Analyzing Interlinkages between Financial and Real Estate Sector in the aftermath of COVID-19's Second wave: An Econometric Approach using VECM model

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ABSTRACT: Entire global economy has been adversely affected by the demand and supply shocks which have been created due to consequent waves of Covid-19 pandemic. Indian Economy was none the better amidst the second wave. Due to the demand and supply shocks at both national and international level, Indian Economy witnessed an unprecedented contraction of its Gross Domestic Product by twenty four percent. In this context one of the few prominent sectors which could assist in the recovery of Indian Economy is expected to be Real Estate Sector. Due to the inherent forward and backward linkages of the sector with infrastructure and manufacturing industry, it could assist in faster recovery of economy through multiplier effect. In addition to that, Credit Policy is going to play a vital role in assisting the recovery of any prominent sector. In this backdrop, our study is an attempt to analyze as to whether Real Estate, Infrastructure and Financial sector are co-integrated or not. If they are co-integrated, how long will it take for the sectors to revert to normalcy. Our paper through its empirical approach aims to suggest relevant credit policy measures.

Keywords: *Real Estate Sector, Financial Sector, Co-integration, Vector Error Correction Model, normalcy, post-pandemic, Covid-19*

INTRODUCTION:

Pandemic has adversely affected entire global economy. India in no way has been an exception (CII,2020; Dev and Sengupta,2020). The severity of the pandemic was more devastating in the second wave, both, in terms of of loss of life and livelihood (Wouter van Eijkelenburg,2021). Indeed, it was a veritable nightmare for the entire Indian Economy and populace. The supply and demand shock created, in this backdrop, has reverberated its impact across all the sectors. Although in the latter half of 2021, Indian economy has shown signs of recovery from pandemic induced supply and demand shocks, it is pertinent to analyze the rate of recovery. Analyzing the rate of recovery with its inbuilt intricacies shall help in optimum policy formulation. This shall in turn help in fastening the process of economic recovery which shall gradually assist populace to return to their normal lives.

In this backdrop, one of the most prominent sectors which has the potential to enhance the pace of economy's recovery through leveraging forward and backward linkages through

multiplier effect is considered to be Real Estate Sector. In addition to it, Relevant Credit policy can go a long way in helping to guide any prominent sector on its road to recovery.

In this backdrop, our study has made an attempt to understand the interlinkages between financial and real estate sector with the help of cointegration analysis. Further we have used Vector Error Correction Model, to estimate as to when the series will revert back to normalcy. The fundamental objective of our study is to underline the interlinkages between credit and real estate sector and so as to suggest relevant policy measures in order to quicken the process of correcting the disequilibria in the economy.

LITERATURE REVIEW:

Real Estate Sector is one of the prominent sectors in any economy due to the inherent backward and forward linkages that it can have with other sectors, be it infrastructure or financial sector. Although at present, real estate sector is contributing 6 to 7 percent of India's Gross Domestic Product (GDP), by 2025, it is expected to contribute 13 percent to the nation's GDP. (IBEF,2021) Viewing Real Estate Sector in isolation would not be a rational thing to do. Real Estate Sector can play a vital role in enhancing the pace of Economic growth through multiplier effect (IBEF,2021). In fact, among 14 major sectors, construction industry ranks 3rd in terms of direct, indirect, and induced effects on the other sectors of the economy. In terms of employment potential, Real Estate is the second largest employment generator, after Agricultural sector in India. It also has the potential of attracting foreign direct investment, both in short and long run (The Economic Times,2020). By 2040, real estate sector is expected to grow to 65,000 Crore industry from 12,000 crore Industry as of 2019. In terms of market size, Real Estate Sector is expected to grow to a size of 1 trillion US Dollars by 2030 from 120 billion US Dollars in 2017.

