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Real Estate Investment Selection and Empirical Analysis of Property Prices: Study of Select Residential Projects in Gurgaon, India

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The paper studies the residential micromarket of the Gurgaon region of the Delhi National Capital Region in India, to identify the key determinants of real estate investment selection and perform empirical analysis of property prices. A primary survey suggests that the goodwill of the developer is the most important factor for investors in the case of residential properties that are under construction (forward projects). Other factors include location, amenities, project density and construction quality. These factors enjoy almost equal importance in selecting completed projects (spot projects). The factor information can be used to construct property quality rating classes. High risk adjusted returns are provided by high quality spot projects and low quality

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forward projects. A long run equilibrium relationship is observed between spot projects and forward prices with the former playing the lead role. Gross domestic product and non-food bank credit are the macroeconomic variables that can predict property prices. The highest pre-tax internal rate of return is observed for forward projects in the first quarter holding itself while for spot projects, it is around the eighth quarter. The research has implications for property developers, real estate investors and market regulators. The study contributes to the real estate investment literature on emerging markets.

Keywords

Property Prices, Real Estate Investment Analysis, Holding Period Returns, Goodwill of the Developer, Cointegration

JEL Codes: R32, G11, C83, C22

1. Introduction

1.1 Background

A house is one of the most important asset of a household and accounts for a major share of its wealth. Due to the migratory nature of the nation's population, both rural and urban, most families in India frequently face the decision of either buying or selling residential real estate property. Since the purchasing or selling of real estate property normally involves a large monetary transaction, this is considered to be one of their major decisions in life. With faster rise in the growth of income, the Indian market is witnessing structural changes with regard to their pattern of consumption and investments. There is an increasing demand for housing as an asset for investment returns and an asset for end use. It is well supported by the increasing speculation of foreign investors and non resident Indians. The realty sector has a powerful multiplier effect on the economy, which operates through various intersectoral linkages. Any movements in the housing sector may, therefore, make a significant impact on economic activities in the country, including on that of the financial sector.

1.2 Indian Real Estate Sector

Nomura (The Hindu BusinessLine, 2014) suggests that post the decisive electoral mandate, India is slated to be the biggest turnaround story amongst the emerging markets in the next 5 years. With the central bank committed to reigning in inflation, the pro active business oriented outlook of the new government along with cutting of red tape and jumpstarting supply side reforms will be a game changer for India. Real estate is the second largest employment generating sector in India after agriculture. The contribution of

the real estate sector to the gross domestic product (GDP) of India has been estimated at 6.3% in 2013 and the segment is expected to generate 7.6 million jobs during the same period (Ernst and Young 2013). It stimulates demand in over 250 ancillary industries, such as cement, steel, paint, brick, building materials, consumer durables, etc. With increasing globalization and allowance of foreign direct investment (FDI) in real estate in 2005, the momentum of this sector was through the increasing participation of both domestic and foreign players in India. Investors pumped $675 million into Indian real estate in the first half of 2014, the most since 2009, according to Cushman and Wakefield estimates (Anand, 2014). According to United Nations estimates, India leads in the rate of change of urban population amongst Brazil, Russia, India and China, or the BRIC nations. It is estimated that 843 million people will reside in cities by 2050 in India, which is equal to the combined population of the US, Brazil, Russia, Japan and Germany. The government estimates the housing shortage in urban and rural India will be around 21.7 and 19.7 million units respectively in 2014 and this will open new avenues of growth for the sector. In a move to boost foreign investment in the sector, the new government has paved the way for the market listing of real estate investment trusts, which will help debt-laden developers access cheaper sources of funding. In its maiden annual budget post election, the government plans to develop 100 new cities, putting a new land use policy into place and planning for low-cost housing. Thus, the realty sector is poised to grow at a compound annual growth rate (CAGR) of 19% in the period 2012-2016 according to estimates by the India Brand Equity Foundation (IBEF).

1.3 Gurgaon Growth Story

Gurgaon, popularly known as Millennium City, is one of the four major satellite cities of Delhi and part of the National Capital Region (NCR). The NCR is the second largest urban agglomeration in the world, with a population of 22 million and the largest by area. According to Indian realty sector experts, the NCR is one of most favored real estate destinations in India. Gurgaon is the second largest city in the Indian state of Haryana and its industrial and financial center. It has the third highest per capita income in India after Chandigarh and Mumbai. As of October 2013, half the Fortune 500 companies have opened offices in Gurgaon. The Jones Lang Lasalle (JLL)[1] estimates show that after Delhi, Gurgaon is the strongest of the submarkets in terms of capital value and even though at times of economic stress, i.e., 2008-2009, there was a correction in prices but the price appreciation post the economic downturn in Gurgaon has been the strongest in relation to its peers in this submarket. JLL figures confirm that Gurgaon is the second strongest submarket of the region in terms of rental values and post the

[1] JLL is a financial and professional services firm that specializes in real estate services. The firm offers integrated services delivered by expert teams worldwide to clients who are seeking increased value by owning, occupying or investing in real estate.

correction during the economic crisis in 2008-2009, the rental values have largely remained the same over time. Thus, Gurgaon has probably the strongest and most dynamic fundamentals of all the NCR sub-markets. Each precinct has its own set of specifications, price points and target segments. Furthermore, the sub-market contains the largest private white-collar workforce and, coupled with future prospects of further job creation, demand is expected to remain robust (Jones Lang Lasalle 2013).

1.4 Review of Literature

In a perfect market, prices are assumed to adjust almost immediately, so that the demand for housing equals the existing stock at any point in time. However, theoretical and empirical works have established that the market for owner-occupied housing is often inefficient and adjusts slowly to changes in market conditions (Case and Schiller 1989). Depasquale and Wheaton (1994, 1995) find strong evidence that it takes many years for market changes to be fully incorporated into housing prices. The real estate investment decision is not just ‘‘to buy, or not to buy”. It is as much ‘‘when to sell”. In fact, the two decisions are inherently interdependent, since the timing of the sale, which provides the single largest cash flow, critically affects the expected overall return of the investment (Cheng et al. 2010). The sale of real estate property is an example of the extreme large-ticket marketing situation, a totally unique product within a limited imperfect market situation of relatively sophisticated potential buyers (Kapplin, 1978). Classical finance theories argue that in an efficient market where asset returns over time are assumed to be independent and identically distributed (i.i.d.), the holding period has no effect on the periodic (e.g. annualized) expected return and volatility of an asset. In other words, there is no optimal holding period for financial assets. Although the issue of i.i.d. remains debatable in the finance field, it is clear that the real estate market is not efficient and property returns are thus not i.i.d (Young and Graff 1995, Englund et al. 1999, and Gao et al. (2009)). The non-i.i.d. feature implies that real estate performance is dependent on the holding period.

1.5 Research Gap

A variety of studies on the real estate markets have focused on assessing the important determinants of housing prices in the residential space and analyzing the efficiency of these markets. However, the literature is thin on studying the relationship between completed residential properties (we term these as spot projects) and residential properties that are under construction (we term these as forward projects). Furthermore, the ‘market value’ of invested equity in both markets exhibits an interesting variation that needs to be analyzed in greater detail. The literature on information transmission and price discovery in the spot and forward groups of residential properties is also non existent even in the international work. The literature on real estate returns from the holding period is virtually absent in the Indian context.

2. Objectives and Scope of the Study

In the present study, it is assumed that completed residential projects are those that have received their regulatory certificates for use, which are categorized as the spot market group and residential projects that are under construction which have yet to receive their regulatory certificate, are categorized as the forward market group. The study shall aim to achieve the following specific objectives: 1.to identify the key factors and subfactors and their relative importance for determining the quality of residential projects separately for the spot and forward markets, 2. to study the risk adjusted returns for the spot and forward market groups of residential projects, 3. to study the long run equilibrium relationship between the spot and forward groups (both intra and inter group comparisons) and to come out with a prediction model, 4. to evaluate the relationship between key macroeconomic variables and property prices for both the spot and forward markets and build predictive models for predicting property prices, 5. to study the trends and relationship of the market value of equity at regular quarterly time intervals in the spot and forward markets and analyze the holding period rate of return in these two markets, and 6. to determine the intra market premiums in both the spot and forward groups, which investors are willing to pay across different quality rating classes.

The study was performed in 2 phases. In Phase 1, we identified the key factors and their relative importance in real estate investment selection based on a primary survey which is detailed in Section 3. The survey findings are used to categorize both spot and forward group projects separately into different quality rating classes in these two groups. In Phase 2, we performed an empirical analysis on spot and forward property prices for similar quality classes in the two groups which is discussed in Section 4. The analysis provides us with insights into the return and risk profiles of real estate projects. Finally, in Section 5, we provide a summary and the concluding observations.

3. Fundamental Determinants of Real Estate Residential Value: A Survey

3.1 Data

This phase of the study involves four data sources, the first being secondary and the rest are primary sources of information. The various data sources are: 1. list of spot and forward projects, which was provided by JLL, 2. members of the JLL senior management team and other stakeholders who helped us in identifying the key broad factors for real estate investment selection in both the spot and forward groups. Based on their expertise and experience, they also provided the broad factor weights, 3. ten members of the JLL inhouse team who helped us in ascertaining the perception scores of each developer.

The perception scores were combined with other information to measure the goodwill of the developer, and 4. eighty two responses were obtained for the e-questionnaire constructed under the guidance of the JLL expert team. These respondents are JLL employees, project developers, property brokers and real estate investors selected on a convenience sampling basis. The sample projects included in the study are residential properties in the Gurgaon region of the Delhi NCR. This includes an exhaustive list of 147 projects in the given micro market which had been characterized by JLL as spot and forward projects. The data comprise projects located on the Golf Course Road, Golf Course Extension and Sohna Road which represent the prime and central micro-markets in Gurgaon. The choice of the data period is purely based on the availability of the data series received from JLL[2].

3.2 Methodology

A primary research was conducted to ascertain the importance of various factors and subfactors on which the participants consider while investing in the spot and forward markets respectively. These factors and subfactors were identified after a series of meetings with the response group (JLL subject experts, developers, brokers and others) besides a review of the literature. A short questionnaire (refer to Appendix 1) was floated to the JLL subject experts and senior management to allocate weight to the 5 factors (goodwill of the developer, location and accessibility of the project, amenities and facilities, density of the project and construction quality or project specifications) individually in the spot and forward markets respectively. Thus we arrived at a mean percentage weight of the various factors in the spot and forward groups.

A survey was then conducted to ascertain the relative importance of the subfactors for the four factors (except for goodwill of the developer). A detailed questionnaire (refer to Appendix 2) was prepared by asking the respondents to rank the various subfactors on a scale of 1 to 5 (1 being not important and 5 being very important). The 82 responses that were received were then divided into the spot and forward groups and the responses that fell into both groups were taken into consideration for both cases to find out the relative contribution of each of the sub-factors to its broad factor in the two groups respectively. The weightages for these sub-factors were calculated from the respective contribution of each of the subfactor computed from the survey to the broad factor weights so obtained from the questionnaire floated to the JLL experts for the two groups respectively.

