European Economic Letters
ISSN 2323-5233
Vol 15, Issue 2 (2025)
http://eelet.org.uk

The Relationship between IPO and Macroeconomics Factors: An Empirical Analysis from Indian Market

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Abstract
The purpose is to analyze the short and long run equilibrium relationship between the external factors and the IPO for Indian market over the period of 1999 to 2020, in order to provide: i) how macroeconomic conditions influence IPOs activities and ii) how long the effects last (shock).

Keywords:
Indian IPO; Long-run relationship; External factors; Cointegration; VECM**.**

1. Introduction
The number and frequency of Initial Public Offerings (IPOs) have been inconsistent over the period of years the frequency of the IPOs will always be fluctuation due the external factors such as country economic performance or growth rate. For example, the major crisis which affect the Indian economy was as follows dotcom bubble (2000-2003), only 20 firms in the India went for public, contrary during 2004-2006 when 144 IPOs. Moreover, during global financial crisis (2008-2009) in US just 55. IPOs and 34 IPOs were listed during the COVID Crisis (2020-2021). We can the IPOs Fluctuations may vary due the Macro-economic environment. The macro-economic environments such PESTEL Political, Economic, Social, Technological, Environmental, Legal are the factor which may affect the frequency of the IPOs.

The aim of this paper is to analyze the short and long run equilibrium relationship between the external factors the factors which we have considered in this study was volatility, stock market return, industrial production, and interest rates and the IPOs for Indian market over the period of 1999 to 2020 - during critical financial conditions (Global financial crisis, 2007-2008, Covid crisis 2019), in order to point out how macroeconomic changes cause IPO frequency. Specially we want to examine which are the key factors and their dynamics (impulse response to shock) that influence the going public decision. On the other hand, this paper examines the effects of volatility of stock market, interest rates and the industrial production on IPOs frequency to uncover the relative importance of different macroeconomic determinants of IPOs.

To understand these relationships, we adopt different time-series econo metrics methods, which have become standards techniques for examining cointegration among financial variables, such as Johansen's cointegration, Vector error-correction model (VECM) and Granger-causality, following Tran and Jeon (2011) approach. One methodology novelty of this paper, is the extended Vector Auto-regression (VAR) model by Toda and Yamamoto (1995) — hereafter T-Y. There are two advantages to apply this method- ology. The first is it can be used independently of order of integration and the second is that the variables can be cointegrated or not. These cointegration methods are able to provide the existence of dynamic equilibrium between the variables and to predict the future state of IPOs frequency, and to highlight these interactions.

2. A Brief Literature Review

Macroeconomic variables are the key indicators that determine the economic conditions of a country. The choice of a company to going public is impacted by macroeconomic factors on an industry and corporate level (Tran & Jeon, 2011). Obtaining cash from the public through an Initial Public Offering (IPO) is one of the capital market's functions in order to finance businesses (investors). Initial Public Offerings (IPOs) are one of the best ways for businesses to raise money, particularly for corporate or operational expansion **(Larasati, 2013).** (Weisbach & Kim, 2008) who concludes that firms use money from IPOs to finance new investment and internal funds to pay off long-term debts. In contrast to (Draho, 2004) and (Weisbach & Kim, 2008) (Pagano, Panetta , & Zingales, 1998) states that the main reason for firms do IPOs is because they want to rebalance the capital structure, exploit mispricing and pay off their long-term debt. (Pagano, Panetta , & Zingales, 1998) also states that firms rather pay off their existing debt before financing new investments and that an IPO could be one way of accomplishing it. (Lowry, 2003) states that macroeconomic variables are exceptional variables for examine what factors that influence the IPO volume. Further, they state that the simultaneously changes of macroeconomic variables will affect the cash flow for firms and impact the discount rates used when valuating firms. Financial managers strategically time an IPO to capitalise on favourable industry and market conditions. IPOs occur in waves according to the movements of the stock market and the economy (Brau & Fawcett, 2006); (Ibbotson & Jaffe, 1975)

