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Macroeconomic variables and initial public offerings in Sri Lanka: a principal component analysis approach

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Abstract

Purpose – This study aims to comprehensively examine the relationship between initial public offering (IPO) activities and macroeconomic factors in Sri Lanka.

Design/methodology/approach – This study uses principal component analysis (PCA) and autoregressive distributed lag (ARDL) techniques to examine the relationship between IPO activities and macroeconomic factors. Ten macroeconomic variables are transformed into principal components (factors) using PCA. Then, ARDL is applied to investigate the long- and short-term relationships between IPO activities and the transformed macroeconomic factors.

Findings – The empirical investigation identifies three principal factors from the ten macroeconomic variables, of which two factors have a significant long-run association with IPO activities: "return on investment (RTOI)" and "economic and market development (ECMD)." In the short run, "trade openness and banking sector development (TOBD)" and RTOI are significantly associated with IPO activities.

Research limitations/implications – The study was based on 30 years of observations, which passed all diagnostic tests but may be insufficient for generalizing the findings. Future studies could use high-frequency data (monthly or quarterly) to increase the number of observations and repeat the method and analysis. Also, while the symmetrical ARDL method was used in this study, an asymmetrical ARDL method may provide more insightful results and interpretations.

Practical implications – The study highlights the importance of considering both long- and short-term associations when analyzing the impact of macroeconomic variables on IPO activities.

Originality/value – This study is the first to comprehensively examine the relationship between IPO activities and macroeconomic variables using PCA and the ARDL technique. The study provides insight into the macroeconomic factors that influence IPO activities in Sri Lanka and highlights the importance of considering long- and short-term associations.

Keywords ARDL, Factor analysis, Going public, IPO, Macroeconomic, PCA, Sri Lanka

Paper type Research paper

1. Introduction

The IPO activity and the IPO markets worldwide have experienced changes in activity levels and geographical distributions over the years. Notably, the first half of 2024 revealed a

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significant drop in global IPO activity, with 551 IPOs garnering $52.2 billion, thus reflecting an average annual decline of 12% in volume and 16% in value sustainably over the year (EY, 2024). This downturn was mainly associated with a slowdown in the Asia-Pacific region especially the Mainland China and Hong Kong markets (Lu & Ren, 2024). On the other hand, the Americas and EMEIA regions performed significantly better and the latter regained the lead role as the largest global IPO market by number of listings for the first time in 16 years (Minuskin, 2024). However, some key markets were relatively immune to such a decline. These recent trends confirm the dynamism of global IPO activities, which call for a systematic analysis of the loaded determinants of IPO decisions across the growing economic environment, particularly in emerging economies such as Sri Lanka. In this light, the IPO market in Sri Lanka is rather interesting to study concerning the effects of macroeconomic variables in the context of an emerging South Asian economy. This paper is relevant when Sri Lanka's economy is recovering from a downturn and the developments in IPOs bring into the light the issues faced by emerging economies, particularly in the case of Sri Lanka.

IPO is the process through which private limited firms offer their stakes either partially or fully to the public for investing capital. Indeed, going public initiatives are highly advantageous to both the firm and the economy. With these numerous benefits, IPO unleashes large funds to issuing firms and assists in financing potential investment opportunities which dominate their hand (Ghonyan, 2017). Stock market capitalization of an economy is primarily a function of size and the number of firms listed in a particular market (Aktas, Andries, Croci, & Ozdakak, 2019; Subrahmanyam & Titman, 1999). However, the number of the companies that are listed is still limited in many of these developing economies, despite the presence of a few. This limitation presents a major problem, especially for developing countries such as Sri Lanka, where sound capital markets are imperative for economic growth. The stock market plays an important role of providing capital to long-term projects with reasonable rates of return to the investors. It enhances market efficiency by offering investors a safer means for trading financial securities and provides companies with more favorable financing terms (Ho & Iyke, 2017). This is a way for companies to join the stock exchanges to access the capital markets for their future needs. However, many potential Companies in Sri Lanka have not been listed in the last few years in stock exchange market and few on the Colombo Stock Exchange (2023). The trend indicated has implications for the future growth of Sri Lanka's capital markets, and there is a clear need to explore the determinants of IPOs in the country.