[2] Reliance on JLL was because of their expertise in this sector and the fact that there is no organized data source for real estate in the Indian context. Data have been collected for an exhaustive list of 147 real estate projects in the Gurgaon micromarket from various brokers after obtaining a list of project names from JLL.

A benchmark specification sheet was prepared for all of the subfactors so as to compare the specifications of the individual projects in the two groups with respect to the benchmark specification sheet. This sheet was prepared in a way so that each specification had some point that summed up to a total of 10 points for each subfactor. These projects were then individually ranked[3] on a scale of 1 to 10 on the various subfactors after obtaining the project specification details from their respective brochures, internet, and in- person visits. For ranking the goodwill of the developer factor, the developers were classified in spot and forward groups and an inhouse survey was conducted to ascertain the perception score (out of a scale of 10) of the goodwill of the developer in the two groups. Besides the mean perception score so obtained from the survey, the number of years of operation in the business for the developer, number of square feet built and private equity participation in the developer's books were the other parameters which were then given equal weight to compute the rank for the goodwill of the developer factor for both groups.

Out of the 147 initial set of projects, we compiled a ranking datasheet for 97 projects after removing plots and villas from our list of projects under consideration, dropping those projects which closed down after being launched and finally those for which information was incomplete about these respective sub-factors for maintaining internal consistency. Out of the 97 final projects, 37 were categorized in the spot group and 60 in the forward group. For each project, the subfactor ranks (out of a scale of 1-10) were multiplied with the respective subfactor weights to obtain a final composite score. The composite score for the spot group projects ranged between 5.67 to 8.45 (out of a gross composite score of 10) and those for the forward group ranged from 4.67 to 9.17, thus showing a higher variation in the latter.

3.3 Survey Findings

We received 82 responses for the detailed questionnaire that was floated and the response group was a heterogeneous mix of people with a majority of the respondents (62%) from outside Gurgaon and thus would have an unbiased outlook on the Gurgaon residential micromarket. Furthermore, 39% of the survey respondents were exclusively in the forward market and 26% in the spot market while 35% of the respondents were active investors in both of these markets.

We analyzed the responses by using SPSS software and a Cronbach alpha of 0.816 was found, which indicates acceptable reliability of the questionnaire. The relative importance of each of these factors and its sub-factors was then

[3] For ranking the various subfactors under the factors of location and accessibility, Google maps and the Commonfloor website were used to compute the distances. For ranking the density factor, an average family size of 5 was taken as according to Population Census 2011.

analyzed as shown in Table 1 for both the spot and forward markets respectively.

Table 1 Factor and Subfactor Weights for Developing Quality Rating Classes

		Weightage Spot	Weightage Forward
Goodwill of Developers	**Total (Goodwill of Developers)**	**23.00**	**31.00**
Location and Accessibility	close to airport	2.68	2.75
	close to highway	3.16	3.28
	close to school	3.86	3.79
	close to hospital	3.88	3.90
	close to office	3.76	3.84
	close to metro station	3.70	3.70
	close to bank	3.12	3.10
	close to shopping complex	3.90	3.67
	Total(Location and Accessibility)	**22.00**	**22.00**
Amenities and Facilities	security system: guards, CCTV, alarm,	4.32	4.36
	garden areas and open spaces	4.48	4.51
	central AC	2.84	2.89
	clubhouse and sports facilities	3.84	3.95
	fire safety system	4.26	4.41
	parking: reserved and visitor parking	4.60	4.57
	100% power backup	4.58	4.66
	round the clock availability of water	4.76	4.70
	earthquake resistant	4.36	4.44
	housing complex away from main road	3.54	3.66
	convenience store in complex	4.14	4.03
	electricity cost/power backup cost	4.08	4.10
	other maintenance changes	3.94	3.93
	Total (Amenities & Facilities)	**21.40**	**18.40**
Density	low density of residential complex	3.76	3.82
	less no of residential units per floor	3.70	3.66
	Total (Density)	15.00	11.00
Construction Quality	quality of construction material	4.60	4.69
	quality of plastering of walls	4.50	4.61
	Total (Construction Quality)	**18.60**	**17.60**

The results of the survey show that spot market participants weigh all the five factors more or less similarly in their real estate investment selection with the highest weight given to goodwill of the developer (23%) and lowest weight to density (15%). For forward projects, the goodwill of the developer has the highest weight (31%) and density the lowest (11%) as there are chances of time and cost overruns by the developer. Subsequently, the subfactors were analyzed and it was found that in the location and accessibility factors, the close to shopping complex is most important subfactor followed by close to school for the spot participant and it is the close to office which is relatively more important for the forward market participant. In terms of the amenities and facilities, the clubhouse and facilities, housing complex away from the main road and fire safety system were relatively given more importance in the forward market than the spot market in which convenience store in the complex and round the clock water availability were given more importance. As for the density factor, less number of people per acre was important relatively in the forward market than the spot market where a smaller number of residential units per floor was important. For the construction quality factor, quality of construction material and quality of plastering of walls were more important in the forward market than in the spot market. Since the majority of the participants in the forward projects are speculators, the relative importance of these sub-factors highlight the fact that investors are looking for attributes that contribute to quality premium that is reflected in the final price besides the price appreciation to earn a higher return on their capital employed. The majority of the spot market participants are end users, hence the relative weights of the subfactors indicate the importance of the various attributes that define modern living and end use utility for the participants in this group.

The composite scores so calculated were then used to divide the projects into quality categories in the two groups. A composite score of 7.5 and above in both groups was labeled as Category A (henceforward termed as Sa and Fa properties to indicate equivalent class in the spot and forward groups respectively). Thus, 9 projects in the spot group and 4 projects in the forward group were found eligible. A total of 20 projects in the spot group and 30 projects in the forward group were found eligible in the B category which had a composite score that ranged from 6 to 7.5. Given the large number of projects that fall in this case, we further created Bplus (B+) and Bminus (B-) categories which have a composite score of 6.75 to 7.5 and 6 to 6.75 respectively. Eight projects qualified to be categorized as B+ category in the spot (Sb+) and 12 projects in the forward (Fb+) groups . Similarly, 12 projects qualified to be categorized as B- category in the spot (Sb-) and 18 projects in the forward (Fb-) groups. Finally, 8 projects in the spot (Sc) groups and 26 projects in the forward (Fc) groups qualified as having a composite score less than 6 and hence were clubbed in the C category. These quality classes should highlight the quality perceptions of the real estate participants which should further be reflected in the property prices and returns.

4. Empirical Analysis of Spot and Forward Prices

4.1 Data

The sample used in the analysis is the quarterly price data for the various projects from 24 quarters[4] (Q1 2008 until Q4 2013) in the Gurgaon region of the NCR of Delhi which was received from JLL. We created a quarterly weighted mean price series for all quality classes in both groups by multiplying property prices (per square feet) with the weight which is equal to number of units in each project divided by total number of units of the various projects in the quality class. The projects which were started in any one of the categories in the forward group during the study period and subsequently completed within the analysis period were reclassified as spot projects in the corresponding category. Hence, property prices for such projects were included to estimate the weighted mean price series for forward projects prior to completion and spot projects after completion.

To study the relationship between the macroeconomic variables and property prices, quarterly data points for these variables were extracted from Q1 2008 to Q4 2013 to match with the observation frequency of property prices. Different macroeconomic indicators, like GDP numbers, wholesale price index (WPI) inflation, USD/INR rates and total non food bank credit (NFBC) were obtained from the Reserve Bank of India (RBI) website for the given sample period to study their relationship with the mean prices. To study the relationship of mean prices with stock markets, the NIFTY (equity benchmark index) prices were extracted from the National Stock Exchange (NSE). Lastly, quarterly home loan interest rates (interest) were taken from the State Bank of India (SBI) for the said period. Housing starts data are not available in India as there is no formal agency which compiles the data for the realty sector. The National Housing Board (NHB) has only macro level data for each state of India. Even this macroeconomic data may be misleading, as according to brokers and realty sector experts in India, there is a large time lag between the acquisition of licenses and starting of construction. In addition, implicit yield on 91 day Treasury bills was obtained from the RBI website to be used as risk free proxy R_f.

4.2 Methodology

We begin with converting the quarterly weighted mean price series into log returns for each category in the two groups. This was followed by a study of the statistical properties from an econometric perspective.

[4] The quarterly price data series are obtained from JLL as there is no compilation agency that compiles the data for real estate projects in India.

4.2.1 Risk Adjusted Returns for the Spot and Forward Project Categories

The Sharpe ratio was calculated for each return series for each category in the two groups to determine the relative attractiveness of each market within the risk return framework. The Sharpe ratio is calculated as under:

$$(R_p - R_f) / \sigma \quad (1)$$

where R_p is the return on each category in the spot and forward groups respectively, R_f is the risk free proxy and σ is the standard deviation of the excess returns for the specific category.

4.2.2 Information Transmission and Price Discovery

The natural logarithm of quarterly weighted mean prices is taken to minimize the heteroskedasticity in the data. We first test whether or not the spot and forward weighted mean price series for the respective equivalent category are co-integrated. The concept of co-integration becomes relevant when the time series being analyzed are non stationary. The testing for stationarity of the data was done through the augmented Dickey Fuller (ADF) test.

If two or more series are themselves non-stationary, but their linear combination is stationary, then the series is said to be co-integrated with the existence of a stable long run relationship between the price pairs. In the context of the spot and forward segments in a market, price changes in one market (forward or spot) generates price changes in the other market (spot or forward) with a view to bring a long run equilibrium relation:

$$F_t = \alpha_1 + \beta_1 S_t + \epsilon_{1t} \quad (2)$$

The above can be re-written with residuals, as under:

$$F_t - \alpha_1 - \beta_1 S_t = \hat{e}_{1t} \quad (3)$$

In the above equations, F_t and S_t are forward and spot prices in the respective category at time t. Both α and β are intercept and coefficient terms, where $\hat{e}_t$ is the estimated white noise disturbance term. A Johansen cointegration test was performed to evaluate the long run equilibrium relationship between the spot and forward prices for each quality class. The appropriate lag length for the autoregressive was estimated for each pair of categories through the Schwarz information criteria (SIC), by selecting the lag length which minimized the SIC and where Johansen cointegration was confirmed.

