

# Factors driving IPO variability: evidence from Pakistan stock exchange

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## Abstract

**Purpose** – The objectives of this study are twofold. First, it intends to investigate the symmetric link between initial public offering (IPO) variability and the determinants of the stock market index, treasury bill rate, inflation, GDP growth rate and foreign direct investment. Second, this study intends to examine the asymmetric link between IPO variability and the aforementioned determinants, namely the stock market index, treasury bill rate, inflation, GDP growth rate and foreign direct investment.

**Design/methodology/approach** – Data from 1992 to 2018 were gathered from the country of Pakistan in order to achieve the above objectives. Augmented Dickey–Fuller (ADF) and Phillips Perron (PP) unit root tests were employed to determine the data's stationarity properties. The Auto Regressive Distributive Lags (ARDL) model was utilized to examine the symmetric links, and the Non-Linear Auto Regressive Distributive Lag Model (NARDL) was employed to determine the asymmetric links. While the long-run co-integration was examined using the ARDL bound test, the short-run dynamics were tested using the error correction method (ECM).

**Findings** – The macroeconomic variables of the stock market index, treasury bill rate, inflation, GDP growth rate and foreign direct investment are found to pose significant short-run and long-run symmetric and asymmetric effects on IPO variability. These results indicate the significance of the aforementioned variables in enhancing IPO variability. The findings also demonstrate the typical reactions of inflation, GDP and FDI towards negative and positive shocks in IPO variability and inflation. This evidence implies that Pakistan's poor capital market development is reflected in the country's weak macroeconomic factors. At the same time, the reduced IPO variability in the country also reflects the lack of confidence among prospective issuers and investors due to Pakistan's weak macroeconomic indicators.

**Originality/value** – This is the first study of its kind to properly investigate the symmetric and asymmetric effects of the macroeconomic variables on Pakistan's IPO variability.

**Keywords** Stock market index, Treasury bill rate, Inflation, GDP growth rate, Foreign direct investment, Pakistani IPO

**Paper type** Research paper



## 1. Introduction

In the context of the Pakistani market, 272 initial public offerings (IPOs) were offered between 1992 and 1997 but only one IPO exercise was held in 1998 and none in 1999 as a result of the country's nuclear attempt, which saw the USA imposing various sanctions that hampered Pakistan's development (Mehmood *et al.*, 2021). This downward trend in IPO issuances persisted from 2000 to 2018, with only 93 firms going public during the period. This dismal number could be attributed to numerous macroeconomic factors, including terrorism activities, political instability, social security threats, low employment, low gross domestic product (GDP), as well as excessive inflation and interest rates.

Several studies have examined the macroeconomic factors that influence IPO issuances in both developed and emerging economies (see Ameer, 2012; Angelini and Foglia, 2018; Tran and Jeon, 2011), but none has focussed on the Pakistani market. Hence, the current study aims to fill the gap by examining Pakistan's economic conditions and uniqueness to relate the identified macroeconomic factors to IPO variability. Unfavourable macroeconomic factors can affect IPO issuance decisions in several ways. Firstly, the decision to go public can be done at any conceivable time, but it is irrevocable once decided. A delay in an IPO issuance reflects a worsening of the waiting firm's unfavourable macroeconomic conditions. Firms go public when it is possible to raise the maximum capital that reflects their worth. However, uncertainties occur in raising the projected capital amounts from IPOs owing to poor macroeconomic performances, causing firms to delay their IPO exercises until the uncertainties dissolve. As explained by Lowry (2003), uncertainties that arise from dismal economic growth cause firms to remain doubtful of their capital demand. The entire business landscape may weaken during severe periods of uncertainty along with unfavourable macroeconomic factors, leading to lower consumption and output rates (Christiano *et al.*, 2014).

Unfavourable macroeconomic factors have been regarded as the causes and drivers of fluctuations in IPO issuances; yet, there is insufficient evidence to support this contention. Hence, there is a need to study the effects of macroeconomic factors on IPO issuances. Thus, the present study examines the effects of macroeconomic determinants, namely the stock market index, treasury bill rate (TBR), inflation rate (INF), GDP growth rate and foreign direct investment (FDI) on IPO variability.

## 2. Literature review

### 2.1 Stock market index and IPO variability

The Pakistani Stock Exchange index began trading in November 1991 at a 2,000-base point. The KSE-100 Index fell one-third from the all-time high recorded in April 2008 as Pakistan's coalition government continued to receive mounting pressure to address the issue of Taliban militants, which worsened the apprehensions concerning the country's economic condition. In January 2017, the stock market hit an all-time high of 49,969 points and later 49,876 points on 13 February of the same year. Consequent to Britain's departure from the European Union (EU) on 24 June 2017, the KSE declined by 1,100 points (3.1 per cent) with stock markets undergoing turmoil as investors began investing in safer alternatives in gold and government bonds. The downward trend persisted in 2018 and 2019. Remarkably, IPO variability has continued to decrease since 1992. Hence, the notion that stock markets are affected by pessimistic and optimistic outlooks is consistent with investor sentiment and market timing theories. Given that investors' inclination to invest determines the stock market index, the frequency of IPO variability varies accordingly.

Companies are more likely to go public if the stock market provides high returns that ensure profits for both the company and the investors. As a result, equity investors prefer to earn a higher initial return on newly listed stocks to maximize compensation while facing

higher risk due to low country-level institutional quality (Wei *et al.*, 2021). As a result, higher returns from newly listed stocks are regarded as the most powerful signals for displaying valuable information. Stock index levels and returns are found to pose a significant and positive effect on IPO variability (Ljungqvist, 1995; Loughran *et al.*, 1994; Rydqvist and Högholm, 1995). Ultimately, Brzeszczynski (2014) concluded that “the IPO variability in emerging markets and the profitability of the public offers are related to macroeconomic conditions, business cycles and stock market activity. In most emerging market countries, there is a time lag between movements of the stock market index and decisions to launch new IPOs”. Given the above discussion, this study proposes the following hypothesis:

*H1.* Stock market index has a positive effect on IPO variability.

