encouraged borrowing and buying of houses. While Spain had one of the largest deviations from the Taylor rule, this country also had the largest housing boom.

Sweden's Central bank, the Riksbank is one of the rare central banks that have taken the approach of targeting the real estate prices. Policy of the Riksbank is to look at property prices while taking decisions about interest rates (Ingves, 2007). In comparison with larger countries, the smaller ones have a stronger monetary transmission through the housing channel but a robust financial system is an imperative requirement for such transmission to be successful (Singh, 2013).

Cross country studies indicate that the growth in housing finance depends upon a number of factors such as credit history of the borrower, ability of the financing institution to secure collateral, macroeconomic stability prevailing in the economy and trends in household income (Warnock and Warnock, 2007). According to Case and Shiller (2004), locational factors such as accessibility, schools, crime, construction costs, and age of housing stock and industrial organization of the housing market also influence movements in housing prices.

According to Shiller (2014) "Sophisticated innovations that rely on data sources, such as home price indices, cannot be implemented until the accurate indices are publicly provided, and with enough history to permit understanding the properties of the data". Moreover, the price index used can have dramatic ramifications on the assessment of whether a home price bubble exists (McCarthy and Peach; 2004).

On indices, constructing an index of home prices, a number of empirical studies establish that key determinants of housing prices are income levels, interest rates, supply conditions, demographic changes, number and size of households, maintenance costs, property taxes and speculative pressures (Case and Shiller, 2004; Poterba, 1984; Allen et.al. 2002 and OECD, 2005). To construct an index across the nation or a region is a complex exercise because home sales do not occur in centralized markets, as do, for example, corporate equity transactions. House price transactions are infrequent and apply to a highly heterogeneous item. Comparing the prices of different things because each house is different, on a regular basis is highly problematic. Moreover, secondary source data are generally used for Housing Price Index (HPI), and their nature depends on the institutional arrangements in a country for selling, financing, taxing, and registering the sale of a residential property. This gives rise to the potential for quite significant methodological and coverage differences in HPI measurement (Silver; 2012).

Internationally, the house price index is compiled using three methodologies. The first methodology is based on simple average of observed prices. The second looks at repeat sales of the same property. The third treats a house as a bundle of attributes, each with its own price that changes over time and makes use of the hedonic methodology**.** In practice, development of an aggregate HPI is difficult because of its inherent heterogeneity and infrequent nature of sales. This means houses vary in quality across sectors and over time. As no two houses are the same, the observed difference in characteristic (quality) between two houses will be reflected in difference in price. Also, since a transaction on any specific house occurs relatively infrequently, it is hard to know the amount at which a specific house will transact on a particular day. Thus, the characteristics of heterogeneity and infrequency of sales together make it all the more difficult to find a representative sample of house prices on which an aggregate price index can be estimated. Accurate estimation of house prices is important for a variety of reasons. Housing consumers, urban economists, and housing policy analysts require information on house prices when making housing consumption decisions, while modeling housing market behaviour and when evaluating the equity and efficiency implications of alternative government housing assistance programs. This is typically done by constructing quality-adjusted house price indices from hedonic price regressions for given metropolitan areas (Thibodeau; 1995, Can and Megbolugbe; 1997). Two basic techniques for measuring and analyzing the structure of housing price are hedonic models (Kain and Quigley, 1970) and repeat sales model (Bailey et.al., 1963).

At its simplest, a hedonic equation capturing the quality variables is a regression of expenditures (rents or values) on housing characteristics (Shiller, 1996). Hedonic models relate the selling prices of dwellings to measure their physical and locational characteristics and to some representation of time. Hedonic pricing models based on multiple regression techniques have the advantage of being able to use several times as much data since all sales may be included, repeat or otherwise. Attempts to adjust for quality and quantity changes are based upon regression models that inherently control for these influences. Hedonic models can be run on whatever sales data are available to date and do not require the recent sales to have prior sales (Miller and Skalarz; 2008). However, the major disadvantage associated with the hedonic-price method is the cost of data collection. Constant-quality methodologies are ideal for many uses and applications such as attempting to identify a "bubble" in housing markets. In this type of analysis, the pure price signal is what should be identified and analysed in an attempt to see if pricing has become irrationally high (Case and Hachter; 2005).

Case and Shiller (1987, 1989, 1990) were the first to produce repeat sales indices in real time and these are now produced by Corelogic, Inc., and the major indices are managed by Standard and Poor's Corporation (Shiller,2014). Repeat Sales indices are estimated by analyzing data where all units have

sold at least twice. Such data allow us to annualize the percentage growth in sales prices over time. These are time series indices in their pure form. They do not provide information on the value of individual house characteristics or on price levels but they have the advantage of being based on actual transactions prices, and in principle allow us to sidestep the problem of omitted variable bias. The advantage of the repeat sales index approach is that there is an attempt to control for changes in the quality or quantity of the homes represented. Homes may age and wear out over time, so such an index is appropriate for those with a typical home who wish to gauge changes in price. Over the years, repeat sales models have come to wide and even commercial use. However, considering the subset of dwellings sold twice entail several challenges. Small sample problems constitute a special concern in repeat sales models, since sample sizes tend to be smaller than hedonic methods based on all transactions in a given period of time. Moreover, a cluster of observations in one time period does not only influence the index corresponding to that particular time period, but all other estimated indices (Miller and Skalarz; 2008., Sommervoll; 2006).

Hybrid indices combine elements of two or more methods into one index. Such methods seek to take advantage of the strengths while minimizing the weakness of the constituent indexes. These could be time series, cross section, or both (Quigley; 1995. Malpezzi; 2002).

Section III: The Indian scenario

Housing is an important subject for any economy. Its volatility concern banks as well as corporates having large exposure to real estate. Further house prices are an important consideration for policy makers in framing monetary and fiscal policies. Granular information on movement of these prices (location, zone and city) are an important relevant indicator for the local authorities in formulating their property tax policies.

Closely following the supply side is the housing finance industry which has been a complementary focus of shelter programs of the government. One of the major considerations in housing finance is the proper valuation of the properties which has critical bearing on the assessment of collateral security. The house prices in India have generally been following a rising trend when measured in nominal terms, but in real terms, on 2008 prices, house prices have declined in some cities (Table 1).

Table 1: Lowest and Highest House Prices in Rupees per sqft in June 2008 prices

Cities		Jun-08	Jun-09	Jun-10	Jun-11	Jun-12	Jun-13	Jun-14
Bangalore	**Lowest**	1843	1707	1490	1746	1854	2205	2303
	Highest	7052	8534	7973	12472	9662	9439	9309
Kolkata	**Lowest**				1252	1339	1525	1405
	Highest				13953	13241	10521	9024
Mumbai	**Lowest**	4096	3467	3671	4456	4680	5360	5579
	Highest	82898	59236	75037	73114	63430	60567	58683
Delhi	**Lowest**		1607	1490	1398	1632	2017	1818
	Highest		9830	10465	10065	10866	9287	9365
Pune	**Lowest**	2158	1885	1714	1873	1840	1991	2058
	Highest	4882	4444	4303	5027	9389	6644	7135

Note: House Prices are deflated using WPI monthly from RBI and making June 2008 price as base.
Source: Liases Foras Real Estate Rating & Research Pvt. Ltd.

In India, two major indices are released by the NHB and the RBI, respectively (Table 2).

Table 2: HPI and Residex for selected cities

Cities	RBI					NHB		
	Base Q4:2008 - 2009	Q4:2009 - 2010	Base 2010-11	Annual Avg (A-M) 2012-13	Annual Avg (A-M) 2013-14	Base 2007	Annual Avg (A-M) 2013	Average Jan-Jun 2014
Ahmedabad	100	124	100	148	169	100	192	211
Bengaluru	100	99	100	138	162	100	109	108
Chennai	100	118	100	128	160	100	315	352
Delhi	100	110	100	194	218	100	197	196
Jaipur	100	143	100	120	126	100	109	102
Kolkata	100	108	100	154	171	100	195	209
Lucknow	100	113	100	157	194	100	187	194
Mumbai	100	136	100	154	167	100	222	231
All India	100	119	100	152				

A-M – April to March
Note: RBI's HPI base year were Q4: 2008-09 and 2010-11
Source: RBI and National Housing Bank

NHB's RESIDEX

RESIDEX is calculated and released by the NHB to measure residential price changes in India. Historically, NHB at the behest of the Ministry of Finance undertook a study to examine the feasibility of preparing an index at a national level which could track the movement of prices in the residential housing segment. Despite the existing gaps in tracking the true prices, NHB believed that an organized mechanism to track prices can be put in place through a suitable index.

NHB recognized that development of a credible database on actual price trends has emerged as a crucial element of market development and for enhancing the efficiency of market process. However, being a heterogeneous good in terms of qualitative and quantitative aspects like locality, covered area, community facilities, individual layouts etc., determination of prices are an outcome of complex interaction of various factors. Such factors posed challenges for NHB in choice of appropriate methodology, selection of sampling techniques, collection of data and finally development of a representative price index. To analyse the data and chart the course of action for computing indices a Technical Advisory Group (TAG) with representations from Government, RBI and market players, was constituted.[2]

NHB RESIDEX – an early Timeline

- The TAG after reviewing international best practices decided to use both the hedonic regression model and the basic Laspeyres weighted index for constructing a housing index for Delhi for their pilot study.

- 2001 was taken as the base year for the study to be comparable with the WPI and CPI. Since registered prices are grossly under estimated due to high registration fee and stamp duty, information was also collected from property dealers, Residents Welfare Associations, Municipal Corporations and private builders.

- For the housing index, basic data was collected for each year since 2001 for select 5 cities. For each selected colony of the 5 cities and for each year, information was collected for 20 transactions which took place during that year.

Period wise change in RESIDEX calculation followed the following timeline -

1. *2001-2007* – Calculated yearly, only 5 cities which are Delhi, Mumbai, Kolkata, Bengaluru and Bhopal were included and 2001 was the base year.

2. *2008- 2009* – Calculated half yearly, 10 more cities namely Ahmedabad, Faridabad, Chennai, Kochi, Hyderabad, Jaipur, Patna, Lucknow, Pune and Surat were added and base year was shifted to 2007.

3. *2010 - 2011* - Calculated quarterly, total 15 cities, 2007 as base year.

4. *January 2012 - December 2012* - Calculated quarterly, expanded to cover five more cities - Bhubaneswar, Guwahati, Ludhiana, Vijayawada and Indore.

---

[2] National Housing Bank, 2007

5. *January 2013 - September 2013* - Calculated quarterly, following 6 more cities added - Chandigarh, Coimbatore, Dehradun, Meerut, Nagpur and Raipur.

Whenever the new cities were included in the RESIDEX calculation, the zones and locations once defined for those cities were not changed in the future updating of RESIDEX.

Data for computing the Index

Primary data on housing prices was being collected from the real estate agents/property dealers, private builders, Development Agencies, municipal corporations and resident welfare associations. The data is also collected from the housing finance companies and bank, which is based on housing loans contracted by these institutions.

The data is collected from a very heterogeneous group of institutions. Illustratively, the Index for the quarter July-Sept, 2013 was constructed with approximately 60,000 transactions provided by 11 HFCs and 11 Banks namely State Bank of India, Bank of India, United Bank of India, IDBI Bank, Indian Bank, Punjab National Bank, State Bank of Patiala, Allahabad Bank, UCO Bank, Punjab & Sind Bank and Oriental Bank of Commerce. [3]

The data coverage was further expanded in order to increase and expand the coverage of Residex and also the frequency of updating, a single point source was adopted from October-December, 2013. CERSAI collects data related to mortgages from all Banks, HFCs and other lending institutions. It provides housing transaction data every quarter for all the Residex cities in a prescribed format. The data captures major fields like institution name, town, locality, property address, pin code, property type, carpet built-up area, evaluated price of asset etc.

Methodology

Modified Laspeyer's approach is used in the calculation of the RESIDEX:[4]

PI (Modified Laspeyer's) =

Weights – Weights are at the zone level transaction - volume based and stock based weightages have been used.

