Chapter 5: Analysis of Trend in Real Estate

Chapter provides brief analysis of data, it further includes the Secondary data collected from the various sources, these data further analysed and evaluated through data analysis techniques. The major techniques utilised for the data analysis are Econometrics. Main aim of this data analysis to investigate investment pattern in Real estate market.

5.1. Model and Methodology

This study used yearly data covering the period 2007 to 2015. The analysis involved four indices and five macroeconomic variables. All the indices of India, Stock exchange (Nifty), Commodity exchange (Gold Indice), Commodity exchange (Silver Indice), real estate (HPI) and macroeconomic variables of GDP per capita (g), interest rate (i), inflation (in), and FDI in real estate (F). Housing Price indices (HPI) and FDI in real estate are exogenous variables while other Market indices and economic indicators are the endogenous variable. The yearly data of macroeconomic variables are from the International Financial Statistics compiled by the International Monetary Fund (IMF) and Reserve Bank of India website. All the indices data are obtained from the NSE website.

To investigate the dynamic linkages of real sector with key economic indicators and the major financial indices in India for the period of 9 years (2007-2015), the following models are used:

Model-1 – To assess the Linkages and trend amongst the real estate prices and the selected key economic indicators

Model Equiation:-

\[ H_I = \alpha + I_R \beta_I + G_R \beta_G + \ln R \beta_{ln} + e_t \]

Model specifications

- \( H_I \) = Housing Price Index during period t
- \( \alpha \) = Constant
- \( I_R \) = Interest Rate (Interest rate of Property or Real estate) during period t
- \( \beta_I \) = Coefficient of Interest Rate
In
\( R \) = Inflation Rate during period t
\( \beta_{In} \) = Coefficient of Inflation Rate
\( G_R \) = Growth Rate Per Capita for the Nation during period t
\( \beta_G \) = Coefficient of Growth Rate
e_t = Error Term During Period t

Model-2 – To assess the linkages and trend amongst the real estate prices and selected major market Indices

Model Equation:-
\[ H_t = \alpha + N_I \beta_{N} + G_I \beta_{GM} + S_I \beta_{S} + e_t \]

Model Specifications
\( \alpha \) = Constant
\( H_t \) = Housing Price Index during period t
\( N_I \) = Nifty Index Movement Index during period t
\( \beta_{N} \) = Coefficient of Nifty Indices
\( G_I \) = Gold Market Index during period t
\( \beta_{GM} \) = Coefficient of Gold Indices
\( S_I \) = Silver Market Index during period t
\( \beta_{S} \) = Coefficient of Silver Indices
e_t = Error Term During Period t

Model-3 – To assess the linkages and trend amongst the real estate investments (FDI) and selected key economic Indicators

Model Equation:-
\[ F_R = \alpha + I_R \beta_I + G_R \beta_G + I_{nR} \beta_{In} + e_t \]

\( F_R \) = FDI in Real estate during period t
\( \alpha \) = Constant
\( I_R \) = Interest Rate (Interest rate of Property or Real estate) during period t
\( \beta_I \) = Coefficient of Interest Rate
\( I_{nR} \) = Inflation Rate during period t
\( \beta_{In} \) = Coefficient of Inflation Rate
\( G_R \) = Growth Rate Per Capita for the Nation during period t
\( \beta_G \) = Coefficient of Growth Rate
\( I_R \) = Inflation Rate
e_t = Error Term During Period t
Model-4—To assess the linkages and trend amongst the real estate investments (FDI) and selected major market indices.

Model Equation:-

$$F_R = \alpha + N_I \beta_N + G_I \beta_{GM} + S_I \beta_S + e_t$$

- $F_R = \text{FDI in Real Estate during Period } t$
- $\alpha = \text{Constant}$
- $N_I = \text{Nifty Index Movement during Period } t$
- $\beta_N = \text{Coefficient of Nifty Indices}$
- $G_I = \text{Gold Market Index during Period } t$
- $\beta_{GM} = \text{Coefficient of Gold Indices}$
- $S_I = \text{Silver Market Index during Period } t$
- $\beta_S = \text{Coefficient of Silver Indices}$
- $e_t = \text{Error Term during Period } t$

5.2. Econometrics Used for Data Analysis

1. Augmented Dickey-Fuller Test

If an OLS regression is estimated with non-stationary data and residuals, then the regression is spurious. To overcome this problem the data has to be tested for the unit roots (i.e. whether it is stationary). If both sets of data are I (1) (non-stationary), then if the regression produces an I(0) error term, the equation is said to be cointegrated. The most basic non-stationary time series is the random walk, the Dickey-Fuller test essentially involves testing for the presence of a random walk.

$$y_t = y_{t-1} + u_t$$  \hspace{1cm} (1)

Although this has a constant mean, the variance is non-constant and so the series is non-stationary. If a constant is added, it is termed a random walk with drift. To produce a stationary time series, the random walk needs to be first-differenced:

$$\Delta y_t = u_t$$  \hspace{1cm} (2)

The Dickey-Fuller test is used to determine if a variable is stationary. To overcome the problem of autocorrelation in the basic DF test, the test can be augmented by adding various lagged dependent variables. This would produce the following test:

$$\Delta y_t = (\rho - 1)y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta y_{t-i} + u_t$$  \hspace{1cm} (3)

The correct value for $m$ (number of lags) can be determined by reference to a commonly produced information criteria such as the Akaike criteria or Schwarz-Bayesian criteria. The
aim being to maximize the amount of information. As with the DF test, the ADF test can also include a drift (constant) and time trend.

2. Engle-Granger test for Cointegration

To test for cointegration between two or more non-stationary time series, it simply requires running an OLS regression, saving the residuals and then running the ADF test on the residual to determine if it is stationary. The time series are said to be cointegrated if the residual is itself stationary. In effect the non-stationary I (1) series have cancelled each other out to produce a stationary I (0) residual.

\[ y_t = \beta_0 + \beta_1 x_{1t} + \ldots + u_t \]  \hspace{1cm} (4)

Where \( y_t \) and \( x_{1t}, x_{2t}, x_{3t} \) are non-stationary series. To determine if they are cointegrated, a secondary regression is estimated:

5.3. Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Std. Dev.</th>
<th>C.V.</th>
<th>Skewness</th>
<th>Ex. kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDI in Real Estate</td>
<td>803.11</td>
<td>431</td>
<td>197</td>
<td>2191</td>
<td>787.08</td>
<td>0.9800</td>
<td>0.8807</td>
<td>-0.9315</td>
</tr>
<tr>
<td>Interest Rate (Real Estate)</td>
<td>10.546</td>
<td>10.292</td>
<td>6.75</td>
<td>13.31</td>
<td>2.1236</td>
<td>0.2013</td>
<td>-0.3448</td>
<td>-0.6835</td>
</tr>
<tr>
<td>GDP Per Capita</td>
<td>1372.3</td>
<td>1449.7</td>
<td>1022.58</td>
<td>1808</td>
<td>260.79</td>
<td>0.1900</td>
<td>0.0178</td>
<td>-0.9436</td>
</tr>
<tr>
<td>Inflation rate</td>
<td>8.8444</td>
<td>8.9</td>
<td>6.4</td>
<td>12</td>
<td>2.1430</td>
<td>0.2423</td>
<td>0.0670</td>
<td>-1.3863</td>
</tr>
<tr>
<td>Nifty Index</td>
<td>5944</td>
<td>6134.5</td>
<td>2959.15</td>
<td>8282.7</td>
<td>1615.8</td>
<td>0.2718</td>
<td>-0.2645</td>
<td>-0.3445</td>
</tr>
<tr>
<td>Gold Index</td>
<td>22233</td>
<td>24994</td>
<td>10592</td>
<td>30446</td>
<td>7222.9</td>
<td>0.3248</td>
<td>-0.4479</td>
<td>-1.2681</td>
</tr>
<tr>
<td>Silver Index</td>
<td>36645</td>
<td>36519</td>
<td>17847</td>
<td>56736</td>
<td>13617</td>
<td>0.3715</td>
<td>-0.0635</td>
<td>-1.2383</td>
</tr>
<tr>
<td>Avg. HPI</td>
<td>162.67</td>
<td>169</td>
<td>100</td>
<td>226</td>
<td>47.631</td>
<td>0.2928</td>
<td>-0.0712</td>
<td>-1.5067</td>
</tr>
</tbody>
</table>