Despite 2020, being a forgettable year, the resilience of Demand exhibited by real estate sector is worth mentioning. For instance, domains of warehousing and retail real estate attracted Private Equity investments of 971 million USD and 220 million USD. In the later half of 2020, around 86000 units of new housing projects were launched in just top 8 cities of India. In addition to it, sales volume of houses across the above eight major cities doubled from October 2020 to December 2020. Although real estate sector has exhibited a phenomenal growth in face of adversity (The Economic Times,2020) its potential for growth and rallying the economy in years to come is still much more. In fact, according to Economic Times Housing Finance Summit, there is veritable shortage of houses in urban area which is to the tune of approximately 10 million units (The Economic Times,2017). Moreover, in the summit it was further pointed out that an additional 25 million units of houses were required to be constructed by 2030 to meet the needs and demands of growing populace. Even in terms of attracting Foreign Direct Investment, Real Estate Sector is arguably one of the top contenders. According to the recent report provided by Department for Promotion of Industry and Internal Trade Policy (DPIIT), construction is the 3rd largest sector in terms of FDI flow. Even in terms of investment growth potential, the caliber of the sector is remarkable. In fact, in the first half of 2021, Indian Real Estate Sector was able to attract 2.4 billion USD which is a year-on-year growth of 52 percent.

Recognizing the vast potential that the sector is endowed with, even the Government has taken, several prominent initiatives to stimulate the growth and development of Real Estate

Sector. Although Government's ambitious scheme of building 100 Smart Cities stands head and shoulders above all the other schemes, other fiscal initiates worth mentioning are as follows: In latest Union Budget of 2021-22, government of India announced tax deduction up to 1.5 lakh rupees on residential loans and projects. Even in 2020, under the package of Atmanirbhar Bharat 3.0, Government has provided real estate developers and potential home buyers with tax relief in purchases of residential plots of up to 2 crore rupees. In addition to the above measures, Government also has established formal institutions like National Housing Bank with initial corpus of 10,000 crore rupees along with Affordable Housing Fund (AHF) to finance affordable funding for institutions and people alike. In this backdrop, given the obvious significance of Real Estate Sector in Indian Economy, it becomes pertinent to understand the intricacies between financial sector and real estate sector. Although the real estate, along with infrastructural sector has shown remarkable resilience in midst of supply and demand shock created by pandemic, through ARCH modelling, we have observed that there has been veritable shock in the series.

RESEARCH GAP:

Despite underlying importance of real estate sector in the economy and the veritable shock that the sector has undergone, we do not find an empirical study undertaken to evaluate the interlinkages between financial and real estate sector. Given the prominence of these sectors in the functioning and recovery of national economy, the undertaken study has significant policy implications.

OBJECTIVES:

- To verify as to whether Real Estate, Infrastructure and financial sector are interlinked or not.
- Further, if the said sectors are interlinked, to find out as to when they will revert back to their previous equilibrium status post pandemic shock.

HYPOTHESES:

- There is no co-integration between financial series concerning Financial Sector with Real estate and Infrastructural Sector.
- Further, even if the series of the concerned sectors are cointegrated, there is no possibility of them to revert back to their previous equilibrium in the aftermath of post pandemic shock.

RESEARCH METHODOLOGY

The objective of the paper was to analyze as to whether time series of real estate sector is cointegrated with time series concerning financial sector. If that was the case, our study wanted to analyze as to whether the series will revert back to their previous equilibrium position post pandemic shock or not. To achieve the said objective, first and foremost the time period chosen by us was between November 2020 to November 2021. The rationale behind us choosing the said time period is that the economy on one hand, had suffered shock due to advent of second COVID-19 wave in early part of 2021 and in the latter half of 2021, Indian Economy was showing definite signs of recovery. To understand the fluctuations in the sector many studies (Akbar, M., Ali, S. and Khan, M.F.,2012; Foo, S.Y., et.al.,T.T.L.,2008; Ratanapakorn, O. and Sharma, S.C.,2007) have used capital market