Once it was confirmed that there is at least one long run relationship between the various equivalent categories in both groups, then a vector error correction model (VECM) analysis was undertaken to test the short-run dynamics in order to determine which market leads (dominant) in price discovery and

which follows (satellite). Accordingly, the VECM for change in the forward prices (ΔF_t) and in the spot prices (ΔS_t) can be represented as under:

$$\Delta F_t = \delta_f + \alpha_f \hat{e}_{t-1} + \beta_f \Delta F_{t-1} + \gamma_f \ \Delta S_{t-1} + \epsilon_{ft} \quad (4)$$

and

$$\Delta S_t = \delta_s + \alpha_s \hat{e}_{t-1} + \beta_s \Delta S_{t-1} + \gamma_s \Delta F_{t-1} + \epsilon_{st} \quad (5)$$

where the first part of both equations $\hat{e}_{t-1}$ measures how the current price of the dependent variable adjusts to the deviation of the previous period from the long run equilibrium. The second part of the model represents the short run effect of the change in the prices in the previous period on the deviation of the current price. The remaining part of the equation is the lagged first difference which represents the short run effect of the change in price of the previous period on the deviation of the current period. The coefficients of the equilibrium error, α_f and α_s signify the speed of the adjustment coefficients of the forward and spot prices that claim significant implication in an error correction model. The coefficient acts as evidence of the direction of the causal relation and reveals the speed at which discrepancy from equilibrium is corrected or minimized.

Once the dominance of one market on the other in price discovery has been tested through the VECM analysis, the results were reconfirmed through a Granger causality test, which indicates the direction of the causality.

Finally, prediction models to predict one category from the respective similar category (after identifying the dependent and independent variables) in the two groups respectively were built by using a generalized least squares (GLS) regression. The coefficient covariance estimator is a heteroskedasticity and autocorrelation consistent covariance (HAC) or Newey-West estimator which changes the coefficient standard errors of an equation, but not their point estimates.

4.2.3 Relationship between Macroeconomic Variables and Property Prices

Different macroeconomic variables were selected to study their relationship with the weighted mean prices of various categories in the two groups. The real estate sector has cross sectoral linkages in the economy and a pickup in the real estate sector acts as a lead indicator for the economic activity of the country. Also, the GDP measures the overall strength of the economy and an increase in the GDP augers well for the investment climate in the country which attracts global investors to participate in this growth. Holly et al. (2010) state that changes in housing prices have major implications for output in any country. Thus we hypothesize two-way causality between GDP and property prices. Inglesi-Lotz et al. (2013) state that house prices in South Africa

provide a stable, but quantitatively minor, inflation hedge in the long-run; hence, a one way causality between inflation as measured by changes in the WPI to property prices is hypothesized. Lipscomb et al. (2003) study real estate prices in Mexico, and believe that the increase in real estate prices will lead to an increase in the exchange rate; however, with increases in the exchange rate, real estate prices increase even more so. The relationship is expected to be stronger in the presence of large FDI and NRI investment flows in this sector. Hence, a two way causality between USD/INR and property prices is hypothesized. The easy availability of credit for the housing sector (NFBC) at cheaper rates can push up the housing prices (Himmelberg et al. 2005). Thus, we hypothesize one way causality between NFBC and property prices. Wealth (value of asset) may also influence housing demand. Equity is an important component of wealth and may be positively related to property prices (Chen and Patel 1998) Egert and Mihaljek 2007). The prices of financial assets, namely, stock markets and properties, may have a two way causality relationship as investors hold both equities and real estate as their investment assets. Also, when the supply of equities is high, their returns plummet and investors substitute housing for investment purposes. Alternatively, investors apparently enter into housing market following a crash in the stock market. Thus real estate and stocks act as alternative investment avenues for investors. Also when returns on stocks improve, this gives rise to wealth and that can be utilized in holding housing assets by individuals. Low interest rates (cost of borrowing) may lead to surges in housing prices when complemented with abundant credit availability. Dell'Ariccia et al. (2010) work out a partial equilibrium model in which low interest rates can encourage risk-shifting. Thus, we hypothesize a one way relationship between home loan interest rates and property prices.

The natural logarithm of quarterly weighted mean prices and all the macroeconomic variables were taken. This was done to check if there is a long term relationship between property prices and macroeconomic variables. Johansen cointegration tests were performed for the purpose and VECM analysis was conducted to ascertain lead/lag relationships. In cases where only a macroeconomic variable was leading the weighted mean price series of any category, the prediction models were built by using OLS/GLS regression as was appropriate.

4.2.4 Market Value of Invested Equity in Both Forward and Spot Markets

We have the weighted mean prices series for the respective categories within spot and forward market groups from Q1 2008 to Q4 2013. Now to calculate the market value of equity in the spot market where we assume an 80:20 financing rule wherein the bank finances 80% after the investor has put in his/her 20% to enter the spot market at time t.

Let price of property at time 0 or launch price= $P_{spot\ 0}$
Price of property at time t= $P_{spot\ t}$
Loan to value ratio (LTV)[5] = 80%
Equity invested at time t=0: $X_0 * P_{spot\ 0}$ where $X_0 = (1\text{-LTV}) = 20\%$
Interest rate at t=0 is i% as per observation on Q1 2008 which is then assumed to be fixed throughout.
Market value of equity in spot market at time t ($\sigma_{spot\ t}$):

$$\sigma_{spot\ t} = P_{spot\ 0} * [X_0 + i*\sum^{t}_{t=0}(1- X_0)] + (P_{spot\ t} - P_{spot\ 0}) \quad (6)$$

In Equation 6, the first factor ($P_{spot\ 0}*X_0$) is the upfront down payment (at time t=0) and second factor is invested debt and these two factors are combined to form the overall equity invested factor. The last factor ($P_{spot\ t}$ - $P_{spot\ 0}$) is the market premium.

Hence, the market value of equity in the market is having an option like feature and can be looked as in the following circumstances:

If $P_{spot\ t} > P_{spot\ 0}$, value of invested equity is positive; in the money
$P_{spot\ t} = P_{spot\ 0}$, value of invested equity is at par; at the money
$P_{spot\ t} < P_{spot\ 0}$, value of invested equity is negative; out of the money

To calculate the market value of equity in the forward market, we assume[5] that the project will be completed in 5 years (20 quarters) and a construction linked payment plan[5] (that is prevalent in the micromarket) wherein we pay 10% of the launch price as down payment and 5% of the launch price respectively in the first 2 quarters before we get the bank to finance the remaining amount in a fixed manner, thus spanning 18 quarters. Thus every quarter, the bank pays the developer, and we service the interest for this disbursal amount at the interest rate prevailing in the quarter of its first disbursal (the interest rate is then subsequently assumed to be fixed). Thus, our interest service payout amount linearly increases with every quarter as the bank continues to disburse a fixed amount to the developer in its construction linked payment plan. Now to calculate the equity required to participate in the forward market:

Let price of property at time 0 or launch price= $P_{fwd\ 0}$
Price of property at time t= $P_{fwd\ t}$
Equity invested at time t=0: $X_{fwd\ 0} * P_{fwd\ 0}$ where $X_{fwd\ 0} = 10\%$
Equity invested at time t=1: $X_{fwd\ 1} * P_{fwd\ 0}$ where $X_{fwd\ 1} = 5\%$
Equity invested at time t=2: $X_{fwd\ 2} * P_{fwd\ 0}$ where $X_{fwd\ 2} = 5\%$
Interest rate at t=3 is i_3 which is then assumed to be fixed throughout
Market value of equity in the forward market at time t ($\sigma_{fwd\ t}$):

$$\sigma_{fwd\ t} = P_{fwd\ 0} * \sum^{2}_{t=0} X_{fwd\ t} + P_{fwd\ 0} * i_3 * \sum^{t}_{t=3} X_{fwd\ t} + (P_{fwd\ t} - P_{fwd\ 0}) \quad (7)$$

[5] Assumptions were provided by JLL experts based on their expertise and experience with the Gurgaon residential micromarkets.

In Equation 7, the first factor ($P_{fwd\,0} * \sum^{2}_{t=0} X_{fwd\,t}$) is the upfront down payment (at time t=0, 1, 2) and second factor is invested debt (from time t=3) and these two factors are combined to form the overall equity invested factor. $X_{fwd\,t}$ from time t=3 is the fixed payment to be made to the developer in the construction linked payment plan. The last factor ($P_{fwd\,t} - P_{fwd\,0}$) is the market premium.

Hence, the market value of equity in the market is having an option, like feature, and can be looked as in the following circumstances:

If $P_{fwd\,t} > P_{fwd\,0}$, Value of invested equity is positive; in the money
$P_{fwd\,t} = P_{fwd\,0}$, Value of invested equity is at par; at the money
$P_{fwd\,t} < P_{fwd\,0}$, Value of invested equity is negative; out of the money

The market value of equity in each of the categories in the spot and forward groups are hence computed by taking Q1 2008 as the launch quarter.

4.2.5 Analyzing the Quality Premium in Spot and Forward Categories

Quality premium has been defined as the premium in terms of price that the market participants are willing to pay for the incremental quality features perceived to be achieved while moving habitat from a lower to higher category (as is measured by the composite scores computed above in the primary survey) in the two groups respectively. Hence, it studies the trends of how the premium levels have moved over quarters which imply the relative attractiveness of the category habitat that the participants are willing to switch onto in the two groups.

4.2.6 Return on Investment Analysis

The internal rate of return for the various categories within the two groups are calculated to study the trends over time. Since the schedule of cashflows is not periodic, we work with the XIRR [6]. All assumptions [7] for the XIRR computation was given by JLL experts based on their experience in the Gurgaon residential micromarkets. For computing the pre tax XIRRs for the various categories in the two groups, the capital values are taken as the quarterly mean weighted price series that we had computed for each quarter. These are the per square feet rates and hence are taken as the buying/ selling prices. For computation of spot pre tax XIRRs in any category, the gross rental value is taken as 2% of the capital value (this is in line with the market norms) for the year at the prevailing quarter of entry. It is further assumed that 30% of this gross rent is paid towards common area maintenance and other miscellaneous maintenance charges and hence net rent so obtained is then

[6] The XIRR function in MS Excel returns a rate of return for a schedule of cash flows that is not necessarily periodic.
[7] This includes no transaction/ brokerage costs. Estimated vacancy and collection loss rate are ignored and so is the depreciation.

projected to increase at 2.5% every quarter. The 80:20 bank financing (with 80% as debt and 20% as equity) is assumed and thus an outright 20% down payment of the prevailing price at the entry quarter is paid and the remaining is financed by debt. The debt is raised at an interest rate which is prevailing at the entry quarter which is then assumed to be fixed throughout the loan life. The maturity of the loan is assumed to be 20 years, interest for which is serviced quarterly. Pre-tax XIRR is then computed for any given holding period depending on the quarter of the entry and exit. For the computation of pre tax XIRR in forward projects in any category, a completion time of 5 years (20 quarters) is assumed and debt is factored in after 2 quarters from the entry quarter. At time of buying a forward project, an outright 10% down payment of the prevailing price at the entry quarter needs to be paid and further to which 5% of the prevailing price at the entry quarter needs to be paid in the two quarters further to which debt is taken. A construction linked plan is assumed wherein the developer asks the bank to pay a fixed amount every quarter and the bank pays the needful and demands an interest for the same from the forward market participant. Hence, after paying 20% of the price in the first 2 quarters, the remaining amount is paid over the 18 quarters (as completion time is 20 quarters) at the prevailing interest rate when we take the debt which is then subsequently assumed to be fixed throughout the loan life. The pre tax XIRR is thus computed and then analyzed over time and across various holding periods for the respective categories in the two groups.