Table-5.1 describes summary of descriptive statistics for the data that were used for the analysis of the effect of Key economic variables and Major financial indices on the real estate. The numbers of observations used were 72.data gathered for 9 year to have the clear
idea about the trend in the real estate prices and direct investments. The mean of housing price index is 162.67 with standard deviation of 47.631. The mean of FDI in Real estate is 803.11 rupees in billion dollars with standard deviation of 787.08. The mean of annual growth rate (GDP per capita) is 1372.3 rupees with standard deviation of 260.79. The mean of inflation is 8.84 with standard deviation of 2.14.

In addition the mean value of interest rate (Real estate and housing landing rate) 10.55% during the mention period with a standard deviation of 2.12%. Inflation rate having a mean value of 8.84% with a deviation of 2.14%. Watch towards the key market shows that Nifty index, Gold index and silver index having an average of 5944, 22333 and 36645 respectively. The observed standard deviations for the same are 1615.8, 7222.9 and 13617 respectively.

### 5.4. Analysis of Association of Housing Price Index (HPI)

Correlation coefficients, using the observations 2007 - 2015
5% critical value (two-tailed) = 0.6664 for \( n = 9 \)

#### Table-5.2 – Correlation Matrix for HPI in India

<table>
<thead>
<tr>
<th>FDI in REAL</th>
<th>Interest Rate</th>
<th>GDP Per Capita</th>
<th>Inflation Rate</th>
<th>Nifty Index</th>
<th>Gold Price</th>
<th>Silver Price</th>
<th>HPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.1483</td>
<td>-0.501</td>
<td>0.6479</td>
<td>-0.4463</td>
<td>-0.5046</td>
<td>-0.1964</td>
<td>-0.6294**</td>
</tr>
<tr>
<td>1</td>
<td>-0.8975</td>
<td>-0.0385</td>
<td>-0.6303</td>
<td>0.7195</td>
<td>0.5995</td>
<td>-0.5353</td>
<td>-0.7415**</td>
</tr>
<tr>
<td>1</td>
<td>-0.1974</td>
<td>0.7195</td>
<td>0.799</td>
<td>0.5832</td>
<td>0.9485***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>-0.3623</td>
<td>0.1344</td>
<td>0.4021</td>
<td>-0.2074*</td>
<td>0.7073**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.4246</td>
<td>0.217</td>
<td>0.7073**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.8573</td>
<td>0.573</td>
<td>0.877***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.573</td>
<td>1</td>
<td>0.7073**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>0.877***</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>0.573</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Represent the significant relationship between the variables at 5% significance
** Represent partial correlation between the variables at 5% significance
*** Represents high degree of correlation amongst the variables at 5% significance
Hypothesis:

H\textsubscript{1.1} There is significant relationship between Real Estate price movement and Interest rate
H\textsubscript{1.2} There is significant relationship between Real Estate price movement and Inflation Rate
H\textsubscript{1.3} There is significant relationship between Real Estate price movement and GDP Per Capita
H\textsubscript{1.4} There is significant relationship between Real Estate price movement and Nifty Indices Movements
H\textsubscript{1.5} There is significant relationship between Real Estate price movement and Gold Indices Movements
H\textsubscript{1.6} There is significant relationship between Real Estate price movement and Silver Indices Movements
H\textsubscript{1.7} There is significant relationship between Real Estate price movement and Movement in Foreign Direct Investment (FDI) in the Real estate segment.

Correlation analysis was conducted to inspect the relative degree of co-movement between housing price index and key economic indicators and major financial market indices to identify whether there is positive or negative relationship between them. The analysis also helps us to predict future behaviours of house price index based on these indicators.

The null hypothesis for this analysis was zero correlation coefficient of house price index with other selected variables and the alternative hypothesis was correlation coefficient different from zero which was two-tailed test. The result is shown above in Table- 5.2. As seen in Table-5.2, the numbers on the top heading of the Table-5.2 indicate coefficients of correlation, p value for the given level of significance 0.05 for which the test was conducted and lastly the number of observation.

The results indicate that there is strong inverse relationship between interest rates (Real estate and housing landing rates prevailing in India and mentioned statistics by Reserve Bank of India) and housing price index of India. The coefficients of correlation between housing price index and interest rates range between -0.7415. moreover more inverse
A relationship was observed in the data that was between FDI in Real estate sector and the Housing Price indices which was -0.6294 and in addition to that Inflation in India and Housing Price Index also bearing the inverse relationship which was -0.2074.

Furthermore, the analysis shows the strong positive relationship between per capita GDP of the nation and the housing price indices. In addition to this Gold Price Index and Nifty index also shows the positive relationship with the housing price indices which was 0.887 and 0.7073 respectively. Silver price index has uphill linear relationship 0.573

5.5. Linkages of Housing Price Index

$H_{2,1}$ : There is a significant Impact of key economic Indicators on Housing Price Index

Model 1: OLS, using observations 2007-2015 ($T = 9$)
Dependent variable: Avg. HPI

<table>
<thead>
<tr>
<th>Table-5.3 – Regression Analysis HPI and Economic Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coefficient</strong></td>
</tr>
<tr>
<td>Const</td>
</tr>
<tr>
<td>Interest rate</td>
</tr>
<tr>
<td>GDP Per Capita</td>
</tr>
<tr>
<td>Inflation rate</td>
</tr>
</tbody>
</table>

Mean dependent var 162.6667  S.D. dependent var 47.63140
Sum squared resid 435.9874  S.E. of regression 9.337959
R-squared 0.975979  Adjusted R-squared 0.961566
F(3, 5) 67.71607  P-value(F) 0.000181
Log-likelihood −30.23220  Akaike criterion 68.46439
Schwarz criterion 69.25329  Hannan-Quinn 66.76195
Rho 0.058839  Durbin-Watson 1.861200

Model Equiation:-

$H_1 = \alpha + I_R \beta_I + G_R \beta_G + I_n R \beta_{In}$

$H_1$ = Housing Price Index
$\alpha$ = Constant
$I_R$ = Interest Rate (Interest rate of Property or Real estate)
$\beta_I$ = Coefficient of Interest Rate
$I_n R$ = Inflation Rate
$\beta_{In}$ = Coefficient of Inflation Rate
\( G_R \) = Growth Rate Per Capita for the Nation  
\( \beta_G \) = Coefficient of Growth Rate

**Dependent variable** : Housing Price Index  
**Independent variable** : Key Economic factors

**Interpretation**

Housing price index = -442.086 + interest rate (16.16) + GDP per capita (0.296) + Inflation Rate (3.12477)

Referring the above Table-5.3, here dependent variable is average of housing price index and independent variable is economical factor

Further, ‘p ‘value of Interest rate is 0.0106 and GDP per capita is 0.0003 which is less than 0.05 therefore it implies that the variable is statistically significant and so we can reject the null hypothesis hence we conclude that there is relationship between interest rate, GDP per capita and housing price index. But in inflation rate ‘p ‘value is more than 0.05 hence we conclude that there is No significant relationship between inflation rate and average of housing price index, so for that economical factor we accept the null hypothesis.