The methodology involves 3 steps –

1. In each zone for every category, the average price was obtained by taking average of all the prices pertaining to that category in the zone. After this the ratio of the current quarter average price to the base year is taken and multiplied by hundred and hence the price relative for that category for the year was worked out.

2. The category wise price relatives were combined using the number of the transactions reported under different categories during 2007 (the base year) in a zone as weights, to get an index for the zone.[5]

3. The city index was calculated by aggregating the zone level indices using the area covered in the different zones/housing stock during 2007 as the weights.

Merits

The key merits of RESIDEX are- a) RESIDEX covers both, the transactions and the home loan disbursals while compiling data; and b) Since the information is collected from various sources such as real estate agents, housing finance companies and banks, it can be considered as a representative value of the property. RESIDEX suffers from the following limitations – a) Since a large part of the data collected to compile the index comes from real estate agents via different private consultancy/research organizations and as there are no set standards and valuations, the property valuations done by people with varying skills may differ; and b) It does not segregate the residential properties as apartments or houses or villas or other types of properties. It does consider the size and zones/localities but prices within every locality may vary based on the type of property or the kind of segment it is catering to. Therefore, RESIDEX may not be the correct representative index of the housing markets in India.

RBI's House Price Index (HPI)

Beginning with Mumbai city, the Reserve Bank initiated the work of compiling HPI in 2007 and brought out a quarterly HPI for Mumbai city (base 2002-03=100) in the fourth quarter review of Macroeconomic and Monetary Developments 2008-09. Over the years/quarters, the coverage was extended by incorporating eight more cities, viz., Delhi, Chennai, Kolkata, Bengaluru, Lucknow, Ahmedabad, Jaipur and Kanpur, and the base was shifted to Q4:2008-09=100. Trends in all-India HPI and its constituent cities were also disseminated regularly by the RBI.

---

[5] Stratification of the colonies was based on the house stock distribution as available in census 2001.

The price data on transacted houses while registering of a house are collected from the Registration Departments of respective state governments. This approach attempts to develop a house price index on the basis of registration price data and stratified weighted average measures, where transactions are stratified in three categories, viz., small, medium and large houses and different geographical wards/zones. However, this measure captures prices relating only to those houses that are sold during a period and not relevant to all houses in the economy. In addition stamp duty is known to lower prices and number of transactions (Dachis, et al., 2012). And, stamp duty is varies across states and time (Duranton, et al., 2014).

Methodology for the Compilation of HPI

Registration of property is a legal and official necessity for any property transaction in India. Therefore, in principle, the official authority of property registration has the details of all transactions during a reference period. Registration authorities of respective state governments possess the data on the registration of transactions of properties including shops, land and residential houses located in their jurisdiction. The data are reported on transaction basis. For most centers, basic information is available in local language. Even though the data structure is not strictly common across states, it contains the following fields: date of registration, registration number, address, survey number, area, seller's name, buyer's name, consideration amount (transacted price) and market value. From this, data related to residential occupancies is suitably extracted and analyzed for the compilation of house price index. The house price index is compiled on a quarterly basis with Q4:2008-09=100 as the base. The data on prices of residential properties are scrutinized and unacceptable data points are removed using z-scores[6] calculated separately for each stratum in each quarter. All the observations above/below plus/minus 3 z-scores are removed. Since the data do not include the information on type of house, i.e., under-construction or new or resale house, the date of registration is considered as date of sale of the house. The analysis of data as well as compilation of the index is done on the transacted price. While interpreting the results, the fact may be taken into account that the index is based on the price which is officially declared by the buyer for the purpose of registration.

The house price indices are calculated using weighted average method. The sample data are stratified/segregated in different dimensions reflecting size, wards/zones for each city. First, the indices are estimated at ward/zone level, which is averaged (weighted) to obtain the city indices. An all-India level weighted average house price index is also compiled based on the nine city indices. Weighted

---

[6] The z- score is $z = \dfrac{X - \mu}{\sigma}$ where: x is the variable to be standardized, μ is the mean and σ is the standard deviation. The quantity z represents the distance between the individual observations and the population mean in units of the standard deviation

Average Method Compilation of weighted average price index is done using Laspeyres weighted average methodology. The methodology for computing the respective indices is as follows-

1. The simple average of price (per square meter) of houses (P_{ij}) in each category, classified by Floor Space Area (FSA) into small, medium and large for each ward/zone in each quarter is calculated. As a method of averaging, median is used.

2. The proportion of number of houses transacted in the three categories of FSA within a ward/zone during the period January 2009 – March 2009 is taken as the weight ($w_{i,j}$).

3. Based on an average per square meter price for three FSA category houses in each ward/zone, price-relatives are calculated for each quarter. The price relative is nothing but a ratio of current period price to the base period price. Price relative per square meter for the ith FSA, j^{th} ward/zone, t^{th} quarter is given by: $RP_{i,j,t} = P_{i,j,t}/P_{i,j,0}$

   Where $p_{i,j,0}$ is the price in the base period

4. The quarterly ward/zone weighted average price relatives are calculated.

5. These weighted relative prices are again averaged using proportion of number of houses in each ward to the total number of houses transacted in the city during the period January 2009 – March 2009 as the weight W_t. The following formula is used for compiling the city-wise HPI for the tth quarter.

   City $HPI_t = (\sum_j (\sum_i RP_{i,j,t} \times W_{i,j})W_j) \times 100$ for all t.

6. The city-wise price indices are averaged using the population proportion (based on 2011 census) of the nine cities to its total to obtain the all-India index.

The HPI has some limitations- a) There is a perception that registration price is not the actual price paid by a buyer. To avoid high registration fees and stamp duty as well as obligations for the payment of property tax; b) The differences in the time gaps between the actual transactions and registrations also do not always follow the similar pattern across different states; c) Registrations of the properties are done taking into account different criteria in different states, some of which are - (i) partial consideration of un-divided share of land, (ii) partial consideration of sale of terrace rights, and (iii) consideration of agreement to sale at the time of booking for total price; d) HPI does not have separate information on the type of property (residential/commercial) for Chennai. Thus, for trends both are considered and both get reflected for the city; e) As no two houses are the same, observed difference in characteristics (quality) between two houses will be reflected as difference in price.

Section IV: House price indices of Select Countries
This section, undertakes a brief study and indices prepared by other countries. A number of countries compute housing indices with different frequency and methodologies. In a number of advanced and emerging countries, monthly indices are released (Table 3). The methodology used in a number of countries is mixed and not only repeat sales or hedonic (Table 4).

Table 3: Frequency of publication of house price indices in various countries[7]

Frequency	Advanced Economies	Emerging Economies
Monthly	UK, Canada, Australia, USA, Germany	China, Brazil, Israel, Korea, Thailand, Russia
Quarterly	Australia, USA	India, Indonesia, Mexico, Philippines
Annually	Germany	

Source: Annex I and II.

Table 4: Methodology adopted by advanced countries[8]

Methodology	Advanced Economies
Hedonic	UK, Australia, Germany, France
Repeat Sales	UK, Canada, Australia, USA
Mix-Adjusted	UK, Australia, Spain, Italy, Japan, Switzerland, Belgium, Sweden
Median Estimate	Australia, USA, New Zealand

Source: Annex III.

IV a. Advanced Countries

1. USA

(a) House Price Index

The US Federal Housing Finance Agency (FHFA) (formerly the Office of Federal Housing Enterprise Oversight, OFHEO) publishes the HPI index, measuring movement in single-family detached house prices. Mortgage transactions of apartments, cooperatives, multi-unit properties, and planned unit developments are excluded. It serves as a timely, accurate indicator of house price trends at various geographic levels and provides an analytical tool useful for estimating changes in the rates of mortgage defaults, prepayments and housing affordability in specific geographic areas. FHFA uses data supplied by Federal Home Loan Mortgage Corporation (Freddie Mac) and the Federal National Mortgage Association (Fannie Mae), as it has access to this information by virtue of its role as the federal regulator responsible for these government-sponsored enterprises. Moreover, Fannie Mae and Freddie Mac are the largest mortgage finance institutions in the United States representing a significant share of total outstanding mortgages.[9]

The FHFA began publishing the HPI in the fourth quarter of 1995 (March 1996). A comprehensive report is published every three months. Beginning in March 2008, OFHEO began publishing monthly indexes

---

[7]Details in Annex I and II
[8]Details in Annex III
[9] http://www.fhfa.gov/KeyTopics/Pages/House-Price-Index.aspx

for census divisions and the United States. FHFA continues publishing and updating these indexes each month.

The methodology is a modified version of the Case-Shiller geometric weighted repeat-sales procedure. The HPI is a weighted, repeat-sales index, meaning that it measures average price changes in repeat sales or refinancing on the same properties. For model estimation, the loan origination date is used as the relevant transaction date. This information is obtained by reviewing repeat mortgage transactions on single-family properties whose mortgages have been purchased or securitized by Fannie Mae or Freddie Mac since January 1975. The HPI is updated each quarter as additional mortgages are purchased or securitized by Fannie Mae and Freddie Mac. The new mortgage acquisitions are used to identify repeat transactions for the most recent quarter and for each quarter since the first quarter of 1975.

Office of Management and Budget (OMB) recognizes 381 Metropolitan Statistical Areas (MSA), 11 of which are subdivided into a total of 31 Metropolitan Divisions. As noted earlier, FHFA produces indexes for the divisions where they are available, in lieu of producing a single index for the MSA. In total, 401 indexes are released: 370 for the MSAs that do not have Metropolitan Divisions and 31 Division indexes. The starting dates of indices differ and are determined by a minimum transaction threshold; index values are not provided for periods before at least 1,000 transactions have been accumulated.

To construct the quarterly index, all transactions from the same quarter are aggregated and index values are estimated using the assigned quarters. In the monthly indexing model, all transactions for the same month are aggregated and separate index values are estimated for each month. The Census Division indexes are constructed from statistics for the component states.

The *weights* used in constructing the indexes are estimates for the shares of one-unit detached properties in each state. For years in which decennial census data are available, the share from the relevant census is used. For intervening years, a state's share is the weighted average of the relevant shares in the prior and subsequent censuses, where the weights are changed by ten percentage points each year.

(b) S&P/Case-Shiller Home Price Index

The Case-Shiller Home Price Index originated in the 1980s and was formulated by Karl E. Case and Robert J. Shiller. Case and Shiller developed the widely used repeat sales pricing technique to track changes in the housing price levels and the index is published by Standard and Poor (S&P) (Annex – IV). To the accumulated sales pairs the repeat sales methodology is applied. Different weights are assigned to different changes in home prices to measure changes in the value of the residential real estate rather than

the atypical changes in the value of individual homes. Each sales pair is assigned a weight equal to the first sale price and also sales pairs with longer intervals are given less weight than sales pairs with shorter intervals to exclude physical changes factor.[10]

HPI versus S&P/Case-Shiller Home Price indexes

Although both indexes employ the same fundamental repeat-valuations approach, there are a number of data and methodology differences. Among the dissimilarities:

a. The S&P/Case-Shiller indexes only use purchase prices in index calibration, while the all-transactions HPI also includes refinance appraisals. FHFA's purchase-only series is restricted to purchase prices, as are the S&P/Case-Shiller indexes.

b. FHFA's valuation data are derived from conforming, conventional mortgages provided by Fannie Mae and Freddie Mac. The S&P/Case-Shiller indexes use information obtained from county assessor and recorder offices.

c. The S&P/Case-Shiller indexes are value-weighted, meaning that price trends for more expensive homes have greater influence on estimated price changes than other homes. FHFA's index weights price trends equally for all properties.

d. The geographic coverage of the indexes differs. The S&P/Case-Shiller National Home Price Index, for example, excludes valuation data from 13 states. FHFA's U.S. index is calculated using data from all states.

(c) Zillow Home Value Index (ZHVI)

Zillow approximates the home price index using the Zestimates. A Zillow Home Value Index (ZHVI) is a time series tracking the monthly median Zestimate home value. A Zestimate home value is Zillow's estimated market value for an individual home and is calculated for about 100 million homes across US. The Zestimate is automatically computed using a proprietary formula three times per week based on millions of public and user-submitted data points on every home. Though they are not an official appraisal, the index is created from estimated sale prices on every home instead of using actual sale prices. Zillow has estimated sale prices not just for the homes that get sold, but for all homes even if they didn't sell in that time period (Annex V).