According to (Loughran & Ritter, 1995), corporations time their IPO activities to maximise their offering price by utilising the favourable market window. The capital market in Nepal, which is referred to be the "barometer" or "immediate mirror" of the economy, is still in the process of expanding, and its stock market is generally inefficient **(Kafle, 2005; Sthapit, & Dangol, 2006, Shrestha & Sthapit, 2009**; (Tamang, 2022); (Sthapit, Laohakosol, & Sharma, 2018)), study covered the yearly data related to IPOs (proxy by Number of IPOs, IPONUM; Total IPO Proceeds raised, IPOTP; and Average IPO Proceeds raised, IPOAP) and that of the macroeconomic variables: Gross Domestic Product (GDP), Inflation [proxy Inflation rate (INF)], Interest rate [proxy by Bank Lending Rate (BLR)], Stock Market Index [proxy by NEPSE], and Remittance (REM), from the fiscal year 1993/94 to 2015/2016. According to their research, the stock market index, remittance inflow, and interest rate are some of the key macroeconomic factors influencing how IPO activities have changed in the Nepalese context. The number of IPOs issued, the overall amount of IPO proceeds raised, and the average amount of IPO proceeds raised are all positively impacted statistically by the stock market index and the inflow of remittances. The number of IPOs issued, the total amount raised through IPOs, and the average amount raised through IPOs in the Nepalese primary market are all significantly negatively correlated with interest rates, which has a negative causal

relationship with IPO activity. According to the study, a time of lower interest rates, greater inflows of remittances, and a positive secondary market condition point to a macroeconomic environment with greater liquidity and greater investor confidence. (Alim, Khan, Iqbal, & Haider, 2020)

There are a number of studies relating to IPO in Asia has been conducted. The Malaysian market analyses the relation between the macroeconomic variables to the primary equity market activities in the emerging markets. Comparing other Malaysian IPOs this paper has a greater time period i.e., 1990 to 2008. It aims to find whether the local economic variables have any influence on the number of IPOs in the emerging Malaysian market. The factors considered in this study are Interest rate and industrial production through Markov regime switching technique which is used to demonstrate that the impact of macroeconomic factors on Malaysian IPOs is not time-invariant. It allows us to show that from the existence of unknown IPO market condition, which shows a 10% probability of swing from a "hot" to "cold" IPO market regime (and vice versa) due to variations in the interest rate. (Ameer, 2012), (Tran & Jeon, 2011) and (Jensen & Meckling, 1976), state that there is negative relationship between interest rate and the numbers of IPOs, and a significant positive relationship between industrial production and the numbers of IPOs, macroeconomic variables and the number of IPOs. The result reveals that the IPO in Malaysia are driven by monetary policy. (Goyal & Frank , 2009) conclude the opposite of (Ameer, 2012); (Tran & Jeon, 2011)and (Jensen & Meckling, 1976)**.** Based on datasets over a 25-30-year period, they find a positive correlation between the real interest rate and IPO volume.

In Europe, IPO volume has varied throughout the past 15 years, and in 2012, it was at its lowest point in recorded history. The impact of macroeconomic conditions on the recovery of the US stock market has been studied by (Chang, 2011). The study period covered the years 1974 through 1994, and according to (Chang, 2011) interest rates are a great tool for implementing tight or loose monetary policy, which will have an impact on the stock market via various credit channels**.** (Chang, 2011) adds that fluctuations in interest rates will affect the amount of initial public offerings.