In this R-squared show that economical factor predicts 97.59 % of the variation in average of housing price index

**H\textsubscript{2.2}** : There is a significant impact of Major Market Indices Movement on Housing Price Index

**Model 2: OLS, using observations 2007-2015 (T = 9)**  
Dependent variable: Avg. HPI

**Table-5.4 – Regression Analysis HPI and Market Indices**

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>11.3196</td>
<td>13.7708</td>
<td>0.8220</td>
<td>0.4572</td>
</tr>
<tr>
<td>Nifty</td>
<td>0.00894711</td>
<td>0.00214988</td>
<td>4.1617</td>
<td>0.0141 **</td>
</tr>
<tr>
<td>Gold</td>
<td>0.00768857</td>
<td>0.000907787</td>
<td>8.4696</td>
<td>0.0011 ***</td>
</tr>
<tr>
<td>Silver</td>
<td>-0.00124035</td>
<td>0.000499901</td>
<td>-2.4812</td>
<td>0.0681 *</td>
</tr>
</tbody>
</table>

Mean dependent var | 162.6667 | S.D. dependent var | 47.63140
Sum squared resid | 282.3537 | S.E. of regression | 8.401693
R-squared | 0.984443 | Adjusted R-squared | 0.968887
F(4, 4) | 63.28107 | P-value(F) | 0.000719
Log-likelihood | -28.27716 | Akaike criterion | 66.55432
Schwarz criterion | 67.54044 | Hannan-Quinn | 64.42627
Rho | -0.709958 | Durbin-Watson | 2.691988
Model Equation:-

\[ H_I = \alpha + N_I \beta_N + G_I \beta_{GM} + S_I \beta_S \]

Model Specifications
\( \alpha \) = Constant
\( H_I \) = Average Housing Price Index
\( N_I \) = Nifty Index Movement
\( \beta_N \) = Coefficient of Nifty Indices
\( G_I \) = Gold Market Index
\( \beta_{GM} \) = Coefficient of Gold Indices
\( S_I \) = Silver Market Index
\( \beta_S \) = Coefficient of Silver Indices

Dependent variable : Housing Price Index
Independent variable : Major Market Indices Movement

Housing price index = 11.3196 + NIFTY (0.0089) + Gold (0.0076) + Silver (-0.0012)

Referring the above Table -5.4, here dependent variable is average of housing price index and independent variable is Market Indices

Here, 'p' value of all Market Indice Movement is less than 0.05 therefore it implies that the variable is statistically significant and so we can reject the null hypothesis and hence we conclude that there is strong relationship between Market Indice Movement and housing price index. Further it infers that Market movement influence the real estate price indices

In this R-squared show that Market Indice Movement predicts 9.84 % of the variation in housing price index

5.6. Trend in Housing Price Index – Comparative Analysis

1) Trend in HPI, Inflation Rate and Interest Rate

Here, mentioned Figure-5.1 shows the relationship of Housing Price Indices with the Interest Rate and Inflation rate for the period of 9 years (2007-2015). Starting to establish the relationship amongst the variables it can be clearly seen that Housing Price Indices and Interest rates bearing the inverse trend which can be observed from the trend line plotted where pre and post year 2010 it shows the quite rapid opposite movement.
For a while after the year 2010 and till 2012 (For the period of 2 years) both HPI and Interest rate follows an upward trend and maintain the momentum and cointegrated movement but after that again both shows the reciprocal movement.

Further on the same trend Figure -5.1 there is another variable plotted, which is inflation rate. Initially inflation rate was very low during the year 2007 but later it jumped up rapidly during next two years (During year 2008-2010) and was marked highest in the year 2010.

Comparing the trend of the inflation rate with the Trend of housing price indices, It can be clearly observed that initially both moves together in the same direction which is in the upward direction but later in the early 2011 suddenly both the variables shows the inverse trend as inflation dragged down rapidly and on the other hand housing price indices soars upward.

The entire trend shows that interest rate bearing the inverse relationship with the Housing price indices and inflation rate initially holds positive relationship but later gradually it becomes inverse to the housing price indices.
2) Trend in HPI, FDI in Real estate and GDP per Capita

Figure 5.2 – Trend of HPI, GDP and FDI in Indian Real estate

Figure 5.2 mentioned above shows the Trend of Housing Price Indices along with the Trend of Foreign Direct Investment and GDP per capita of the nation for the period of 2007-2015. Further it can be represented that all these three variable shows the large deviation with the upward move but there is a similar trend observed in all the variables during the initial period and continue till the year 2010. In the year 2010 FDI in Real estate segment was on its pick level which was highest during this period of 9 years and then suddenly it dragged down in the year 2011 which shows the major fluctuation in the real estate segment. Apart from those housing price indices shows the gradual upward move throughout these 9 years and along with that stagnant and slight upward trend observed in the Per capita GDP.

The overall trend represents that HPI and GDP per capita follows the related movement in the same direction. On the other hand FDI in real estate segment shows the fluctuations in the trend during the year 2010 and 2011, which can be caused by the major market correction or economic fluctuations.
3) Trend in HPI, GOLD Indices, Silver Indices and Nifty Indices

Figure 5.3 shows the trend and interrelationship between the Housing Price indices and other major financial market indices including Gold Indices, Silver Indices and Nifty indices for the period starting from 2007 to 2015. The time series mentioned above indicating the relationship of fluctuations in the mentioned markets.

Further from the Figure 5.3 it can be observed clearly that in the beginning all the market indices shows the upward trend as they all rose upward with the time being. Later the time series analysis shows that silver indices moves down quickly in the year 2013 and moves down in the further years up to 2015. Along with this trend housing price indices follows the same trend but it doesn’t carrying the momentum of silver indices time series and continues moving upward in the further years too. Gold indices on the other hand also become stagnant after year 2012 and slopped slightly downwards through the year 2012 to 2015. Considering the Nifty indices, it shows the flatter movement in comparison to the housing price index movement. As time series of the nifty indices since 2007 to 2015 shows the flat movement in comparison to other financial market indices shown in the time series Figure 5.3.
5.7. Analysis of Relationship of FDI in Real estate

Correlation coefficients, using the observations 2007 - 2015
5% critical value (two-tailed) = 0.6664 for n = 9

