Pivotal Drivers Shaping India's External Commercial Borrowings

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Abstract: *To achieve a targeted economic growth is the central objective of every economy, and in order to attain this predetermined goal, companies look at alternative modes of domestic as well as global financing. ECBs are playing a crucial role in this context. These serve as a conduit for Indian entities, both in the public and private sector for approaching international financial markets, thereby supplementing domestic capital resources, and contributing to economic growth. the present paper identified macroeconomic factors that are significantly associated with the variations in ECB inflows in long run. Among these, foreign exchange rate and index of industrial production are found to be major factors having significant impact on ECB inflows in India.*

Keywords*: External Commercial Borrowings (ECBs), Vector Error Correction Model (VECM), Johanson Cointegration, Foreign Exchange Rate, Index of Industrial Production.*

JEL Codes*: E44, F21, F34, F40, G15, G30*

Introduction

Since independent, India was indebted due to huge bank borrowings by British East India Company during the colonial rule to maintain its operations in India and abroad. India's move towards industrialization and import substitution after independence, particularly during 1950s and 60s necessitated the government to make considerable investment and build local industries, which again forced authorities to go for domestic as well as foreign debt. Subsequently, increase in oil prices due to Arab-Israel war (1956) led to increase in India's import bill, current account deficit, balance of payment issues and economic inefficiencies. It resulted into draining of country's foreign reserve and expansion of India's debt. Consequently, India approached IMF and World Bank for aid and borrowed heavily from overseas to sustain the economy.

The borrowing of financial resources from various sources facilitates the fulfillment of a nation's financial requirements, distribution of risk, and the use of investment possibilities. The global economic factors influence the growth of both debt and non-debt flows, as they expose a country to risks such as fluctuations in interest rates and currency rates, as well as the possibility

of financial contagion via transactions that take place across international borders. A few macroeconomic indicators, in a similar vein, have an impact on the growth of the ECBs in a country. These variables also assist market participants and policymakers in managing external borrowings by lowering risk and establishing strategies. Kraay and Nehru (2006), and Shanker (2019) are of the view that long-term viability of debt has an impact on borrowing money from external sources.

The theoretical framework of ECBs delineates the elements that exert influence on borrowing choices from foreign sources. The prevailing theoretical paradigm posited that countries characterized by stable macroeconomic circumstances, such as robust economic development and minimal inflation rates, tend to attract greater levels of foreign borrowing compared to those with elevated levels of risk. This indicates that a nation's borrowing choices are influenced by macroeconomic issues such as inflation, policy frameworks, and currency rate stability.

The neoclassical approach suggests that external sourced borrowing has the potential to foster a nation's economic expansion and can contribute to the stabilization of economies by addressing imbalances in the balance of payment. But an overabundance of borrowing may result in the buildup of debt that becomes unmanageable if the country is unable to repay it. It exemplifies the potential of a country to have a slow growth because of debt buildup, ultimately culminating in economic calamities.

Reviews of Literature

The rigorous investigations carried out by Harrod (1939), Chenery and Bruno (1962), and Thirlwall (2007) underscore the significance of external borrowing in addressing the twin gap and provide potential remedies for nations struggling with financial difficulties. Singh (1993) found that the nation's economic crisis ensued due to its heavy dependence on imports, primarily due to the exorbitant financing expenses precipitated by the escalated petroleum import costs in mid-1980s. Consequently, a significant portion of their obligations manifested as short-term debt and commercial borrowings.

Guillermo (1993) viewed that capital flows are volatile due to a variety of internal and external conditions, including monetary and fiscal policy measures, exchange rate policies, and terms of trade. Additional factors which contributed to the escalation of capital inflows into Latin America include recession and low interest rates. Kohli (2001) observed FDI, FII, and ECB as primary sources of capital inflows in India. In view of Singh (2007) domestic factors such as money supply, interest rate differentials, and IIP have an impact on the demand for ECBs in India.

Some researchers (Aizenman and Hutchison, 2012; and Aggarwal, 2015) observed that countries experiencing higher levels of economic growth tend to have a greater inclination toward external debt to address their financial requirements for infrastructure development, and there exists a direct relationship between the amount of money injected through external borrowings and the rate of economic development. Chandrashekhar (2009), Saxena (2020), and Verma and Prakash (2011) observed that India attracts a greater volume of ECBs due to its more lenient policies, greater interest rate differentials, Dev (2013) found a favorable correlation between ECB inflows and a multitude of variables, including interest rates, exchange rates, and index of industrial production.

The push-pull model, which highlights the influence of economic factors on the transfer of money across international borders, postulates that capital flows are subject to the effect of push factors in the country of origin and pull factors in the country of destination. The pull factors encompass various aspects of the borrower country, such as political stability, market size, and regulatory environment, which serve as attractive incentives for foreign investments. Conversely, the push factors encompass attributes like GDP growth, interest rates, and investment opportunities that incentivize investors to pursue substantial returns. The

model in question has been the subject of examination and analysis by several scholars in multiple scholarly articles, such as Clavo et al. (1993), Chakraborti (2006), Verma and Prakash (2011), Kapoor (2014), Ray et al. (2017) and Sur et. al. (2019).