Zillow receives the data from counties and other municipalities, though not all jurisdictions make it available. Only residential properties are considered and other properties such as office buildings, shopping centers, and farms are excluded. Zestimates in turn are computed based on proprietary statistical and machine learning models which observe recent sale transactions and learn the relative contribution of

---

[10] http://us.spindices.com/index-family/real-estate/sp-case-shiller

various home attributes in predicting the sale price. These home attributes include physical facts about the home and land, prior sale transactions, tax assessment information and geographic location. Based on this information the models then estimate sale prices of homes that have not been sold yet.[11]

To see the price variations in different US indices see Annexure VI

2. U.K

In the UK, a number of housing price indices are computed. The important ones can be briefly summarised as follows:

(a) Halifax House Price Index

The Halifax House Price Index measures the monthly house price changes covering the whole country from January 1983. For Halifax HPI calculation, the mortgage data of the country's largest mortgage lender, Bank of Scotland, is used.[12]

As the houses differ according to their characteristics, Halifax uses standardized rather than simple price averages. Also, as the house price changes occur during the course of the year irrespective of the underlying trend in price movements, so the results are seasonally adjusted and the seasonal factors are updated monthly.

While calculating, hedonic method is used that is prices are disaggregated into their constituent parts[13] and the coefficients are then estimated and 1983 is taken as the base year. The index numbers themselves are computed by comparing the weighted (i.e. mix-adjusted) prices in each current period with the weighted average price in the base period.

(b) Land Registry House Price Index

The Land Registry House Price Index (HPI) calculates the change in prices of the residential properties using the sales data collected by the Land Registry on all residential housing transactions, whether for cash or with a mortgage, in England and Wales since January 1995. The HPI is calculated monthly using repeat sales regression method. At present it contains details on over 19 million sales, of which over seven million are identifiable matched pairs, providing the basis for the repeat-sales regression analysis

---

[11] http://www.zillow.com/research/data/

[12] http://www.lloydsbankinggroup.com/media/economic-insight/halifax-house-price-index/

[13] The constituent parts are qualitative characteristics (type of property, region, etc.) and quantitative characteristics (age of property, number of habitable rooms, garages, bathrooms, etc.) of a property.

used to compile the index.[14] The Land Registry HPI is designed to remove the influence of seasonal variations on house price changes. It measures the average price change for the same property that is price changes of one property is not compared with the other properties.

(c) Asking Price Index

The Asking Price Index (API) measures changes in the prices asked by house sellers across the nation. The measure is an indicator of what might happen to actual selling prices in five months' time. The API is calculated monthly using a dataset of more than 500,000 UK properties for sale found through the Home.co.uk Property Search Engine.[15] Depending on property characteristics such as Property Type (detached, semi-detached, terrace or flat) or Region (governmental office regions), asking price observations are divided into groups of price observations. Mix-Adjustment method is used in the calculation. Mix adjustment improves upon the reliability of an index calculated using simple averages by applying weightings to the constituents of the averages. The data used in API calculation is based on asking prices rather than actual completed sales and the results are not seasonally adjusted.

(d) Nationwide House Price Index

Nationwide measures the mix adjusted house price for houses across the UK. The publication of the house price data started in 1952 but it was yearly, then from 1993 the frequency was increased to monthly. All house price information is derived using nationwide mortgage data and hedonic regression method is used. While calculating, a set of characteristics that describes the 'typical' UK house in order to track the value of a typical UK property over time is used. Nationwide house prices are mix-adjusted. And, also it produces a seasonally adjusted series for UK house prices which seeks to remove seasonal effect.[16]

(e) Rightmove House Price Index

The Rightmove House Price Index (RHPI) is produced entirely from asking prices of residential properties that are currently in the market. It was initiated in 2002 and a survey of 200,000 houses asking price each month is used in the calculation which is obtained from the 10,000 estate agency branches who list their properties on the Rightmove website.[17] In the index calculation, averaging of prices that is the mix-adjustment standardization method is used. The properties which are already on the market are

---

[14] http://www.landregistry.gov.uk/public/house-prices-and-sales/about-hpi

[15] API Technical calculation document http://www.home.co.uk/asking_price_index/Mix-Adj_Methodology.pdf

[16] http://www.nationwide.co.uk/about/house-price-index

[17] http://www.rightmove.co.uk/house-prices.html

not taken in calculation, but only those properties which are new on the market in any given month are considered. The RHPI does not adjust the data to seasonal changes. If the initial asking prices are high compared to actual transaction prices then the RHPI house price figures can be very misleading.

(f) Office for National Statistics House Price Index

From 1986 to 2012, the Department for Communities and Local Government (DCLG) calculated a quarterly house price index but from April 2012, Office for National Statistics (ONS) is publishing the HPI on a monthly basis. The HPI is based on completed mortgage transactions and data is taken from the Regulated Mortgage Survey as collected by the Council of Mortgage Lenders (CML).[18] The ONS HPI is a mix-adjusted chained Laspeyers-type price index. The chain linking of the index is carried out annually, with each year's index being based on January of the current year. Prices are estimated using hedonic regression based on the data provided each month by CML.[19] The transaction weights are based on the preceding three years' transactions data (for instance, the 2012 weights are based on transactions completed between October 1, 2009 and 30 September, 2011). The HPI is adjusted seasonally but the ONS also publishes the non-seasonally adjusted estimates each month. The dataset used in HPI calculation is limited to mortgage purchases i.e. it does not include the cash sale transactions.

3. Canada

(a) Teranet – National Bank House Index (NBHI)

There are two forms of NBHI, both calculated monthly but have a two month lag release –

1. *Composite 11* **-** It gives the rate of change of home prices in eleven metropolitan areas.[20] A national composite index is then obtained by the combination of these sub-indices. It was initiated in March 1999 but first published in May 1999.
2. *Composite 6* **–** It is calculated in the same way as Composite 11 but uses only six metropolitan cities. Calculation started in February 1999 but the index was first published in April 1999.

The index is calculated using the "repeat sales methodology". Using simple linear regression the model is estimated and regression coefficient is the reciprocal of the desired index. In estimation, those properties whose price may be impacted due to the endogenous (e.g., renovations) factors are excluded and only those which were sold at least twice in a particular time frame are considered.

(b) New Housing Price Index (NHPI)

---

[18] http://www.ons.gov.uk/
[19] Developments in the United Kingdom's Housing Price Index by Office of National Statistics

NHPI measures the monthly changes in the contractors' selling prices of new residential houses. Surveys are conducted in 21 metropolitan cities by Statistics Canada covering single dwellings, semi-detached and row houses. The NHPI was developed in 1981 and is published monthly with 2007 as the base year.[21]

Through surveys the selling price of the new residential houses and the estimated current value of the land are collected mainly from the contractors/builders. This index does not measure the change in price for the existing houses.

(c) Multiple Listing Service (MLS) Home Price Index

The HPI tracks relative price level by comparing the price level at a point of time to the reference or base period (January 2005) price level. It is calculated for one- and two- storey single family homes, townhouse/row units, and apartment units.[22] The measuring of HPI started in February 2012 and from then it is calculated every month covering ten major housing markets. The property considered as Benchmark property (BP) have median values for the quantitative attributes and the modal value for qualitative attributes. The relative benchmark prices (RBP) measures the percentage change in the prices of benchmark property for a particular area and then categorizes it on the basis of whether it is below or above the overall market BP.

Multivariate regression is used to calculate the index value. Also, Repeat-Sales and Hedonic Price methods are used while calculating HPI. It does not include the data on private transactions, that is, properties marketed outside the MLS system. And MLS system is also limited to metropolitan areas only. The Benchmark prices may not be able to capture the overall volatility in the market.

4. Spain

The main objective of HPI in Spain is to measure the evolution of the level of the merchanting prices of new and second-hand housing over time. This is therefore an indicator conceived solely for establishing comparisons over time.

The HPI is prepared quarterly, which enables estimating the evolution of prices between consecutive quarters that accumulated over the year, as well as the annual evolution. Not included within its scope is the measurement of price levels. Therefore, spatial comparisons cannot be established for the price levels, whereas they can for the price evolutions.

---

[21] http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=2310
[22] MLS Home Price Index Methodology, http://homepriceindex.ca/docs/ref/HPI_Methodology.pdf#View=FitV

The information used for calculating the HPI is from the General Council of Notaries (GCN). GCN, via the Notarial Certification Agency (ANCERT), provides the data making up the main source of information for this indicator. Every month, ANCERT provides the information from the transfers of property occurring in Spain, in addition to the subsequent updates in which new observations or modifications are included of those previously sent. The information submitted monthly by ANCERT includes following variables- (a) Dwelling location variables - autonomous community, province, municipality, postal code, type, name and number of the road, duplicate, block, stairwell, floor and door; (b) Time variable indicating the day on which the dwelling is transferred - date of authorization; and (c) Variables relating to the price of the dwelling- price of the operation and value of the object.

The HPI is a short-term, quarterly index, and involved in its compilation is the latest data that the National Statistics Institute has at the time of calculation, which represents, on average, more than 90 per cent of the total transfers carried out each quarter. The calculation system of the HPI is based on the combination of two basic elements that reflect the characteristics of the real estate market, and which are essential to the calculation of the price indices: the prices of the dwellings, which represent the confluence of market supply and demand, and the weightings, or relative importance of each type of dwelling according to the value of the purchase. The combination of these two elements in order to obtain the HPI is carried out using the chain-linked Laspeyres index formula.[23]

5. Australia

Australian Bureau of Statistics (ABS) prepares the index measuring the change in prices of established houses in each of the eight capital cities namely Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, Darwin and Canberra.[24] HPI is calculated at the end of each quarter, and is published five weeks after it. In April 1994, HPI was published for the first time for the period December 1993 to March 1994.

For each of the eight capital cities, suburbs which are the building blocks of the index, are grouped together to form different clusters. An analysis (2004 HPI review) determined that four structural variables,[25] four locational variables[26] and one neighborhood variable were the most relevant in determining the similarity of suburbs for stratification purposes. The weight assigned to a cluster is basically the value of stock of established houses in the cluster. This stock of houses is recorded in the

---

[23] http://www.ine.es/en/daco/daco42/ipv/metodologia_en.pdf
[24] "House Price Indexes: Concepts, Sources and Methods, Australia, 2009", Chapter 6 Coverage and Classification, of Australian Bureau of Statistics http://www.abs.gov.au/
[25] 2001 Census of Population and Housing data
[26] ABS Socio-Economic Index for Areas (*An Introduction to Socio-Economic Indexes for Areas* (SEIFA), 2006 (cat. no. 2039.0).), which is a measure, derived from Census data

Census of Population and Housing and is held constant from period to period. HPI is calculated using Laspeyers methodology.

The scope for the HPI is restricted to those dwellings where the primary purpose is residential (i.e. excluding commercial properties) regardless of ownership or tenure of the occupants (i.e. including government-owned properties and properties owned by private landlords). This approach does not include flats, apartments and terrace houses. Price comparison between the cities is not calculated.

Other than HPI released by ABS, there are several private players releasing house price indices in cities. Two popular ones are the Residex (released by Residex),[27] and ASX Property Index (released by RP Data Rismark).[28]

6. Portugal

The *Confidential Imobiliário Index* tracks developments in the residential market in Portugal, in particular in the Lisbon and Oporto metropolitan areas covering the new and existing dwellings. It is released monthly starting in January 1988 and uses data available at www.lardocelar.com, which in 2005 contained around 280,000 real estate registers.[29] This index is calculated on the basis of asking prices and weighted by region and dwelling condition (new or existing).[30]

IV b. Housing market in Emerging Economies[31]

Data on housing prices and activity are particularly weak in the LAC region, despite recent progress. Only Brazil, Chile, Colombia, Mexico, Peru, and Uruguay publish housing price data. However, even these time series are short, and coverage is limited to large metropolitan areas. Lack of comprehensive time series on house prices is perhaps the most serious shortcoming for monitoring and assessing housing market developments in many emerging countries.