Table-5.5 – Correlation Matrix for FDI in Indian Real estate

| FDI in REAL | Interest Rate | GDP Per Capita | Inflation Rate | Nifty Index | Gold Price | Silver Price | FDI in REAL | Interest Rate | GDP Per Capita | Inflation Rate | Nifty Index | Gold Price | Silver Price | FDI in REAL | Interest Rate | GDP Per Capita | Inflation Rate | Nifty Index | Gold Price | Silver Price |
|------------|---------------|----------------|----------------|-------------|------------|--------------|------------|---------------|----------------|----------------|-------------|------------|--------------|------------|---------------|----------------|----------------|-------------|------------|--------------|------------|
| 1          | 0.1483**      | -0.501***      | 0.6479**       | -0.4463*    | -0.5046*   | -0.1964*     | 1          | -0.8975       | -0.0385        | 0.6303**       | -0.5995**   | -0.5353    | 1            | -0.1974    | 0.7195**       | 0.799***      | 0.5832    | 1            | -0.3623* | 0.1344 | 0.4021 |
| 1          | -0.8975       | -0.0385        | 0.6303**       | -0.5995**   | -0.5353    | -0.1964*     | 1          | -0.8975       | -0.0385        | 0.6303**       | -0.5995**   | -0.5353    | 1            | -0.1974    | 0.7195**       | 0.799***      | 0.5832    | 1            | -0.3623* | 0.1344 | 0.4021 |
| 1          | 0.1483**      | -0.501***      | 0.6479**       | -0.4463*    | -0.5046*   | -0.1964*     | 1          | -0.8975       | -0.0385        | 0.6303**       | -0.5995**   | -0.5353    | 1            | -0.1974    | 0.7195**       | 0.799***      | 0.5832    | 1            | -0.3623* | 0.1344 | 0.4021 |

* Represent the significant relationship between the variables at 5% significance
** Represent partial correlation between the variables at 5% significance
*** Represents high degree of correlation amongst the variables at 5% significance

Hypothesis:

H₃.₁ There is significant relationship between Foreign Direct Investment (FDI) in the Real estate segment and Interest rate

H₃.₂ There is significant relationship between Foreign Direct Investment (FDI) in the Real estate segment and Inflation Rate

H₃.₃ There is significant relationship between Foreign Direct Investment (FDI) in the Real estate segment and GDP Per Capita

H₃.₄ There is significant relationship between Foreign Direct Investment (FDI) in the Real estate segment and Nifty Indices Movements

H₃.₅ There is significant relationship between Foreign Direct Investment (FDI) in the Real estate segment and Gold Indices Movements

H₃.₆ There is significant relationship between Foreign Direct Investment (FDI) in the Real estate segment and Silver Indices Movements
The mentioned Table-5.5 shows the Correlation analysis between FDI in Real estate and key economic indicators and major financial market indices to identify whether there are any linkages exist between this variables or not. The analysis also helps to predict future movement and further forecast of causality between FDI in Real estate and other selected Market Indices and economic indicators.

The null hypothesis for this analysis was zero correlation coefficient of FDI in Real estate with selected economic variables and selected market indices. In addition to this the alternative hypothesis was correlation coefficient different from zero which was two-tailed test. The result is shown above in Table-5.5. As observed in Table-5.5, the numbers on the top heading of the Table-5.5 indicate coefficients of correlation, p value for the given level of significance 0.05 for which the test was conducted and lastly the number of observation.

The results indicate that there is strong inverse relationship between GDP per capita and FDI in real estate which was -0.501. Further negative correlation was observed with the Gold indices as market is concern which was -0.5046. This represent that these two variables GDP per capita and Gold indices moves in the opposite direction in comparison to FDI investments in real estate. The coefficients of correlation between FDI in real estate and Inflation rate was observed positive which was 0.6479. Which implies that rise in the price levels in the real estate segment attracts more investment from the foreign countries. The next positive relationship was observed with interest rates which was 0.1483 which also suggest that interest rates bearing the notable effect on the FDI investments. Some more inverse relationship was observed in the data that was with Nifty Indices and Silver Indices which was -0.4463 & -0.1964 respectively. Which is obvious because Institutional investors and foreign direct investors are directly or indirectly associated with the stock market. so FDI in Real estate sector fluctuated through these indices.
5.8.  Linkages of FDI in Real estate

1) Linkages between FDI in Real estate and Economic variables

H₄₁: There is an impact of GDP Per Capita, Interest Rate Inflation Rate on FDI in Real Estate

Model 1: OLS, using observations 2007-2015 (T = 9)
Dependent variable: FDI in Real Estate

<table>
<thead>
<tr>
<th>Table-5.6 – Regression Analysis FDI and Economic Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coefficient</strong></td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Const</td>
</tr>
<tr>
<td>Interest rate</td>
</tr>
<tr>
<td>GDP Per Capita</td>
</tr>
<tr>
<td>Inflation rate</td>
</tr>
</tbody>
</table>

Mean dependent var 803.1111  S.D. dependent var 787.0830
Sum squared resid 1082097  S.E. of regression 465.2091
R-squared 0.781659  Adjusted R-squared 0.650654
F(3, 5) 5.966653  P-value(F) 0.041676
Log-likelihood -65.40779  Akaike criterion 138.8156
Schwarz criterion 139.6045  Hannan-Quinn 137.1131
Rho -0.164108  Durbin-Watson 2.113385

Model Equation:-

\[ F_R = \alpha + I_R \beta_I + G_R \beta_G \]

\[ F_R = 10959.4 + I_R (-451.632) + G_R (-4.63504) \]

\( F_R \) = FDI in Real estate
\( \alpha \) = Constant
\( I_R \) = Interest Rate (Interest rate of Property or Real estate)
\( \beta_I \) = Coefficient of Interest Rate
\( G_R \) = Growth Rate Per Capita for the Nation
\( \beta_G \) = Coefficient of Growth Rate
\( I_R \) = Inflation Rate

Dependent variable: FDI in Real Estate
Independent variable: Economical factors

Table-5.6 mentioned above shows the regression statistics between foreign direct investment in the real estate segment and the selected fundamental factors of the economy
which includes Interest Rate (Property Landing Rate), Growth Rate (GDP per Capita) and Inflation Rate. It shows the relationship between the key economic variables and the FDI in real estate segment. Referring the above Table-5.6, FDI in real estate segment taken as a dependent variable in this model and the selected economic variables taken as independent variables to assess the trend in FDI because of the economic fluctuation of the nation. Further analysis of the output of regression model results shows that, ‘p’ value of GDP per capita is 0.04 which is less than 0.05 therefore it implies that the variable is statistically significant and so we can reject the null hypothesis hence we conclude that there is relationship between GDP per capita and FDI investment in Real estate, But in the case of Interest rate and inflation rate’ p ‘value is more than 0.05 which are 0.0762 and 0.2799 hence it can be concluded that there is No such dependency of FDI in Real estate segment on inflation rate and Interest Rate,

No doubt the R-squared value 0.781659 show the positive significance between the economic factors of the country and the FDI investment in the real estate segment and economical factor predicts 0.7816 of the variation in FDI investment in Real estate. But analysis shows that there is no significant influence of interest rate and inflation rate on FDI in real estate market.