According to a study conducted by Nwala (2008), countries with insufficient savings for capital stock investment tend to depend on the savings of other nations to sustain their economic development. Saxena and Shanker, (2019), added to this concept by primarily focusing on the presence of two significant gaps that have the potential to trigger economic crises: the import-export gap and the investment-saving gap. The existence of the investment-saving gap may be attributed to diminished productivity and inadequate investment, resulting in reduced income that subsequently diminishes savings, buying power, and perpetuates a detrimental cycle of poverty.

Some researchers, such as Ekpo (2016), Ray et al. (2017), Sur et. al. (2019), and Mishra (2020), have scrutinized the pivotal role of certain macroeconomic factors that exert substantial influence on the nationwide circulation of commercial borrowings. Ekpo (2016), in a study focusing on Nigeria, mentioned that GDP, inflation, and currency rates are noteworthy indicators for predicting external borrowings. Mishra (2020) mentioned that India's ECB are significantly influenced by GDP, trade openness, inflation, and foreign currency reserves. Pradhan and Hiremath (2020), in a study on the impact of macroeconomic and firm-specific variables on ECB growth identified interest rate differentials as macroeconomic determinant, and return on assets, ratio of export earnings to net sales, log of total assets, ratio of net fixed assets to total assets, and debt to total assets as firm-specific factors.

Economic liberalization and unrestricted international investment made external borrowings a key source of financing for Indian enterprises in 1990s. Moreover, the ECBs, which make up most of India's foreign debt, despite tightened policies and regulations on repayments, has increased continuously and are main source of borrowing for Indian corporations particularly due to interest rate differentials and many other factors.

Material and Methods

ECBs serve as a significant means of financing, enabling corporations to get overseas cash to satisfy their financial needs. The influencing variables associated with the ECBs are of utmost importance for borrowers, investors, and policymakers which are trying to make well-informed choices and effectively address the related risks. By considering crux of theories, literature, and own observations, the researcher identified some factors for developing econometric model on determinants of ECBs in India.

Variables Selected for Econometric Modelling

S. No.	Variable Name	Unit	Method	Data Source
A: Dependent Variable				
A-1	Gross External Commercial Borrowing (ECB)	US$ Million	ECB Inflows	http://dbie.rbi.org.in
B: Independent Variables				
B-1	Capital Account Openness (CAO)	US$ Million	Total capital account/ GDP of India	http://dbie.rbi.org.in
B-2	Foreign Exchange Rate (FOREX)	Percent	Percent	http://dbie.rbi.org.in

B-3	GDP Growth Differentials (GDPDIF)	Percent Change	GDP growth of OECD nation – GDP growth of India	http://data.worldbank.org/wdi
B-4	Index of Industrial Production (IIP)	Index	Indexing	http://dbie.rbi.org.in
B-5	Interest Rate Differentials (INTDIF)	Percent Diff.	LIBOR – India's Call Money Rate	http://dbie.rbi.org.in http://data.worldbank.org/wdi
B-6	International Liquidity (IL)	US$ Million	_____	https://www.imf.org/en/Data
B-7	Money Supply to GDP (MSGDP)	US$ Million	Money Supply/ GDP of India	http://data.worldbank.org/wdi
B-8	Trade Openness (TO)	US$ Million	Total trade/ GDP of India	http://dbie.rbi.org.in

Source: *Own compilation*

The researcher employed some econometric techniques, presuming that "the identified macroeconomic factors do not cause any impact on ECB flows in India". The annual database on ECB inflows and selected independent variables for a period from 1990-91 to 2021-22 is sourced from official website of Reserve Bank of India, International Monetary Fund, and World Bank (table 4.3). The data with regards to money supply is available in Indian Rupees. So, to maintain homogeneity of unit in data series, broad money as percentage of GDP, sourced World Bank database is considered. Since data on broad money is variable only up to 2021-22, the analysis is limited to the financial year 2021-22. The econometric model on determinants of ECBs in India is developed by using Vector Error Correction Model (VECM) and Impulse Response Function (IRF) methodology and diagnostic checking. The step-by-step procedure for applying the VECM, Variance Decomposition (VD), and IRF involves conducting a stationarity test, model specification, and optimum lag order selection. Once the lag is determined, the VECM is applied, and a three-way causality check is performed. In addition, some diagnostic tests are conducted to ascertain if the model adequately captures the information in the data. Finally, the forecast is made using VD and the IRF.

To check stationarity of dependent and identified independent variables Augmented Dickey Fuller (ADF) unit root test is used. The test results presented in table 1 indicate that all variables are non-stationary at their level, but stationary at first difference (I(1)) allowing to use a cointegration test and VECM.