4.3 Empirical Results

4.3.1 Return Risk Characteristics and Sharpe Ratio

We begin the empirical analysis by finding the descriptive statistics of the quarterly returns for various categories in the spot and forward groups respectively as shown in Table 2.

Within the spot group, Sb+ has the highest quarterly mean returns of 4.33% with standard deviation, as a measure of volatility, being 5.75%. Sc has the lowest mean quarterly returns of 3.23% with a standard deviation of 5.19%. For all the price series in this group, the returns show evidence of fat tails, since the kurtosis exceeds three, which is the normal value, thus implying a leptokurtic distribution; these returns also show evidence of negative skewness, which means that the negative tail is particularly extreme except for Sb+ which shows positive skewness. The null hypothesis of the normal distribution under the Jarque Bera test is rejected for categories Sb- and Sc while accepted for Sa and Sb+, and thus these latter two series are identically distributed. Next, the Ljung Box (LB) test at the significance level indicates a p-value for the Q-statistic (for the 12^{th} lag) of more than 0.05 for all of the spot series. Thus, the null hypothesis of no autocorrelation is accepted. Therefore, past values of the innovations do not affect current values in all of the four categories, which implies that the series are independently distributed and hence exhibit weak form efficiency.

Table 2 Descriptive Statistics of Return Series

	Sa	Sb+	Sb-	Sc	Fa	Fb+	Fb-	Fc
Mean	0.0397	0.0433	0.0357	0.0323	0.0340	0.0242	0.0312	0.0303
Median	0.0325	0.0266	0.0476	0.0362	0.0220	0.0117	0.0233	0.0284
Maximum	0.1859	0.1596	0.0952	0.1102	0.2576	0.1353	0.1460	0.1019
Minimum	-0.1878	-0.1042	-0.1088	-0.1355	-0.1048	-0.0398	-0.1133	-0.0456
Std. Dev.	0.0844	0.0575	0.0479	0.0519	0.0673	0.0406	0.0591	0.0370
Skewness	-0.3609	0.0406	-1.2263	-1.3527	1.4613	0.6861	0.0031	-0.1736
Kurtosis	3.8355	3.8977	4.8524	5.9225	7.0862	3.5195	3.5966	2.3229
Jarque-Bera	1.1682 (.557)	0.7785 (.677)	9.0529 (.011)*	15.1989 (.000)*	24.1866 (.000)*	2.0630 (.356)	0.3411 (.843)	0.5548 (.758)
Ljung Box (Q statistic)	18.1280 (.112)	9.342 (.673)	16.089 (.187)	17.261 (.140)	6.749 (.874)	10.812 (.545)	12.182 (.431)	30.427 (.002)*
Sharpe Ratio	0.2588	0.4433	0.3733	0.2785	0.2395	0.1555	0.226	0.3348
Observations	23	23	23	23	23	23	23	23

Note: Fig. in ( ) indicate p-values;

* denotes significance at 5% level. Ljung Box statistics are reported up to 12 lags.

Within the forward group, Fa has the highest quarterly mean returns of 3.40% with a standard deviation of 6.73% while Fb+ has lowest mean returns in this group of 2.42% with a standard deviation of 4.06%. For all of the series except Fc, the returns show evidence of fat tails, since the kurtosis exceeds three, which is the normal value, thus implying a leptokurtic distribution; these returns also show evidence of positive skewness, which means that the positive tail is particularly extreme, except for Fc, which shows negative skewness. The null hypothesis of the normal distribution under the Jarque Bera test is rejected for all of the groups except for Fa. Next, the LB test at the significance level indicates a p-value for the Q-statistic (for the 12^{th} lag) of more than 0.05 for all of the series except for Fc. Thus, the null hypothesis of no autocorrelation is accepted for all of the series except for Fc. As for the Sharpe ratio results from Table 2, the B+ category provides the highest risk adjusted returns in the spot group, while Fc does best within the forward group. Surprisingly, Fb+ is the worst performer in its group. It seems that price movements in the B+ category is subdued in the forward market and gets an uplift when the projects in this category are completed. Thus, we can infer that in the spot market, the high quality project category (Sb+) as is depicted by the composite score is better performing, and in the forward market, it is the lowest quality project category (Fc) which is the best performing in the quarterly risk adjusted returns basis.

4.3.2 Information Transmission and Price Discovery

Before testing for the existence of co-integration, as the first step, the ADF test was performed for all of the log price series in the two groups to check for stationarity. The results are provided in Table 3.

The null hypothesis of the existence of a unit root (i.e., non-stationary) is accepted at the significance level for all of the log series except for Sc, thus implying that the level series is stationary. However, the null hypothesis is rejected at the first difference for all of the remaining series except for Sb- and Fc, thus implying that the return series are stationary and integrated to order 1. Sb- and Fc are, however, stationary at the second difference.

The results in Table 4 show that there exists at least one co-integrating vector which confirms a long run equilibrium relationship between the two series under study in the spot and forward groups respectively. Thus the matching spot and forward market categories share common long-run information and there is a price discovery process. This also implies that there is informational efficiency across the spot and forward markets. The VECM analysis has been performed for all of the respective categories in the two groups with the lags as indicated by the SIC and the results are reported in Table 5.

The findings show that in the VECM model, error correction coefficients are significant. Furthermore, the absolute value of the coefficients for the categories in the forward group are higher than those for the spot group,

which implies that in the event of deviation from equilibrium in the short run, it is the forward market that makes greater adjustment than the spot market in order to restore the equilibrium. In other words, the spot markets lead the price discovery process in all of the categories. To confirm the above relationships, particularly the direction of causality, the Granger causality test was performed and the results are given in Table 6**.**

Table 3 Results of Augmented Dickey Fuller Test (Test of Stationarity)

	Level t- statistics (p-value)	First Difference t- statistics (p-value)	Second Difference t- statistics (p-value)	Inference on integration
Sa	-1.90 (.621)	-5.05 (.005)*	-	1
Sb+	-1.32 (.857)	-3.58 (.059)**	-	1
Sb-	-1.89 (.627)	-2.68 (.254)	-5.26 (.002)*	2
Sc	-4.61 (.007)*	-	-	0
Fa	-3.20 (.110)	-3.97 (.028)*	-	1
Fb+	-1.82 (.664)	-3.83 (.034)*	-	1
Fb-	-1.52 (.785)	-3.90 (.033)*	-	1
Fc	-3.35 (.0857)	-1.54 (.782)	-4.35 (.017)*	2

Note: Figures in brackets indicate the p-values;
* denotes significance at 5% level. ** denotes significance at 10% level

The Granger causality test strengthens the VECM results in that the spot market is leading the forward market. Even though Category A projects show weak unidirectional causality with the given number of observations, but at the 20% level of significance, we can infer that the spot market is causing the forward market.

Thus one can conclude that the spot market leads the price discovery process in any event of disequilibrium in the short run. The explanation of this lies in the fact that depressed investor sentiments, overall tepid investment and macroeconomic environment have reduced the risk appetite of the investor in the forward market thus dampening its demand. The absorption volume in Gurgaon declined to a 19-quarter low of 2,414 units in Q4 2013 (JLL 2013). When returns in other asset classes are low, real estate investment is predominantly for end use perspectives and not for speculative ones. The stressed balance sheet of the developers due to high interest rates and increasing costs also affects the timely completion of forward projects at this

time. Also, average capital values in Gurgaon rose at a tepid pace, symptomatic of the slowing demand levels and thus keeping investors at bay (JLL 2013). B category projects are mid sized homogenous groups which lie between the best in Classes A and C category projects, hence they able to attract home buyers. The best is in Class A category projects, even though they show weak unidirectional causality from the spot market to the forward market as these are big ticket investments in which one pays a quality premium, which is somewhat derived from the specifications on offers in the spot market projects, which attracts the home buyers in the forward category. The C category projects in both the spot and forward markets are the new "affordable housing homes" that attract both the buyers and investors in the ever growing large private white collared workforce, who at times of economic stress, become a "home buyer" than a "value buyer" and thus spot prices influences the forward prices in this group.

Relationship between Forward and Spot Prices: A Forecast Model

Since the spot prices lead the forward prices for all of the categories, the information can be used to develop models for predicting forward prices by using the optimal lag value as indicated by the SIC. The independent variable is the lagged log prices of the spot category for the corresponding log prices of the forward category which is the dependent variables. These predictive models are shown in Table 7.

Our models exhibit strong predictive power as the corrected R^2 is greater than 80% in all cases. As we move down the quality categories, the coefficient of elasticity continues to increase with the exception of B+, thus signifying that the quantum of relative change in prices in the forward category is more than 100% with corresponding relative changes in prices in the spot category.

4.3.3 Relationship between Macroeconomic Variables and Property Prices

Analysis of Category A projects

The long term association of the prices of A category properties with the macroeconomic variables is shown in Table 8.

A long run equilibrium is confirmed between Sa and gdp, nfbc and nifty, and also between Fa and inflation, gdp and usdinr. Subsequently, we checked for the short term lead/lag relationship at the same lag as was used in the cointegration test for these pairs. We built the forecast model from the macroeconomic variable only after confirming that it is the leading variable against the weighted price category series. The results of the prediction model for the A category project prices from the macroeconomic variables showed that for both the spot and forward groups, the lagged values of gdp give a high R^2. A multiple regression model for both the spot and forward categories was not found suitable because of high multicollinearity between the macroeconomic variables and similar results were obtained for all of the other categories which are subsequently discussed.