indices as NIFTY or SENSEX as proxy. In line with established rationale, for understanding the fluctuations in financial sector as a whole, we have taken Bank Nifty. To understand fluctuations in Real Estate sector, we have chosen Nifty Infra and Nifty Reality. The rationale behind choosing these composite indices is that Real estate sector has strong backward and forward linkages with infrastructure. In addition to it, we also wanted to ascertain as to whether the series concerning the sectors have actually undergone a shock or not during the given time period. By using ARCH model, we were able to ascertain presence of shocks in the series. Since one of the main foci of our paper is to showcase the usage of Cointegration and Vector Error Correction Model, we shall not be dwelling much on the ARCH results. Moreover, the demand shock caused by second wave of COVID-19 on all the sectors of the economy is self-evident. (Dev, S, Mahendra,2020)

Further, since we had to test the presence or absence of cointegration among more than 2 series, we have taken the aid of Johansen Cointegration test (Manikandan, B and Rajarathinam, A.2019; Engle, R. F., and C. W. J. Granger, 1987) to achieve the same. Once we realized that, our series are cointegrated, we have used vector error correction model to analyze as to when the given series shall revert back to their previous normalcy and their speed of adjustment.

Cointegration: If the given time series are integrated at same level and if their linear combination is stationary, then the two series are said to be cointegrated. Cointegration is superior than other analytical tools of time series as it helps us to work with non-stationary series. When we use nonstationary series there is no loss of information, due to which our inferences shall be more reliable (Granger, C. W. J.,1986).

While using Cointegration two points needs to be taken into consideration:

1. The series taken to consideration should be integrated at same level
2. Linear Combination of the series should be stationary at level. I(0)

Cointegrated Series have the following properties which enables us to subject them to further mathematical treatment and infer more information:

1. Co-Integrated Series have common trends.
2. Series can be represented as one having moving average.
   For instance, if Y_t and X_t are two series which are integrated at I(1) process and $e_t = Y_t - \beta_1 - \beta_2 X_t$ where e_t is integrated at I(0). Now this process can be represented through Moving Averages
3. If the series are cointegrated, then, we can further use Error Correction Model on the given series.

To test as to whether the series are cointegrated or not, we can use either Engle and Granger two-step testing procedure or go with Johansen's Methodology of Cointegration.

Engel and Granger two-step testing procedure is applicable when there are only 2 series in which case, we shall get one cointegrating relationship.

Since in our present study, we are using multiple series, we are going to be using Johansen's Methodology of Cointegration.

Johansen's Methodology of Cointegration builds cointegrated variables based on maximum likelihood estimation instead of basing the same on Ordinary Least Square procedures. There are two tests in Johansen Cointegration Method which are as follows:

Trace Test

The null hypothesis (H_0) for Trace test is: There exists r cointegrating vectors.

The alternative hypothesis (H_1) is that there exists at least 1 cointegrating relationship (n>r)
The Maximum Eigenvalue tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n>r+1 cointegrating vectors.

Vector Error Correction Model: is mainly used to analyze data wherein the underlying variables have a long run common stochastic trend. This type of models helps us to estimate both short term and long-term effects of one time series on another. Error correction basically implies that last period's deviation from a long run equilibrium (error) due to shock, influences its short run dynamics. Hence, Error correction Models helps us to estimate the speed at which dependent variable reverts back to equilibrium for a given change in other variables.

RESULTS and INTERPRETATION

Before going for Johansen Method of Cointegration, it was necessary for us to test as to whether all the series that we had taken into consideration fulfilled the properties of cointegrated series or not. Thus, in this context we checked whether all the series we had taken into consideration were integrated at same level, the results of which are summarized in Table 1:

Table 1: Table Showing the results of tests for stationarity

Unit Root Test	**Level**	***Financial Sector`***	***Real Estate***	***Infrastructure***
ADF Test	Level	-13.99 (0.0000)	-14.75 (0.0000)	-13.73 (0.0000)
Phillips-Perron Test	Level	-13.93 (0.0000)	-14.77 (0.0000)	-13.66 (0.0000)