According to Ivanov and Lewis (2008) and Lowry (2003) there is a positive relationship between the IPO activities and the economic status. The relationship between these macroeconomic factors and IPO activities has recently become an area of focus for scholars and researchers globally. The market size and liquidity are the key indices used to evaluate the stock market development that the stock market participants determine, which includes the listed companies and the investors as well as trading activities (Grbić, 2020; Ahmad, Khan, & Tariq, 2012). A high number of new listings (IPOs) and active trading of many stocks in the market is essential in stock market development (Fontaine & Cissé, 2011). The stock market and its growth are underpinned by two fundamental components: listed companies that provide trading stocks and potential investors who generate demand. These two entities form the cornerstone of the stock market's functioning. Therefore, having a reasonable number of listed companies and investors is vital (Wassal, 2013). Consequently, policymakers responsible for developing stock markets must formulate effective strategies to incentivize new listings and attract potential investors to their national stock exchange to boost its growth potential (Grbić, 2020).

Macroeconomic factors, which impact the entire economy rather than specific to an individual firm, play a role in determining the optimal time for a company to go public. These macroeconomic conditions influence the profitability of both industries and individual companies and can thus influence the IPO decision of firms (Tran & Jeon, 2011). While a company may pursue an IPO at any time, this decision is not reversible, and unfavorable

macroeconomic conditions within the country may delay or discourage the company from going public (Mehmood, Mohd-Rashid, & Ahmad, 2020). As noted by Çolak and Günay (2011), the frequency of IPOs was significantly reduced during the economic crisis in the United States. Changes in economic conditions over time have been shown to significantly impact the frequency of IPOs (Tran & Jeon, 2011). According to Thanh (2020), an increase of one standard deviation in macroeconomic uncertainty leads to a long-term decline of nearly four IPOs per month. IPO frequency decreases with a rise in macroeconomic uncertainty caused by fewer applications and more withdrawals.

The optimal timing for a company to go public is determined by the prospect of obtaining the highest inflow of cash from the IPO, which should reflect the company's overall market value. However, unfavorable macroeconomic conditions can impede the realization of projected cash inflows, causing companies to delay their IPO. The state of the economy significantly impacts businesses' cash inflows and risk-adjusted discount factors, as several studies have shown that economic variables can be used to evaluate factors affecting the volume of IPOs (Tran & Jeon, 2011; Chen, 2009; Ameer, 2012). A thriving economy increases IPOs, as investment opportunities become more robust and potential buyers are more willing to participate in IPOs. The clustering of IPOs occurs when companies leverage the information generated by prior IPOs to launch their own, resulting in clusters of IPOs occurring within a limited period (Hoffmann-Burchardi, 2001).

Importantly, the literature review reveals that macroeconomic variables, such as stock market development, stock market return, interest rate, trade openness, bank sector development, economic growth, foreign direct investment, inflation, and stock market liquidity, impact the IPO activities of companies. Although some of these variables significantly affect the IPO decision of companies in certain countries, the relationship between IPO activities and macroeconomic variables results is inconclusive and depends on the study context. This lack of consensus presents a critical gap in our understanding, particularly in emerging markets like Sri Lanka, where the interaction between macroeconomic factors and IPO activities remains understudied. The study collects all relevant macroeconomic variables tested in previous studies and comprehensively examines the relationship between IPO activities and macroeconomic variables in Sri Lanka. The unique economic landscape of Sri Lanka characterized by its transition to a middle-income economy and recovery from civil conflict, offers a compelling case study. Based on macroeconomic time series variables, this study creates new factors by applying PCA and it employs the ARDL technique to examine the relationship between IPO and long-run and short-run macroeconomic factors. This approach enables us to model complex effects while avoiding multicollinearity problems comprehensively. This paper aims to have a broad perspective on how different macroeconomic factors affect IPOs in Sri Lanka. By doing so, we seek to enhance theoretical understanding of IPO determinants in emerging markets and provide valuable insights for policymakers working to stimulate economic growth through capital market development.

2. IPOs in Sri Lanka

Sri Lanka has had institutionalized stock trading since 1896, and the Colombo Stock Exchange (CSE) was formed in 1985 by combining the Colombo Brokers Association and the Share Brokers Association. As of 2009, the CSE was the world's top-performing stock exchange (Rathnayake, Louembé, Kassi, Sun, & Ning, 2019), and again ranked the second best-performing market in the world on January 13, 2021, by Bloomberg data (Colombo Stock Exchange, 2021). The mainboard of CSE consists of 290 public companies representing 20 sectors as per the Global Industry Classification Standard (GICS) as of January 2023. In addition to the mainboard, CSE maintains the Diri Savi Board, Watch List, and Second Board for listing equity shares as per the state of compliance with CSE rules. Total market

capitalization was Rs. 2,851 billion, and the market liquidity was Rs. 171 billion in 2019 (Colombo Stock Exchange, 2019).