Table 4 Results of Johansen Cointegration Test

	Sa and Fa		Sb+ and Fb+		Sb- and Fb-		Sc and Fc	
Test Statistic	**r=0**	**r=1**	**r=0**	**r=1**	**r=0**	**r=1**	**r=0**	**r=1**
Max Eigen Value	31.95	1.08	13.56	.786	15.48	.18	18.81	.10
	(.000)*	(.299)	(.064)**	(.375)	(.032)*	(.664)	(.009)*	(.750)
Trace Statistic	33.03	1.08	14.34	.786	15.67	.188	18.91	.10
	(.000)*	(.299)	(.074)**	(.375)	(.047)*	(.664)	(.015)*	(.749)
Lag length#	5	5	2	2	1	1	5	5

Note: r – cointegration rank of the model; figures in brackets indicate the p-values;
* denotes significance at 5% level; ** denotes significance at 10% level;
# - Based on minimum values of the Schwarz information criteria

Table 5 VECM Results

	Sa	**Fa**	**Sb+**	**Fb+**	**Sb-**	**Fb-**	**Sc**	**Fc**
Error Correction	-0.540	0.773	0.103	0.246	-0.383	0.686	0.235	0.666
Coefficient	(.343)	(.144)	(0.138)	(0.073)	(0.210)	(0.202)	(.305)	(.212)
	[-1.575]	[5.377]*	[0.750]	[3.392]*	[-1.825]	[3.399]*	[0.771]	[3.141]*
Lead/Lag	Leading	Lagging	Leading	Lagging	Leading	Lagging	Leading	Lagging
Lag length#	5	5	2	2	1	1	5	5

Note: Standard Error ( ); T statistic [ ]; * denotes significance at 5% level;
- Based on minimum values of the Schwarz information criteria

Table 6 Results of Granger Causality Test

Null Hypothesis	F statistic	P value
Sa does not Granger cause Fa	2.130	0.163
Fa does not Granger cause Sa	0.427	0.818
Sb+ does not Granger cause Fb+	7.573	0.004*
Fb+ does not Granger cause Sb+	1.766	0.201
Sb- does not Granger cause Fb-	23.714	0.000*
Fb- does not Granger cause Sb-	0.376	0.547
Sc does not Granger cause Fc	3.334	0.064**
Fc does not Granger cause Sc	1.1684	0.401

Note: * denotes significance at 5% level; ** denotes significance at 10% level;
- Based on minimum values of the Schwarz information criteria

Table 7 Forecast Model to Predict Forward Prices from Spot Prices

Dependent Variable	Independent Variable	Intercept	Slope	R-square
		3.111*	0.662*	
#Fa	Sa(-5)	[3.882]	[7.456]	0.83
		3.634*	0.590*	
#Fb+	Sb+ (-2)	[8.278]	[11.95]	0.91
		1.213*	0.856*	
Fb-	Sb-(-1)	[4.807]	[29.36]	0.98
		-0.196	1.023*	
#Fc	Sc(-5)	[-0.133]	[6.059]	0.81

Note: T statistic [ ]; # denotes Newey West estimation of least squares
* denotes significance at 5% level

Analysis of Category B+ projects

The long term relationship between the prices of B+ category properties with the macroeconomic variables is shown in Table 9.

This test shows that there is a long run equilibrium between Sb+ and gdp, and nifty, and between Fb+ and gdp, and nfbc. Subsequently, we checked for the short term lead/lag relationship at the same lag as was used in the cointegration test for these pairs. The error correction term of gdp is slightly greater than Sb+ and hence, the macroeconomic variable is the lagging variable. So we built the forecast model only for the forward category with requisite lagged values of gdp and nfbc. Thus for the forward category, the lagged values of gdp and nfbc give a high R^2 and the coefficient of elasticity is high in the case of the gdp as an independent variable as opposed to the nfbc.

Table 8 Relationship between Category A Prices and Macroeconomic Variables

Panel A: Cointegration Test				
	Test Statistic	**Trace Statistic**	**P value**	**Lag length#**
Sa + inflation	r=0	13	0.115	1
Sa +gdp	r=0	21.48	0.005*	4
Sa + interest	r=0	8.924	0.372	1
Sa + nfbc	r=0	14.947	0.060**	1
Sa + nifty	r=0	16.267	0.038*	1
Sa + usdinr	r=0	3.044	0.964	1
Fa + inflation	r=0	19.356	0.012*	1
Fa +gdp	r=0	34.41	0.000*	4
Fa + interest	r=0	8.67	0.396	1
Fa + nfbc	r=0	8.117	0.453	1
Fa + nifty	r=0	13.154	0.109	1
Fa + usdinr	r=0	33.639	0.000*	4
Panel B: VECM Test				
	Error Correction Term	**T stat**	**Lead/Lag**	**Lag length#**
Sa	-1.612*	[-2.24]	Lagging	4
gdp	0.097	[.309]	Leading	4
Sa	-0.493*	[-3.09]	Lagging	1
nfbc	0.156*	[3.24]	Leading	1
Sa	-0.003	[-0.044]	Leading	1
nifty	0.321*	[3.97]	Lagging	1
Fa	-0.174	[-1.638]	Leading	1
inflation	0.7812	[1.695]	Lagging	1
Fa	-1.684*	[-4.73]	Lagging	4
gdp	0.229	[0.847]	Leading	4
Fa	0.512*	[2.38]	Lagging	4
usdinr	0.454*	[3.06]	Leading	4
Panel C: Forecast Model				
Dependent Variable	**Independent Variable**	**Intercept**	**Slope**	**R-square**
^Sa	gdp(-4)	-8.631* [-2.773]	1.246* [5.816]	0.816
^Sa	nfbc(-1)	-7.997* [-5.052]	1.146* [11.03]	0.886
^Fa	gdp(-4)	-4.394* [-2.744]	0.939* [8.333]	0.862
^Fa	usdinr(-4)	3.741 [1.650]	1.385* [2.358]	0.275

Note: r – cointegration rank of the model; [ ] denotes T statistic
* denotes significance at 5% level; ** denotes significance at 10% level;
# Based on minimum values of the Schwarz information criteria
^ denotes Newey West estimation of least squares

Analysis of Category B- projects

The long term relationship between the prices of B- category properties with the macroeconomic variables is shown in Table 10.

Table 9 Relationship between Category B+ Prices and Macroeconomic Variables

Panel A: Cointegration Test				
	Test Statistic	**Trace Statistic**	**P value**	**Lag length#**
Sbplus + inflation	r=0	11.864	0.164	2
Sbplus +gdp	r=0	15.711	0.046*	1
Sbplus + interest	r=0	8.636	0.4	1
Sbplus + nfbc	r=0	11.403	0.188	1
Sbplus + nifty	r=0	17.89	0.021*	1
Sbplus + usdinr	r=0	4.551	0.854	1
Fbplus + inflation	r=0	5.289	0.777	1
Fbplus +gdp	r=0	34.379	0.000*	3
Fbplus + interest	r=0	7.518	0.518	1
Fbplus + nfbc	r=0	28.156	0.000*	4
Fbplus + nifty	r=0	13.243	0.106	1
Fbplus + usdinr	r=0	11.872	0.163	1

Panel B: VECM Test				
	Error Correction Term	**T stat**	**Lead/Lag**	**Lag length#**
Sb+	-0.367	[-1.984]	Leading	1
gdp	0.402*	[2.510]	Lagging	1
Sb+	-0.017	[-0.329]	Leading	1
nifty	0.324*	[3.259]	Lagging	1
Fb+	-0.415*	[-4.059]	Lagging	3
gdp	-0.397*	[-3.307]	Leading	3
Fb+	-0.866*	[-5.355]	Lagging	3
nfbc	-0.191	[-0.977]	Leading	3

Panel C: Forecast Model				
Dependent Variable	**Independent Variable**	**Intercept**	**Slope**	**R-square**
Fb+	lngdp(-3)	-4.483* [-4.504]	0.932* [13.462]	0.905
^Fb+	lnnfbc(-3)	-3.777* [-2.743]	0.848* [9.302]	0.924

Note: r – cointegration rank of the model; [ ] denotes T statistic
* denotes significance at 5% level; ** denotes significance at 10% level;
# Based on minimum values of the Schwarz information criteria
^ denotes Newey West estimation of least squares

Table 10 Relationship between Category B- Prices and Macroeconomic Variables

Panel A: Cointegration Test				
	Test Statistic	**Trace Statistic**	**P value**	**Lag length#**
Sbminus + inflation	r=0	8.641	0.399	2
Sbminus + gdp	r=0	19.23	0.013*	1
Sbminus + interest	r=0	17.208	0.027*	2
Sbminus + nfbc	r=0	19.172	0.013*	1
Sbminus + nifty	r=0	26.676	0.000*	1
Sbminus + usdinr	r=0	12.325	0.142	2
Fbminus + inflation	r=0	15.877	0.043*	2
Fbminus + gdp	r=0	30.571	0.000*	5
Fbminus + interest	r=0	11.41	0.188	1
Fbminus + nfbc	r=0	18.008	0.020*	4
Fbminus + nifty	r=0	16.262	0.038*	1
Fbminus + usdinr	r=0	4.656	0.844	1

Panel B: VECM Test				
	Error Correction Term	**T stat**	**Lead/Lag**	**Lag length#**
Sb-	-0.39	[-3.92]*	Lagging	1
gdp	0.28	[1.895]	Leading	1
Sb-	0.03	[1.963]	Leading	2
interest	0.042*	[4.11]*	Lagging	2
Sb-	-0.41	[-4.67]*	Lagging	1
nfbc	0.11	[1.384]	Leading	1
Sb-	-0.07	[-1.400]	Leading	1
nifty	0.286*	[2.16]*	Lagging	1
Fb-	-0.14	[-1.477]	Leading	2
inflation	0.88	[1.551]	Lagging	2
Fb-	-0.07	[-1.700]	Leading	5
gdp	-0.14	[-3.10]*	Lagging	5
Fb-	-0.91	[-2.88]*	Lagging	4
nfbc	0.39	[2.00]*	Leading	4
Fb-	-0.16	[-3.65]*	Leading	1
nifty	0.26	[2.89]*	Lagging	1

Panel C: Forecast Model				
Dependent Variable	**Independent Variable**	**Intercept**	**Slope**	**R-square**
^Sb-	gdp(-1)	-9.427* [-7.179]	1.257* [13.958]	0.945
^Sb-	nfbc(-1)	-7.654* [-5.001]	1.089* [10.827]	0.935
^Fb-	nfbc(-4)	-6.111* [-4.457]	0.989* [10.894]	0.916

Note: r – cointegration rank of the model; [ ] denotes T statistic
* denotes significance at 5% level; ** denotes significance at 10% level;
# Based on minimum values of the Schwarz information criteria
^ denotes Newey West estimation of least squares

The results show that there is a long run equilibrium between Sb- and gdp, interest, nifty and nfbc. Also, a long term association exists between Fb- and inflation, gdp, nfbc and nifty. Subsequently, we checked for the short term lead/lag relationship at the same lag as was used in the cointegration test for these pairs. The VECM results show that the gdp and nfbc series at their respective lags were found to be leading variables with respect to Sb- while nfbc was found to be a leading variable with respect to Fb- and hence, a predictive model for these pairs was built. The independent variables explain more than 90% of the variation in the dependent variable. The coefficient of elasticity is more than 1 for the spot group, thus showing that the quantum of relative change in prices in Sb- is more than 100% with corresponding relative changes in prices in the two macroeconomic variables (for both gdp and nfbc at their respective lags).

Analysis of Category C projects

The long term relationship between prices of C category properties with the macroeconomic variables is shown in Table 11.