Section V: Indian house price indices: A comparison of Select Cities

This section probes into the relative efficacy of the two major house price indices in India earlier discussed in section III, by comparing them on different parameters. These two indices are computed through different methodologies by taking into account limited samples.

---

[27] http://www.residex.com.au/
[28] http://www.asx.com.au/
[29] European Central Bank http://www.ecb.europa.eu/
[30] Fonseca and Guimarães (2006).
[31] For description and sources of housing indices in emerging countries see Annex: VII; For frequency see Annex II.

HPI (RBI) is based on registered values while RESIDEX (NHB) uses transacted values and disbursals on residential properties. RBI's HPI covers all residential properties that are officially registered in the 9 cities tracked except Chennai. In Chennai, since separate information on the type of the property is not available both commercial and residential properties are covered. HPI covers the lowest number of cities as compared to other indices. A distinct characteristic of the HPI is that it gives official data derived from the registered values of properties. Since these registered values are considered while charting out government policies, hence they form official records. RESIDEX covers price movement of residential properties over a period of time by size and location of the dwelling units (location wise, zone wise and city wise) in 26 cities.

Trend analysis between NHB's RESIDEX and RBI's HPI

The following graphs analyze trends in RESIDEX and HPI for eight major cities in India. Interestingly, trends in house prices shown by these two indices do not follow a uniform pattern.

From Graph 1 it is evident that, there are significant differences between the two indices over the period of time. HPI showed an upward trend during the last quarter of 2010 and first two quarters of 2011 whereas; the RESIDEX was indicating a downward trend during the same time period. Also, Q3 and Q4 of 2010-11 had witnessed the same trend where HPI was rising and RESIDEX was falling. However, during Q1 of 2012-13 a reverse trend has been reported i.e. RESIDEX was showing an upward trend but apparently HPI was observing a declining tendency.

Graph 1: HPI vs RESIDEX- MUMBAI
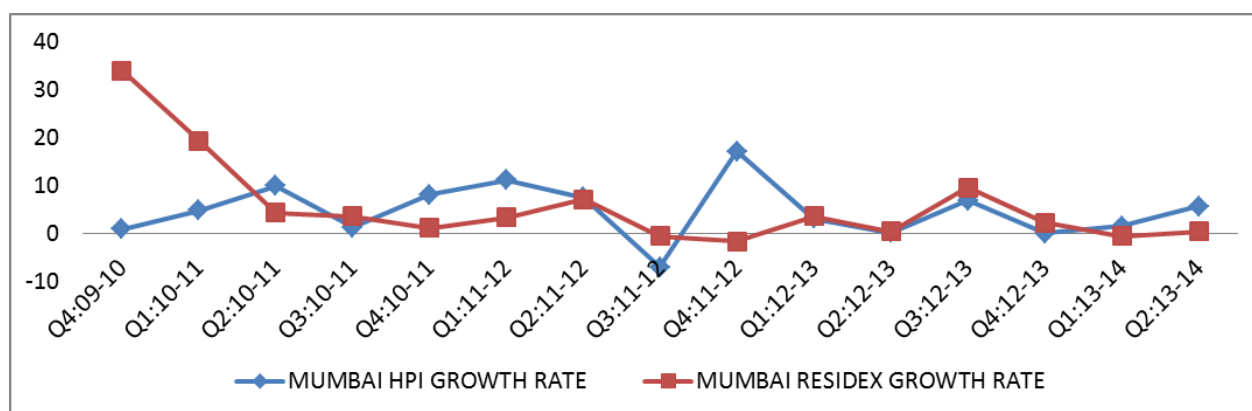
Source: RBI and NHB, Authors Calculations.

Graph 2 shows the difference between HPI and RESIDEX in Delhi. In the case of Delhi, differences between the two indices are quite noticeable. Up to Q1 2011-12 both the indices show contradictory trends and it was only until Q3 of 2011-12 somewhat synchronized trends are visible. But, during the

subsequent periods, again we see conflicting results. However, Q2 of 2012-13 onwards apparently both the indices show similar trends.

Graph 2: HPI vs RESIDEX- DELHI
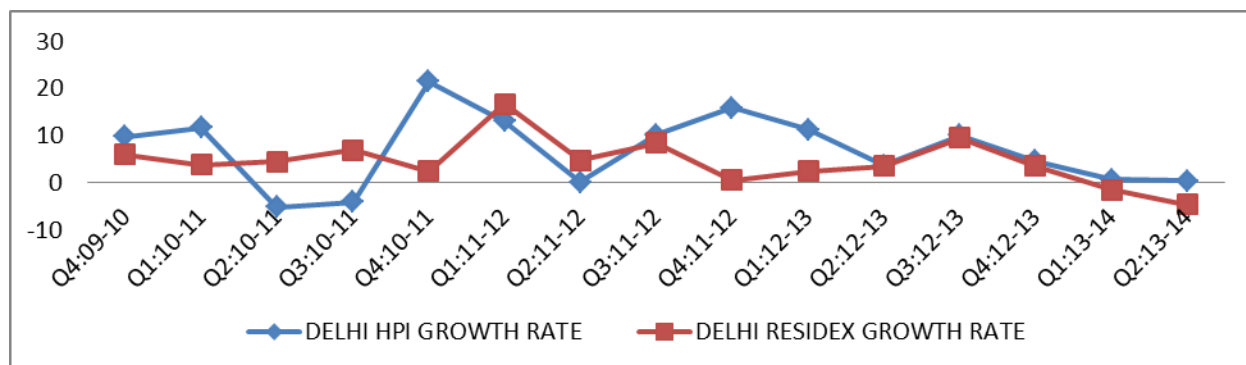
Source: RBI and NHB, Authors Calculations.

From the graph 3, it is evident that RESIDEX shows less volatility than HPI. The difference is quite noticeable especially after Q4 of 2011-12. From Q4 of 2011-12 onwards RESIDEX shows a stable trend, meanwhile HPI suggests for many ups and down during the same period of time. However, the two indices have different coverage as pointed out earlier.

Graph 3: HPI vs RESIDEX- CHENNAI
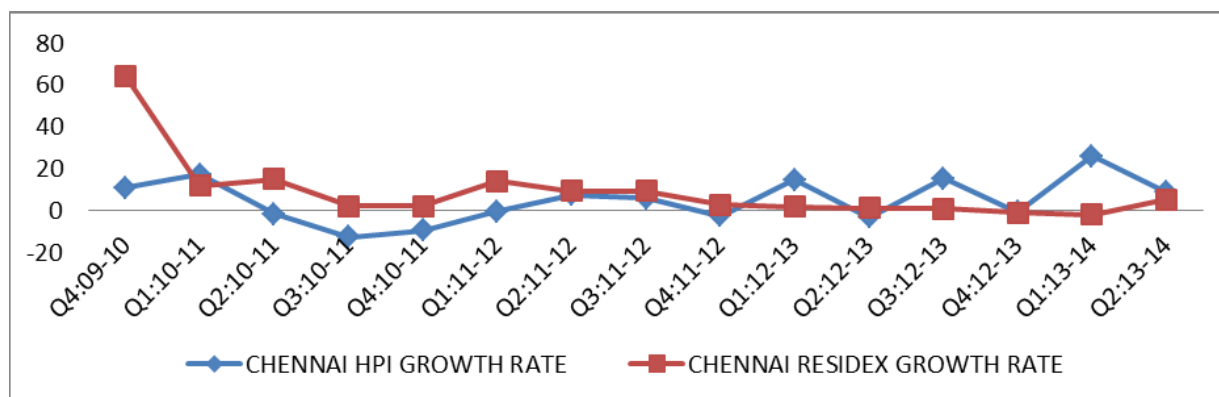
Source: RBI and NHB, Authors Calculations.

From Graph 4 it is evident that in the case of Kolkata also, there had been sharp differences between both the indices. For example, during Q4 of 2009-10 RESIDEX indicates a sharp decline in the house prices on the contrary during the same time period HPI suggests a clear escalation in the house prices. Similarly, during Q3 of 2012-13, HPI suggests a downward trend in the house prices whereas, the RESIDEX shows an exactly opposite trend.

**Graph 4: HPI vs RESIDEX- KOLKATA**
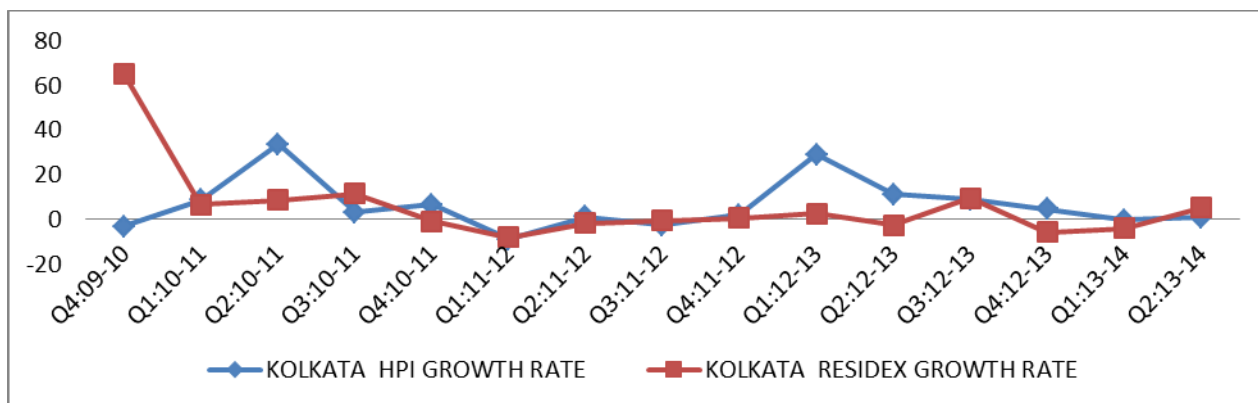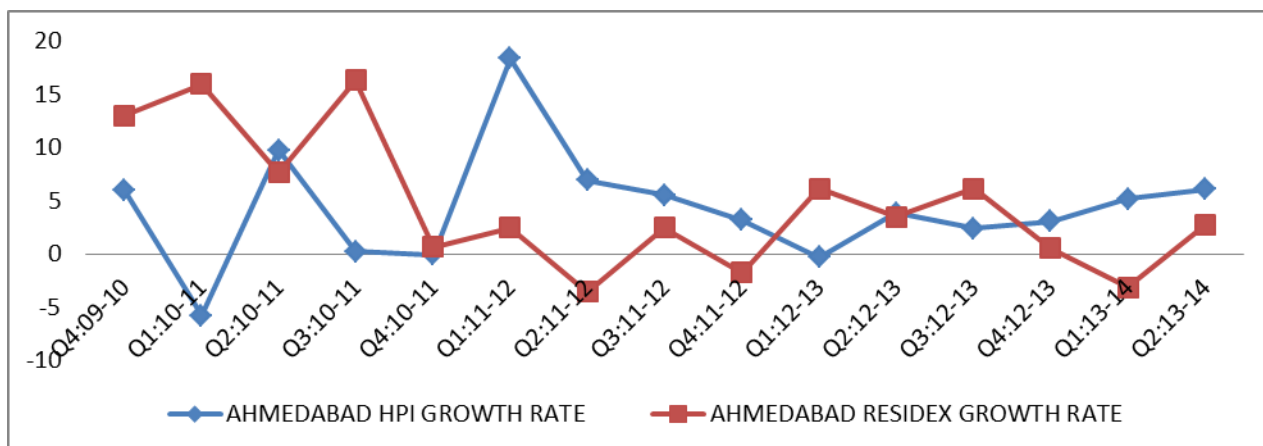
Source: RBI and NHB, Authors Calculations.

In the case of Bangalore (Graph 5), the difference is quite visible during the Q4 of 2010-11. While the RESIDEX indicates that the house prices had plummeted sharply during this period, HPI gives completely different picture by indicating a surge in the house prices. Apart from that, even when both the indices suggest a rise, the magnitude differs significantly. From Q4 of 2011-12 onwards, HPI shows a consistent rise except for a marginal dip after Q3 of 2012-13. However, the RESIDEX shows somewhat volatile trend during the same period.