2) Linkages between FDI in Real estate and Selected Market Indices

H\textsubscript{4.2}: There is an impact of NIFTY, GOLD, and SILVER on FDI in Real Estate

Model 2: OLS, using observations 2007-2015 (T = 9)

Dependent variable: FDI in REAL

Table- 5.7 – Regression Analysis FDI and Market Indies

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Const</td>
<td>2580.84</td>
<td>1246.72</td>
<td>2.0701</td>
<td>0.1072</td>
</tr>
<tr>
<td>Nifty</td>
<td>-0.0794822</td>
<td>0.194637</td>
<td>-0.4084</td>
<td>0.7039</td>
</tr>
<tr>
<td>Gold</td>
<td>-0.125229</td>
<td>0.0821855</td>
<td>-1.5237</td>
<td>0.2022</td>
</tr>
<tr>
<td>Silver</td>
<td>0.0609734</td>
<td>0.045258</td>
<td>1.3472</td>
<td>0.2492</td>
</tr>
<tr>
<td>Mean dependent var</td>
<td>803.1111</td>
<td>S.D. dependent var</td>
<td>787.0830</td>
<td></td>
</tr>
<tr>
<td>Sum squared resid</td>
<td>2314281</td>
<td>S.E. of regression</td>
<td>760.6380</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.533034</td>
<td>Adjusted R-squared</td>
<td>0.066069</td>
<td></td>
</tr>
<tr>
<td>F(4, 4)</td>
<td>1.141485</td>
<td>P-value(F)</td>
<td>0.450521</td>
<td></td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-68.82868</td>
<td>Akaike criterion</td>
<td>147.6574</td>
<td></td>
</tr>
<tr>
<td>Schwarz criterion</td>
<td>148.6435</td>
<td>Hannan-Quinn</td>
<td>145.5293</td>
<td></td>
</tr>
<tr>
<td>Rho</td>
<td>0.148461</td>
<td>Durbin-Watson</td>
<td>1.430668</td>
<td></td>
</tr>
</tbody>
</table>
Model Equation:-

\[ F_R = \alpha + N_I \beta_N + G_I \beta_{GM} + S_I \beta_S \]

\[ F_R = 2580.84 + N_I (-0.79) + G_I (-0.125) + S_I (0.06) \]

- \( F_R \) = FDI in Real Estate
- \( \alpha \) = Constant
- \( N_I \) = Nifty Index Movement
- \( \beta_N \) = Coefficient of Nifty Indices
- \( G_I \) = Gold Market Index
- \( \beta_{GM} \) = Coefficient of Gold Indices
- \( S_I \) = Silver Market Index
- \( \beta_S \) = Coefficient of Silver Indices

Dependent variable: FDI in Real Estate
Independent variable: Market factor

Interpretation:-

Another relationship was tested between the Key Financial Market indices and the FDI in the real estate segment. Table-5.7 mentioned above shows the regression statistics between foreign direct investment in the real estate segment and the Key financial Market indices which includes Nifty Market Indices (Stock Market), Gold Indices (Gold Market and Inflation Rate). It shows the relationship between the major market variables and the FDI in real estate segment. Referring the above Table-5.7, FDI in real estate segment taken as a dependent variable in this model and the selected market variables taken as independent variables to assess the trend in FDI because of the market fluctuation of the nation.

Further analysis of the output of regression model results shows that, ‘p’ value of all the selected market indices higher than 0.05 therefore it implies that the variable is statistically not significant and so we can reject the null hypothesis hence we conclude that there is no such significant relationship between market variables and FDI investment in Real estate. Further value of R square shows value 0.533, which also indicates that there is a partial correlation exists between these variables. But no evidence for the significant relations between these variables so it can be concluded that, FDI in real estate does not influenced by the movement of major financial market movement.
5.9. Trend in FDI in Real estate – Comparative Analysis

1) Trend in FDI in Real estate, Inflation Rate & Interest Rate

From the Figure -5.4 which depicts the trend and pattern of movement amongst the FDI in Real estate, Inflation Rate and Interest Rate for the period starting from 2007 to 2015. The time series indicate the relationship of fluctuations in the selected economic factors and FDI in real estate.

Further from the time series it can be observed clearly that, though, during the starting year 2007 there was a huge deviation in the movement of all the selected variables but they are following the upward trend except interest rate. Interest rate dramatically started declining since the beginning year 2007 till 2010 then it moves slight upward when there is a declining trend in the FDI investment in the real estate segment during the year 2010 onwards. And momentum continues and FDI in real estate adopted the stagnant trend from year 2011 to 2015. On the other hand inflation rate having a quite positive movement along with the FDI Movement which rose and move around the FDI trend, this concludes that there is a direct effect of inflation rate on the FDI in real estate segment, as it’s the fact that investment of market is subject to price levels prevails in the market and inflation is the best indicator to conclude the price levels.
In total among all three variables interest rate holds the inverse trend to the FDI in real estate and inflation rate bearing the positive trend with the FDI in real estate as both moves in the same direction.

2) Trend in FDI in Real estate and GDP per Capita

Figure-5.5 – Trend of FDI and GDP

Figure-5.5 Shows the time series analysis of FDI in real estate and GDP per capita to identify the trend prevail in both the variables. Further the mentioned Figure-5.5 shows the upward trend in the FDI in real estate besides that GDP per capita shows the balanced movement and rose quite slowly over the period of mentioned time. Comparing to trend of both the time series both follows an inverse trend which is non-stationary that is because of the huge differences in the movement during the period of 2008 to 2011 and then 2011 to 2015 because FDI in real estate shows the large fluctuation on upward and downward.

So the above time series concludes that there is no relationship between the FDI in real estate segment and GDP per capita because both moves totally in the opposite direction with a differences in the trend.
3) Trend in FDI in Real estate and Gold, Nifty and Silver Indices

Figure-5.6 – Trend of FDI and Market Indices

Figure-5.6 shows the trend and interrelationship between the FDI in Real estate and other major financial market indices including Gold Indices, Silver Indices and Nifty indices for the period of 9 years starting from 2007 to 2015. Mentioned time indicate the momentum and movement along with pattern of movement amongst the selected variables. Further it can give a clear idea about the association and long run relationship amongst the variables. In the beginning all the market indices shows the upward trend. Besides that FDI in real estate and Nifty indices shows the slight upward move and both moves along together for the selected time span as depicted on the time series Figure-5.6. Rest of the variables like Gold and Silver Indices bearing the high fluctuating trend and creates quite differences in a trend which makes the time series non stationary between the FDI in real estate and GOLD and Silver indices movement. The time series between FDI in real estate and Nifty indices shows quite similar as they moves together which shows their association and co-movement. Gold indices on the other hand also become stagnant after year 2012 and slopped slightly downwards through the year 2012 to 2015. Considering the silver indices, it shows the high fluctuation in movement in comparison to the FDI in real estate and other
selected indices but after 2012 it shows the downward slope which shows the declining trend in the silver indices.

5.10. Cointegration Analysis of HPI and FDI in Real estate

Before testing for the causality it is necessary to test the root test which can be done through the ADF unit root test, because it’s a condition to fulfil that, time series must be stationary to proceed further for the causality and cointegration test of Engel granger

1) Testing Stationarity of Data - ADF unit root test

H₅: there is no unit root – the time series is stationary.