The results show that there is a long run equilibrium between Sc and gdp, nifty and nfbc. Also, a long term association exists between Fc and gdp, interest and nfbc. Subsequently, we checked for the short term lead/lag relationship at the same lag as was used in the cointegration test for these pairs. The VECM results show that the gdp and nfbc series at their respective lags were found to be leading variables with respect to Sc while the gdp and nfbc series were found to be leading variables with respect to Fc and hence, a predictive model for these pairs was built. It can be seen that the independent variables explain for more than 90% of the variation in the dependent variable. The coefficient of elasticity is more than 1 for both groups, thus showing that the quantum of relative change in the prices in Sc and Fc is more than 100% with corresponding relative changes in prices in the two macroeconomic variables (for both gdp and nfbc at their respective lags).

Analysis of Average Spot and Forward Projects

The average of the weighted mean prices of all the categories was taken in both groups in their respective quarters to analyze the overall relationship with the macroeconomic variables as shown in Table 12.

The results show a long term relationship between the average spot project and gdp, nfbc and between the average forward project and inflation, gdp, interest, nfbc, nifty. Subsequently, we checked for the short term lead/lag relationship at the same lag as was used in the cointegration test for these pairs of spot/forward projects and macroeconomic variables. The VECM results show that gdp and nfbc are the leading variables with respect to both the average spot and forward projects, and thus, a predictive model is built for the same.

Table 11 Relationship between Category C Prices and Macroeconomic Variables

Panel A: Cointegration Test				
	Test Statistic	**Trace Statistic**	**P value**	**Lag length#**
Sc + inflation	r=0	8.029	0.462	1
Sc +gdp	r=0	25.066	0.001*	1
Sc + interest	r=0	11.292	0.192	1
Sc + nfbc	r=0	16.608	0.034*	1
Sc + nifty	r=0	16.155	0.039*	1
Sc + usdinr	r=0	8.282	0.436	1
Fc + inflation	r=0	6.361	0.653	2
Fc +gdp	r=0	17.235	0.027*	2
Fc + interest	r=0	14.024	0.082**	2
Fc + nfbc	r=0	14.694	0.065**	2
Fc + nifty	r=0	9.696	0.305	2
Fc + usdinr	r=0	12.246	0.145	2

Panel B: VECM Test				
	Error Correction Term	**T stat**	**Lead/Lag**	**Lag length#**
Sc	-0.39*	[-4.24]	Lagging	1
gdp	0.159	[1.102]	Leading	1
Sc	-0.365*	[-3.75]	Lagging	1
nfbc	0.087	[1.225]	Leading	1
Sc	-0.064	[-1.568]	Leading	3
nifty	0.278*	[2.41]	Lagging	3
Fc	-0.277*	[-3.51]	Lagging	2
gdp	-0.102	[-0.733]	Leading	2

Panel B: VECM Test				
	Error Correction Term	**T stat**	**Lead/Lag**	**Lag length#**
Fc	0.008	[0.880]	Leading	2
interest	0.031*	[3.55]	Lagging	2
Fc	-0.252	[-3.04]	Lagging	2
nfbc	0.078	[0.802]	Leading	2

Panel C: Forecast Model				
Dependent Variable	**Independent Variable**	**Intercept**	**Slope**	**R-square**
^Sc	gdp(-1)	-8.460* [-5.231]	1.185* [10.673]	0.926
^Sc	nfbc(-1)	-6.752* [-3.852]	1.024* [8.884]	0.912
^Fc	gdp(-2)	-7.924* [-5.707]	1.138* [11.868]	0.926
^Fc	nfbc(-2)	-6.604* [-4.240]	1.005* [9.759]	0.926

Note: r – cointegration rank of the model; [ ] denotes T statistic
* denotes significance at 5% level; ** denotes significance at 10% level;
# Based on minimum values of the Schwarz information criteria
^ denotes Newey West estimation of least squares

Table 12 Relationship between Spot/Forward Prices and Macroeconomic Variables

Panel A: Cointegration Test				
	Test Statistic	**Trace Statistic**	**P value**	**Lag length#**
spot + inflation	r=0	11.305	0.193	1
spot + gdp	r=0	19.621	.0113*	1
spot + interest	r=0	8.69	0.395	1
spot + nfbc	r=0	17.968	0.021*	2
spot + nifty	r=0	13.23	0.107	1
spot + usdinr	r=0	3.872	0.914	1
fwd + inflation	r=0	13.893	0.086**	1
fwd +gdp	r=0	37.141	0.000*	4
fwd + interest	r=0	15.739	0.046*	4
fwd + nfbc	r=0	31.646	.000*	4
fwd + nifty	r=0	19.615	.011*	2
fwd + usdinr	r=0	6.882	0.591	1

Panel B: VECM Test				
	Error Correction Term	**T stat**	**Lead/Lag**	**Lag length#**
spot	-0.469*	[-3.137]	Lagging	1
gdp	0.344*	[2.099]	Leading	1
spot	-0.664*	[-3.731]	Lagging	2
nfbc	0.251*	[2.395]	Leading	2
fwd	0.009	[0.177]	Leading	1
inflation	1.039*	[2.300]	Lagging	1
fwd	-1.262*	[-5.15]	Lagging	4
gdp	-0.449	[-1.099]	Leading	4
fwd	0.009	[0.314]	Leading	4
interest	0.064*	[3.287]	Lagging	4
fwd	-0.782*	[-3.99]	Lagging	4
nfbc	0.239	[1.498]	Leading	4
fwd	-0.092*	[-3.59]	Leading	2
nifty	0.203*	[2.16]	Lagging	2

Panel C: Forecast Model				
Dependent Variable	**Independent Variable**	**Intercept**	**Slope**	**R-square**
spot	gdp(-1)	-10.158* [-8.630]	1.323* [16.406]	0.945
spot	nfbc(-2)	-8.616* [-5.851]	1.1709* [12.072]	0.931
fwd	gdp(-4)	-6.238* [-9.666]	1.049* [23.406]	0.955
fwd	nfbc(-4)	-5.261* [0.943]	0.943* [16.455]	0.967

Note: r – cointegration rank of the model; [ ] denotes T statistic
* denotes significance at 5% level; ** denotes significance at 10% level;
# Based on minimum values of the Schwarz information criteria
^ denotes Newey West estimation of least squares

As shown from the table, the independent variables explain for more than 90% of the variation in the dependent variable. The coefficient of elasticity is more than 1 for both groups, thus showing the quantum of relative change in the prices in the average spot/forward projects is more than 100% with corresponding relative changes in prices in the two macroeconomic variables (for both gdp and nfbc at their respective lags). The lags are smaller for spot projects and higher for forward projects in the macroeconomic variables used in the prediction model.

The results show that given our short data frequency, the interest rate, inflation and exchange rates have no significant long run equilibrium relationship with the property prices. However, since the gdp and nfbc macroeconomic variables cause higher lags of the property prices (refer to Tables 8, 9, 10, and 11) thus implying the effect is a lagged effect on property prices (at higher lags) and hence must have subsumed the effects of inflation, interest rate and exchange rates. Under the interest rate channel of monetary policy transmission, changes in monetary policy are eventually reflected in real long term interest rates which influence the aggregate demand by altering business investment and consumption decisions, thus leading to increases in the nfbc. This in turn, gets reflected in aggregate output and prices. Empirical studies concur that inflation impacts growth by reducing investment and thereby reducing the rate of productivity growth. A high economic growth is accompanied by high investment rate and high export growth as well, thereby increasing the current account surplus and leading to appreciation of currency.

Although there is a long run equilibrium between real estate prices and the stock market, the information transmission process seems to be moving from the realty sector to stock markets across the categories in the two groups and thus rejecting our hypothesis. Gdp and nfbc are the two macroeconomic indicators which are leading or coincident on the property prices across the categories in the two groups. They explain a higher variation of the property prices as is seen from the R^2, but both have high correlations. Also, the elasticity coefficient in general in the prediction model is high as we go down the quality classes in the two groups and also the lags indicated are lower. Thus for the lower quality classes, 100% relative change in the independent macroeconomic variable causes a relatively larger change (more than 100%) in the prices of the spot and forward categories and that too in a short period of time as is shown by the lower lag length.

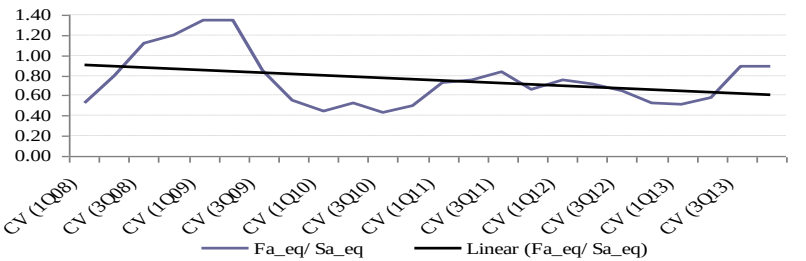
4.3.4 Relationship between Mean Prices and Market Value of Equity

Equity required to participate or market value of equity in all of the categories respectively in both the spot and forward markets is given by Equations 6 and 7 as explained before, and takes Q1 2008 as the launch quarter.

Analysis of A category Projects

Figure 1 shows the ratio of the forward to the spot equity (Sa_eq and Fa_eq), which initially peaked until Q2 2009 as the equity required to participate in the forward market was higher than that in the spot market. Subsequently, it declined and this decline coincided with the beginning of the recession of 2008-2009 and also the premium in the spot group increased at a steady pace thereafter. There was again a dip in the ratio in Q1 2013 as some projects were completed in the forward market to enter the spot market, but the ratio recovered as the two high ends were launched in this category. The trendline shows that the ratio is declining over the quarters and hence spot equity participation has been increasing over equity participation in the forward market as the market was dominated by "end users" rather than "investors".

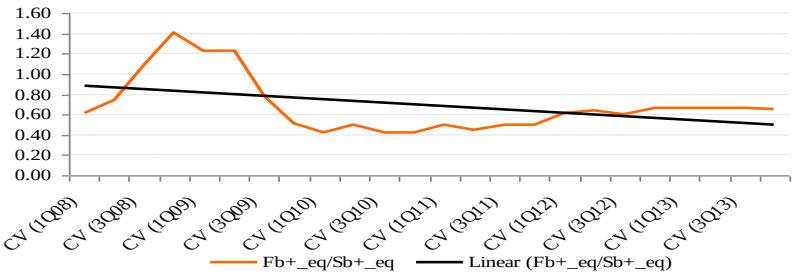
Figure 1 Ratio of Forward and Spot Equity Participation for Category A



Analysis of B+ category projects

Figure 2 shows the ratio of the forward to the spot equity, which initially peaked only to decrease around Q3 2009 in which some major projects were completed in the forward category and transferred to the spot category which resulted in a corresponding decline in the mean prices. Hence, the equity required to participate also took a hit as price premium had gone negative. The ratio has been growing steadily after Q3 2010 as price premium has been increasing in both markets but the increase is more in the spot category thus flattening the slope of the ratio curve. The trendline, though, has been declining over the quarters as the ratio of the forward to spot equity participation has been declining, owing to a steady increase in the weighted mean prices of the spot category rather than the forward category. The negative slope of the trendline is the highest among all categories, thus showing the relative attractiveness of the spot over the forward market which is represented in the equity participation ratios.