According to the market's genuine perception of a company's value, the underpricing phenomena suggests that companies receive less than they should (Sudarmaji, Ambarwati, Hubbabsyah, & Astuti, 2020). Nonetheless, it is advantageous to investors as they profit from the return on their investment in held shares **(Aini, 2013).** At the time of initial public offering, under-pricing often occurs when the initial stock price on the primary market is lower than the stock price on the secondary market which will disadvantage the company because the collected funds are not maximum. (Nasution & Mutasowifin, 2021) examines the impact of macroeconomic factors on under-pricing of IPOs on the Indonesia Stock Exchange from 2010 to 2022. The study focuses on three macroeconomic variables: Inflation, IDX Composite Index, and GDP. The IDX Composite Index is a crucial index that investors, both domestic and international, consider while investing in the Indonesia Stock Exchange due to its inclusion of all shares listed on the IDX. The study aims to provide insights into the impact of macroeconomic factors on IPO under-pricing and their implications for investors.

The study by **Sukirno (2011)** examines the relationship between the IDX Composite Index and GDP with share prices, which is important for investors. The study uses multiple regression analysis and various statistical tests, such as the F statistic, t statistic, and R2, to assess the impact of macroeconomic factors on under-pricing in IPO. The results show that

companies issuing securities must consider macroeconomic factors when determining offering share prices to minimize under-pricing. When GDP increases, demand for goods and services rises, leading to higher company profits and more investment. The study highlights the importance of macroeconomic factors in the IPO process.

The study conducted by (Aidrous & Glavina, 2020) investigates the relationship between various macroeconomic factors and the volume and number of initial public offerings (IPOs) in the Gulf Cooperation Council (GCC) emerging market. The study covers a decade-long period from 1996 to 2016. The macroeconomic factors considered in the study are the reference interest rate, crude oil production, stock market index, direct foreign investment, loan growth, and GDP. The research aims to identify the internal and external factors that influence businesses to raise capital through IPOs. The researchers excluded some variables, including private equity investment growth, growth of the industrial production rate, and global stock index, since they had insignificant impacts on the number of IPOs in the market. The variables that had significant impacts on IPOs were GDP Growth, LIBOR, and Bond10.

The initial public offering segment of the corporate securities market experiences booms and slumps. Research in the context of developed capital markets have shown that changes in the size and frequency of initial public offerings are influenced by both macroeconomic factors and market-specific factors (IPOs). (Rani & Kaurman, 2017) looked at the relationship between IPO activity in the Indian market and overall economic activity and financial market conditions from January 2004 to December 2010. According to the report, the amount of activity in the IPO market is related to GDP growth. As a result, the cyclical pattern of GDP can be used to estimate changes in the new issue market in terms of issue volume.

(D.A.I & A.W.G.C.N, 2015) undertook a study in Sri Lanka from 1989 to 2014 to look at the long-term dynamic relationship between IPO activity and macroeconomic factors. The time frame was chosen to encompass both Sri Lanka's extremely turbulent period and its incredibly tranquil climate following the civil war. Three proxies for the IPO activity—number of IPOs each year, total IPO proceeds, and average IPO proceeds—were taken into consideration when analysing the dependant variable.

2.1. Theoretical Hypothesis

The preceding literature suggests that macroeconomics factors and the IPO frequency are in a relationship. Therefore, we present the following hypothesis that we want to test.

1 Hypothesis:

There is a negative relationship between volatility and the number of IPOs.

2 Hypothesis:

There is a positive relationship between stock performance and IPO frequency.

3 Hypothesis:

There is a positive correlation between IP growth and number of IPO.

4 Hypothesis:

There is a negative relationship between interest rate and the number of IPOs.

3. Data And Variables

The sample is composite of the firm listed on Indian stock exchange which is NSE (National Stock Exchange) over the period January 1999 | December 2020. The monthly number of

European Economic Letters
ISSN 2323-5233
Vol 15, Issue 2 (2025)
http://eelet.org.uk

IPOs (N IPO) were obtained from National Stock Exchange NSE website. We select four macroeconomic and financial variables. As a proxy for real economy, we choose the Indian Industrial production index. For financial environment, we selected NIFTY Index (NSE50) as a measure of stock market performance, and the market volatility (VOL) for investment risk. Finally, as a measure for long-term Financing cost in liabilities we selected the Long-term interest rate (LT). Industrial production index, and 10-years bond yield have been taken from the RBI database, while the NIFTY50 index from NSE website. We estimate the annualized market volatility by GARCH (1,1) model. Table 1 shows the source and the unit measure of each variable.