Table 1: ADF Unit Root Test Results

Variable	Z(t)	CV	Order of Integration	R^2	DW Test	Prob. Value	Remark
ECB	-4.75	-2.96	I(1)	0.44	2.04	0.0006	Stationary
CAO	-5.27	-2.96	I(1)	0.49	1.98	0.0002	Stationary
FOREX	-4.69	-2.96	I(1)	0.44	2.06	0.0007	Stationary
GDPDIF	-5.30	-2.96	I(1)	0.77	1.93	0.0002	Stationary
IIP	-3.65	-2.96	I(1)	0.32	2.26	0.0104	Stationary

INTDIF	-8.88	-2.96	I(1)	0.73	2.16	0.0000	Stationary
IL	-3.52	-2.96	I(1)	0.30	1.84	0.0140	Stationary
MSGDP	-4.47	-2.96	I(1)	0.41	1.82	0.0013	Stationary
TO	-3.57	-2.96	I(1)	0.31	1.66	0.0127	Stationary
* CV = Critical value at 5 percent							

Source: *Own calculations*

While examining the relationship among the variables, it is important to keep in mind that they may not be immediately dependent on each other. In fact, there may be a temporal delay in their response to each other, commonly referred to as lag. Determination of the appropriate number of lags is essential in VAR and VECM models. For optimum lag selection, VAR Lag Order Selection Criteria method is commonly used. It considers all chosen variables as endogenous and determines the optimal lag based on the criteria that minimize the error term. The lag order based on several criterion presented in table 2 indicates that the AIC and SC has lowest values, allowing the selection of 2 lags.

Table 2: Lag Order Selection

Lag	Log L	LR	FPE	AIC	SIC	HQ
0	213.1049	---	996	-13.60699	-13.18664	-13.47252
1	477.9926	353.1835	599	-25.86617	-21.66258	-24.52141
2	644.0012	121.7397*	126*	-31.53341*	-23.54659*	-28.97836*

Source: Own calculations

To determine the degree of correlation between variables, two methods: Engle-Granger approach, and Johanson Cointegration approach are commonly used. For working with multiple non-stationary time series data, the Johansen Cointegration test is used to determine if they cointegrate. Unlike the Engle-Granger approach, Johansen's approach allows for multiple co-integration connections. In the context of VECM, there are two Johansen cointegrating tests: the trace test and the maximal eigenvalue test.

In the present analysis, the test has confirmed the presence of six (trace statistics) and five (Max-Eigen statistics) cointegrating equations, indicating a long-term relationship among variables, as the p-values are less than 0.05 at 5% level of significance, (table 3 and 4), it confirms the usability of VECM.

Table 3: Result of Johansen Cointegration

Hypothesized Number of CE(s)	Eigenvalue	Trace Statistics	Critical Value at 5%	Prob.
Unrestricted Cointegration Rank Test (Trace Test)				
None*	0.988	463.6180	197.3709	0.0000

At most 1*	0.976	330.7211	159.5297	0.0000
At most 2*	0.921824	219.4316	125.6154	0.0000
At most 3*	0.790650	142.9677	95.75366	0.0000
At most 4*	0.731826	96.05521	69.81889	0.0000
At most 5*	0.591726	56.57158	47.85613	0.0061
At most 6	0.444671	29.69708	29.79707	0.0513
At most 7	0.328572	12.05125	15.49471	0.1545
At most 8	0.003354	0.100781	3.841465	0.7509
The trace test indicates 6 cointegrating equations at 5% level. *Denotes rejection of the hypothesis at the 5% level.				

Source: Own calculations

Table 4: Result of Johansen Cointegration

Hypothesized Number of CE(s)	Eigenvalue	Trace Statistics	Critical Value at 5%	Prob.
Unrestricted Cointegration Rank Test (Maximum Eigenvalue Test)				
None*	0.988084	132.8968	58.43354	0.0000
At most 1*	0.975514	111.2895	52.36261	0.0000
At most 2*	0.921824	76.46395	46.23142	0.0001
At most 3*	0.790650	46.91244	40.07757	0.0009
At most 4*	0.731826	39.48363	33.87687	0.0021
At most 5	0.591726	26.87451	27.58434	0.0614
At most 6	0.444671	17.64583	21.13162	0.1437
At most 7	0.328572	11.95047	14.26460	0.1125
At most 8	0.003354	0.100781	3.841465	0.7509
The trace test indicates 5 cointegrating equations at 5% level. *Denotes rejection of the hypothesis at the 5% level.				

Source: Own calculations

The cointegration equations imply that there is a linear association between the series, meaning that they will eventually converge (in the long-run), regardless of whether short-run shocks impact the movement of individual series. Therefore, the VECM is the most suitable approach for determining the connection between the variables over the long-term.