From the above table, we can see that, the series concerning financial sector, real estate and infrastructure are stationarity at level. The results of both Augmented Dicky Fuller Test (Dickey, D. A., and W. A. Fuller ,1979) and Phillips-Perron Test (Phillips, P. C., and P. Perron,1988) which are significant at less than 1 percent probability level for all the series assert the absence of unit root among all the series. Thus, with fair degree of confidence, we can infer that, if there is any divergence among the series, they can revert back to normalcy.
In our model, we have taken Fluctuations in bank credit (Y_t) to be affected by fluctuations in real estate (Z_t) and infrastructure (X_t), which has been represented in the following equation:

$$Y_t = \beta_1 + \beta_2 X_t + \beta_3 Z_t + e_t \quad \text{……..(1)}$$

From Equation 1, we were able to generate linear combination of the residuals which has been represented in the second equation

$$e_t = Y_t - \beta_1 - \beta_2 X_t - \beta_3 Z_t \text{……. (2)}$$

To test the stationarity of the residual series, which was generated through linear combination, Philips Perron Test and Augmented Dickey Fuller test was used. As test statistic of Philips-Perron test and A.D.F were significant at 1 percent probability level, we could infer that the residual generated through the linear combination of the series was stationary at level.

It could be inferred from the above tests that the series could be cointegrated. To verify the same with certainty, we had two tests at our disposal, on one hand we could go with Engle

and Granger two step testing procedure, or we could go with Johansen's methodology of testing procedure. Since, we were dealing with multiple time series, we have used Johansen's methodology of cointegration to test the absence or presence of cointegration.
The results of the same are summarized in table 2:

Table 2: Test Results of Johansen's Methodology of Cointegration

Hypothesized Number of Cointegrated Equations	**Eigen Value**	**Trace Statistic**	**Critical Value**	
			5%	**P-values****
*None**	0.3841	308.69	29.79	0.0000
*At most 1**	0.3622	192.35	15.49	0.0000
*At most 2**	0.2965	84.41	03.84	0.0000
Hypothesized Number of Cointegrated Equations	**Eigen value**	**Max-Eigen Statistics**	**Critical Value**	
			5%	**P-values****
*None**	0.3841	116.33	21.131	0.0000
*At most 1**	0.3622	107.93	14.264	0.0000
*At most 2**	0.2965	84.419	03.841	0.0000

In table 2, we have summarized the test results of Trace statistics and Max-Eigen statistics of Johansen's Methodology of Cointegration. The trace test tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of n>r cointegrating vectors. Since the probability value of the test statistics are significant at 1 percent probability level. Hence, we could reject the null hypothesis that there is no cointegration can be rejected and we can accept the alternate hypothesis that there is cointegration among the variables. Even through, Max - Eigen test statistics, we can observe that there is cointegration among the series. Thus, we can reject our First hypothesis that there is no cointegration among the chosen series.

Since, the series are cointegrated, we can use Vector Error Correction Model: Vector error correction model is useful in estimating both short term and long-term behavior of series exhibiting long-run common stochastic trend. If the cointegrated series are subject to any shock, Error correction models helps us in estimating the speed at which the dependent variable returns to equilibrium for a given change (shock) in other variables.

In our analysis, we have taken the dependent variable to be financial sector for which we have taken proxy to be time Nifty Bank share prices. The independent variables in our analysis are real estate and infrastructure. Nifty reality has been used as a proxy for real estate and Nifty infra is used as a proxy for infrastructure. The rationale behind choosing the said variables as dependent and independent variables are as follows. Infrastructure has significant forward and backward linkages with real estate sector. Real estate Sector in itself is the second largest employment generator, after agricultural sector and among 14 major sectors ranks 3rd in terms of inducing multiplier and accelerator effects on other sectors of Economy. Moreover, according to RBI report concerning disbursement of Credit, Real Estate and Infrastructure absorb around 15 to 20 percent of the total credit sanctioned by the commercial banks. Given, Both Industry and real sector are severely affected by pandemic (CII ,2020), the shock experienced by these sectors shall be inevitably translated to Financial Sector as

well. As we have already established that these series are cointegrated, through Vector Error Correction Model, we can estimate as to whether the series will converge back to normalcy or not. If the series are going to converge to normalcy, we can also estimate the speed of adjustment. Independent of convergence or divergence of the series, the results of vector error correction model is going to have significant policy implications.