Table 1.
Variables

Variables	Unit	Source
Number of IPOs	Frequency	NSE
Industrial Production Index	Index	RBI Website
Indian Stock market Index - NIFTY50	Index	NSE Website
Long-term interest rate	Precent	RBI Website
Volatility of stock prices	Level	Own calculation on data stream

Table 2.
Summary Statistics

	N_IPO	LT_ Bond_Yield	Index_Return	IIP	VOL
Mean	2.4375	7.720194	6208.581	306.868	5.88528
Median	1	7.591	5287.225	338.535	5.03725
Maximum	17	12.223	18758.35	485.5	23.32067
Minimum	0	5.1	913.85	146.3	1.598275
Std. Deviation	2.978948	1.479968	4589.148	98.3257	3.31981
Skewness	1.748679	1.05077	0.873084	-0.19396	2.27328
Kurtosis	3.416204	1.327445	0.055834	-1.35372	7.04670

Table 2. gives an overview of descriptive statistics of monthly IPOs and macroeconomic-time series data. During the period 1999 to 2020, 702 firms were listed on National Stock Exchange (NSE). We find that the mean of the N_IPO is 2.4375. It's interesting note that in the year 2007, there was a record of 94 new firms being listed on NSE, with a maximum in no of monthly IPOs (17). This seems to be driven by a substantial economic upswing during the year 2005 to 2007. After the collapse of Lehman brothers and the beginning of global financial crisis, there was a very decrease in in the number of IPOs. Only in 2015 , the N_IPO started to growth. The upward movement of the reference interest rate (LT) displays dramatic changes in default risk during the global financial crisis (200-2008) and reaches its peak level of ___ % in __. The average of industrial production Index is growing year on year from 1999 to 2020, while the lowest value was registered in 2022. Finally, regarding the return of financial market was affected from global financial crisis as well as volatility. High level of this have negatively on stock price Index, namely on number of IPOs.

4. Methodology

This section details the econometrics models utilized to study the linkages between frequency of IPO and macroeconomics variables. We use the classical cointegration analysis. Johansen

cointegration approach (2001) to investigate the existence of a cointegration relationship, Vector Error Correction model (VECM) to analyse the dynamic relationship, Granger causality test (1987) and Toda-Yamamoto causality test (1995), to examine the direction of causality. Our aim is to find some existence of short and long-term relationship between number of IPOs and external factors (market volatility, stock market return, business cycle and interest rate).

4.1. Stationarity test:

Economic time series are usually non-stationary, i.e., give a spurious regression and incorrect estimates. For identify the non-stationarity condition of variables, we performed Augmented Dickey-Fuller test (ADF) unit root test (1979). ADF estimation equation is given as follows:
Where is the time series variable to be tested (IPO), $\propto 0$ is the constant, t captures the time trend, δ is the estimated coefficient,$\in$t represents the error term, p the maximum lag length. The test relates the null hypothesis of stationary (α = 0) against the alternative hypothesis of

$$\Delta y_t = \alpha_0 + \alpha_1 t + \delta y_{t-1} + a_i \sum_{i=1}^{p} \Delta y_{t-i} + \varepsilon_t \qquad (1)$$

stationary ($\alpha \neq 0$). The number of appropriate lag length is selected using Schwarz Bayesian criterion (SC).