**Graph 5: HPI vs RESIDEX – BANGALORE**
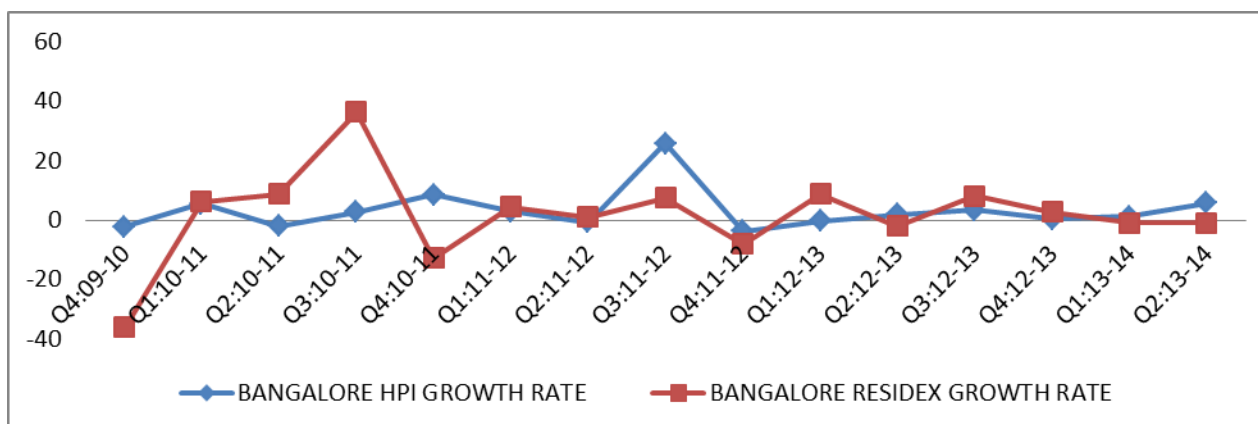
Source: RBI and NHB, Authors Calculations.

Graph 6 shows that, like other cities the contradictory trends repeat in the case of Ahmedabad also. Moreover, there was huge mismatch between the two indices in terms of the magnitude, for example during Q1 of 2011-12 HPI shows a sharp price escalation whereas, and the price hike was moderate according to RESIDEX.

Graph 6: HPI vs RESIDEX – AHMEDABAD

Source: RBI and NHB, Authors Calculations.

There was a notable difference between the two indices in Lucknow (Graph 7) during the period ranging from Q4: 2010-11 to Q3 2011-12. But thereafter both indices show a similar trend even though the magnitude varied significantly.

Graph 7: HPI vs RESIDEX- LUCKNOW
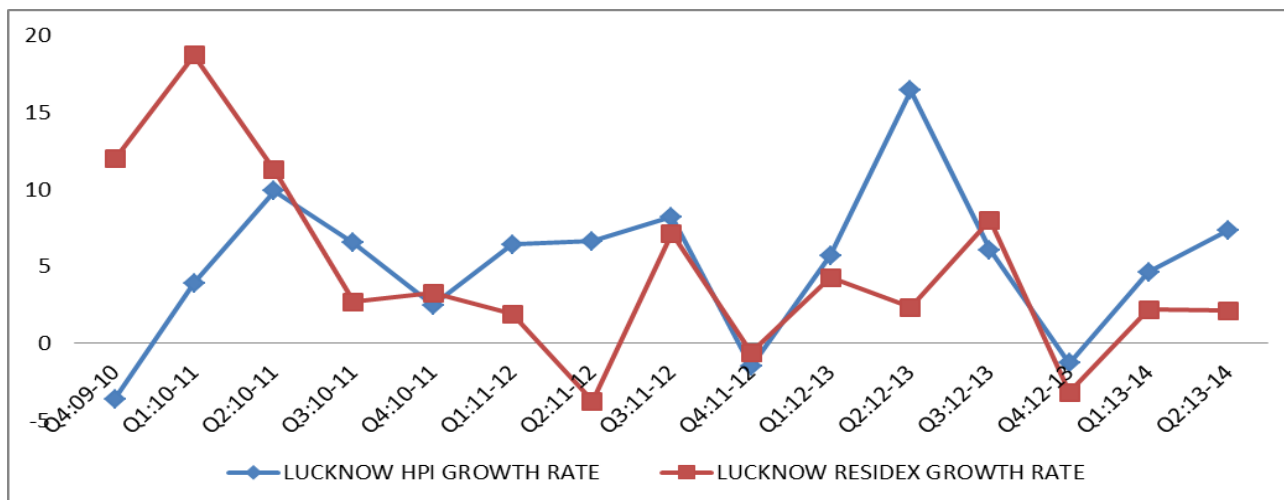
Source: RBI and NHB, Authors Calculations.

Graph 8 shows that HPI and RESIDEX in Jaipur have differed from each other and with different magnitudes from Q3: 2011-12 to Q1: 2013-14. This contradiction in the price trends needs to be addressed, as many sectors in the economy follow the house price indices as an indicator of real estate performances and a base to form expectations about the market.

Graph 8: HPI vs RESIDEX- JAIPUR
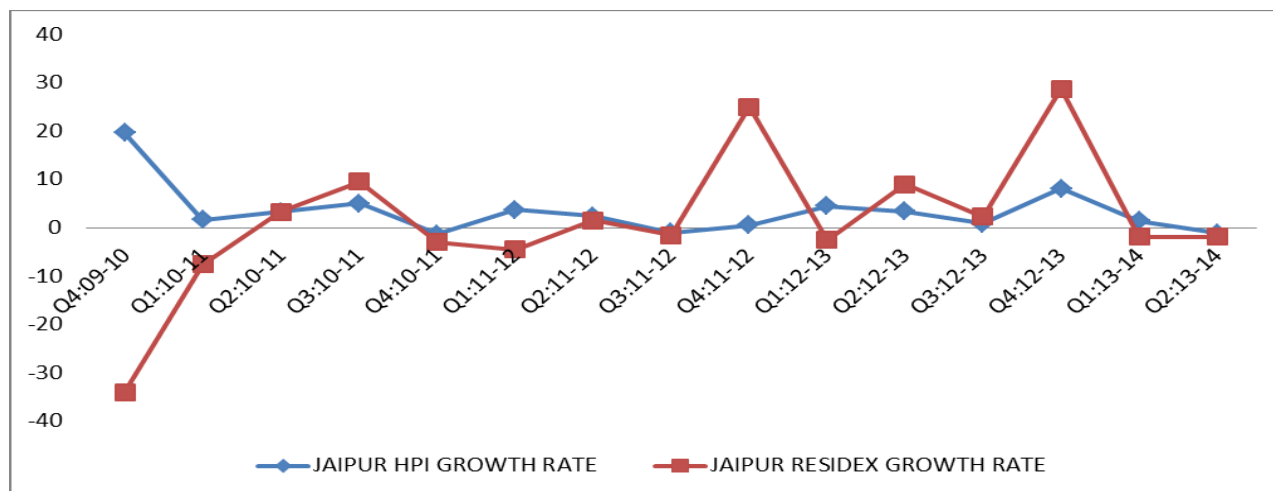
Source: RBI and NHB, Authors Calculations.

Other indices in the market

In India, select private sector real estate entities also compute their own indices. In this context, two most important are Magicbricks (computes PropIndex; Annex - VIII) and Jones Lang LaSalle (JLL computes REIS; Annex - IX).

A comparison was made by Magicbricks for two respective cities Delhi and Mumbai for a limited period. The HPI and RESIDEX have followed a similar pattern. The PropIndex of Magicbricks also follows a similar pattern but growth is significantly lower over the period of comparison.

Graph: 9 - Comparative analysis between RESIDEX, HPI and PropIndex by Magicbricks
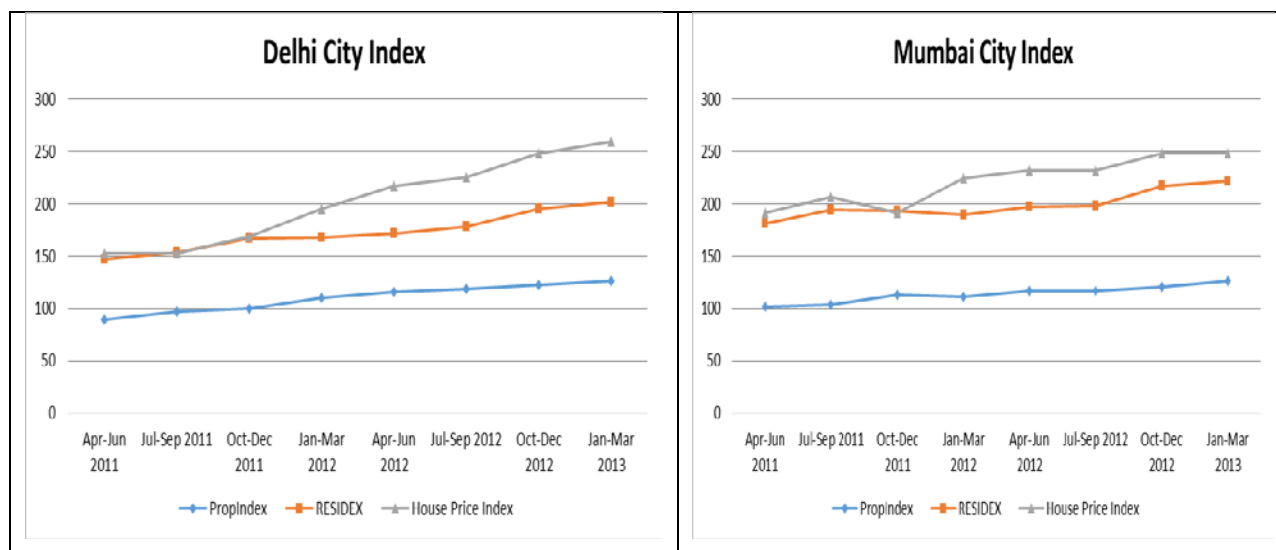
Source: Magicbricks, Annex VIII.

A comparison was made by JLL for Kolkata and Chennai and the findings reveal contradictory trends. Three Indices, REIS, HPI and RESIDEX, cannot be compared overall as the simultaneous data existence is only available for three quarters which is not sufficient to judge and interpret the performance. The value of the data is different as three indices capture different market scenarios. While RESIDEX and HPI covers only the main city, REIS also includes the suburbs and hence the average value comes down as most of the main cities contain high priced residential units. Although the geographic coverage is different, RESIDEX and HPI in Kolkata are probably able to capture the market's ups and downs (Refer graph's peaks and troughs). The value of the market swing could be different, but the trend that is required to understand the whole market is much evident. In the case of Chennai, suburban locations represent around 95 percent of actively selling projects. Since the REIS Index includes the suburban locations and off late with the suburban locations gaining more dominance, REIS Index is relatively flat representing the price trends in suburban locations. In addition, the NHB and RBI's Housing index is represented only by a smaller sample size, therefore these indices exhibit more volatility than the REIS Index.