### *2.2 Treasury bill rate and IPO variability*

Mehmood *et al.* (2020b) asserted that a firm’s engagement in a stock market is driven by several macroeconomic variables such as interest rates that provide valuable stock information. The present study uses the TBR to measure the effects of interest rate on IPO variability since it provides a comprehensive picture of market conditions. In the context of developed countries, the USA offers a TBR of 1.56% of 2019; meanwhile, developing countries have been demonstrating an upward trend, with Pakistan reporting an annual TBR of 13.10% in 2019. According to Ameer (2012), IPO variability decreases by 10% for every 1% hike in interest rate. The author adds that the interest rate is a vital monetary policy instrument that drives the capital market and proliferates the IPO cycle. Interest rate is negatively correlated to the frequency of IPO exercises, as companies are discouraged from issuing IPOs during high-interest rate periods. Additionally, Brau *et al.* (2003) suggest that a high interest rate influences a firm’s decision to go public. An increase in the interest rate will cause an increase in capital cost. Pakistan has been showing an increasing trend in its annual TBR for the past five years, reaching 13.10% in the year 2019, which has caused an increase in the capital cost. The few studies that have been conducted found that interest rate affects IPOs variability and the total amount derived from equity issuances (see Ameer, 2007; Brau *et al.*, 2003; Chang, 2009; Neumeier and Perri, 2005; Uribe and Yue, 2006). Based on the argument put forth by Brau *et al.* (2003), interest rate influences the IPO choice for a new company takeover whereby lower interest rates enable the acquiring company to utilize more debt for acquisition purposes, thus lowering the IPO and boosting the takeover variability. Based on all the above, this study proposes the following hypothesis:

*H2.* The TBR has a negative effect on IPO variability.

### *2.3 Inflation and IPO variability*

In Pakistan’s context, the State Bank of Pakistan is the sole body practising mandatory monetary policies, which influence all asset prices bubbles and private capital inflows and outflows. Pakistan recorded an INF of between 10 and 13% from 1991 to 1999 that persisted well into 2019, albeit with a minor decrease to 9.41% in 2019 (Iqbal and Naveed, 2016; Shahzad, 2019). The INFs recorded by Pakistan are significantly higher than any developed nation; hence, there are high capital costs for equity offerings that must be borne by newly listed securities, thus discouraging firms from going public (Omran and Pointon, 2001).

High rates of return are anticipated during periods of high inflation. Likewise, a high-risk premium tends to complicate the generation of new future investments due to the additional strict requirements of funds (Ameer, 2012). Tran and Jeon (2011) found a positive link between inflation and IPO variability. Whilst, this current study suggests that the INF is a proxy for inflation consistent with the findings of other past works (Omran and Pointon,

2001; Tiwari *et al.*, 2015). The USA recorded a 1.6% INF in FY2018. As indicated by Omran and Pointon (2001), high rates of inflation discourage investors from going public due to demands for higher returns, which in turn elevates the capital cost for the firms.

*H3.* INF has a negative effect on IPO variability.

#### *2.4 GDP growth rate and IPO variability*

The GDP is popular among all previous studies because it reveals market conditions; therefore, it is the major capital structure determinant of country-level performance (Shabbir *et al.*, 2020; Pradhan *et al.*, 2020; Dey and Tareque, 2020; Camara, 2012). In the Asian region, high annual GDP growth rates are recorded in 2019, India (7.1%), Malaysia (5.9%) and China (6.9%). Meanwhile, Pakistan's GDP growth rate fell from 5.8% in 2018 to 3.3% in 2019 due to increased uncertainty. According to Mehmood *et al.* (2020b), low economic growth reduces investment opportunities for businesses, causing the economy to deteriorate. Since GDP growth rates are determined by consumption demand as well as monetary and fiscal policies, positive performance of macroeconomic factors can lead to economic balance and improvement in the instability outcomes. According to the neoclassical economic theory, GDP growth rates provide strong signals to entrepreneurs to invest in the market. Likewise, Ameer (2012) asserted that the GDP growth rate shows the country's economic snapshot, which has a direct influence on IPO activities. Thus, an increase in GDP will lead to an increase in IPO variability. Numerous studies have shown that GDP growth has a significant positive effect on IPO variability (see Ameer, 2012; La Porta *et al.*, 1997; Tran and Jeon, 2011).

*H4.* GDP growth rate has a positive effect on IPO variability.

#### *2.5 Foreign direct investment (FDI) and IPO variability*

According to the recent report of World Investment (2020) [1], FDI inflow into Pakistan increased from US\$1.7bn to US\$2.2bn in 2019. The total amount of FDI inflow reached US\$34.8bn in 2019. In addition, Pakistan is currently experiencing a gradual decline in the GDP trend, approaching the lowest level in the country's history, whereas inflation and taxes have been increasing over time. These developments do not augur well for FDI inflows, resulting in lower IPO variability. With the global opening of local stock markets, foreign investors can access local stock markets to diversify their portfolios. According to Kaminsky *et al.* (2001), the emerging capital markets in the East Asian region grow by relying on mutual fund investments, that is, net private equity flows. A substantial portion of emerging markets' foreign capital came from US-based mutual funds (Aggarwal *et al.*, 2005). Foreign investors are more attracted to emerging markets' higher returns, enabling local firms to profit from the risk-sharing strategy and lower equity costs. Based on the discussion above, this study proposes the following hypothesis:

*H5.* FDI (net private equity) flows have a positive effect on IPO variability.

The contribution of this study is twofold. First, it focusses on macroeconomic determinants that affect key equity market activities in emerging markets. Compared to past studies on IPOs in Pakistan, this study focusses on a longer period and a higher number of IPOs (Mehmood *et al.*, 2020b). Second, this study employs the switching auto-regressive distribution lag (ARDL) and non-linear auto-regressive distributed lag (NARDL), regression techniques to demonstrate the effects of macroeconomic variables on Pakistan's IPOs are not time-invariant. These techniques allow us to document unidentified IPO market conditions – specifically the prevalence of hot or cold regimes – in the IPO market. A hot IPO regime is linked to an upward trend in IPO variability, whereas a cold IPO regime denotes otherwise.