4.2. Cointegration Test:

Johansen test is used to verify the null hypothesis of no cointegration among IPO frequency and macro factors, against the alternative hypothesis of cointegration. The Johansen test are likelihood-ratio tests there are two tests: the trace and the max eigen value. The trace (2) and maximum (3) test can be written as
Where r is the cointegration vector, T is the size of sample, and λi is the largest canonical correlation.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{n} \ln(1 - \lambda_i) \qquad (2)$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \lambda_{r+1}) \qquad (3)$$

4.3. The VEC model

The Vector Error Correction model is used to examine the short and long-run dynamics relationship. The linear expression can be shown as:
Where Y = (Xi, Mj) is a vector of variables (Xi = N_IPO and Mj = VOL, Nifty_50, IP and

$$\Delta Y_{t,i} = \alpha_i + \gamma_i \beta_i Y_{t-1} + \sum_{z=1}^{n} \Gamma_{j,i} \Delta Y_{t-j,i} + \varepsilon_{t,i} \qquad (4)$$

LT), $\propto$ is a vector of constant stand for linear trend, Γ is a matrix that reflect the short-run relationship, while βi is the cointegration vector. The error correction coefficient (γ), that

European Economic Letters
ISSN 2323-5233
Vol 15, Issue 2 (2025)
http://eelet.org.uk

should have a negative sign with range -1< γ < 0, provide information about the speed of adjustment to the long equilibrium path. The information is very useful to understand how the variable react to shock.

4.4. Causality of Granger

By the Granger causality (Engle and Granger, 1987), we want to test that there may exist co-movements i.e., we want to investigate the causality direction between number of IPO and macroeconomic variables and that they will have trend together in finding long-run stable equilibrium. Formally, to test causality between economic IPOs activity and external factors and its direction in Granger sense, the following equation to be estimated are specified:

$$X_t = \sum_{i=1}^{n} \alpha_i Y_{t-i} + \sum_{j=1}^{n} \beta_i X_{t-j} + \mu_{1t} \quad (5)$$

$$Y_t = \sum_{i=1}^{m} \lambda_i X_{t-i} + \sum_{j=1}^{m} \delta_i Y_{t-j} + \mu_{2t} \quad (6)$$

Where Xt , is the number of IPOs, Yt is the four-macroeconomics variable (VOL, Nifty_50, IP, LT), $\alpha i, \beta i, \lambda i, \delta i$ are the coefficients, and μ1;2t are the error terms assumed uncorrelated, and m and n indicate the maximum number of lags. Equation (5) shows how variable X is determinate by lagged value of Y and X, while the equation (6) expresses the opposite, that is how the variable Y is influenced by itself and lagged X variable. On the other hand, Granger- causality signify the lagged Y influence X and the lagged X influence Y (equation 5 and 6 respectively).

4.5. Toda – Yamamoto approach:

Toda and Yamamoto method (1995) is a causality test, alternative to Granger causality, to analyse the causation, using Wald statistic (an asymptotic χ2 - distribution) The test is implemented use extra lags and be used independently of order of integration. In fact, the variables can be cointegrated or not. A multivariate VAR (n + Z_{max}) that included the N IPO and four macroeconomics variables, can be express as follow:

$$X_t = \omega + \sum_{j=1}^{n} \theta_i X_{t-1} + \sum_{j=n+1}^{n+z_{max}} \theta_i X_{t-1} + \sum_{j=1}^{n} \delta_i Y_{t-1} + \sum_{j=n+1}^{n+z_{max}} \delta_i Y_{t-1} + \mu_1 \quad (7)$$

$$Y_t = \psi + \sum_{j=1}^{n} \phi_i Y_{t-1} + \sum_{j=n+1}^{n+z_{max}} \phi_i Y_{t-1} + \sum_{j=1}^{n} \beta_i X_{t-1} + \sum_{j=n+1}^{n+z_{max}} \beta_i X_{t-1} + \mu_2 (8)$$

where X = N IPO and Y = IP, NIFTY 50, _VOL, LT respectively; ω, θ, δ, ψ, φ, β, are the coefficients; Z_{max} is the maximum (optimal number) order of integration, and $\mu_{1;2t}$ are the white-noise errors. The Toda- Yamamoto methodology made of two steps: first the choice of lag length (m) and second the maximum order of integration (Z_{max})[4].