(Max Lag order was 2, criterion AIC), Sample size 8, including 0 lags of (1-L)

Unit-root null hypothesis: a = 1

Test with constant Model: (1-L) y = b₀ + (a-1)*y (-1) + ε

Test With constant and trend Model: (1-L) y = b₀ + b₁*t + (a-1)* y (-1) + ε

1. Housing Price Indice

Test with constant

Estimated value of (a - 1): -0.00817599

P-value 0.912

1st-order autocorrelation coeff. for ε: 0.359

Test with constant and trend

Estimated value of (a - 1): -1.94471

Asymptotic P-value 0.8121

1st-order autocorrelation coeff. for ε: -0.827

ADF Root test for the Housing Price Indice Shows the Estimated p value for average housing price index with constant and with constant and trend are 0.912 and 0.8121 respectively, which is larger than the significance 0.05. Hence, it fails to reject he null hypothesis and It further confirms that, time series of housing price index are non-stationary and there is a unit root in the Time series of the Housing Price indices, To establish the cointegration of the series, it is necessary to make it stationary.
2. **FDI in Real Estate**

Test with constant

- Estimated value of \((a - 1)\): -0.444067
- P-value: 0.5911
- 1st-order autocorrelation coeff. for \(e\): 0.261

Test with constant and trend

- Estimated value of \((a - 1)\): -2.41674
- Asymptotic P-value: 0.05107
- 1st-order Autocorrelation coeff. for \(e\): -0.795

ADF Root test for the FDI in Real estate shows the estimated p value for time series with constant and with constant and trend are 0.5911 and 0.5107 respectively, which is larger than the significance 0.05. Hence, it fails to reject he null hypothesis and It further confirms that, time series of FDI in real estate are non-stationary and there is a unit root in the Time series of the FDI in real estate. To establish the cointegration of the series, it is necessary to make it stationary.

3. **Interest Rate**

Test with constant

- Estimated value of \((a - 1)\): -0.449721
- P-value: 0.6885
- 1st-order autocorrelation coeff. for \(e\): -0.269

Test with constant and trend

- Estimated value of \((a - 1)\): -2.68707
- Asymptotic P-value: 0.4559
- 1st-order Autocorrelation coeff. for \(e\): -0.795

ADF Root test for the Interest Rate shows the estimated p value for time series with constant and with constant and trend are 0.6885 and 0.4559 respectively, which is larger than the significance 0.05. Hence, it fails to reject he null hypothesis and It further confirms that, time series of Interest Rate are non-stationary and there is a unit root in the Time series
of the Interest Rate, To establish the cointegration of the series, it is necessary to make it stationary.

4. **For GDP per Capita**

Test with constant

Estimated value of \((a - 1)\): -0.0886824

Asymptotic P-value 0.9168

1st-order autocorrelation coeff. for \(e\): -0.700

Test with constant and trend

Estimated value of \((a - 1)\): -2.63677

Asymptotic P-value 0.2905

1st-order autocorrelation coeff. for \(e\): -0.847

ADF Root test for the GDP per Capita shows the estimated p value for the time series with constant and with constant and trend are 0.9168 and 0.2905 respectively, which is larger than the significance 0.05. Hence, it fails to reject the null hypothesis and it further confirms that, time series of GDP per Capita are non-stationary and there is a unit root in the Time series of the GDP per Capita, To establish the cointegration of the series, it is necessary to make it stationary.

5. **For Inflation Rate**

Test with constant

Estimated value of \((a - 1)\): -0.733511

P-value 0.3295

1st-order autocorrelation coeff. for \(e\): 0.141

Test with constant and trend

Estimated value of \((a - 1)\): -1.89759

Asymptotic P-value 4.52e-062

1st-order autocorrelation coeff. for \(e\): -0.865

ADF Root test for the Inflation Rate shows the estimated p value for the time series with constant and with constant and trend are 0.3295 and 4.52e-062 respectively, which is larger than the significance 0.05. Hence, it fails to reject the null hypothesis and it further confirms
that, time series of Inflation Rate are non-stationary and there is a unit root in the Time series of the Inflation Rate, to establish the cointegration of the series, it is necessary to make it stationary.

6. Nifty Market Indice

Test with constant

Estimated value of (a - 1): -0.587382
P-value 0.5416
1st-order autocorrelation coeff. for e: 0.024

Test with constant and trend

Estimated value of (a - 1): -1.5744
Asymptotic P-value 0.6805
1st-order autocorrelation coeff. for e: 0.139

ADF Root test for the Nifty Market Indice shows the estimated p value for the time series with constant and with constant and trend are 0.5416 and 0.6805 respectively, which is larger than the significance 0.05. Hence, it fails to reject the null hypothesis and it further confirms that, time series of Nifty Market Indice are non-stationary and there is a unit root in the Time series of the Nifty Market Indice, to establish the cointegration of the series, it is necessary to make it stationary.

7. Gold Market Indice

Test with constant

Estimated value of (a - 1): -0.287519
Asymptotic P-value 0.1555
1st-order autocorrelation coeff. for e: -0.027

Test with constant and trend

Estimated value of (a - 1): -0.78747
Asymptotic P-value 0.6982
1st-order autocorrelation coeff. for e: -0.332

ADF Root test for the Gold Market Indice shows the estimated p value for the time series with constant and with constant and trend are 0.1555 and 0.6982 respectively, which is
larger than the significance 0.05. Hence, it fails to reject he null hypothesis and it further confirms that, time series of Gold Market Indice are non-stationary and there is a unit root in the Time series of the Gold Market Indice, to establish the cointegration of the series, it is necessary to make it stationary

8. Silver Market Indice
Test with constant

Estimated value of (a - 1): -1.16528
Asymptotic P-value 9.889e-006
1st-order autocorrelation coeff. for e: -0.525

Test with constant and trend

Estimated value of (a - 1): -1.23809
Asymptotic P-value 0.7214
1st-order autocorrelation coeff. for e: -0.529

ADF Root test for the Silver Market Indice shows the estimated p value for the time series with constant and with constant and trend are 9.889e-006 and 0.7214 respectively, which is larger than the significance 0.05. Hence, it fails to reject he null hypothesis and it further confirms that, time series of Silver Market Indice are non-stationary and there is a unit root in the Time series of the Silver Market Indice, to establish the cointegration of the series, it is necessary to make it stationary

Further the mentioned analysis shows that the Time series Stationarity Test for the selected time series variables are Non-Stationary which means that series contains unit roots and seems to be independent, but the initial OLS regression results shows that, there are several relationship exist on the basis of regression of the Non-stationary time series. Hence further to assess the suspicious relations amongst the time series, the differences d1, d2, dx should be added to test with differences and perform further Engle-Granger test for Cointegration. The series test done with the differences shows the time series stationarity, and reject the hypothesis of unit roots, which further indicates the suspicious relationship amongst the variables

Thus, Engle-Granger test for Cointegration should be performed to identify the linkages through cointegrating regression
2) Cointegration Analysis of HPI and FDI in Real estate

There is evidence for a cointegrating relationship if:

(a) The unit-root hypothesis is not rejected for the individual variables.
(b) The unit-root hypothesis is rejected for the residuals (uhat) from the Cointegrating regression.