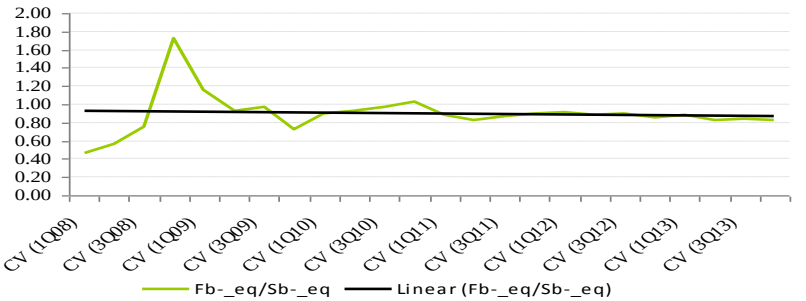
Figure 2 Ratio of Forward and Spot Equity Participation for Category B+



Analysis of B- category projects

Figure 3 shows the ratio of the forward to the spot equity, which initially increased as the equity required to participate in the forward group grew at a steeper pace than the spot group until Q1 2009. Then, it decreased until Q1 2010 only to increase further in tandem thereafter which can be seen from the near flat ratio graph. The trendline for the same is more or less flat, thus indicating minimal differences in the mean price appreciation in the spot category vis-à-vis the forward category.

Figure 3 Ratio of Forward and Spot Equity Participation for Category B-



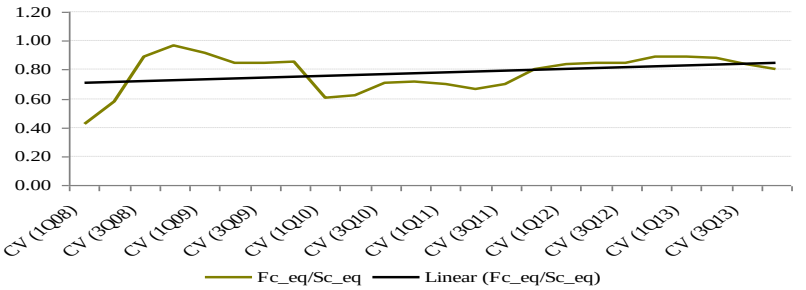
Analysis of C category projects

As the mean weighted prices in the forward group grew steeper than the spot group, the ratio of equity required to participate in this category as is shown in Figure 4 increased until Q1 2009. Then the projects were completed and transferred to the spot category, and hence there is a fall in the ratio graph. However, after Q3 2010, the ratio reached back to its previous highest level, although again tapering after Q2 2013. The trendline shows that ratio of the forward to spot equity participation is on a steady increase over the quarters

unlike for other categories, thus indicating the relative attractiveness of the Fc category projects over the Sc category projects.

The equity participation trends show that real estate participants are relatively attracted to the low class category (Fc) in the forward group and high class category in the spot group (Sb+). Equity participation is derived from the price premiums in the various categories of the two groups and also the debt factor. Thus leverage is taken at t=0 for the spot group and hence, leverage benefits are maximum in Sb+ whereas leverage is factored in after 2 quarters in the forward group and hence, leverage benefits are maximum in Fc.

Figure 4 Ratio of Forward and Spot Equity Participation for Category C



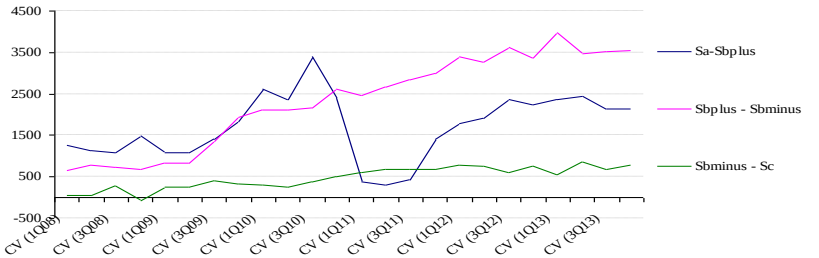
4.3.5 Quality Premium Trends

Trends in the quality premium graphs indicate the premium in price per square foot that buyers and investors are willing to pay to move up from a low to a high category in a group with increasing quality as measured by the composite score calculated above. This shows the attractiveness of the category within the spot and forward groups, where the perceived quality attributes should command a premium to be paid by the investor.

As is shown by Figure 5, the premium of the Sa- Sb+ categories is high in the initial period and investors and buyers paid the highest premium to move from the B+ to the A category until Q3 2010. Subsequently, the premium nosedived and plummeted to a level even lower than that of the Sb- to the Sc classes in Q1 2011. However, the mean price subsequently recovered to increase from thereon. The quality premium for the B category projects gradually increased over the quarters which can be attributed to increasing demand for the projects in this category and the perceived quality additions for which the investors were ready to pay. Due to market conditions and the macroeconomic environment, the investors felt comfortable in remaining in this category and were interchangeable enough to move within this category from B- to B+. Thus the "habitat switching" of the investors and buyers is the maximum within the B category and the market is paying the developers a premium for

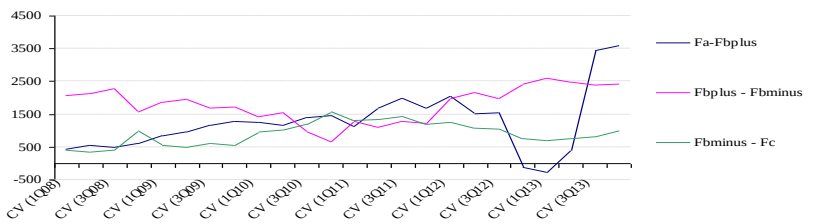
the quality enhancement that is being provided in the B+ category in addition to that prevalent in B-. There seems to be slight appreciation for the quality premium to move from C to B- as the perceived incremental quality features demand a huge premium which the market participants are hesitant to pay for.

Figure 5 Time series of Quality Premium for Spot Group



As seen from Figure 6, the quality premium for the B category forward projects seem to be gradually decreasing until Q3 2010 and subsequently increases, thus showing that the market is ready to pay for the quality features that are obtained upon switching habitat from B- to B+. However, post Q1 2011, the quality premiums for this category has risen back to its previous high gain in price for whatever prices that it lost prior to Q1 2011. Quality premiums for the movement to the Class A category from B+ are very volatile. The quality premium for the Fb- to Fc has appreciated at a steady pace over the quarters.

Figure 6 Times Series of Quality Premium for Forward Group



The quality premium trends indicate that the B category is the most interchangeable in both the spot and forward groups, and investors are ready to pay a premium to switch habitat from B- to B+. For the best in the Class A category, which provides the highest quality attributes to real estate participants, the premium to move from B+ to A has the highest variation in both groups while the premiums to move from C to B- are more or less steady for both groups.

4.3.6 Return on Investment Analysis

Pre tax XIRR was computed for each of the categories in the spot and forward groups for a maximum holding period of 23 quarters in the spot group and 19 quarters in the forward group, which span data from Q1 2008 to Q4 2013 with entry and exit allowed in any quarter within this range. However, a comparison was done only for 19 holding quarters to maintain time parity since we assumed a completion time of 20 quarters for forward projects.

To compare the XIRR across different holding periods for various similar categories in the two groups, Figures 7-10 were charted out.

Figure 7 Pre-Tax XIRR over Holding Period for Sa and Fa

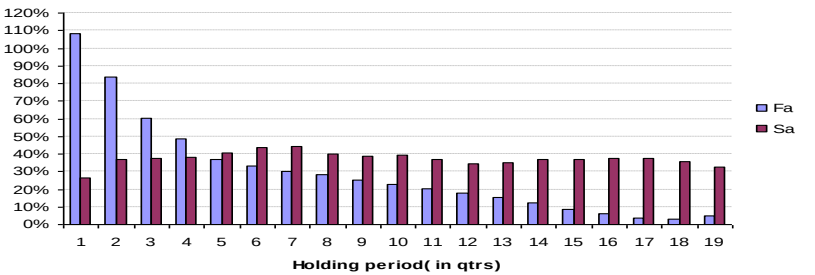
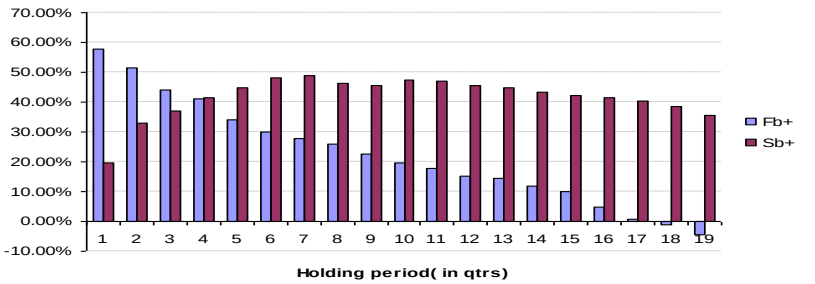


Figure 8 Pre-Tax XIRR over Holding Period for Sb+ and Fb+



It can be clearly seen from Figure 7 that Fa has spectacular average XIRRs in the initial holding periods which subsequently taper, but the average XIRRs in the Sa category are steady across the holding period. For the first 3 holding quarters (1st year) on average, Fa projects had an XIRR of 84.01% vis-à-vis 31.42% of the spot projects.

Figure 9 Pre Tax XIRR over Holding Period for Sb- and Fb-

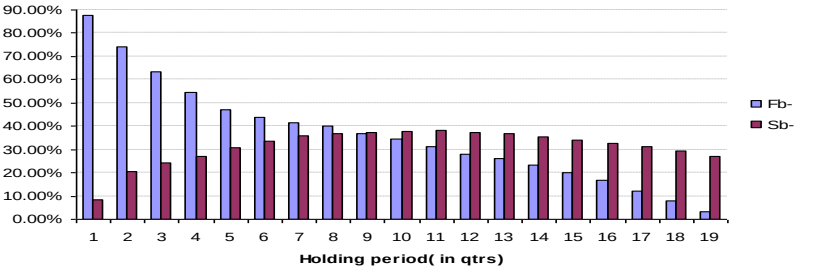


Figure 10 Pre Tax XIRR over Holding Period for Sc and Fc

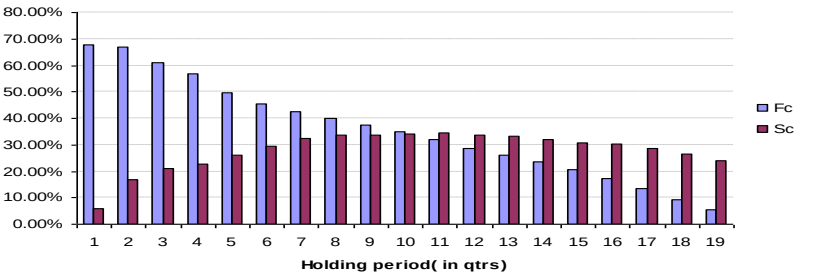


Figure 8 shows that the average XIRR for Fb+ is initially very high which then subsequently begins to taper down and becomes negative in the 18th and 19th quarters (just before completion) whereas it continues to increase for spot projects before gradually decreasing after the 10th quarter. For the first 3 holding quarters (1st year) on average, the Fb+ projects have an XIRR of 51.17% vis-à-vis 29.90% of the spot projects. The Sb+ returns catch up with the Fb+ returns only in the 4th quarter holding period itself to remain upwards from thereon. Also, for the Sb+ category, 14 of the 19 holding quarter returns are greater than 40%.