### 3. Institutional background of the Pakistani IPO market

The Corporate Law Authority (CLA) was formed by the Pakistani government in 1981 with the aim of encouraging and facilitating trade activities. However, the stock market's trade activities remained modest up until 1989. In 1991, the Pakistani government conducted reforms to improve the transparency and efficiency of the stock market due to its liberalization, deregulation and privatization. The reforms had a positive effect on the listing activities as exhibited by the high number of share issuances by private firms in their aim of raising capital, diversifying ownership and creating exit strategies. A major surge of IPO issuances occurred between 1991 and 1996. As a measure for strengthening the stock market activities, the Securities and Exchange Commission of Pakistan (SECP) was formed in 1997 to replace the CLA. Despite the reforms, Pakistan continues to have poor institutional performance, with signs of distress. According to [Hassan \(2002\)](#), the country has experienced significant institutional degeneration over the last 30 years, peaking in the 1990s. The country's poor governance resulted in the exclusion of the general public from decision-making; institutional failure had reduced the country's per capita income, resulting in poor economic growth and, as a result, a lower number of IPOs. In the Pakistani market, 272 IPOs were offered between 1992 and 1997, but only one IPO exercise was held in 1998 and none in 1999 ([Mehmood et al., 2020a](#)).

### 4. Methodology

This paper samples the IPOs listed on the Pakistani Stock Exchange from January 1992 to December 2018. Despite experiencing vibrant IPO variability from 1992 to 1998, Pakistan's IPO market experienced a sudden and significant decline in 1999, reaching zero IPO exercise following the US sanction imposed as a response to the country's nuclear testing activities. The total IPO issuance data were derived from the Pakistani Stock Exchange [2] data portal under the flotation sub-section. Data on other macroeconomic determinants, including stock market index (KSE), TBR, INF, GDP and FDI were derived from the International Monetary Fund's [3], World Development Indicators [4]. The equation is presented as follows:

$$NIPO = a + \beta_1 KSE_i + \beta_2 TBR_i + \beta_3 INF_i + \beta_4 GDP_i + \beta_5 FDI_i + \varepsilon_i \quad (1)$$

where NIPO is the number of IPOs, KSE is the stock market index performance, TBR is the treasury bill rate, INF is the inflation rate, GDP is gross domestic product (GDP) growth rate and FDI is foreign direct investment. The long-run parameters are  $\beta_1, \beta_2, \beta_3, \beta_4$ , and  $\beta_5$ . [Shin et al. \(2014\)](#) introduced the asymmetric ARDL model using negative and positive partial sum decompositions that enable identifying short-term and long-run asymmetric effects. The NARDL model is more advantageous than the traditional co-integration models in several ways. Firstly, the NARDL model functions well with small sample sizes ([Romilly et al., 2001](#)). Secondly, it does not require stationary testing ([Ibrahim, 2015](#)) since it is just as efficient for stationary variables at the level  $I(0)$  as it is for the first difference  $I(1)$  or the fractionally integrated ([Pesaran and Pesaran, 1997](#)). Nevertheless, this model would not be applicable if any of the variables is  $I(2)$ .

The asymmetric ARDL method is employed in this study since it has the capability to measure the short-term and long-run asymmetries among the predicted variables. The NARDL bound test ([Shin et al., 2014](#)) is used to measure the short-term and long-run relational dynamics. The model in [Equation \(1\)](#) solely generates long-run effects. Short-run effects are examined by remodelling [Equation \(1\)](#) in the error correction approach arrangement. This study hence employs the bound testing method ([Pesaran et al., 2001](#)) using the error correction approach, as stated below:

$$\begin{aligned} \Delta\text{NIPO}_t = & \theta + \sum_{k=1}^{P1} \theta_k \Delta\text{NIP0}_{t-k} + \sum_{k=1}^{P2} \theta_k \Delta\text{KSE}_{t-k} + \sum_{k=1}^{P3} \theta_k \Delta\text{TBR}_{t-k} + \sum_{k=1}^{P4} \theta_k \Delta\text{INF}_{t-k} \\ & + \sum_{k=1}^{P5} \theta_k \Delta\text{GDP}_{t-k} + \sum_{k=1}^{P6} \theta_k \Delta\text{FDI}_{t-k} + \lambda_1 \text{NIP0}_{t-1} + \lambda_2 \text{KSE}_{t-1} + \lambda_2 \text{TBR}_{t-1} \\ & + \lambda_3 \text{INF}_{t-1} + \lambda_4 \text{GDP}_{t-1} + \lambda_5 \text{FDI}_{t-1} \mu_t \end{aligned} \tag{2}$$

Equation (2) is consistent with the approach introduced by Engle and Granger (1987). However, a slight modification is made by replacing the lag of error term from Equation (1) with its proxy, that is, the linear combination of the lagged level variable. Equation (2) provides more advantages than the Engle and Granger (1987) approach due to its ability to measure the long-run and short-term effects. In Equation (2), the long-run coefficients are denoted by  $\lambda_1, \lambda_2, \lambda_3$  and  $\lambda_4$  whilst the short-run coefficients are denoted by the first difference variable. The long-run causality needs to be determined to ensure the validity of the long-run coefficients. Pesaran *et al.* (2001) proposed the bound *F*-test to confirm co-integration between the number of IPOs and the determinants.