5. Empirical Results

Before perform the analysis, the time series data must be stationary, so we perform unit root test for each variable using Augmented Dickey-fuller test (ADF),to ensure the no presence of

European Economic Letters
ISSN 2323-5233
Vol 15, Issue 2 (2025)
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Unit roots. The hypothesis for this test is about the h0 which is that the variable is not stationary which is they have a unit root. For this reason, we perform ADF test (all variables are expressed in natural logarithm). The results (Table 3) show that presence of unit-root at the level and then we use a first difference. On the other hand, these variables are integrated of order 1, and they may evidence any long run combination, according to **Engle and Granger (1987).** We have to check for the potential existence of long-run relation among them by means of a cointegration test. For getting the optimal lag, we have use three criteria, the Akaike Information Criteria (AIC), the Schwarz Bayesian Criteria (BIC), and the Hannan-Quinn Criteria (HQC). According to them, the appropriate number of lags should be 5 (see Table 4). Thus, if all series are stationary then we will reject the hypothesis of no relationship between them even when none exists. For there to be a long run relation between the variables, them must be cointegrated. For this reason, we perform the **Johansen and Juselius (1990**) test of cointegration between number of IPOs and the four-macroeconomics series. Table 5 summaries the results of Johnson test, performed with 1 to 5 number of lags. The trace and maximum test suggest the existence of cointegration relationship between number of IPO and all the four macroeconomic variables. The implication is that even though the series (N_IPO,VOL,NIFTY 50,IP and LT) are not individually stationary, but their linear combination is stationary. This implies that exist a long-run equilibrium relationship among the variables.

Table 3.
Augmented Dickey Fuller (ADF)test

Variables	Log Level	Log Difference
N_IPO	-2.96	-11.31***
VOL	-1.52	-5.84***
NIFTY 50	-2.90	-6.03***
IP	-16.5	-16.5***
LT	-3.09	-11.6***

Table 4.
Lag Structure

Lag	Log L	FPE	AIC	SC	HQ
0	821.5564	1.89E-09	-5.89571	-5.830298*	-5.86947
1	885.5716	1.43E-09	-6.17741	-5.78492	-6.019929*
2	927.4927	1.26E-09	-6.29959	-5.58002	-6.01087
3	952.2939	1.27E-09	-6.29815	-5.2515	-5.8782
4	975.2177	1.29E-09	-6.28316	-4.90944	-5.73197
5	1007.244	1.22e-09*	-6.333891*	-4.63309	-5.65147
6	1026.15	1.28E-09	-6.28989	-4.26201	-5.47623
7	1044.745	1.35E-09	-6.24365	-3.88869	-5.29875
8	1073.788	1.31E-09	-6.27284	-3.59081	-5.19671
9	1092.573	1.38E-09	-6.22796	-3.21885	-5.0206
10	1105.774	1.51E-09	-6.14277	-2.80658	-4.80417
Notes: (*) indicates the best value of the respective information criteria. the FPE = Final prediction error, AIC = Akaike Criterion, SC = Shawarz Bayesian Criterion, HQ = Hannan-Quinn Criterion					

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European Economic Letters
ISSN 2323-5233
Vol 15, Issue 2 (2025)
http://eelet.org.uk

Johansen's cointegration results

Hypothesized No. of CE(s)	Trace Statistic	Max-Eigen Statistic	Critical Value (5%)	
			Trace	Max
None *	354.2865	98.42956	69.81889***	33.87687***
At most 1 *	255.8569	96.35415	47.85613***	27.58434***
At most 2 *	159.5028	70.95829	29.79707***	21.13162***
At most 3 *	88.54449	48.15805	15.49471***	14.26460***
At most 4 *	40.38644	40.38644	3.841465***	3.841465***
Note: Trace test and Max eigenvalue indicates 4 cointegrating eqn(s) at the 0.01 level (***) indicate the rejection of null hypothesis at 1%				

5.1 Dynamic relationship

After having identified the existence of long-run equilibrium, we perform the Vector Error Correction model (VECM) in order to explore the dynamics relationship among number of IPOs and the macroeconomics variables.