The IPO market in Sri Lanka has experienced fluctuations over time. In 2020, the CSE reformed the requirements and timing of initial share listings to improve the IPO market in Sri Lanka. The results indicate that underpricing occurs more frequently than overpricing in Sri Lanka. There have been some notable IPOs in Sri Lanka in 2021. The highest level of overseas subscription at an IPO in Sri Lanka was Rs 40 billion. However, not all years have seen strong interest in Sri Lank IPOs. In recent years CSE has failed to attract new companies in the form of IPO to list equity shares on its boards. No company was newly listed on the main board in 2019 and 2020. There were 32 companies delisted from CSE in the last ten years, among which ten delistings were in 2019 alone (Colombo Stock Exchange, 2019). These figures indicate that the go-private transactions (delisting) supersede the go-public (listing via equity IPO) in the CSE and cause a listing gap. Furthermore, many potential companies have been reluctant to go public in CSE in recent years.

Recent research has sought to understand the motivations behind companies going public in Sri Lanka. Riyath and Dayaratne (2024) employed a mixed-method approach to investigate why companies choose to list on the Colombo Stock Exchange, highlighting both the benefits and challenges perceived by company executives. This research contributes to a more understanding of IPO dynamics in the Sri Lankan context, complementing the macroeconomic perspective of our current study. Abeysekera (2024) examined how fiscal, monetary, and public policies impact sustainable development in Sri Lanka. The study found that fiscal policy, particularly government expenditure, plays a crucial role in driving sustainable development. Monetary policy was found to have a more indirect influence, while public policy showed mixed effects. Tharanga, Banda, Dewasiri, and Peiris (2024) examined factors influencing dividend policy in Sri Lankan financial firms. The implication of the result on the determinants of dividend policies may be useful to firms that intend to float their shares in the stock market owing to the effect that potential dividends may have on the IPO demand. Analyzing the interaction between the Sri Lankan stock market during the debt crisis and its trading partners, Kakran, Sapra, Kumar, and Sidhu (2024) explored the dynamics of the related relationships at a market level instead of focusing on individual firm-specific factors. Their findings describe how economic shocks impact stock market returns and could impact IPO activities and, therefore, concretely illustrate the market situations during periods of economic difficulties.

3. Theoretical framework

The theoretical underpinnings of IPO activities are mainly based on the market timing theory; according to this, firms deliberately plan their IPOs when the market conditions are right (Baker & Wurgler, 2002). This theory, which is drawn from capital structure literature, argues that companies follow equity issuance at high stock prices due to investor optimism (Arnold, Lewis, & Pearson, 2019). According to the market timing theory, firms opt for the IPO at the time the market is considered to be overvalued (Pagano & Röell, 1998), when its cash flow is high (Benninga, Helmantel, & Sarig, 2005), or the overall market is overvalued (Lowry & Schwert, 2002). This argument is supported by the evidence that IPOs occur in “hot issue” periods when firms mimic their counterparts in the same industry to embark on an IPO (Lowry & Schwert, 2002; Jain & Kini, 2006). Chemmanur and Fulghieri (1999) also support this by showing that IPO volume is positively related to the stock market return of listed companies in the same industry.

However, to understand the IPO activities further, it is necessary to consider the additional theoretical framework that can be referred to as complementary to the concept of market timing theory. The information asymmetry theory (Rock, 1986) and signaling theory (Allen & Faulhaber, 1989) can also explain more about the IPO price and timing, especially for markets in the emerging world that may not be similar to developed countries. In addition, the life cycle

theory of IPOs (Zingales, 1995) noted that firms emit IPO status when the benefits of being in this status exceed the costs, which might have been affected by macroeconomic characteristics. This rich theoretical framework that cuts across various sub-disciplinary fields of finance is handy in explaining the observed trends in IPO activities and macroeconomic indicators, thereby presenting sound grounds for empirical investigation. In the case of Sri Lanka, an emerging market with a different economic structure, these theories can help explain how macroeconomic factors could affect the choice of IPOs. The following theoretical framework provides a strong foundation for the present study about the impact of macroeconomic factors on IPO activities in Sri Lanka, assisting in relating our conclusions with other empirical findings of the market timing hypothesis and factors affecting IPOs. Applying such theories in combination allows for a richer understanding of the dynamics of IPOs in any given country, which in this case are the conditions of the emerging market of Sri Lanka.