Equation (2) assumes that all the independent variables have a symmetrical effect on the dependent outcome variable; however, this study is concerned with the asymmetric effects of the macroeconomic variables on Pakistan’s IPO variability. Towards that end, the variables under study (i.e. inflation, GDP and FDI) are grouped into negative and positive components [5]. The asymmetric regression of  $X_t = \delta^+ y_t^+ + \delta^- y_t^- + \mu_t$  where  $\delta^+$  and  $\delta^-$  are linked to the long-run coefficients and  $y_t$  is a vector of the independent variables is stated as:

$$Y_t = Y_0 + y_t^+ + y_t^-$$

where  $Y^+$  and  $Y^-$  are the regressors decomposed as a partial sum of the positive and negative changes. Equations (3)–(6) are partial sums of the positive and negative changes in inflation and unemployment.

$$\text{INF}^+ = \sum_{i=1}^t \Delta\text{INF}_i^+ = \sum_{i=1}^t \max(\Delta\text{INF}_i, 0) \tag{3}$$

$$\text{INF}^- = \sum_{i=1}^t \Delta\text{INF}_i^- = \sum_{i=1}^t \min(\Delta\text{INF}_i, 0) \tag{4}$$

$$\text{GDP}^+ = \sum_{i=1}^t \Delta\text{GDP}_i^+ = \sum_{i=1}^t \max(\Delta\text{GDP}_i, 0) \tag{5}$$

$$\text{GDP}^- = \sum_{i=1}^t \Delta\text{GDP}_i^- = \sum_{i=1}^t \min(\Delta\text{GDP}_i, 0) \tag{6}$$

$$\text{FDI}^+ = \sum_{i=1}^t \Delta\text{FDI}_i^+ = \sum_{i=1}^t \max(\Delta\text{FDI}_i, 0) \tag{7}$$

$$\text{FDI}^- = \sum_{i=1}^t \Delta\text{FDI}_i^- = \sum_{i=1}^t \min(\Delta\text{FDI}_i, 0) \tag{8}$$

The asymmetric ARDL framework is developed by putting the negative and positive series derived in Equations (3)–(6) into Equation (2) to derive Equations (7) and (8). Meanwhile, Equation (9) represents the NARDL equation.

$$\begin{aligned} \Delta\text{NIPO}_t = & \theta + \sum_{k=1}^{P1} \theta_k \Delta\text{NIPO}_{t-k} + \sum_{k=1}^{P2} \theta_k \Delta\text{KSE}_{t-k} + \sum_{k=1}^{P3} \theta_k \Delta\text{TBR}_{t-k} + \sum_{k=1}^{P4} \theta_k \Delta\text{INF}_{t-k}^+ \\ & + \sum_{k=1}^{P5} \theta_k \Delta\text{INF}_{t-k}^- + \sum_{k=1}^{P6} \theta_k \Delta\text{GDP}_{t-k}^+ + \sum_{k=1}^{P7} \theta_k \Delta\text{GDP}_{t-k}^- + \sum_{k=1}^{P7} \theta_k \Delta\text{FDI}_{t-k}^+ \\ & + \sum_{k=1}^{P8} \theta_k \Delta\text{FDI}_{t-k}^- \lambda_1 \text{NIPO}_{t-1} + \lambda_2 \text{KSE}_{t-1} + \lambda_2 \text{TBR}_{t-1} + \lambda_3 \text{INF}_{t-1}^+ + \lambda_4 \text{INF}_{t-1}^- \\ & + \lambda_5 \text{GDP}_{t-1}^+ + \lambda_6 \text{GDP}_{t-1}^- + \lambda_6 \text{FDI}_{t-1}^+ + \lambda_7 \text{FDI}_{t-1}^- \mu_t \end{aligned} \quad (9)$$

In their study, Shin *et al.* (2014) used Pesaran *et al.*'s (2001) bound testing method, which they propose to be appropriate for the model (7). In the present study, the decomposed negative and positive series for inflation, GDP and FDI are incorporated to derive specification (2) of the asymmetric ARDL. Specification (2) is thus called the linear ARDL model.

### 5. Results and discussion

Table 1 presents the descriptive statistics for the listed IPOs as well as the macroeconomic and capital market variables. The findings show a mean value of 13 IPOs, with a maximum of 85 IPOs and a minimum of 0 IPO throughout 1992–2018 (see Table 1). A moderate recovery is demonstrated in 2004, 2005 and 2007. The average stock price index point is 12,679, with the maximum and minimum points of 46,332 and 911, respectively, indicating a wide dispersion. The average TBR is 10.11%, while the maximum and minimum rates are 14.53 and 5.4%, respectively. This finding suggests that a low TBR can affect the capital market and discourage firms from engaging in IPOs. Future income is computed according to the discounted method during periods of higher interest rates. According to Malik and Nishat (2017), higher interest rates cause more volatility in Pakistan; this trend, which began post-1973, still persists today due to the country's unstable economy. The mean value for inflation is 9.52%, with a maximum of 20.28% and a minimum of 2.5%, consistent with Arby and Ali (2017). These findings demonstrate a high variance in inflation throughout 2000–2018. Compared to the past five years, 2013–2018, the present INF is higher, which reduces the

	Mean	Median	Max	Min	Std. Dev	Skewness	Kurtosis
NIPO	13	4	85	0.0000	21.4068	2.3042	7.3413
KSE	12,679	7,188	46,332	911	14,221	1.1271	2.8789
TBR	10.1064	10.7307	15.7350	1.8650	3.5630	-0.5709	2.7653
INF	9.5236	7.6829	20.2812	0.4002	7.3589	2.3532	9.7888
GDP	4.1155	4.3282	7.7058	0.9888	1.8521	0.0411	2.2388
FDI	1.1261	0.8165	3.6683	0.3755	0.8482	1.9344	5.7420

**Note(s):** NIPO is the total number of new firms going public/engaging in IPO exercises per year. KSE is the stock market index, i.e. an aggregated value derived from the combination of several stocks. TBR is the annual treasury bill rate in percentage. INF is the annual inflation rate in percentage. GDP is the annual gross domestic product growth rate in percentage. FDI is the annual total net private foreign equity investment

**Source(s):** Author's computation

**Table 1.**  
Descriptive statistics

purchasing power. For the GDP growth rate, the average is 4.11% and the lowest is 0.98% (Arby and Ali, 2017). The highest growth rate is 7.70%. The findings suggest that the number of IPOs will decline when the GDP growth rate is low. For FDI, the average is 1.12%, while the lowest and highest are 0.37 and 3.66%, respectively. The findings suggest that the number of IPOs will decline when the FDI is low.