1. Cointegrating regression of HPI and Key Economic Indicators

OLS, using observations 2007-2015 (T = 9)

Dependent variable: HPI

Table 5.8 – Cointegrating Regression Analysis HPI and Economic Variables

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>std. error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-442.086</td>
<td>96.8947</td>
<td>-4.563</td>
</tr>
<tr>
<td>Interest rate</td>
<td>16.1566</td>
<td>4.06630</td>
<td>3.973</td>
</tr>
<tr>
<td>GDP per Capita</td>
<td>0.296375</td>
<td>0.0337502</td>
<td>8.781</td>
</tr>
<tr>
<td>Inflation Rate</td>
<td>3.12477</td>
<td>1.81292</td>
<td>1.724</td>
</tr>
</tbody>
</table>

Mean dependent var 162.6667
S.D. dependent var 47.63140
Sum squared resid 435.9874
S.E. of regression 9.337959
R-squared 0.975979
Adjusted R-squared 0.961566
Log-likelihood -30.23220
Akaike criterion 68.46439
Schwarz criterion 69.25329
Hannan-Quinn 66.76195
rho 0.058839
Durbin-Watson 1.861200

Dickey-Fuller test for uhat - Testing for a unit root in uhat
Sample size 8
Unit-root null hypothesis: a = 1
Model: (1-L)y = (a-1)*y(-1) + e
1st-order autocorrelation coeff. for e: 0.011
Estimated value of (a - 1): -0.941161
Test statistic: tau_c(4) = -2.46588
P-value for the Engle Granger Cointegration test: 0.0159

The mentioned above analysis shows the result of the Cointegrating regressions, which further shows the p-value for the cointegrating test 0.0159, which is larger than the level of significant 0.05. This calculated value conveys that, the time series are stationary and further conclude that the series doesn’t have the unit root so, unit root null hypothesis should be rejected for this cointegrating regression and depicts that there is a long run
relationship amongst economic variables and the housing price indices. Further the cointegrating regression shows the R squared value 0.9615, which entails that there is a 9.6% aggregate variation observed because of the selected economic variables in the Housing Price indices. Further coefficient of Interest rate is 16.1566 which mean that approx. 0.16% positive variation in the housing price indices caused by the inflation. GDP per capita bearing 0.29% variation in the housing price indices which is least in compare to the other selected economic indicators, another variable Inflation rate which causes 3.12477% variation in the Housing price Indice.

2. Cointegrating regression HPI with Major financial market indices

Table- 5.9 – Cointegrating Regression Analysis HPI and Financial Indices

<table>
<thead>
<tr>
<th>Cointegrating regression - OLS, using observations 2007-2015 (T = 9)</th>
<th>Coefficient</th>
<th>std. error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.733702</td>
<td>16.9682</td>
<td>-0.04324</td>
<td>0.9672</td>
</tr>
<tr>
<td>Nifty Indice</td>
<td>0.00941004</td>
<td>0.00286668</td>
<td>3.283</td>
<td>0.0219 **</td>
</tr>
<tr>
<td>Gold Indice</td>
<td>0.00770399</td>
<td>0.00121611</td>
<td>6.335</td>
<td>0.0014 ***</td>
</tr>
<tr>
<td>Silver Indice</td>
<td>-0.00174134</td>
<td>0.000598279</td>
<td>-2.911</td>
<td>0.0334 **</td>
</tr>
<tr>
<td>Mean dependent var</td>
<td>162.6667</td>
<td>S.D. dependent var</td>
<td>47.63140</td>
<td></td>
</tr>
<tr>
<td>Sun squared resid</td>
<td>633.4372</td>
<td>S.E. of regression</td>
<td>11.2555</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.965100</td>
<td>Adjusted R-squared</td>
<td>0.944160</td>
<td></td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-31.91316</td>
<td>Akaike criterion</td>
<td>71.82632</td>
<td></td>
</tr>
<tr>
<td>Schwarz criterion</td>
<td>72.61522</td>
<td>Hannan-Quinn</td>
<td>70.12388</td>
<td></td>
</tr>
<tr>
<td>rho</td>
<td>-0.465207</td>
<td>Durbin-Watson</td>
<td>2.025132</td>
<td></td>
</tr>
</tbody>
</table>

P-value for the Engle Granger Cointegration test: 0.0411

The above analysis states the result of the Cointegrating regressions for Housing Price Indices and major financial market, which further shows the p-value for the cointegrating test 0.0411, which is lower than the level of significant 0.05. This calculated value conveys that, the time series are stationary and further conclude that the series doesn’t have the unit root so, unit root null hypothesis should be rejected for this cointegrating regression and depicts that there is a long run relationship amongst the major market indices and the housing price indices. Cointegrating regression shows the R squared value 0.9651, which entails that there is a 9.65% aggregate variation in the housing price indices observed...
because of the selected market indices. Further coefficient of Nifty Indice is 0.0094, which means that per 1% change in the housing price Indice, Nifty Indice dominate 0.0094%.

3. Cointegrating regression FDI in Real estate with Major financial market indices

### Table- 5.10 – Cointegrating Regression Analysis HPI and Financial Indices

<table>
<thead>
<tr>
<th>Dependent variable: FDIinREAL</th>
<th>Coefficient</th>
<th>std. error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>2247.48</td>
<td>1083.50</td>
<td>2.074</td>
<td>0.0927  *</td>
</tr>
<tr>
<td>Nifty Indice</td>
<td>-0.0666787</td>
<td>0.183052</td>
<td>-0.3643</td>
<td>0.7306</td>
</tr>
<tr>
<td>Gold Indice</td>
<td>-0.124803</td>
<td>0.0776546</td>
<td>-1.607</td>
<td>0.1689</td>
</tr>
<tr>
<td>Silver Indice</td>
<td>0.0471176</td>
<td>0.0382032</td>
<td>1.233</td>
<td>0.2723</td>
</tr>
</tbody>
</table>

Mean dependent var 803.1111 S.D. dependent var 787.0830
Sum squared resid 2582827 S.E. of regression 718.7248
R-squared 0.478848 Adjusted R-squared 0.166157
Log-likelihood -69.32271 Akaike criterion 146.6454
Schwarz criterion 147.4343 Hannan-Quinn 144.9430
rho 0.162493 Durbin-Watson 1.292798

Augmented Dickey* Fuller Test for uhat
including one lag of (1-L)uhat (max was 1)
Sample size 7
Unit-root null hypothesis: a = 1
Model: (1-L)y = (a-1)*y(-1) + ... + e
1st-order autocorrelation coeff. for e: -0.503
Estimated value of (a - 1): -1.12851
test statistic: tau_c(4) = -4.22896
Asymptotic p-value 0.03506

The mentioned analysis states the result of the Cointegrating regressions for FDI in real estate and major financial market, which further shows the p-value for the cointegrating test 0.0356, which is lower than the level of significant 0.05. This calculated value conveys that, the time series are stationary and further conclude that the series doesn’t have the unit root so, unit root null hypothesis should be rejected for this cointegrating regression and depicts that there is a long run relationship amongst the major market indices and the FDI in Real estate. Co-integrating regression shows the R squared value 0.4788, which entails that there is a 4.788% aggregate variation in the FDI in real estate caused by the selected market indices. Further coefficient of Gold market Indice is -0.124803, which means that
gold indices bearing an inverse influence to the FDI in real estate which further concludes that a possible decrease in Gold market Indice by approx. 1.24% causes to increase in the FDI in real estate by 1%. The gold market Indice bearing the highest influence on the FDI in the real estate sector.

4. Cointegrating regression of FDI in Real estate and Key Economic Indicators

| Cointegrating regression - OLS, using observations 2007-2015 (T = 9) |  |
|---|---|---|---|---|
| Dependent variable: FDIinREAL | coefficient | std. error | t-ratio | p-value |
| constant | 10959.4 | 4827.21 | 2.270 | 0.0724 * |
| Interest rate | -451.632 | 202.580 | -2.229 | 0.0762 * |
| GDP Per-capita | -4.63504 | 1.68140 | -2.757 | 0.0400 ** |
| Inflation Rate | 109.397 | 90.3181 | 1.211 | 0.2799 |
| Mean dependent var | 803.1111 | S.D. dependent var | 787.0830 |
| Sum squared resid | 1082097 | S.E. of regression | 465.2091 |
| R-squared | 0.781659 | Adjusted R-squared | 0.650654 |
| Log-likelihood | -65.40779 | Akaike criterion | 138.8156 |
| Schwarz criterion | 139.6045 | Hannan-Quinn | 137.1131 |
| rho | -0.164108 | Durbin-Watson | 2.113385 |

The mentioned analysis states the result of the Cointegrating regressions for FDI in real estate and key economic variables, which further shows the p-value for the cointegrating test 0.034, which is lower than the level of significant 0.05. This calculated value conveys that, the time series are stationary and further conclude that the series doesn’t have the unit root so, unit root null hypothesis should be rejected for this cointegrating regression at 5% significance level and depicts that there is a long run relationship amongst the key economic variables and the FDI in Real estate. Co-integrating regression shows the R squared value 0.7816, which entails that there is an approx. 7.82% aggregate variation in
the FDI in real estate caused by the key economic variables. Further coefficient of interest is -451.632, which shows that interest rate bearing an inverse relationship with the FDI in real estate segment.