Before running vector Error Correction model, it is necessary for us to estimate optimum lag. To estimate optimum lag, first and foremost we should run standard Vector Auto Regression taking all the variables. With that we can estimate optimum lag length criterion. The estimates of optimum lag length criterion are summarized in Table 3.

Table 3: Lag Length Criterion

Lag	LogL	LR	FPE	AIC	SC	HQ
0	2108.496	NA	3.07e-12	-17.99569	-17.95139*	-17.97783*
1	2117.572	17.84242*	3.07e-12*	-17.99634*	-17.81915	-17.92490
2	2121.404	7.434557	3.21e-12	-17.95217	-17.64208	-17.82714
3	2125.584	8.003144	3.34e-12	-17.91098	-17.46799	-17.73236
4	2132.660	13.36495	3.40e-12	-17.89453	-17.31864	-17.66233
5	2135.689	5.644154	3.58e-12	-17.84350	-17.13471	-17.55772
6	2138.826	5.764125	3.76e-12	-17.79338	-16.95170	-17.45402
7	2142.473	6.607768	3.94e-12	-17.74763	-16.77305	-17.35468
8	2144.872	4.286349	4.17e-12	-17.69121	-16.58374	-17.24468

Note: * indicates significant at less than 5 percent.
FPE: Final Prediction Error
AIC: Akaike information Criterion
SC: Schwarz information Criterion
HQ: Hannan-Quinn information Criterion

Thus, through the estimates we can see that, optimum lag length is 1 according to Akaike information Criterion (AIC). Based on previous literature, we are considering AIC criterion for estimating optimum lag length. The results of Vector Error Correction model is summarized in Table 4.

Table 4: Error Correction Results

Error Correction:	D(BANKR)	D(INFRAR)	D(REALITYR)
CointEq1	-0.107814	-0.091869	-0.082797
	(0.01197)	(0.00831)	(0.01885)
	[-9.00393]	[-11.0559]	[-4.39205]
D(BANKR(-1))	-0.372077	0.120225	0.034737
	(0.06912)	(0.04796)	(0.10881)
	[-5.38335]	[2.50659]	[0.31923]
D(INFRAR(-1))	0.621888	0.055573	0.552908
	(0.13142)	(0.09120)	(0.20690)
	[4.73213]	[0.60936]	[2.67234]
D(REALITYR(-1))	-0.106857	-0.104023	-0.564895
	(0.05029)	(0.03490)	(0.07917)
	[-2.12492]	[-2.98084]	[-7.13513]
C	-8.79E-05	-6.34E-06	-5.49E-05
	(0.00099)	(0.00069)	(0.00156)
	[-0.08848]	[-0.00920]	[-0.03514]

Note: In the above table, standard errors is in ( ) and t- statistic is in [ ]
BANKR represents Financial Sector
INFRAR represents Infrastructural Sector

REALITYR represents Real Estate Sector

Error Correction Coefficient: helps us to estimate the speed at which the model will restore its equilibrium following any shocks or disturbances (Füss R. and Herrmann, F.,2005) . The coefficient of dependent variable BANKR (Financial Sector) with INFRAR (Infrastructure) and REALITYR (Real Estate Sector) is negative and statistically significant. It implies that there is convergence from short dynamics towards long run equilibrium. Even when we observe the coefficients of infrastructure and Real Estate sector, we observe that their coefficients are negative and significant. It implies that, if there is any divergence, even in these series, there is a tendency of them helping the model to revert back to equilibrium in the long run. When it comes to speed of adjustment or error correction as displayed by Cointegrating Equation (CointEq1) of Table 4, we observe that, with respect to Financial Sector, it is 10 percent, with respect to Infrastructural sector it is 9 percent and with regards to Real Estate Sector it is 8 percent. Thus, even our second hypothesis, which assumed that the series may not revert back to equilibrium in the long run stands rejected.