This study employs Pearson’s correlation coefficients to explain the link between the independent and dependent variables (see Table 2). Each of TBR, INF, GDP and FDI is found to be positively correlated with IPO variability. These findings suggest an increase in Pakistan’s IPO variability when there are positive changes in the country’s INF, GDP growth rate and political stability. On the contrary, both KSE and FDI are found to have negative and significant correlations with IPO variability. Maddala and Lahiri (1992) asserted that the effects of an independent variable on the dependent variable could change when a strong correlation exists.

The variables’ stationarity is tested first before examining the effects of the stock market index, TBR, inflation, GDP growth rate and FDI on IPO variability. The ARDL model is a flexible econometric co-integrating method that can be applied when the variables are stationary at  $I(0)$  or  $I(1)$  or a combination of  $I(0)$  and  $I(1)$ . Stationarity testing is not needed for ARDL estimation since the method can be applied when the variables are stationary at level  $I(0)$  or  $I(1)$  or a combination of  $I(0)$  and  $I(1)$ . However, this method cannot be applied when the  $I(2)$  variable is present (Ibrahim, 2015). Given that the presence of  $I(2)$  variables will render the test results invalid, the Augmented Dickey–Fuller (ADF) and Phillips Perron (PP) unit root tests are carried out to determine the variables’ stationarity to exclude the  $I(2)$  variables. Table 3 presents the unit root test results, which reveal the absence of  $I(2)$  variables. Hence, this study can proceed with the asymmetric ARDL method.

Table 4 presents the linear and non-linear con-integration results from the bound testing conducted in this study. According to Bahmani-Oskooee and Mohammadian (2016), long-run correlations rely mainly on an optimal lag selection. Additional and lower lag selections can

	NIPO	KSE	TBR	INF	GDP
NIPO					
KSE	-0.3405				
TBR	0.3308	-0.2627			
INF	0.0838	-0.3716	0.3038		
GDP	0.2575	0.1411	-0.6039	-0.2304	
FDI	-0.0501	-0.1021	-0.0121	-0.0101	0.0270

Source(s): Author’s computation

Table 2.  
Correlation matrix

Series	At levels		At first difference		Decision
	ADF	PP	ADF	PP	
NIPO	-4.290*** (0.002)	-6.564*** (0.000)			$I(0)$
KSE	1.386 (0.998)	1.335 (0.532)	-3.598 (0.014)***	-8.544*** (0.001)	$I(1)$
TBR	-3.535** (0.016)	-5.012*** (0.000)			$I(0)$
INF	-4.835*** (0.000)	-6.081*** (0.000)			$I(0)$
GDP	-3.827*** (0.007)	-5.342*** (0.001)			$I(0)$
FDI	-2.858 (0.044)**	-5.024*** (0.001)			$I(0)$

Note(s): \*\* and \*\*\* reject the null hypothesis of unit root at the 5 and 10% levels of significance

Source(s): Author’s computation

Table 3.  
Unit root tests

cause crucial information to be omitted from the model and misleading long-run inference. Hence, the Akaike Information Criterion (AIC) is employed in this study. The symmetric co-integration result reveals a bound test  $F$ -stat value of 3.184. Since this value is between the lower and upper bounds, it indicates an inconclusive co-integration. Meanwhile, the asymmetric co-integration result reveals the  $F$ -statistics value of  $-9.8268$ , that is, higher than the lower and upper critical bounds at a significance level of 5%. This finding confirms co-integration or long-run correlations between the variables being studied. This confirmation allows the study to proceed with the short-term and long-run estimations of the IPO variability via the NARDL model. Meanwhile, since the symmetric co-integration result is inconclusive, the estimated coefficient of error-correction term (ECT) term can be utilized to determine the long-run correlations between the variables. Ultimately, this study employs both the symmetric and asymmetric ARDL.

After determining symmetric co-integration (previously inconclusive in the symmetric framework), the symmetric long-run correlations between the variables are then established. Table 5 presents the findings on the long-run correlations between the variables that confirm the positive and significant long-run effects of KSE, GDP and FDI on IPO variability. The findings suggest that pessimistic stock market outlooks project a downward trend on market prices, whereas optimistic outlooks project higher stock market trading volumes and returns (Tetlock, 2007). IPO variability varies as the stock market index is an indication of the likelihood of investors to invest. Firms are more inclined to engage in IPO activities if the stock market offers higher returns and thus more profit for the firms and investors. Stock index levels and returns pose a significant and positive effect on IPO variability (Ljungqvist, 1995; Loughran *et al.*, 1994).

Further, the findings suggest that an increase in the growth rate will lead to an increase in IPO variability in a given setting, considering the economy's healthy growth (Choe *et al.*, 1993). In the Malaysian market, Ameer (2012) found that the GDP growth rate has a significant positive effect on IPO variability. Breinlinger and Glogova (2002) asserted that the effectiveness of law enforcement, which is substantially linked to GDP per capita, is strongly and positively associated with IPO variability. The finding also suggests that an increase in FDI will lead to an increase in IPO variability. Hence, from the perspective of private equity investment, emerging markets present a suitable investment diversification opportunity and

**Table 4.**  
Non-linear co-integration on the base of the bound test

	$F$ -statistics	Lower bound 95 per cent	Upper bound 95 per cent	Decision
Linear ARDL	3.1849	2.39	3.38	Inconclusive
Asymmetric ARDL	$-9.8268$	$-2.86$	$-5.05$	Cointegration

**Note(s):** The  $F$ -statistics value is calculated using the bound testing approach by Pesaran *et al.* (2001) and Shin *et al.* (2014)  
**Source(s):** Author's computation

**Table 5.**  
Long-run symmetric ARDL estimation

Variable	Coefficient	Std. Error	$t$ -Statistic	Prob
KSE	0.0008	0.0004	1.9258	0.0763
TBR	$-10.2079$	4.1068	$-2.4855$	0.0273
INF	$-0.8325$	0.3278	$-2.5393$	0.0247
GDP	13.3091	6.6692	1.9955	0.0674
FDI	9.9489	3.7032	2.6865	0.0187

**Source(s):** Author's computation

attainment of excess risk premiums (Errunza, 1983). Lowry (2003) stated that higher external capital demands motivate managers to find cheaper measures for raising capital, that is, via risk sharing with foreign investors. Since foreign investors are more likely to invest in an emerging market that provides higher returns, local firms often benefit from risk sharing and lower equity costs.