5. Cointegrating regression of HPI with All the Selected Variables

Table 5.12 – Cointegrating Regression Analysis FDI and All Variables

<table>
<thead>
<tr>
<th>Cointegrating regression - OLS, using observations 2007-2015 (T = 9)</th>
<th>coefficient</th>
<th>std. error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: FDI in Real Estate</td>
<td>constant</td>
<td>-22956.1</td>
<td>28971.2</td>
<td>-0.7924</td>
</tr>
<tr>
<td></td>
<td>Interest rate</td>
<td>817.905</td>
<td>1097.98</td>
<td>0.7449</td>
</tr>
<tr>
<td></td>
<td>GDP Per Capita</td>
<td>12.1942</td>
<td>14.1876</td>
<td>0.8595</td>
</tr>
<tr>
<td></td>
<td>Inflation_Rate</td>
<td>574.790</td>
<td>391.578</td>
<td>1.468</td>
</tr>
<tr>
<td></td>
<td>Nifty Indice</td>
<td>-0.0966617</td>
<td>0.199618</td>
<td>-0.4842</td>
</tr>
<tr>
<td></td>
<td>Gold Indice</td>
<td>-0.352638</td>
<td>0.310821</td>
<td>-1.135</td>
</tr>
<tr>
<td></td>
<td>Silver Indice</td>
<td>0.0472028</td>
<td>0.0600329</td>
<td>0.7863</td>
</tr>
</tbody>
</table>

Mean dependent var 803.1111 S.D. dependent var 787.0830
Sum squared resid 604502.7 S.E. of regression 549.7739
R-squared 0.878026 Adjusted R-squared 0.512104
Log-likelihood -62.78766 Akaike criterion 139.5753
Schwarz criterion 140.9559 Hannan-Quinn 136.5961
rho -0.709333 Durbin-Watson 3.226431

Dickey-Fuller test for what
sample size 8
unit-root null hypothesis: a = 1
model: (1-L)y = (a-1)*y(-1) + e
1st-order autocorrelation coeff. for e: 0.103
estimated value of (a - 1): -1.70933
test statistic: tau_c(7) = -7.91665
p-value 0.04523

The analysis states the result of the Cointegrating regressions for FDI in real estate with the key economic variables and Major market indices to check the overall impact of both variables on the FDI in real estate, which further shows the p-value for the cointegrating test 0.04523, this is lower than the level of significant 0.05. This calculated value conveys that, the time series are stationary and further conclude that the series doesn’t have the unit root so, unit root null hypothesis should be rejected for this cointegrating regression at 5% significance level and depicts that there is a long run relationship of FDI in real estate and the key economic variables and major market variables. Co-integrating regression shows the R squared value 0.878026, which entails that there is an approx.
8.78% aggregate variation in the FDI in real estate explained by the key economic variables and the major market variables. Further amongst the all variables the major variation explained by the Interest rate and inflation rate as the coefficient for both 817.905 and 574.790 respectively. On the other hand gold market Indice having inverse relationship as the coefficient for the gold market is -0.352638. which shows the 3.52% inverse effect explained by the gold Indice.

6. Cointegrating regression of HPI with All the Selected Variables

Table- 5.13– Cointegrating Regression Analysis HPI and All Variables

<table>
<thead>
<tr>
<th>OLS, using observations 2007-2015 (T = 9)</th>
<th>Coefficient</th>
<th>std. error</th>
<th>t-ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dependent variable: HPI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>const</td>
<td>392.958</td>
<td>15.6065</td>
<td>25.18</td>
<td>0.0253  **</td>
</tr>
<tr>
<td>FDI</td>
<td>0.00466331</td>
<td>0.000332306</td>
<td>14.03</td>
<td>0.0453  **</td>
</tr>
<tr>
<td>Interest rate</td>
<td>-15.7806</td>
<td>0.583201</td>
<td>-27.06</td>
<td>0.0235  **</td>
</tr>
<tr>
<td>GDP Per-capita</td>
<td>-0.135811</td>
<td>0.00780230</td>
<td>-17.41</td>
<td>0.0365  **</td>
</tr>
<tr>
<td>Inflation_Rate</td>
<td>-7.33955</td>
<td>0.265232</td>
<td>-27.67</td>
<td>0.0230  **</td>
</tr>
<tr>
<td>Nifty Indice</td>
<td>0.00501193</td>
<td>9.91577e-05</td>
<td>50.55</td>
<td>0.0126  **</td>
</tr>
<tr>
<td>Gold Indice</td>
<td>0.0105779</td>
<td>0.00187267</td>
<td>56.49</td>
<td>0.0113  **</td>
</tr>
<tr>
<td>Silver Indice</td>
<td>-0.00221806</td>
<td>3.22799e-05</td>
<td>-68.71</td>
<td>0.0093  ***</td>
</tr>
<tr>
<td>Mean dependent var</td>
<td>162.667</td>
<td>47.63140</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.D. dependent var</td>
<td>0.066754</td>
<td>0.258367</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.999996</td>
<td>0.999971</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>9.297422</td>
<td>-2.594845</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schwarz criterion</td>
<td>-1.017048</td>
<td>-5.999724</td>
<td></td>
<td></td>
</tr>
<tr>
<td>rho</td>
<td>-0.498615</td>
<td>2.756354</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Augmented Dickey-Fuller test for uhat
Including one lag of (1-L)uhat (max was 1), sample size 7
unit-root null hypothesis: a = 1
Model: (1-L) y = (a-1)*y (-1) +... + e
Asymptotic p-value 0.0235

The analysis states the result of the Cointegrating regressions for housing price index with the key economic variables and Major market indices to check the overall impact of both variables on the housing price index, which further shows the p-value for the cointegrating test 0.0235, this is lower than the level of significant 0.05. This calculated value conveys that, the time series are stationary and further conclude that the series doesn’t have the unit root so, unit root null hypothesis should be rejected for this cointegrating regression at 5% significance level and depicts that there is a long run relationship of housing price index.
and the key economic variables and major market variables. Co-integrating regression shows the R squared value 0.99, which entails that there is an approx. 9.9% aggregate variation in the housing price index explained by the key economic variables and the major market variables. Further amongst the all variables the major variation explained by the Interest rate and inflation rate as the coefficient for both -15.7806 and -7.33955 respectively. Both showing an inverse relation with the housing price

The mentioned analysis above for the cointegration between the variable tested for the differences to make time series stationary and reject the null hypothesis. Further analysis of cointegration shows the significant influence of all the variables on HPI on real estate as well as on FDI in real estate so, here it can be concluded that both the real estate market variables influenced by the Market and economic variables.