Results and Discussion

VECM is used in time series analysis, especially when there are long-run correlations between the variables in a system. By examining both the long-run equilibrium relationships and the short-run deviation from that equilibrium, the VECM model can estimate the short-run coefficients as well. The presence of cointegration equations in the model suggests for using VECM with (p – 1) or (2 – 1), i.e., one lag.

The functional relationship of the model in present analysis can be expressed as:

ECB = f (CAO, FOREX, GDPDIF, IIP, INTDIF, IL, MSGDP, TO)

The mathematical relationship in VECM system ordered by variable is represented as:

D(ECB) = C(1)*(ECB(-1)) – 0.414*CAO(-1) – 1.490*FOREX(-1) – 0.004*GDPDIF(-1) – 1.318*IIP(-1) – 0.218*INTDIF(-1) – 0.122*IL(-1) + 0.219*MSGDP(-1) + 0.445*TO(-1) + 0.271 + C(2)*D(ECB(-1)) + C(3)*D(CAO(-1)) + C(4)*D(FOREX(-1)) + C(5)*D(GDPDIF(-1)) + C(6)*D(IIP(-1)) + C(7)*D(INTDIF(-1)) + C(8)*D(IL(-1)) + C(9)*D(MSGDP(-1)) + C(10)*D(TO(-1)) + C(11)

The above equation determined by VECM outlines the interplay between its constituent variables. The relationship between these factors can be comprehensively analyzed by interpreting this interplay as a three-way causality. This process incorporates several tests to determine the direction of causality, including regressor's 't' statistics, Wald causality test and Granger causality (Pairwise) test.

Regressors t-statistics, takes ECB as a dependent variable and its determinants as independent variables. The results contained in table 5 show calculated 't' statistics of all the variables are more than 2, which suggests that there exists a significant long-run relationship between ECB and all its selected determinants.

Table 5: Result of VECM (Long-run)

Dependent Variable	CointEq1	Observation	Decision
ECB (-1)	1.000000		
CAO (-1)	-0.413531 (0.04377) [-9.44807]	1% increase in CAO is associated with 41.4% increase in ECB	Significant
FOREX (-1)	-1.489838 (0.14858) [-10.0269]	1% increase in FOREX is associated with 149% increase in ECB	Significant
GDPDIF (-1)	-0.003773 (0.00215) [-1.75335]	1% increase in GDPDIF is associated with 0.38% increase in ECB	Significant

IIP (-1)	-1.318566 (0.13961) [-9.44482]	1% increase in IIP is associated with 131.9% increase in ECB	Significant
INTDIF (-1)	-0.218014 (0.01859) [-11.7284]	1% increase in INTDIF is associated with 21.8 increase in ECB	Significant
IL (-1)	0.122111 (0.01240) [-9.84972]	1% increase in IL is associated with 12.2% decrease in ECB	Significant
MSGDP (-1)	-0.219148 (0.11349) [-1.93100]	1% increase in MSGDP is associated with 21.9% increase in ECB.	Significant
TO (-1)	0.444790 (0.05718) [7.77868]	1% increase in TO is associated with 44.5% decrease in ECB.	Significant
C	0.270857		
Note: Long-run relationship exhibits as the t-statistics is more than 2.			

Source: Own calculations

The long-run coefficients show the speed of convergence towards long-run equilibrium. For correct interpretation of convergence, the signs of the adjustment coefficients need to be corrected. The results of VECM (Short-Run) are presented in table 6.

The results show that the 't' statistics of all the variables less than 2 except international liquidity (near 2) indicating that there is no significant relationship between ECB and all its selected determinants, instead the model determined only the degree of association of the selected variables with ECB, in the short run. But all the selected variables have a long-term relationship with the series of ECB flows in India, therefore, the hypothesis "the identified macroeconomic determinants have no effect on ECB flows in India" is rejected.

Table 6: Result of VECM (Short run)

Cointegrating Eq:	CointEq1 (ECB)	Observation	Decision
CointEq1	-0.233553 (0.18533) [-1.26022]	The value of error correction term is negative. The previous year deviation from long run is corrected in the current year at an adjustment speed of 2%.	Significant
D (ECB (-1))	0.080869 (0.24747) [0.32679]	T-value < 2 1% increase in ECB is associated with 8.1% increase the ECB in short run.	Insignificant
D (CAO (-1))	0.246530 (0.18397) [1.34007]	T-value < 2 1% increase in CAO is associated with 24.7% increase in ECB in short run.	Insignificant
D (FOREX (-1))	0.583295 (0.63922) [0.91251]	T-value < 2 1% increase in FOREX is associated with 58.3% increase in ECB in short run.	Insignificant
D (GDPDIF (-1))	0.000701 (0.00476) [0.14714]	T-value < 2 1% increase in GDPDIF is associated with 0.07% increase in ECB in short run.	Insignificant
D (IIP (-1))	0.563622 (0.54390) [1.03626]	T-value < 2 1% increase in IIP is associated with 56.4% increase in ECB in short run.	Insignificant
D (INTDIF (-1))	0.010849 (0.05336) [0.20330]	T-value < 2 1% increase in INTDIF is associated with 1.1% increase in ECB in short run.	Insignificant
D (IL (-1))	0.264759 (0.13322) [1.98742]	T-value near to 2 1% increase in IL is associated with 26.5% increase in ECB in short run.	Significant
D (MSGDP (-1))	-0.596583 (0.63530) [-0.93905]	T-value < 2 1% increase in MSGDP is associated with 59.7% decrease in ECB in the short run.	Insignificant
D (TO (-1))	-0.059966 (0.25341) [-0.23663]	T-value < 2 1% increase in TO is associated with 6% decrease in ECB in short run.	Insignificant
C	0.004750 (0.02993) [0.15871]		