TBR and inflation affect NIPO negatively. A 1% increase in TBR will reduce NIPO by 10.20% in the long run. Ameer (2012) asserted that in the context of Malaysia, monetary policy affects the capital market directly and the mediation of the central bank drives IPO cycles. Using the findings of Ameer (2012) concluded that the interest rate negatively correlates with IPO variability. The findings also suggest that higher INFs lead to expectations of higher return rates from new investments, thus higher costs for firms that hinder them from going public. Increased risk premiums elevate the hurdle rate, discouraging firms from making future investments; this, in turn, raises the need for further funding (Ameer, 2012). This finding is in line with that of Omran and Pointon (2001).

Table 6 presents the findings on the short-term correlations between the variables in this study. It is found that in the short term, TBR and inflation have negative and significant effects on NIPO. TBR rates are the primary benchmark from which all other yields are derived all over the world, and they are the most concerning sources of investment for investors. As a result, TBR is the safest asset; if its rate is reduced, investors will look for other options to earn the highest return, and the number of IPOs in Pakistan may increase in the short term. In contrast, an economic slowdown caused by high inflation is regarded as an unfavourable environment for issuing new equity. As a result, higher inflation reduces the purchasing power of issuers and investors in the short term and reducing the number of IPOs. On the other hand, KSE, GDP and FDI pose positive and significant effects on NIPO. It is asserted that the stock market's performance is considered as one of the key sentiment indicators for issuers and investors which thereby influences their decision to go public and to subscribe to IPO in short term. Similarly, in Pakistan, there was a short-term growth problem. Due to the low short-term growth of an economy, firms are unable to spend much on research and development activities, especially when the economy is in a slump, which reduces the number of IPOs. Finally, FDI is a major contributor to short-term economic growth by increasing productivity, operations and human capital generation, and as a result, the number of IPOs may rise. However, the short-term effect on NIPO on top of a 63% adjustment speed.

Since co-integration has been confirmed, the study proceeds with the estimation of the long-run and short-run non-linear ARDL (NARDL). Table 4 presents the NARDL bound test results, which show the prevalence of long-run co-integration between the variables. Hence, the asymmetric effects of KSE, TBR, inflation, GDP and FDI on IPO variability are

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	-49.2473	35.790	-1.3759	0.1921
KSE	0.0005	0.0002	2.3571	0.0348
TBR	-6.5314	2.1547	-3.0312	0.0096
INF	-0.6494	0.1281	-5.0671	0.0002
GDP	-8.5157	2.7878	-3.0546	0.0092
FDI	6.3657	2.2594	2.8173	0.0145
ECT/CointEq(-1)*	-0.6398	0.0653	-9.7944	0.0000

**Note(s):** \* indicates significance at 1%

**Source(s):** Author's computation

**Table 6.**  
Short-run ARDL

determined by applying the NARDL. Tables 7 and 8 present the results of the long-run and short-run estimations.

The long-run asymmetric ARDL coefficients are shown in Table 7. TBR and NIPO have a significantly negative correlation at the 1% significance level. A 1% increase in TBR is shown to result in a 6.3% decrease in NIPO. Higher government borrowings via treasury bill issuances have an impact on the stock market by causing investors' portfolio balances to rebalance. Low TBRs are expected to stimulate domestic funds transfer from the money market to the stock market. Long-term capital demand for private firm securities is negatively affected by persistently high fiscal deficits, as well as the issuance of high-yielding but low-risk government instruments such as treasury bills. Investors are enticed to purchase additional government instruments due to the high yields on treasury bills. As a result, treasury bills are regarded as a resource for investors alongside stocks and bonds, which are likely to reduce demand for stock market instruments and, as a result, IPO variability. This finding is supported by previous research (Ameer, 2007).

This research also looks at the asymmetric effect of inflation on IPO volatility. At the 10% level of significance, the results show that INF POS has a positive and significant effect on NIPO. As a result, a 1% increase in INF will result in a 1.722% increase in NIPO. As a result, inflation has a positive and significant relationship with IPO volatility, implying that higher inflation increases IPO volatility. Mallik and Chowdhury (2001) discovered that inflation has a positive and significant effect on growth in Pakistan, Bangladesh, Sri Lanka and India. Mild inflation, according to Doan (2020), can be beneficial to financial growth.

This study's findings also suggest that NIPO has an asymmetric response to GDP. GDP POS has a significant positive effect on NIPO at the 5% level of significance, whereas GDP

**Table 7.**  
Long-run coefficients  
of asymmetric ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob
KSE	-0.0002	0.0001	-1.202	0.315
TBR	-6.036	0.835	-7.221	0.0050
INF_POS	1.727	0.595	2.900	0.0621
INF_NEG	0.4155	0.1249	3.3265	0.0055
GDP_POS	1.073	0.122	8.783	0.0031
GDP_NEG	2.179	1.143	1.653	0.1951
FDI_POS	7.011	1.735	4.040	0.0272
FDI_NEG	-5.557	1.850	-3.002	0.0574

Source(s): Author's computation

**Table 8.**  
Short-term coefficients  
of asymmetric ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob
C	-346.118	59.749	-5.792	0.010
D(TBR)	-3.239	0.955	-3.389	0.042
D(KSE)	0.001	0.0002	3.809	0.031
D(INF_POS)	0.717	0.171	4.192	0.024
D(INF_NEG)	2.291	1.173	1.953	0.145
D(GDP_POS)	-10.813	4.438	-2.436	0.092
D(GDP_NEG)	-1.512	0.776	-2.807	0.1199
D(FDI_POS)	0.749	6.040	0.124	0.909
D(FDI_NEG)	0.559	8.040	0.184	0.409
ECT/CointEq(-1)	-1.503	0.031	-48.355	0.000

Source(s): Author's computation

NEG has no effect on NIPO. As a result, a 1% increase in GDP would result in a 1.0733% increase in NIPO. Furthermore, FDI is found to have an asymmetric long-run effect on NIPO. Meanwhile, FDI POS has a direct positive effect on NIPO and a direct negative effect on NIPO. A 1% increase in FDI would result in a 7.1% increase in NIPO, while a 1% decrease in FDI would result in a 5.56% increase in NIPO.