Estimating The Long Run Coefficient: The estimated equation by taking Financial Sector (BANKR) as dependent variable is summarized in Table 5:

Table 5: Long Run Coeffecient (Taking Financial Sector as Dependent Variable)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.107814	0.011974	-9.003931	0.0000
C(2)	-0.372077	0.069116	-5.383345	0.0000
C(3)	0.621888	0.131418	4.732131	0.0000
C(4)	-0.106857	0.050288	-2.124917	0.0346
C(5)	-8.79E-05	0.000993	-0.088478	0.9296

In table 5, C1 represents long run coefficient, C2 represents Financial Sector's Coefficient, C3 represents Coefficient of infrastructural sector, C4 represents Coefficient of Real Estate Sector and C5 represents constant or intercept. In the above table, we also observe that, all the coefficients except the intercept are significant at 1 percent probability level.

Here, in the table we observe that coefficient of C1 is negative and significant which reflects long run causality between Financial Sector with Real Estate and Infrastructural Sector. Since the coefficient of Financial Sector is negative it reflects the ability of the series to revert back to equilibrium after shock. If the coefficient's sign would have been positive, then the movement of the series would have been away from the equilibrium. Moreover, the rate of error correction or speed of adjustment in Banking Sector is 10.78 percent.

Estimating The Short Run Coefficient: From Table 5, we can also observe that, A percentage increase in C2 (Financial Sector) will lead to decline in itself by 3.7 percent. When C3 (Infrastructural Sector) increases by a percentage, then Financial Sector (C2) increases by 6.2 percent. This observation was on expected lines. However, an interesting observation seen in context of Real Estate Sector is that when Real Estate Sector increases by 1 percent, we observe that financial sector decreases by 1.06 percent. Although on the surface, it may seem to be anomaly. In reality, it doesn't seem to be that farfetched on account of two

factors, On one hand, there is prominent presence of black money and parallel economy in the domain of real estate, due to which, growth in legal financial sector might not have been up to the mark. On the other hand, due to long gestation periods in real estate projects short term growth in real estate sector might not be able to immediately raise demand in financial sector.

For the above analysis adjusted R Square was 36.5 percent, F statistic was significant and Durbin Watson Test statistic was 2.0 which reflects the model is free from serial correlation. We also wanted to verify as to whether both Real Estate Sector and Infrastructural Sector were affecting Financial Sector for which we took the aid of Wald Test (Manikandan, B and Rajarathinam, A.2019). The results of Wald Test are summarised in Table 6

Table 6: Wald Test Result Diagnostics

Test Statistic	Value	df	Probability
F-statistic	11.39715	(2, 235)	0.0000
Chi-square	22.79430	2	0.0000

Null Hypothesis: C(3)=C(4)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(3)	0.621888	0.131418
C(4)	-0.106857	0.050288

In table 6, C(3) represents Coefficient of Infrastructure and C4 represents Coefficient of real Estate Sector. From the above table we can observe that, both Infrastructure and Real Estate sector is influencing Financial Sector.