Note: (a) D, refers to the differenced variable, representing short-run co-efficients.
(b) CointEq1*: It captures the long-run equilibrium and signifies the convergence to it.

Source: *Own calculations*

The decision criterion for Wald Causality test depends on the acceptance of null hypothesis, which states that there is no causal relationship between selected variables and ECB, and the alternative hypothesis, that there exists a causal relationship between selected variables and ECB in short run.

The results of Wald Causality test on lagged explanatory variables, presented in table 7 indicate p value of international liquidity (IL) only less than 0.05, which suggests the existence of short run causal relationship between ECB inflows and international liquidity (IL) only. Meaning that ECB inflows do not have short run relationship with other variables under consideration

Table 7: Results of Granger/ Wald Causality Test

Independent Variables	Chi-sq	Prob. Value	Decision
D(CAO)	1.7958	0.1802	Accept
D(FOREX)	0.8327	0.3615	Accept
D(GDP_DIFF)	0.0217	0.8830	Accept
D(IIP)	1.0738	0.3001	Accept
D(IDIFF)	0.0413	0.8389	Accept
D(IL)	3.9499	0.0469	Reject
D(MSGDP)	0.8818	0.3477	Accept
D(TO)	0.0560	0.8129	Accept
Accept Null Hypothesis = No causal relationship Reject Null Hypothesis = Causality exists in the short run.			

Source: *Own calculations*

The results of pairwise Granger causality test and interpretation about inter-relationship between identified variables are presented in table 8.

The results delineate that there is no causal relationship between interest rate differentials and ECB in the short run, a unidirectional causal relationship running from CAO to ECB, ECB to FOREX, IIP to ECB, IL to ECB, MSGDP to ECB, and TO (trade openness) to ECB, and a bi-directional causality between ECB and GDP in the short run.

Table 8: Results of Granger Causality

Null Hypothesis	F-Stat.	P-Value	Interpretation
CAO does not Granger Cause ECB ECB does not Granger Cause CAO	11.8345 0.01933	0.0018 0.8904	Reject Null: Uni-directional short-run causality CAO? ECB. Accept Null: ECB does not cause CAO.
FOREX does not Granger Cause ECB ECB does not Granger Cause FOREX	0.71819 13.7322	0.4039 0.0009	Accept Null: FOREX does not cause ECB. Reject Null: Uni-directional short-run causality ECB? FOREX.
GDPDIF does not Granger Cause ECB ECB does not Granger Cause GDPDIF	6.38510 5.92478	0.0174 0.0216	Reject both Null hypotheses. Bi-directional short-run causality ECB? GDP.
IIP does not Granger Cause ECB ECB does not Granger Cause IIP	5.58195 0.90836	0.0253 0.3487	Reject Null: Uni-directional short-run causality IIP? ECB. Accept Null: ECB does not cause IIP.
INTDIF does not Granger Cause ECB ECB does not Granger Cause INTDIF	2.43572 0.18468	0.1298 0.6707	Accept both Null hypotheses. No short-run relationship between INTDIF and ECB.
IL does not Granger Cause ECB ECB does not Granger Cause IL	4.00538 2.37201	0.0551 0.1348	Reject Null: Uni-directional short-run causality IL? ECB. Accept Null: ECB does not cause IL.
MSGDP does not Granger Cause ECB ECB does not Granger Cause MSGDP	5.06623 0.02186	0.0324 0.8835	Reject Null: Uni-directional short-run causality MSGDP? ECB. Accept Null: ECB does not cause MS.
TO does not Granger Cause ECB ECB does not Granger Cause TO	12.5569 0.36496	0.0014 0.5506	Reject Null: Uni-directional short-run causality TO? ECB. Accept Null: ECB does not cause TO.
Note: P > 0.05 means null hypothesis is accepted, and vice versa.			

Source: *Own calculation*

The reliability and validity of statistical models need diagnostic and residual testing to ensure model accuracy. The residual testing investigates residuals pattern, independence, homoscedasticity, and normality. It also examines model performance and finds residuals trends and outliers. Table 9 and 10 indicate the residual testing through serial correlation (LM test), and the test of normality.