Figure 9 shows a high average XIRR in the first 3-4 quarters for Fb- after which it tapers down but still in the positive range until the completion period. The corresponding spot category has increasing XIRRs initially, after which, it steadies down. For the first 3 holding quarters (1st year) on average, the Fb- projects have an XIRR of 75.13% vis-à-vis 17.67% of the spot projects.

Figure 10 shows that the average XIRR of Fc is maximum at the initial quarters of the holding period and continues to taper down over the quarters and the corresponding XIRR in the spot category continues to increase before steadying around the 10th quarter of holding. For the first 3 holding quarters (1st year) on average, the Fc projects have an XIRR of 65.32% vis-à-vis

14.66% of the spot projects. For the first 8 holding periods, the average XIRR is more than 40% in the forward category.

The probability of obtaining a return greater than the target return (eg. 20% and 40%) in the two groups across the holding years is shown in Table 13.

Table 13 Probability of Getting Pre Tax Returns Greater than Target Return over Different Holdings Years for Spot/Forward Group

Holdings Year	1		2		3		4	
Target return	20%	40%	20%	40%	20%	40%	20%	40%
Sa	0.52	0.43	0.82	0.53	0.85	0.38	0.89	0.44
Sb+	0.57	0.33	0.88	0.47	1	0.77	1	0.44
Sb-	0.52	0.38	0.76	0.41	1	0.54	1	0.33
Sc	0.52	0.33	0.82	0.29	0.85	0.38	0.78	0.33
Fa	0.67	0.57	0.59	0.47	0.38	0.15	0.22	0
Fb+	0.67	0.57	0.71	0.53	0.62	0.23	0.22	0
Fb-	0.86	0.62	0.82	0.41	0.77	0.31	0.56	0
Fc	0.67	0.62	0.76	0.65	0.69	0.38	0.56	0

The probability of obtaining a return higher than 40% sharply increases for the Sb+ in the spot group across the holding years and tapers down to be the slowest in the Fc category in the forward group.

In the forward group, with the exception of Fa, which includes top end projects launched in 2013 at exorbitant prices, it is actually the low quality classes (Fb- and Fc) which have given consistently high average XIRRs in their group. As the variability in the holding period XIRR is higher in Fb-, hence it is Fc which is the best in this group to invest and earn a healthy return with a short investment horizon of a maximum of 1 year. Also with increasing urbanization, higher earnings, increased bank credit and thrust for development of smart cities will lead to an increased demand for affordable residential property space. Thus, the real estate participant base would be higher for the low quality class (Fc) category as these are low entry points where future appreciation potential would be higher. Also, this could be attributed to the risk return perception of investors which helps them to overreact on low quality category classes owing to asymmetric information. By taking the corollary from the overreaction hypothesis (Lakonishok et al. 1994) which confirms that investors trade growth stocks for value stocks at a premium, thus resulting in exaggerated movements in stock prices followed by correction, the Fc category can hence be treated as penny stocks of the overreaction hypothesis. In the spot group, the XIRR increases with every holding quarter increase, but high quality classes like Sa and Sb+ show a high XIRR even in the 1 year holding. Since the variability returns is high for Sa, hence it is Sb+ which is the best in this group to invest and earn a healthy return with a relatively long investment horizon of at least 2 years.

5. Summary and Policy Recommendations

The existing literature is virtually thin on studying the relationship and information transmission between spot and forward projects. The literature on real estate investment analysis from the holding period is also non existent in the Indian context. Thus the present study tries to fill this research gap in the Indian context by investigating various residential projects in the Gurgaon micromarket of the NCR of Delhi as a case study. Data for the study are received from the JLL.

A survey is conducted to ascertain the weightage of the various factors and subfactors so identified which help to determine real estate investment selection. The findings of the survey show that weightage for the goodwill of the developer factor (31%) is the highest in the forward group followed by location (22%) and the least is density (11%). In the spot group, all factors are more or less similar in weightage with the highest being goodwill of the developer factor (23%) followed by location (22%) and the lowest being density (15%). In the location factor, the close to shopping complex is most important subfactor followed by close to school for the spot participant and it is the close to office which is more important for the forward participant. In terms of the amenities and facilities factors, clubhouse and facilities, housing complex away from the main road and fire safety systems are given relatively more importance by the forward than the spot groups in which convenience store in the complex and round the clock water availability are given more importance. As for the density factor, low density is preferred by the spot than the forward group. In terms of construction quality, the quality of the construction material and quality of the plastering of walls are more important for the forward than the spot group. A primary research is then conducted to compile a ranking datasheet for an exhaustive list of 97 projects (37 in spot and 60 in forward projects) to arrive on a composite score for each of these projects after multiplying the ranks with the corresponding weightages for each of the subfactors. The composite scores so obtained help us to create homogenous quality classes within the two groups. Thus, four categories (A, B+, B-, C) in the spot and forward groups respectively have been carved out.

The quarterly price data for these respective projects in the various categories in the two groups are then multiplied with the weight which is equal to the number of units in each project divided by the total number of units of the various projects in the quality class. It is found that in the spot market, the high quality project category (Sb+) as is depicted by the composite score is better performing and in the forward market, it is the lowest quality project category (Fc) which is the best performing on risk adjusted returns basis (Sharpe ratio equivalent). A long run equilibrium relationship is established between similar quality categories in the spot and forward groups with the spot prices leading the price discovery process. Prediction models to predict forward prices from corresponding lagged spot prices are built by using GLS

regression and the coefficient of determination is more than 80% in all 4 categories.

Different macroeconomic variables (gdp, inflation, usdinr, nfbc, interest, nifty) are selected to study their relationship with the various weighted mean prices of various spot and forward categories in the two groups. The results confirm that the gdp and nfbc are the macro indicators which are leading or coincident on the property prices across the categories in the two groups and also for the average spot/ forward prices. The results for the market value of equity in both groups for all categories show that real estate participants are relatively attracted to the low class category (Fc) in the forward group and high class category in the spot group (Sb+) which is in line with the Sharpe ratio results. The quality premium trends, which track the willingness of the investors to move from a lower quality class to a higher category one in a group, indicate that the B category is the most fungible in both the spot and forward groups and investors are ready to pay a premium to switch habitat from B- to B+. The pre tax XIRR for the various categories within the two groups is calculated to study the trends over time. The results show that in the forward group, the XIRR begins to taper as the holding period increases, but it identifies that the low quality class Fc has given consistently high average XIRRs in its group. In the spot group, the XIRR increases with every holding quarter increase, but it is for the high quality class Sb+ that shows high XIRRs in its group.

The findings of the study have implications for various stakeholders in the real estate sector. The relative weights determined for different factors and subfactors in the spot and forward groups respectively give the developers insight into the various parameters that help to determine real estate investment selection by participants. Thus, besides the project specifications on offer, it is this perception of goodwill of the developer that developers must consider in their new product offering to attract the interest of real estate participants.

For the small and institutional investors, this study clearly identifies that low quality classes in the forward group (Fb+) and high quality classes in the spot group (Sb+) can be a good bet in this market to attain the desired risk adjusted returns. The study suggests that for an investor who is looking for a holding period of less than 1 year, s/he should hold low quality class in the forward group i.e. Fc, while if s/he has a longer investment horizon of at least 2 years, s/he should hold a high quality category in the spot group (i.e. Sb+) to attain the desired return on the capital employed. Also, the weights determined from the survey can help institutional investors to build a hedonic model for the valuation of real estate properties as they clearly identify the various factor/ subfactor inputs for the same.

For policymakers and lenders, the study confirms that spot prices are causing forward prices and the forward prices of the lower class category are more

sensitive to changes in its spot prices. The information transmission path is from the macroeconomic variables (gdp and nfbc) to the spot group, and then from the spot to the forward group. Thus for lower quality classes, changes in the prices of the spot and forward categories are more sensitive to changes in these two macroeconomic variables and that too in a short period of time. Thus information diffusion is fast for the lower level categories. The property market prices then affect the stock markets. The study helps in identifying the period of stress for the real estate market from the weakening macroeconomic fundamentals and the possible spillover to the stock markets. The results show that interest rate, inflation and exchange rate do not affect property prices both in the spot and forward groups.

The present study can be extended in several ways. A larger sample of respondents could have been used for conducting the primary survey. A longer time period with more data points could be applied to undertake more comprehensive empirical analysis. The present study is conducted on the Gurgaon micromarket in the NCR of Delhi which has the most strongest and dynamic fundamentals in the NCR. Future research could be expanded to other residential real estate micromarkets in India to compare their results with those of Gurgaon and come up with a broad framework for the Indian real estate sector at large. The research makes contribution to the field of real estate investment analysis (an alternative investment class) for an emerging market such as India.

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Appendix

Appendix 1: Expert Survey Prepared to Identify Factor Weights

Each of the five factors given below are assigned a weightage under two categories, based on their relevance and importance while investing in a residential property. The total should sum up to 100% for each category.

	Weightage for Completed Projects	Weightage for Projects Under-construction
Goodwill of Developers Location and Accessibility Amenities and Facilities Density Construction Quality		
Total	**100%**	**100%**

Appendix 2: Questionnaire Prepared to Identify Determinants of Real Estate Investment Selection

For the following factors, there are sub-factors for each broad factor that you may consider while buying a residential property. Please rate the questions independently of the others on the basis of their relevance and importance

	Not Important	Less Important	Neutral	Important	Very Important
Location and Accessibility Close to airport Close to highway Close to school Close to hospital Close to office Close to metro station Close to bank Close to shopping complex Amenities and Facilities Security system: Security Guards, CCTVs, access control cards, detection and alarm system, intercoms; gated community Garden area and open spaces Centrally air-condition Clubhouse and Sports facilities Fire safety system Parking space: Reserved parking and visitor parking					

(Continued…)

(Appendix 2 Continued)

	Not Important	**Less Important**	**Neutral**	**Important**	**Very Important**
100% power back-up					
Round the clock water availability					
Earthquake resistant					
Housing complex away from the main road					
Convenience store in complex					
Electricity cost/Power back-up cost					
Other maintenance charges					
Density					
Low density of residential complex (less number of persons per acre)					
Less number of residential units per floor					
Construction Quality					
Quality of construction materials/fixtures					
Quality of plastering on walls					