Residual Diagnostics: To ensure the stability of our model, we ran the following tests whose results are summarised below:

Normality Test: We ran Normality test, whose graphical results are depicted in Diagram 1:

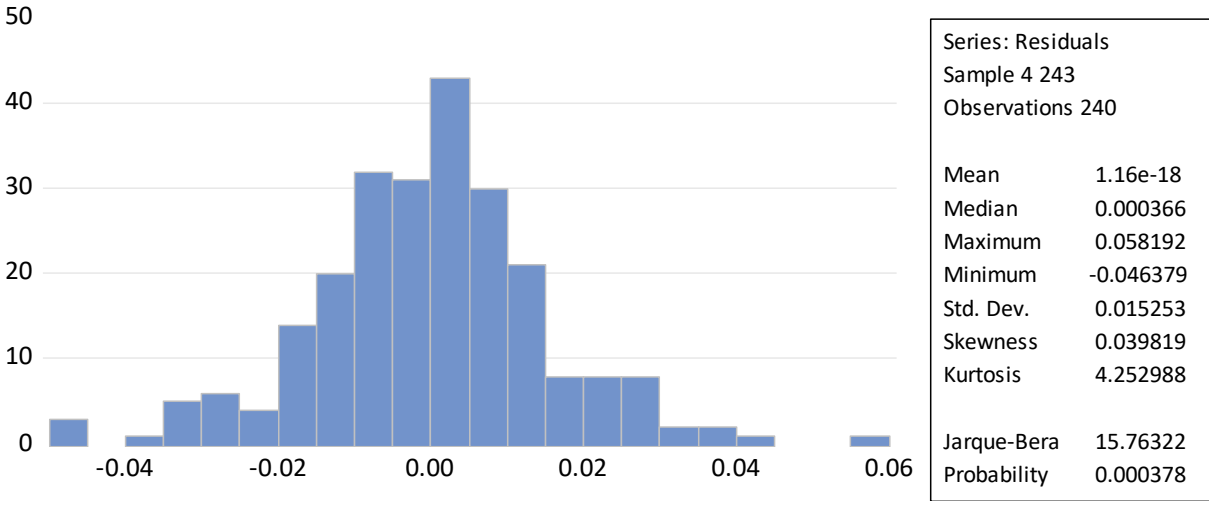

Diagram 1: Normality test results of Error Correction Model

From the above table, through Jarque- Bera test statistic, which is significant at 1 percent probability level, we can observe that our sample is normally distributed.

Serial Correlation: Durbin Watson Test Statistic for our model was 2.08, which implies that there is no serious problem of Auto correlation in our model.

Heteroskedasticity Test: To test as to whether our model was suffering from problem of Heteroskedasticity or not, we ran Breusch-Pagan-Godfrey Heteroskedasticity test. The results of the same are summarized in Table 7:

Table 7: Breusch-Pagan-Godfrey Heteroskedasticity test

Null hypothesis: Homoskedasticity

F-statistic	0.698575	Prob. F(6,233)	0.6510
Obs*R-squared	4.241081	Prob. Chi-Square(6)	0.6441
Scaled explained SS	6.613667	Prob. Chi-Square(6)	0.3581

The null hypothesis for Breusch-Pagan-Godfrey Heteroskedasticity test is that there is Homoskedasticity in the model. Since both F and Chi-Square statistic is insignificant, we do not have enough evidence to reject null hypothesis and consequently we can infer that our model is not suffering from Heteroskedasticity.

Thus, through residual diagnostics, with fair degree of confidence we can conclude that our model is stable.

Summary and Policy implications:

The objective of the paper was to analyze as to whether, the financial sector was cointegrated with real estate and infrastructure or not. If they had been cointegrated, what would be the rate of error correction in the given model. From our empirical study, we realized that the sectors are indeed cointegrated and interlinked. Given the prominent multiplier and accelerator potential that the real estate and infrastructure sector possess, they deserve Government support. To be fair, during the second wave, Government had given the above sectors leeway and breathing space to recoup and go on with their business. However, the harsh reality of the present time is that the demand across the sectors has suffered immensely due to post pandemic shock. In this context, Government is expected to do all it can to revive the economy in earnest.

In this backdrop, Government adopting expansionary monetary policy and allocating more credit to further accelerate Infrastructure and Real Estate sector on priority basis is going to further enhance Economic recovery and growth to a great extent.

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