Table 9: Results of VECM Residual Serial Correlation LM Test

Null Hypothesis: No Serial Correlation at lag 1						
Lag	LRE* Stats	DF	Prob.	F-stats	DF	Prob.
1	81.8514	81	0.4526	0.7549	(81, 21.9)	0.8179

Source: *Own calculations*

Table 10: Results of Normality Test

Component	**Jarque-Bera**	**DF**	**Prob.**
1	2.463	2	0.2919
2	1.342	2	0.5112
3	0.779	2	0.6773
4	7.041	2	0.0296
5	6.532	2	0.0311
6	1.313	2	0.5186
7	0.929	2	0.6285
8	2.734	2	0.2549
9	0.890	2	0.6408
Joint	25.023	18	0.0881

Source: *Own calculations*

The results for serial correlation suggest no serial correlation in the series, as the p-value is more than 0.05 at 5% level of significance.

The results of the test of normality indicate that the probability value of Jarque-Bera for almost all the selected variables is more than 0.05 at 5% level of significance, hence all the variables considered in the model are normally distributed.

Variance decomposition analysis evaluates the relative contributions of different components to the total variance of a dataset or outcome and analyzes how the identified factors produce dataset variability. The results of VECM variance decomposition are presented in table 11 (short-run) and 12 (long-run).

Table 11: Results of Variance Decomposition (Short-Run)

Independent Variables	**Short Run (Forecasted for 2 years)**	**Observation (for Short Run)**	**Decision**
CAO	2.14	CAO is explaining 2.14 percent of the forecast error variance in ECB.	Strongly endogenous
FOREX	0.31	FOREX is explaining 0.31 percent of the forecast error variance in ECB.	Strongly exogeneous
GDPDIF	0.76	GDPDIF is explaining 0.76 percent of the forecast error variance in ECB	Strongly exogeneous
IIP	2.24	IIP is explaining 2.24 percent of the forecast error variance in ECB.	Strongly endogenous

INTDIF	0.81	INTDIF is explaining 0.81 percent of the forecast error variance in ECB	Strongly exogeneous
IL	8.53	IL is explaining 8.53 percent of the forecast error variance in ECB	Strongly endogenous
MSGDP	0.87	MSGDP is explaining 0.87 percent of the forecast error variance in ECB	Strongly exogeneous
TO	0.10	TO is explaining 0.10 percent of the forecast error variance in ECB	Strongly exogeneous
Strongly Exogeneous: Very week influence on dependent variable for predicting future values. Strongly Endogenous: Strong influence on dependent variable for predicting future values.			

Source: *Own calculations*

Table 12: Results of Variance Decomposition (Long Run)

Independent Variables	Long Run (Forecasted for 10 years)	Observation (for Long Run)	Decision
CAO	3.91	CAO is explaining 3.91 percent of the forecast error variance in ECB	Strongly endogenous
FOREX	17.29	FOREX is explaining 17.29 percent of the forecast error variance in ECB	Strongly endogenous
GDPDIF	1.73	GDPDIF is explaining 1.73 percent of the forecast error variance in ECB	Strongly endogenous
IIP	1.28	IIP is explaining 1.28 percent of the forecast error variance in ECB	Strongly endogenous
INTDIF	0.30	INTDIF is explaining 0.30 percent of the forecast error variance in ECB	Strongly exogeneous
IL	30.52	IL is explaining 30.52 percent of the forecast error variance in ECB	Strongly endogenous
MSGDP	0.89	MSGDP is explaining 0.89 percent of the forecast error variance in ECB	Strongly exogeneous
TO	0.08	TO is explaining 0.08 percent of the forecast error variance in ECB	Strongly exogeneous
Strongly Exogeneous: Very week influence on dependent variable for predicting future values. Strongly Endogenous: Strong influence on dependent variable for predicting future values.			

Source: *Own calculations*

The results presented in table 11 (short-run) and 12 (long-run) suggest that out of the eight variables only three (capital account openness, index of industrial production, and international liquidity) exerts a strong influence on dependent variable (ECB inflows) for predicting future values in short run, and all the identified variables except interest rate differentials, money supply, and trade openness have a strong influence on ECB inflows for predicting future values in the long run.

An IRF is a tool that provides a clear understanding of how a system reacts to an external stimulus. In economics and finance, the use of IRFs is crucial as they correspond to the application of theoretical models and describe a system's input-output behavior. IRFs are best represented as grid graphs, showing individual variable responses to shock over a specific period. The following section presents the response of ECB to the identified determinants of ECB.

- Response of ECB to Capital Account Openness (CAO)**:** It is evident from figure 4.1 that any innovation or shock in the

capital account openness will positively influence ECB inflows in India. The growth in ECB will be considerable in the initial stages, a reasonable growth in future for up to ten years. In short, a shock to CAO will have a favorable impact on ECB inflows.