The estimation results of error-correction models indicate that the all-error term coefficients have correct sign (negative) and they are statistically significant at 1%.

The corresponding adjustment speeds to equilibrium is about 15% and % respectively. Large absolute values of the coefficient show equilibrium agents remove a large percentage of disequilibrium in each period. The ECT imply that 69% negative deviations in time period t 1 in the N IPO is correct in monthly t. It is interesting to note that the coefficient of error-term is very large in contrast to other studies. This imply that the speed of adjustment is very rapid, i.e., the UK market is very efficient in terms of response to external shocks.

We use the estimated coefficient of error-correction (ECT), for computed the time required of halfway adjustment, following Tran and Jeon (2011).The disequilibrium from long-run values are corrected approximately in 5

Table 6.

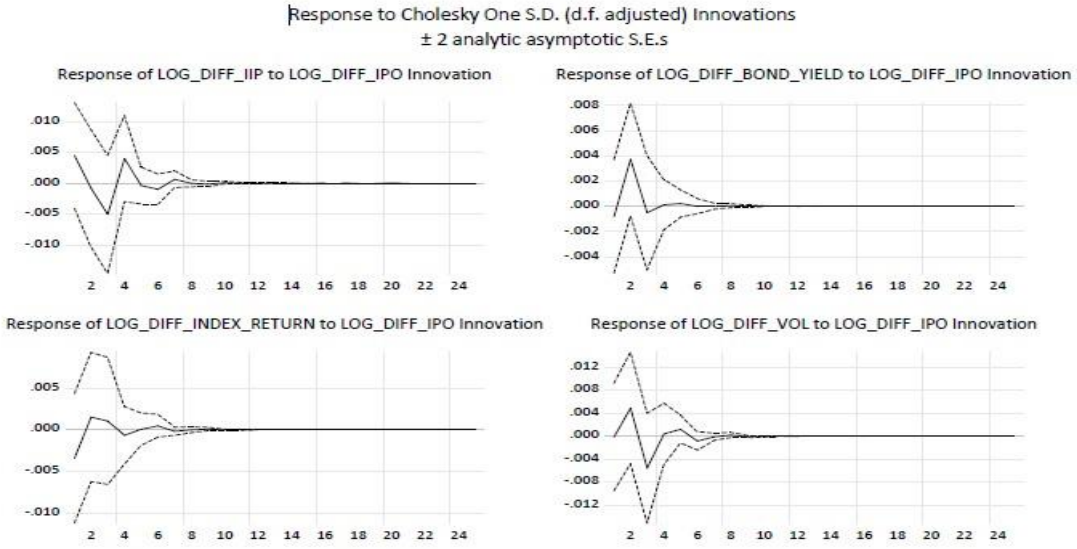
Variance decomposition

Period	S.E	N_IPO	VOL	NIFTY 50	IP	LT
1	0.532384	100	0	0	0	0
2	0.575236	98.65838	0.859558	0.044434	0.192939	0.244692
3	0.584835	98.28912	0.86696	0.098486	0.412706	0.332725
4	0.589896	96.64915	0.91291	0.634553	0.864953	0.938439
5	0.59812	94.96309	1.955556	0.856074	1.205534	1.01975
6	0.598406	94.89168	1.999962	0.867342	1.221152	1.019864
7	0.609042	93.1249	3.775245	0.837356	1.21213	1.05037
8	0.610037	92.867	3.816047	0.892745	1.23071	1.193497
9	0.610583	92.75334	3.850734	0.896209	1.241436	1.258281
10	0.611217	92.63215	3.84287	0.968267	1.246941	1.30977
11	0.612386	92.36915	4.104583	0.967784	1.251607	1.306873
12	0.612652	92.34217	4.104418	0.968447	1.269239	1.315724