Table 8 presents the short-run asymmetric ARDL results. It is found that in the short run, TBR poses a significant negative effect on NIPO at the 5% significance level. Meanwhile, INF\_POS has a significant effect on NIPO whilst INF\_NEG does not affect NIPO significantly in the short run; overall, this finding confirms the short-run asymmetric effect of INF on NIPO. GDP is also found to have a short-run asymmetric effect on NIPO; specifically, GDP\_POS has a significant effect on NIPO at the 5% significance level, but GDP\_NEG does not affect NIPO. Finally, FDI\_POS and FDI\_NEG do not influence NIPO significantly.

The model's error correction term (ECT) has a significant negative effect at the 1% significance level, indicating a 1.50% adjustment speed. The ECT term suggests the stability of the model; any disturbance will cause the model to converge at a 1.50% adjustment speed per year.

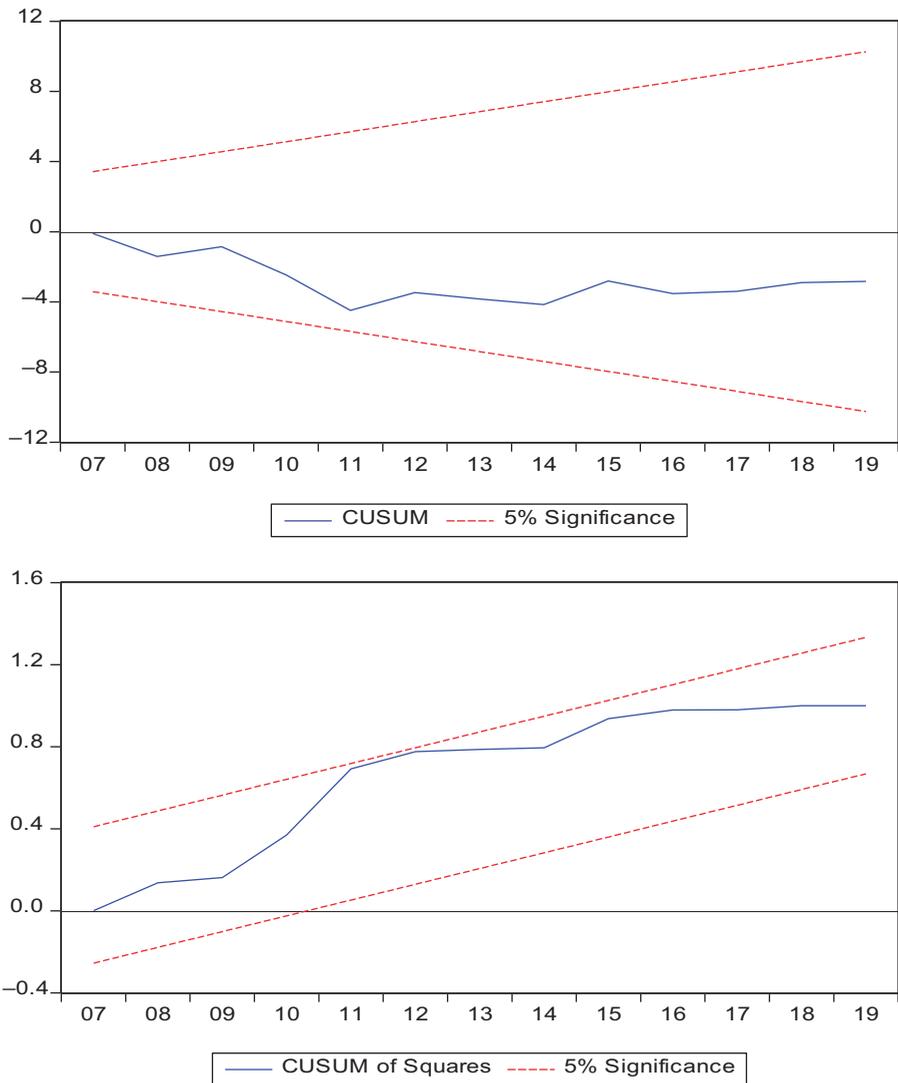
After determining the long-run and short-run estimations, the parameters' stability must be confirmed. Towards that end, this study uses the CUSUM and CUSUMSQ approach introduced by Brown *et al.* (1975), as proposed by Pesaran and Pesaran (1997) to test the stability of the parameters. As shown in Figure 1, CUSUM and CUSUMSQ (indicated in blue lines) are within the upper and lower bounds, indicating that the parameters are stable, and the estimations are reliable.

Figure 2 presents the dynamic multiplier graph, that is, the non-linearity plotting. The graph shows the measurement of the long-run asymmetric adjustment in IPO variability due to the negative and positive shocks of inflation, FDI and GDP. The asymmetric adjustment is demonstrated by the positive and negative change curves at certain points in time. In Figure 2, INF refers to inflation, FDI denotes foreign direct investment and GDP refers to the GDP growth rate. The horizontal axis plots the year and the vertical axis plots the positive and negative shocks. As demonstrated in the figure, IPO variability is strongly affected by the positive and negative shocks of inflation, FDI and GDP growth rate. The result suggests the implication for monetary policy that policymakers need to continue putting effort into achieving and maintaining a single level of inflation to support economic growth.

## 6. Conclusions

This study has examined the symmetric and asymmetric effects of the stock market index, TBR, inflation, GDP growth rate and FDI on the variability of IPOs listed on the Pakistani stock exchange between January 2000 and December 2018. This study enriches the existing body of knowledge on IPOs by revealing the unfavourable macroeconomic conditions in the Pakistani market that demotivate firms from going public. The study employed ARDL and NARDL models to determine the links between the macroeconomic variables and IPO variability. The empirical findings indicate that the macroeconomic determinants of the stock market index, TBR, inflation, GDP growth rate and FDI have significant long-run and short-run symmetric and asymmetric effects on IPO variability.