Graph 10: Comparison made by JLL for Kolkata and Chennai

Kolkata	Chennai
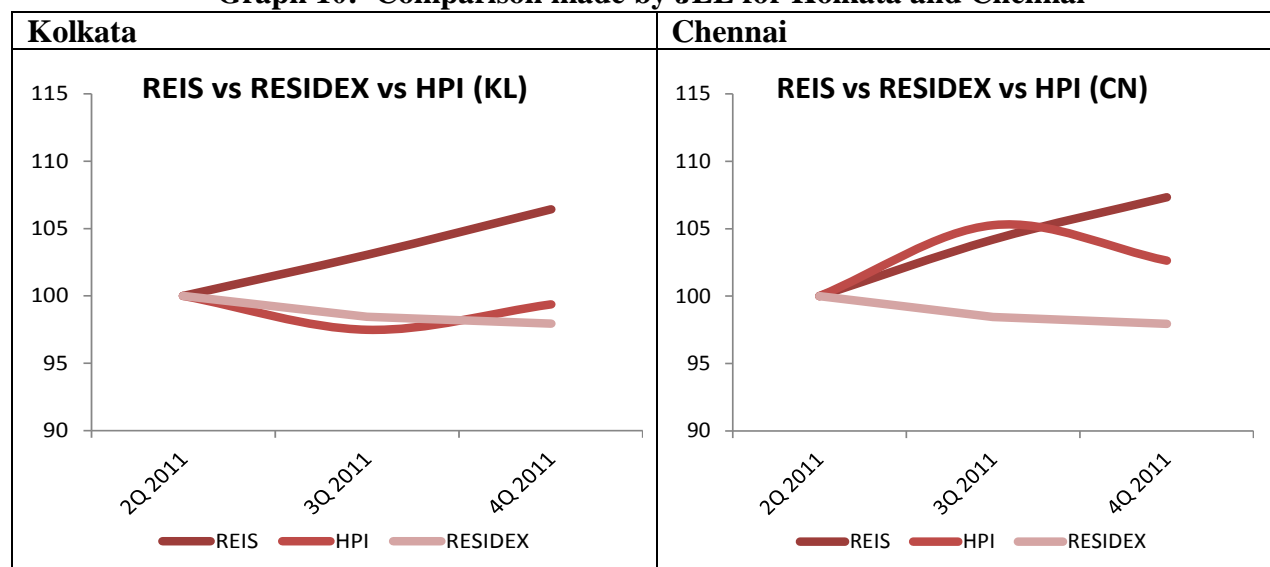
Source: Jones Lang LaSalle, Annex IX.

Section – VI: Conclusion and Recommendations

The Indian economy is passing through a transition from a low growth economy to a high growth economy. The government is encouraging the housing sector which is inter-linked with nearly three hundred industries in the country. The housing sector also has strong linkage with credit market and banking institutions. The monetary policy also has a two-way relationship with the housing sector.

Housing price indices play an important role in understanding the price movement of housing as well as general trend of growth in the country. To understand about house prices, it is important to understand about housing indices. These indices need to be publicly provided and accurately calculated to help understand the underlying asset. In India, NHB and RBI construct and release an index each, RESIDEX and HPI, respectively. In case of both the indices there are a number of problems. Illustratively, RESIDEX is based on extensive data collected by different commercial banks and finance company located in 26 cities and is widely accepted in the country. Innovations that rely on data sources cannot be implemented until precise indices are provided in public domain and with robust history to inspire confidence.

In India, neither data definitions are standardized nor is the methodology. The data is also collected by non-trained officials. The methodology of the RBI's HPI is somewhat standardized but also has gaps. HPI only covers data collected from registration department of 9 cities but computes a national HPI based on that limited data set. RBI's HPI is a weighted average of city-level HPIs. Ideally, the number of transactions at city level could have been used as weight. However, in the existing data collection

mechanism, separate information on the type of the property (residential/commercial) of Chennai is not available. As a result, the proportion of population of the city (to the total population of nine cities together) is used as the weight, as a proxy to the number of transactions. Indeed, the trend in two indices is generally contradictory and confusing for economic analysis.

Ideally, in any housing index, house price data series should have national coverage and differentiate between new and existing homes and between commercial and residential real estate. Those series should be complemented by information on the stock and flows of housing, as well as on construction activity (including employment, price of inputs, and land prices). The housing price index in India needs re-examination, especially the methodology of collecting data and computing indices. First, there should be a scientific basis for collecting data by a well trained staff. The data definitions, characteristics of houses, locality and region data as well as qualitative factors need to be standardized and documented. The methodology used should be a hedonic method while mix-adjusted techniques could also be used and supplemented. India being a widely dispersed country and highly heterogeneous in its demand factors due to varied geography would need a seasonally and regionally periodically adjusted national index. It would also be helpful to have a monthly index, similar to the recently introduced Consumer price Index. On a regular basis, it is important that housing data collected for the price index should be periodically verified by survey undertaken by National Sample Survey Organization (NSSO) while the Census should help in verifying and cross-checking the data every ten years.

References

Allen, F. and Carlotta, E. (2011), "What Should Central Banks Do About Real Estate Prices?".

Australian Bureau of Statistics (2005), "Information Paper: Renovating the Established House Price Index (Cat. No. 6417.0), November.

Australian Bureau of Statistics (2006), "Information Paper: An Introduction to Socio-Economic Indexes for Areas (SEIFA)", Cat. No. 2039.0.

Australian Bureau of Statistics (2009) "House Price Indexes: Concepts, Sources and Methods", Cat. No. 6464.0, Chapter 6, Australia.

Bailey, M.J., Muth, R.and Nourse, H.O. (1963), "A regression method for real estate price index construction," Journal of the American Statistical Association, Volume 58, Number 304, pp 933–942, December.

Bernanke, B.S., Gertler, M., and Gilchrist, S. (1999), "The Financial Accelerator in a Quantitative Business Cycle Framework", Handbook of Macroeconomics, Volume 1, Part C, pp1341-1393.

Broadbent, B. (2014), "Monetary policy, asset prices and distribution", Speech, Society of Business Economists Annual Conference, London, October.

Can, A. and I. Megbolugbe (1997), "Spatial Dependence and House Price Index Construction," Journal of Real Estate Finance and Economics, 14, 203-222.

Case, K.E. and Shiller, R.J. (1987), "Prices of Single Family Homes since 1970: New Indexes for Four Cities", NBER Working Paper No. 2393.

Case, K.E. and Shiller, R.J. (2004), "Is there a Bubble In The Housing Market?", Cowles Foundation Paper No. 1089.

Cleveland, R.B., Cleveland, W.S., McRae, J.E. and Terpenning I. (1990), "STL: A Seasonal-Trend Decomposition Procedure Based on Loess", Journal of Official Statistics, Volume 6, No. 1, pp 3-73.

Dachis, B. (2012). The Effect of Land Transfer Taxes on Housing Transactions.

Duranton, G., Ghani, E., Goswami, A.G. and Kerr, W. (2014), "The misallocation of land and other factors of production in India", November.

Eurostat (2013), "Handbook on Residential Property Prices Indices (RPPIs)".

Feldstein, M.S. (2007), "Housing, Housing Finance, and Monetary Policy", NBER Working Paper No. 13471.

Fonseca, I. and Guimaraes, R. (2006) "Confidential Property Index: Methodological Procedure", October.

Forsyth, F.G and Fowler, R. F. (1981), "The Theory and Practice of Chain Price Index Numbers".

Gandhi, R. (2014), "Real estate and housing- a sensitive sector or Samvriddhi sector?", Speech, Mumbai, August.

Government of U.K. (2014), "About the House Price Index", Land Registry, July.

Goodman, A.C. and Thibodeau, T.G. (1995), "Age related Heteroskedasticity in Hedonic House Price Equations", Journal of Housing Research, Volume 6, pp 25-42.

Hilbers, A., Hoffmaister, A.W., Banerji, A. and Shi, A. (2008), "House Price Developments in Europe: A Comparison", IMF Working Paper 08/211.

Ingves, S. (2007), "Housing and Monetary Policy: A View from an Inflation-Targeting Central Bank", Federal Reserve Bank of Kansas City Publication.

Kain, J.F. and Quigley, J.M. (1970), "Measuring the Value of Housing Quality", Journal of American Statistical Association, Volume 65, Issue 330, pp 532-548, June.

Kiyotaki, N. and Moore, J. (1997), "Credit Cycles", Journal of Political Economy, Volume 105, No. 2, April.

Lloyds Banking Group, "Halifax House Price Index- September 2014".

McCarthy, J. and Peach, R.W. (2004), "Are Home Prices the Next Bubble?", Economic Policy Review, Volume 10, No. 3, December.

Miller, N. and Skalarz, M (2008), "Irrational Despair in the Housing Market", Manuscript, Volume 7, August.

National Housing Bank (2007), "NHB RESIDEX: Tracking the prices of residential properties in India".

National Housing Bank (2013), "NHB RESIDEX- Status, Challenges and Way Forward", December.

Office for National Statistics (2012), "Developments in the United Kingdom's House Price Index".

Poterba, J.M (1984), "Tax Subsidies to Owner-occupied Housing: An Asset Market Approach" Quarterly Journal of Economics, Volume 99, No. 4, November.

Quigley, J.M. (1995), "A Simple Hybrid Model for Estimating Real Estate Price Indexes", Journal of Housing Economics, Volume 4, pp 1-12.

Reserve Bank of India (2014), "Pilot Housing Start-Up Index, *Trend in New construction of residential housing during 2009-2011 in 27 cities across India*", February.

Reinhart, C.M. and Rogoff, K.S. (2009), "The Aftermath of Financial Crises", NBER Working Paper No. 14656, January.

Shiller, R. J. (1996), 'Measuring Asset Values for Cash Settlement in Derivative Markets: Hedonic Repeated Measures Indices and Perpetual Futures", Cowles Foundation Paper No.856

Shiller, R.J. (2007), "Understanding Recent Trends in House Prices and Home Ownership", September.

Shiller, R.J. (2014), "Why is housing finance still stuck in such a primitive stage?", Cowles Foundation Discussion Paper No. 1934, January.

Shiller, R.J. (2014), "Speculative Asset Prices", Cowles Foundation Discussion Paper No. 1936, February.

Silver, M. (2012), "Why House Price Indexes Differ: Measurement and Analysis", IMF Working Paper, May.

Singh, C. (2013), "Housing market in India: A Comparison with the US and Spain", IIM B Working paper.

Sommervoll, D.E. (2006), "Counterintuitive response to tax incentives? ", Statistics Norway Research Department, Discussion Papers No. 492, January.

Taylor, J.B. (2008), "The Financial Crisis and the Policy Responses: An Empirical Analysis of What Went Wrong", Stanford University Research Paper.

Warnock, V.C. and Warnock, F.E. (2007), "Markets and Housing Finance", NBER Working Paper No. 13081, May.

Annexure: I

Frequency of the indices in advanced countries

Country	Index	Monthly	Quarterly	Annually
United Kingdom	Halifax House Price Index	✔	✔	
	Land Registry House Price Index (HPI)	✔		
	Nationwide House Price Index (HPI)	✔	✔	
	Rightmove House Price Index	✔		
	Office for National Statistics House Price Index (HPI)	✔		
Canada	Teranet National Bank House Index (NBHI)	✔		
	New Housing Price Index NHPI	✔		
	MLS® Home Price Index (HPI)	✔		
Australia	Residential Property Price Index (RPPI)		✔	
	Residex	✔		
	Daily Home Value Index	✔		
United States of America	FHFA HPI	✔	✔	
	S&P National Home Price Index	✔	✔	
	Zillow Home Value Index	✔	✔	
Germany	Bulwiengesa Property Market Index	✔		✔
	VDP Property Price Index		✔	

Source: Various websites of Central Banks, Real Estate Research Institutes and Statistical Organizations

Annexure: II

Frequency of the indices in emerging countries

Country	Index	Monthly	Quarterly	Annually
India	RESIDEX		✓	
	House Price Index		✓	
China	Shanghai house price index	✓		
Argentina	Average value of old apartments, Buenos Aires			✓
Brazil	Residential Real Estate Collateral Value Index	✓		
Indonesia	Residential Property Price Index		✓	
Israel	Index of Prices of Dwellings		✓	
South Korea	Transaction-based Sales	✓		
	Price Indices Housing Sales Price Index	✓		
	Housing Jeonse Price Index	✓		
Mexico	Housing Price Index		✓	
Philippines	Residential Capital Values		✓	
Thailand	Housing Price Index	✓		
Russia	House Price Index	✓		

Source: Various websites of Central Banks, Real Estate Research Institutes and Statistical Organizations