European Economic Letters
ISSN 2323-5233
Vol 15, Issue 2 (2025)
http://eelet.org.uk

13	0.613113	92.26907	4.154759	0.970694	1.268616	1.336865
Notes: Multivariate VEC estimates of N_IPO and four Macroeconomic variables. The number of lags (in first differences) in the VAR specifications are 1 to 5.						

Figure 1 The Impulse Response



To test the direction of the long run causal relationship between number of IPOs and macroeconomics variables, we report in Table 7 the result of Granger causality test (Engle and Granger, 1987) The Granger test supports the results, that only one macroeconomic variables granger causes the N IPO. Industrial production (IP) has a causal relationship with the number of IPOs. These variables play an important part in Granger-causing the number of IPOs. Furthermore, the Interest rate, return of stock market return, Volatility has not influenced the number of IPOs. This result is contrary with **Ress (1997),** who have provided a positive relationship between equity market returns and IPOs, rather to business cycle.

Table 7
Granger causality

Null Hypothesis	F-Statistic	Prob.
IIP Granger does not Granger Cause N_IPO	2.56868	0.0272**
IPO does not Granger Cause IIP	1.62712	0.1529
BOND_YIELD does not Granger Cause N_IPO	0.31565	0.9034
IPO does not Granger Cause BOND_YIELD	1.01263	0.4105
INDEX_RETURN does not Granger Cause N_IPO	1.15040	0.3341
IPO does not Granger Cause INDEX_RETURN	0.09277	0.9933
VOLATILITY does not Granger Cause N_IPO	0.38592	0.8583
IPO does not Granger Cause VOL	0.22834	0.9500

The T-Y test show, first that it is possible to reject the null hypothesis of no causality at 1% significa

explain the IPO frequency. This mean that Indian firms are more likely to going public when IP ceteris paribus are very low.

6. Conclusions

In this work, we studied the determinants of IPOs in INDIA. We investigated the dynamic link between Initial Public Offerings and macroeconomic variables in Indian market during

the period from 1999 to 2020. In order to understand this relationship, we have adopted different time-series econometrics techniques. After establishing the non-stationarity and the order of integration of each series (as results show all data series are integrated of or der one), Johansen's cointegration technique was applied to investigate

Table 8
Toda-Yamamoto: Modified Wald Tests

Dependent variable: N_IPO			
Excluded	**Chi-sq**	**df**	**Prob.**
IIP	14.19168	5	0.0144
BOND_YIELD	1.488952	5	0.9143
INDEX_RETURN	7.484440	5	0.1870
VOL	2.471166	5	0.7808
All	23.95757	20	0.2443
Notes: Dependent variable: N_IPO; (*) stand for statistical significance at 10%; (**) stand for statistical significance at 5%; (***) stand for statistical significance at 1%			

the long-run relationship between frequency of IPOs and four macroeconomics variables. The findings show that there are cointegration relationship is among all these variables, in particular the IP of India plays the most important role for going public time decision. Furthermore, we performed a VECM for tested the stability of equilibrium and to capture the dynamic interdependencies among the macro environment. The coefficients of the error-correction term of number of IPO are statistically significative at 1% and it carries the correct negative sign, showing that any case of disequilibrium, the system will convergence very fast for restoring the long run equilibrium position. Finally, we used two methodologies to analyse the direction and the causal relationship between macro variables and number of IPOs: the Granger-causality - conventional approach - and the Toda - Yamamoto test. The results show that there is a significant causal between variables and point out that industrial production, and interest rate Granger cause with number of IPOs. Thus, firms who are interested to going public in Indian should pay more attention to the above-mentioned macroeconomic variables.

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