The econometric approach has shown that the treasury bills and INFs have significant negative long-term and short-term effects on IPO variability. On the contrary, the variables of stock market performance, GDP growth rate and FDI have significant positive long-term and short-term effects on IPO variability. Overall, the results indicate the importance of macroeconomic factors in signalling favourable economic conditions for firms that intend to go public. IPO variability will increase if the stock market's output, GDP growth rate and FDI are improved. The significant negative effects of the TBR and inflation on IPO variability

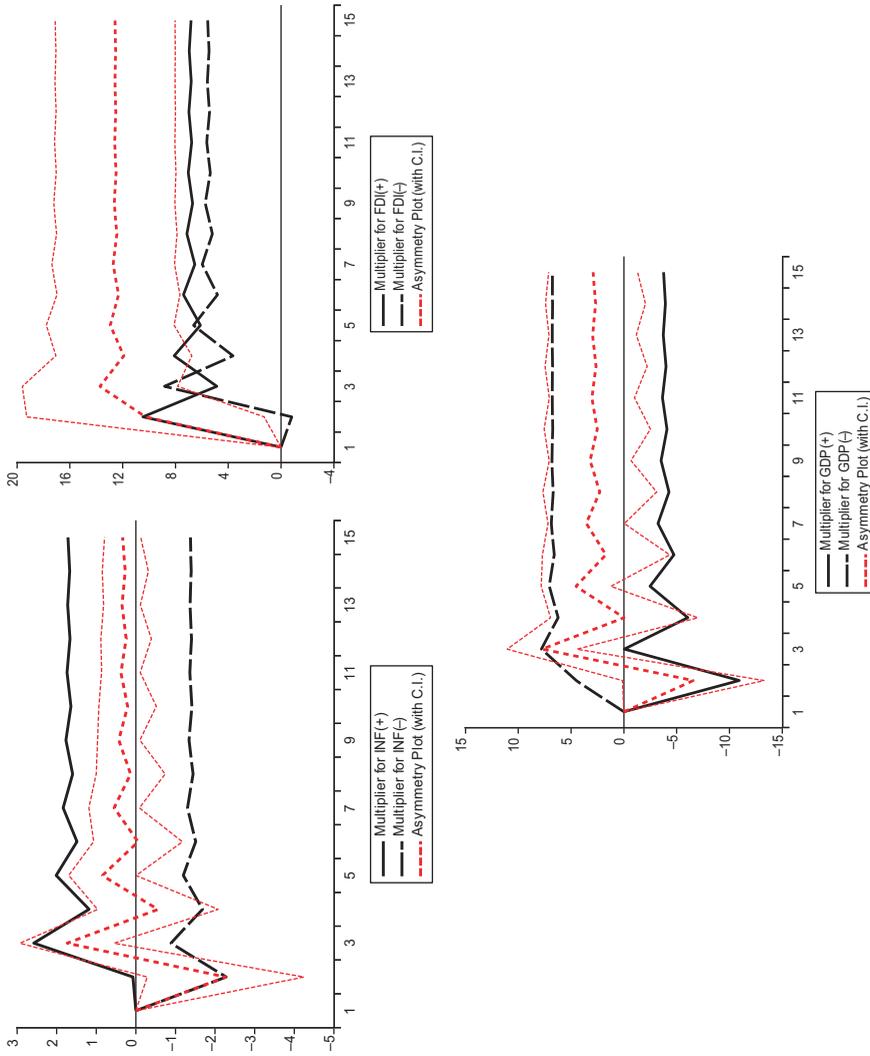


**Figure 1.**  
Parameters  
stability test

**Source(s):** Author's elaboration

indicate that an increase in these determinants may reduce the variability of IPOs issued. Thus, the present study provides an in-depth understanding of the determinants of IPO variability, particularly in terms of their symmetrical and asymmetrical effects.

According to Çolak *et al.* (2017), the macroeconomic indicators' weak performance indicates political instability, which drives information asymmetry and increases IPO issuance costs, thus discouraging firms from issuing new listing equities. Hence, fewer IPO issuances are expected during periods of political instability. Meanwhile, the interest rate has a non-linear effect on IPO variability due to stock price efficiency that drives the confidence of market participants, thus leading to increased IPO issuances. Hence, a firm's decision to go



Source(s): Author's elaboration

Figure 2.  
Dynamic  
multiplier graph

public is influenced by a variety of macroeconomic factors that influence the appeal of the financial market. In the context of Pakistan, the true determinants of IPO variability are stock market performance (KSE), TBR, inflation (INF), GDP growth rate and FDI.

The findings of this study may be valuable for investors, firms, regulators and policymakers. The findings imply that investors should consider macroeconomic conditions when managing investment portfolios and identify profitable IPO variability when making investment decisions. Favourable market conditions can increase the number of IPO issuances and, subsequently, their returns. Likewise, firms may decide to go public during favourable market conditions and obtain full IPO subscriptions. On their part, the government should introduce measures to improve the country's macroeconomic conditions to ensure market growth. Stakeholders can use the findings to improve their knowledge about IPOs, and policymakers can improve the financial capital market to make it more active, wide-ranging and vibrant. This study focussed on only a limited number of variables in examining their dynamic effects on IPO variability. Therefore, future studies can incorporate other macroeconomic determinants such as market liquidity, market volatility and country-level institutional quality. Another potential research area is expanding the data set to include Asian countries in order to examine a variety of market spillovers.

#### Notes

1. <https://unctad.org/webflyer/world-investment-report-2020>
2. <https://www.psx.com.pk/>
3. <https://www.imf.org/en/Data>
4. <https://databank.worldbank.org/source/world-development-indicators>
5. The asymmetric effects of inflation, GDP and FDI are determined by calculating the partial sums of the positive and negative changes in both variables.

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