- Response of ECB to Foreign Exchange Rate (FOREX): Figure 4.2 indicates with innovations in the foreign exchange rate, ECB will undeniably have a negative impact in both short as well as long term. The figure also indicates a significant decline in the first three years followed by a gradual yet steady decline in the trend of ECB inflows.
- Response of ECB to GDP Growth Differentials (GDPDIF)**:** When it comes to innovations in GDP differentials, there will be a notable increase in ECB inflows in the short term; but a substantial decline in the ECB inflows in next three to four years. After the fourth year, the negative effect will begin to weaken. In short, GDP_DIFF will have a detrimental impact on the ECB inflows in the long run.
- Response of ECB to Index of Industrial Production (IIP)**:** With increase in IIP, ECB inflows will have a significant growth in the first year; it will begin to decline at a slower rate in next three years and will continue to decline until the tenth year at a very low rate with variations. In short, there exists an asymmetric relationship between IIP innovation and ECB inflows in the long as well as short run.
- Response of ECB to Interest Rate Differentials (INTDIF)**:** Over the course of time, innovations in interest rate differentials will have an asymmetrical effect on ECB inflows. INTDIF is expected to have a high degree of positive impact on ECB inflows in the early years, but it will have a negative association in the years to come, up to the tenth year.
- Response of ECB to International Liquidity (IL)**:** Figure 4.6 indicates that international liquidity will have a beneficial effect on ECB inflows in India in the long term. The ECB is expected to experience a sharp rise due to an increase in international liquidity in the first three years, and after the third year a somewhat steady trend in ECB inflows. In short, IL has a favorable influence on ECB inflows both in the short as well as long run.
- Response of ECB to Money Supply (MSGDP)**:** Figure 4.7 indicates with innovations in money supply will have immediate reaction on ECB inflows leading it to below zero in next one year. Following the second year, ECB inflows exhibit a very steady positive response to money supply in the long run.
- Response of ECB to Trade Openness (TO)**:** The response of trade openness in India on ECB inflows is similar to money supply. It is expected to have a negative impact on ECB inflows in the next year, and after that a steady positive impact in the long run.