Annexure: III

Data and Methodology: Advanced Economies

Country	House Price Index	Data Type / Data Available From	Methodology
United Kingdom	Halifax House Price Index	The mortgage data of the country's largest mortgage lender Bank of Scotland is used. From: 1983	Hedonic
	Land Registry House Price Index (HPI)	Data collected by the Land Registry From: 1995	Repeat sales regression
	Asking Price Index (API)	Dataset of more than 500,000 UK properties for sale found through the Home.co.uk Property Search Engine. From: 2006	Mix-Adjustment
	Nationwide House Price Index (HPI)	Nationwide mortgage data is used. From: 1952	Hedonic Regression Model – Mix Adjusted
	Rightmove House Price Index	A survey of 200,000 houses asking price each month is used in the calculation which is obtained from the 10,000 estate agency branches who list their properties on the Rightmove website. From: 2002	Mix-Adjustment Standardization
	ONS House Price Index (HPI)	Office for National Statistics Based on completed mortgage transactions and the data is taken from the RMS. From: 1986	Mix-adjusted chained Laspeyer's Index

Source: Various websites of Central Banks, Real Estate Research Institutes and Statistical Organizations

Data and Methodology: Advanced Economies – Continued …

Country	House Price Index	Data Type / Data Available From	Methodology
Canada	Teranet National Bank House Index (NBHI)	From: 1999	Repeat sales
	New Housing Price Index NHPI	NHPI measures the monthly changes in the contractors' selling prices of new residential houses. From: 1981	Chain-Laspeyer's index
	MLS® Home Price Index (HPI)	From: 2012	Repeat Sales with Multivariate Regression
Australia	Residential Property Price Index (RPPI)	Data are provided by State and Territory Land Titles Office or Valuers General Office in each capital city. From: 1986	Stratification Approach – Mix Adjusted
	Residex	Recently sold (median price index), established and previously sold properties (repeat sales index) and properties with detailed attribute data (hedonic index). From: 1970 / 1975	Hedonic / Repeat Sales / Median Price Indices
	Daily Home Value Index	Calculated by RP Data-Rismark. From: 2006	Hedonic
United States of America	HPI	FHFA uses data supplied by Federal Home Loan Mortgage Corporation (Freddie Mac) and the Federal National Mortgage Association (Fannie Mae). From: 1975	Repeat Sales
	S&P National Home Price Index	Information is from local recording offices across the country. From: 1987	Repeat Sales
	Zillow Home Value Index	A Zestimate home value is Zillow's estimated market value for an individual home and is calculated for about 100 million homes across US. From: 1996	Median Estimated Value

Source: Various websites of Central Banks, Real Estate Research Institutes and Statistical Organizations

Data and Methodology: Advanced Economies – Continued …

Country	House Price Index	Data Type / Data Available From	Methodology
Germany	Bulwiengesa Property Market Index	Market index is calculated for 125 German cities. From: 1975 / 1986	Year by Year population weight average
	VDP Property Price Index	Prices from mortgages by member banks are used. From: 2003	Hedonic
	Destatis house price index	From: 2000	Hedonic
Spain	HPI	All dwelling transactions via merchandise contracts are included. From:2002	Mix Adjusted - Chain-linked Laspeyres index
France	INSEE Apartment and House Price Index	From: 1984 / 1996	Hedonic
Italy	Nomisma Real Estate Index	From: 1988	Weighted Average
	Annnuario Consulente Immobiliare	From: 1965	Other
	Osservatorio Mercato Immobiliare	From: 2002	Other
Japan	Japan Real Estate Institute Index	From: 1955	Mix-adjusted
Switzerland	Wuest & Partner / SNB	From: 1971	Mix Adjusted
Belgium	Statistics Belgium / DGSEI	From: 1953	Mix Adjusted
Sweden	Statistics Sweden (SCB)	From: 1975	Mix Adjustment and SPAR
New Zealand	REINZ House Price Index	From: 2009	Stratified Median
	QV Quarterly House Price Index	From: 1980	SPAR

Note: SPAR – Sale Price Appraisal Ratio

Source: Various websites of Central Banks, Real Estate Research Institutes and Statistical Organizations

Annexure - IV

S & P/ Case- Shiller Home Price Index

Standard and Poor (S&P) publishes the Case-Shiller US National Home Price Index in collaboration with CoreLogic® and MacroMarkets LLC. The index is an integration of single-family home price indices for the nine U.S. Census divisions and is calculated quarterly. Other than the national home price index, S&P calculates a 20-city composite index, a 10-city composite index, and twenty individual metro area indices. This index measures changes in the housing market prices with a constant level of quality using the repeat sales methodology.

To calculate the indices, data is collected on transactions of all residential properties from the information that becomes publicly available at local recording offices across the country. Each sales pair is aggregated with all other sales pairs found in a particular Metropolitan Statistical Area (MSA) to create the MSA-level index. The 10 and 20 Metro Area Indices are then combined, using a market-weighted average, to create the Composite of 10 and the Composite of 20.[32]

The main variable used for index calculation is the price change between two arms-length sales of the same single-family home. In an arms-length transaction, both the buyer and seller act in their best economic interest when agreeing upon a price. The price for the property must be obtained through a potential buyer and seller operating through an arm's length transaction, otherwise, the agreed-upon price will likely differ from the actual fair market value of the property.

An automated sale pairing process is designed to collect arms-length, repeat sales transactions for existing, single-family homes. Subsequent sales by mortgage lenders of foreclosed properties are included in repeat sale pairs, because they are arms-length transactions. Since the index is calculated for properties with a given level of quality and not the ones which have gone through renovation or size additions, the pairing process is designed to exclude sales of properties that may have been subject to substantial physical changes immediately preceding or following the transaction. Also, transactions pair that occur once or more than once in less than 6 months are excluded. The data also excludes sale prices associated with new construction, apartments and multi-family houses.

---

[32] http://us.spindices.com/index-family/real-estate/sp-case-shiller

Annexure – V

Zillow Home Value Index

A Zillow Home Value Index (ZHVI) is a time series tracking the monthly median Zestimate home value. The methodology involved is estimating the market value of every home, the Zestimates, is constructed in steps. The regional and market segregation is ensured in the estimates. Zestimate errors are both time and region dependent. While the errors produced by the Zestimate algorithm are generally equally distributed above and below the actual sale price, there can be some residual systematic error detected once more historical sales are known (systematic error here is defined as the median raw error being slightly greater or less than zero). In this event, raw median Zestimates are adjusted through the use of a correction factor. The three-Month moving average is to filter out noise in the data.[33]
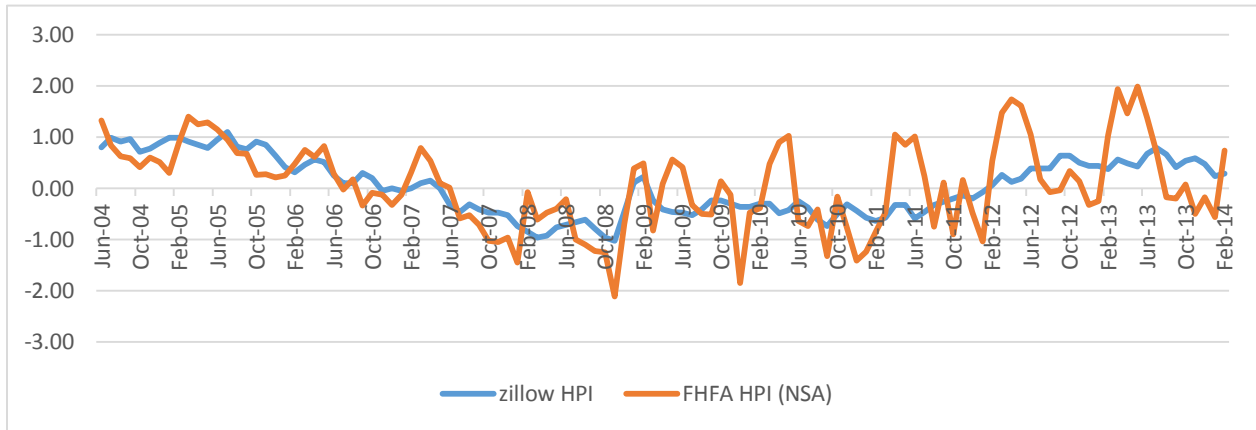
According to Zillow, home sales are affected by seasons within the same year. This seasonality is adjusted so that the trend is more apparent for ease of comparison and forecasting.
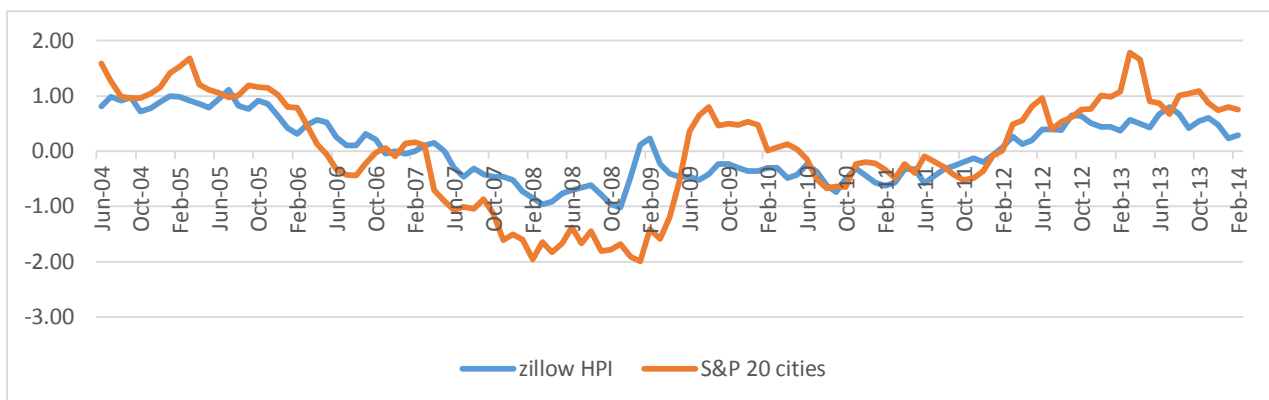
---

[33] http://www.zillow.com/research/data/

Annexure -VI
Price trends between various U.S indices
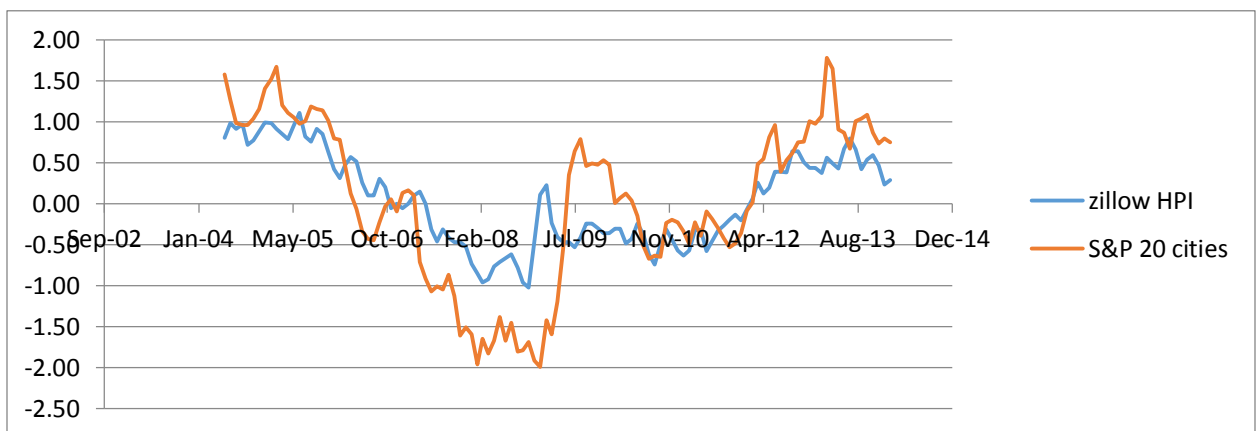
a) **Comparison between Zillow and FHFA**

b) **Comparison between Zillow and S&P**

c) **Comparison between FHFA & S&P**

Source: Data from the respective websites of the house price index calculators

Annexure - VII

Description and Source of Indices: Emerging Countries

Country	Index	Description	Source
India	RESIDEX	Measure residential price changes in India	National Housing Bank
	House Price Index	Registration price data used	Reserve Bank of India
China	Shanghai Second-hand house price index	Tracks prices of second-hand houses in Shanghai, as well as several other cities.	http://ehomeday.com/
Indonesia	Residential Property Price Index	Data on the selling price, number of dwellings and total sales collected directly from developer describing the condition of each quarter and for the next quarter predictions	Bank Indonesia (BI), Residential Property Price Survey (SHPR)
Israel	Index of Prices of Dwellings	Covers new and existing owner occupied dwellings	Central Bureau of Statistics
Philippines	Residential Capital Values	New and residential price of the floor area of commercial or residential condominium space in Makati central business area.	Colliers International: Philippines
Thailand	Housing Price Index	Data taken from Government Housing Bank's mortgage loans contains 5 indices (single detached house with and without land, town house with and without land and land).	Bank of Thailand
	House Price Index	Data from Commercial Bank Mortgage Loan contains 4 indices (single detached house with land, town house with land, condominium and land).	Bank of Thailand