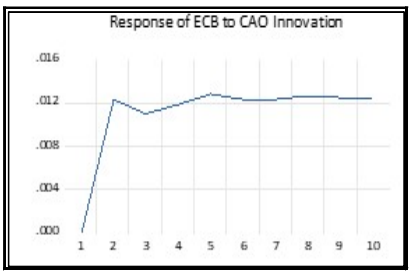

Figure 4.1: Response of ECB to CAO

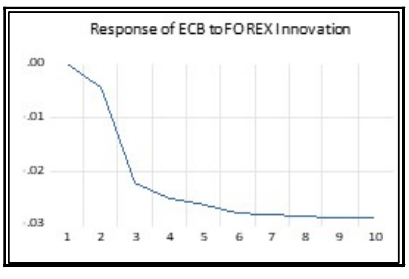

Figure 4.2: Response of ECB to Forex

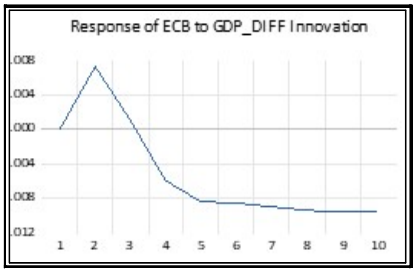

Figure 4.3: Response of ECB to GDPDIF

Figure 4.4: Response of ECB to IIP

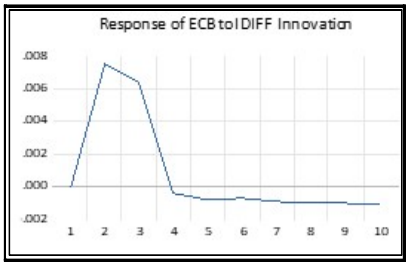

Figure 4.5: Response of ECB to INTDIF

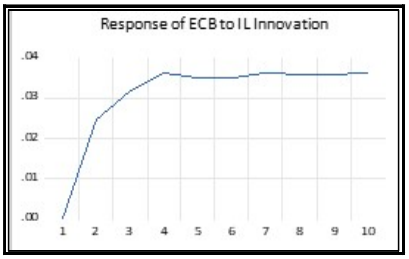

Figure 4.6: Response of ECB to IL

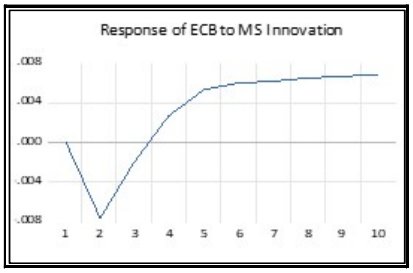

Figure 4.7: Response of ECB to MSGDP

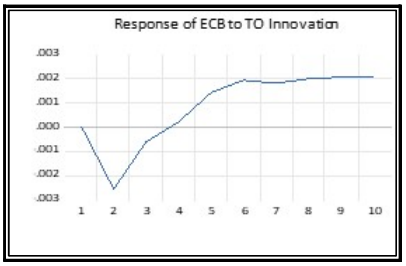

Figure 4.8: Response of ECB to TO

Conclusion

During 1990s, ECBs were the key source of financing for Indian enterprises due to economic liberalization and unrestricted international investment. After the 1990s it continued to be the major components of external debt of India due to interest rate differentials and many other factors. To identify major determinants of ECB inflows in India, the impact of identified macroeconomic variables on ECB inflows is analyzed by using Granger causality test, VECM and IRF in both long run and short run. The results suggest that all the variables, except international liquidity and trade openness, have a significant positive impact on ECB inflows in the long run. However, in the short run, only international liquidity shows a significant impact on ECB inflows in India. The result of Granger Causality delineates that all the variables, except foreign exchange rate and interest rate differentials Granger cause ECB inflows in India.

Annexures

Table 13: ECB and Selected Determinants

Year	ECB	CAO	FOREX	GDP DIFF	IIP	IDIFF	IL	MSGDP	TO
1990-91	10209	4.89	22.74	2.59	15.26	7.40	3,167.56	42.18	9.07
1991-92	11715	4.96	25.92	-0.16	18.6	13.28	2,907.52	43.42	7.93
1992-93	11643	4.56	30.49	3.33	22.36	10.22	3,325.08	44.14	8.15
1993-94	12363	5.57	31.37	3.35	28.22	3.35	3,354.56	44.88	8.77
1994-95	12991	4.68	32.43	3.45	31.75	3.81	3,669.44	46.02	9.92
1995-96	13873	4.06	35.43	4.92	34.6	11.49	3,613.58	43.55	11.49
1996-97	14335	5.65	36.31	4.44	36.54	2.06	2,879.96	44.69	11.33
1997-98	16986	5.89	41.26	0.41	38.21	2.61	2,492.18	47.46	11.47
1998-99	20978	4.82	43.06	3.15	40.47	2.30	2,402.64	48.90	10.67
1999-00	19943	5.26	44.94	5.42	42.92	3.16	2,252.34	51.06	11.22
2000-01	24408	6.76	47.19	-0.25	44.08	2.32	2,329.08	54.65	11.88
2001-02	23320	5.15	48.61	3.41	46.24	3.30	2,711.56	57.74	11.35
2002-03	22530	5.32	46.58	2.27	49.27	3.70	3,322.82	62.62	13.10
2003-04	22101	8.08	45.32	5.83	54.61	3.26	3,808.05	63.18	15.11
2004-05	26405	9.72	44.10	4.66	57.85	2.53	4,101.72	64.64	19.24
2005-06	26452	13.19	45.31	5.10	64.18	1.58	5,366.88	65.55	23.05
2006-07	41443	19.73	41.35	5.04	74.22	1.90	6,871.10	68.06	26.40
2007-08	62334	34.43	43.51	5.06	79.91	0.95	6,605.24	72.28	32.55
2008-09	62461	23.81	48.41	2.70	80.08	4.18	9,486.38	77.37	37.26
2009-10	70726	24.30	45.73	11.27	87.87	1.72	22,469.51	79.08	33.00
2010-11	100476	32.79	46.67	5.52	92.09	4.97	26,620.28	77.68	40.43
2011-12	120136	29.62	53.44	3.37	91.87	7.39	27,219.83	78.84	49.20
2012-13	140125	27.67	58.60	4.07	93.31	7.08	19,724.51	76.91	46.41
2013-14	149375	28.22	61.03	4.88	97.53	7.60	19,377.85	78.18	42.16
2014-15	180295	28.28	64.15	5.32	100.00	7.39	17,240.08	77.90	38.93
2015-16	180480	24.25	67.20	5.59	105.21	6.19	18,584.11	78.01	30.58
2016-17	172045	24.18	65.12	6.46	108.93	4.88	20,421.62	74.55	28.99
2017-18	201821	26.46	68.39	4.29	114.55	4.15	21,689.89	74.14	31.62
2018-19	205804	20.95	70.42	4.12	115.31	3.51	27,830.79	74.10	32.61
2019-20	219466	22.68	74.10	2.14	102.66	3.06	36,957.92	76.98	29.30
2020-21	216559	23.65	73.91	-1.65	115.73	2.67	39,404.52	87.78	27.04
2021-22	225797	27.57	78.60	3.27	121.00	2.96	41,290.89	82.54	37.48
2022-23	221976	21.02	82.90	4.21	125.00	0.97	47,955.56	NA	36.42

Source: *Handbook of Statistics on Indian Economy, RBI, World Bank and IMF database.*

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