Description and Source of Indices: Emerging Countries – continued …

Country	Index	Description	Source
Russia	Price index for Housing market	Prices for newly built dwellings and for the dwellings of existing private housing stock if they are objects of market bargains.	Federal State Statistics Service
Brazil	Residential Real Estate Collateral Value Index	Collateralized dwellings 11 metropolitan areas	Central Bank of Brazil
Mexico	Housing Price Index	Covers mortgaged housing dwellings (standard houses, condominiums. Apartments)	Sociedad Hipotecaria Federal (SHF)
	Apartment Price Index	Covers new and existing detached dwellings, row houses and apartments and data based on a survey of licensed real estate brokers.	Kookmin bank
South Korea	Transaction-based Sales Price Indices		Korean Statistical Information Service
	Housing Jeonse Price Index		Korean Statistical Information Service
	Housing Sales Price Index		Korean Statistical Information Service

Source: Various websites of central banks, real estate research institutes and statistical organizations

Annexure: VIII

PropIndex by Magicbricks[34]

PropIndex is based on properties listed on the Magicbricks site. The website has over 600,000 active properties posted by more than 1, 50,000 active users in 300 cities and 10,000 localities. The methodology followed for PropIndex is very different from the others. It tracks apartments and single floor unit values, commonly known as builder floors, listed on Magicbricks. The index is structured in such a way that individual properties are aggregated into their respective cities and then to the National Index. The 11 cities chosen are based on their activity levels. In addition to this, an individual city index for each of these cities is also compiled. Weightages for the PropIndex are based on the supply of properties within the locality/city.

Based on this structure, PropIndex gives a realistic picture of trends in price and supply change across different cities.

PropIndex, with tables provided for Listed Price Monitor, Rent Monitor, Yield Meter and Capital Values, gives a holistic perspective of the property market performance in the quarter. While listings and their values/supply provide a level of understanding of the market, there are meticulous data checks to prevent aberrations creeping in the Index. These are based on statistical calculations, industry inputs and logical interpretations.

The base of the PropIndex is taken as 100 points. Any movement in the price band in a particular area is denoted by an increase or decrease. Insights into customer demand are gathered through the requirement/searches posted on Magicbricks. Similarly, the supply is calculated based on the properties posted on the website. User behavior is taken into account while compiling the preferred localities list.

Merits

- One of the major factors that work in favor of PropIndex is that all data published is the actively transacted component of the real estate market. This means that the quarter-on-quarter changes in the capital or rental values, preferred localities, rental yields or any other data gets exhibited in the index.
- Locality wise capital and rental values and fluctuations are also provided.
- Factors such as demand and supply, yield meter or any other change in a locality or city, are covered only in this index.
- PropIndex provides a record of quarter-on-quarter change of property prices and supply trends across different property markets in each city.

---

[34] Prepared and provided by Magicbricks on request.

- It gives zone wise information on demand and supply, which is helpful for developers, Government authorities/institutes and real estate agents.

Limitations

- PropIndex is computed based on the properties listed online. Properties listed and transacted offline are not covered in the report.
- Listing values are considered while compiling the data. However, it could vary from actual transaction value depending on the negotiations and the market scenario.

Capital and rental values, along with quarter-on-quarter changes within a locality or a city, are helpful while buying or investing in a property. Information about the top ten preferred localities for sale as well as for rent within a city is also useful for prospective buyers and builders. The yield meter could be used to understand which localities are clocking the highest rental returns in a city. Similarly, demand and supply data helps buyers to know what is being supplied and demanded in a zone/city. This information/data can be used by policy makers, institutes and banks to create policies and carry out real estate related studies, etc.
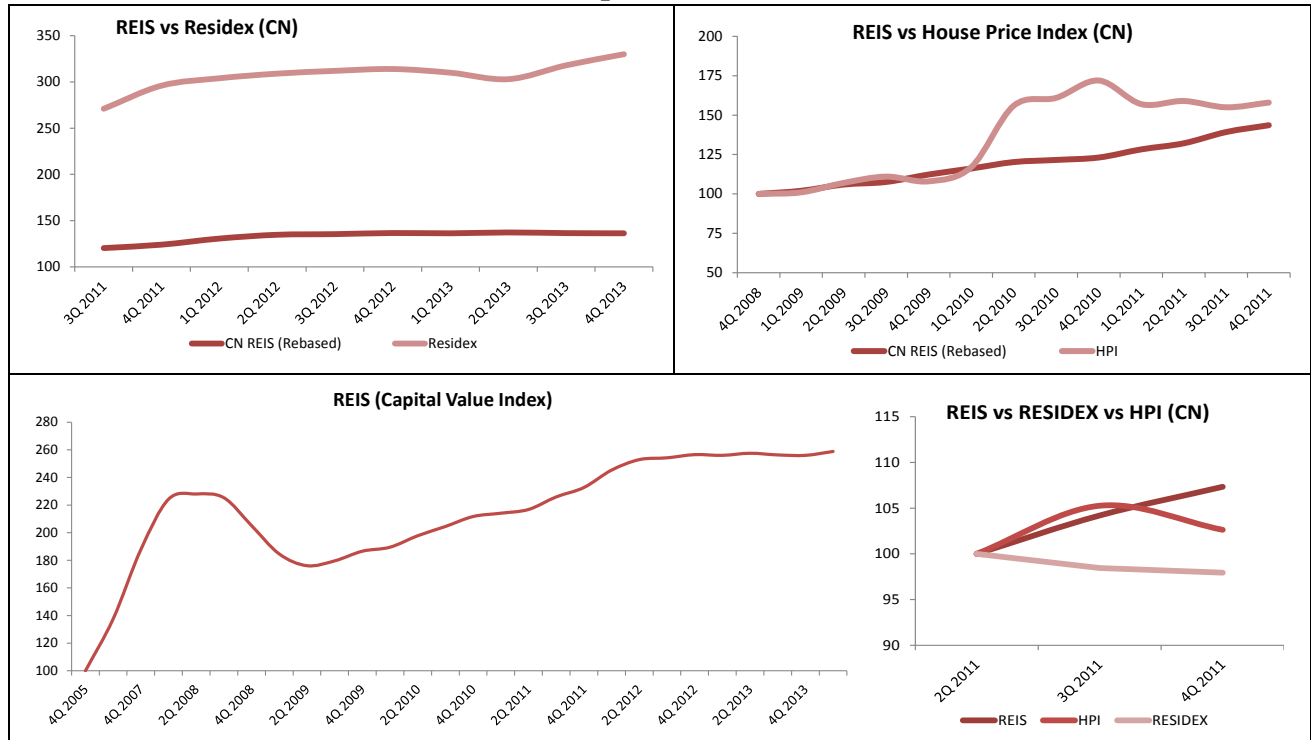
Annexure: IX

REIS by Jones Lang LaSalle[35]

	NHB RESIDEX	RBI House price Index	JLL REIS Index
Data Source	Constructed with transactions provided by 14 HFCs and 11 Banks including State Bank of India, Bank of India, Bank of Baroda, Punjab National Bank, Syndicate Bank and Dena Bank.	Registration authorities of respective state governments possess the data on the registration of transactions of properties. The data are reported on transaction basis. From this, data related to residential occupancies is suitably extracted and analysed for the compilation of house price index.	Constructed based on quoted prices of developers
Methodology	The index has been constructed using the weighted average methodology with Price Relative Method (Modified Laspeyre's approach).	Compilation of weighted average price index is done using Laspeyres weighted average methodology	The index has been compiled using weighted average methodology with effective active stock in the sub-market (stock in the projects that are not completely sold out)
Coverage	The data covers only the notified city area for Chennai, while in case of Kolkata it covers some of the adjoining suburbs in a haphazard manner	The data covers the notified city areas for the cities	The data covers not only the notified city jurisdiction but also the adjoining suburbs to have an overall outlook
Base Period	2001 was taken as the base year for the study to be comparable with the WPI and CPI. Year to year price movement during the period 2001-2005 has been captured in the study, and subsequently updated for two more years i.e. up to 2007	Base Q4:2008-09=100	2003 was taken as the base year

---

[35] Prepared and provided by JLL on request

Index Comparison: Kolkata
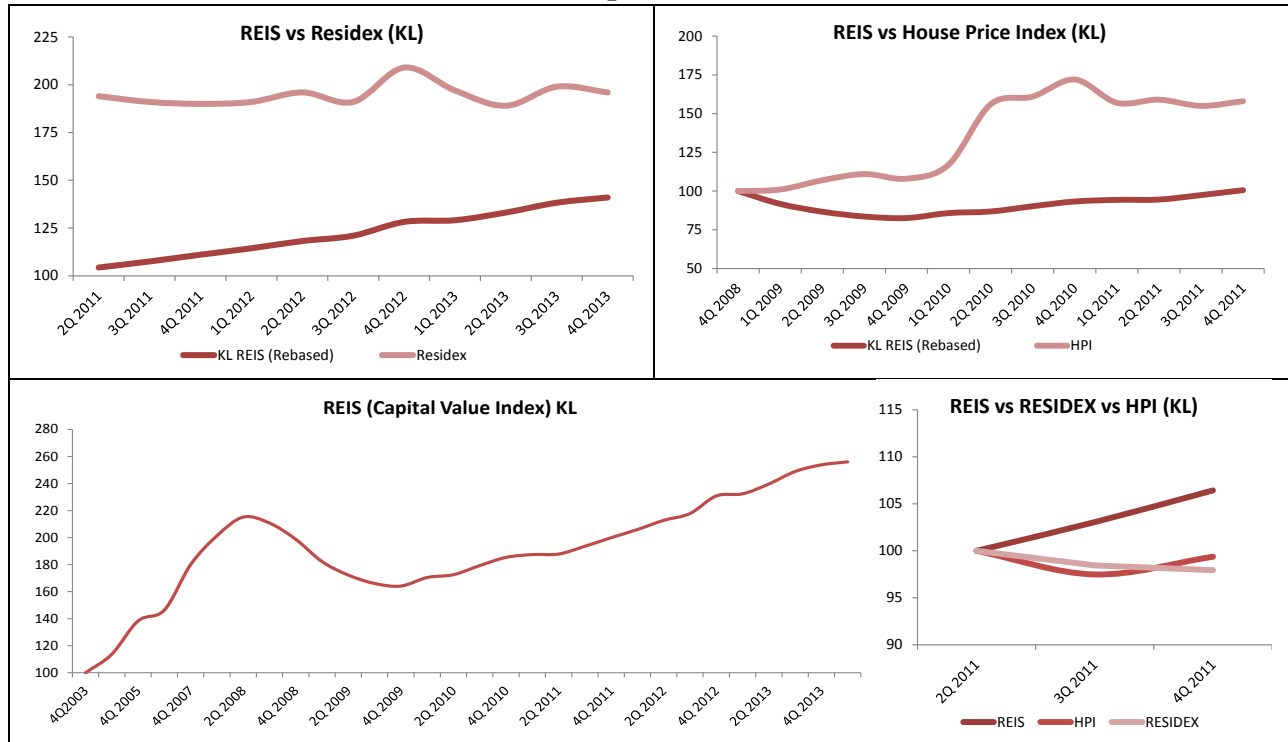
Index comparison: Chennai

Source: JLL