4. Literature review and variable definition

4.1 Stock market development (SMD)

The advancement of the stock market has several positive impacts on businesses and public finance. Firstly, it lowers the equity cost, improving businesses' operational efficiency. Secondly, it promotes stock market cash flow and provides opportunities for improving investment productivity and reducing information costs (Subrahmanyam & Titman, 1999). The development of the stock market also leads to decreased information asymmetry, reducing the need for companies to underprice their shares during IPOs (Engelen & Van Essen, 2010). According to Ritter (1987), underpricing is a significant expense that influences a company's IPO decision, and it creates uncertainty for businesses, limiting the number of IPOs (Bruce & Thilakaratne, 2014; Lowry, Officer, & Schwert, 2010). Finally, companies operating in countries with well-established stock markets benefit more from the funding function of IPOs compared to those operating in countries with weaker stock markets (Aktas *et al.*, 2019).

4.2 Gross domestic product (GDP)

The relationship between growth prospects and capital-raising behavior in the context of IPOs has been a focus of attention in the academic literature. Businesses tend to increase their investment and improve their production capacity to meet the anticipated demand for their products in the future. A favorable economic growth environment creates market opportunities for businesses to expand and increase profitability (Sudweeks, 1989). This provides an incentive for businesses to raise capital through stock issuances. This leads to an increase in the supply of equity, with billions of dollars being raised globally through IPOs each year, which can significantly impact the macroeconomic stability of several nations (Garbowski, Mironova, Perevozova, Khrushch, & Gudz, 2019). GDP growth rate indicates an economy's health and future business activities. Mehmood *et al.* (2020) emphasize that high GDP growth rates promote economic expansion and productivity in emerging economies. La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997) studied 49 countries and found a strong association between the number of IPOs and long-term GDP growth rates. Conversely, Rydqvist and Högholm (1995) found limited predictability of IPO activities based on short-term GDP growth rates across European economies. Angelini and Foglia (2018) also propose a positive association between IPO volume and GDP growth rate. However, Breinlinger and Glogova (2002) found no evidence that the annual volume of IPOs depends on GDP growth rates after examining 18 years of data for six European countries.

4.3 Interest rate

Interest rate is critical in developing financial markets and asset values, as they provide essential information to stock market participants. Recent studies by Tran and Jeon (2011) and Ameer (2012) suggest that higher interest rates lead to lower company valuation, reduced

volume of IPOs, and the relationship between interest rate and volume of IPOs is negetive. Kaya (2013) observes that fluctuations in interest rates impact the number of IPOs launched, with most IPOs taking place when interest rates are low. Brau, Francis, and Kohers (2003) emphasize that interest rates play a critical role in the IPO decision, especially for new company takeovers, where low-interest rates lead to more borrowing and fewer IPOs. Ameer (2012) argues that interest rates are the most significant monetary policy tool and significantly impact the stock exchange and the IPO cycle.

4.4 Foreign direct investment (FDI)

FDI constitutes a significant capital inflow source for developing economies. FDI encourages domestic investment in emerging economies, especially when it leads to advantageous outcomes such as increased exports. This, in turn, motivates local capital to flow toward more lucrative projects. Scholars debate whether FDI and the growth of domestic stock markets are substitutes or complementary factors. Claessens, Demirgüç-Kunt, and Huizinga (2001) claim that FDI will likely flow into economies with strong institutions and a solid economic foundation to support local financial systems. In contrast, Fernández-Arias and Hausmann (2000) contend that FDI inflows more into institutionally weaker, financially undeveloped, and riskier economies. For both loan and equity finance, FDI offers a viable option for undeveloped financial markets. Consequently, FDI has an inverse relationship with stock market development. SMD allows new investors and companies to enter the market (Iuliia, 2018). FDI allows firms to issue new shares to foreign investors on stock exchanges, increasing demand. This, in turn, motivates potential Initial Public Offering (IPO) companies to offer shares at a reasonable price (Feldstein, 2007; Parboteeah & Cullen, 2017). Consequently, FDI influences a firm's IPO decision.

4.5 Inflation

Inflation's impact on stock market returns is widely studied. While overall inflation may not significantly affect stock returns, unexpected inflation can. Some studies claim a positive long-run association between inflation and stock market growth (Kolluri & Wahab, 2008), while others find no significant association (Yartey, 2010). High inflation rates can result in high costs of equity capital, discouraging businesses from going public Niroomand, Hajilee, and Al Nasser (2014). Further, high expected rates of return during high inflation periods may be offset by high-risk premiums, making it more challenging to generate new investments in the future (Ameer, 2012). However, Tran and Jeon (2011) find the relationship between IPO activities and inflation is positive. According to Bekaert and Engstrom (2010), Bonds and stock returns have a considerable positive correlation with inflation expectations.

4.6 Banking sector development (BSD)

The relationship between the stock market and the banking sector has diverse and contradictory findings. While some argue for competition, others suggest that stock markets and banks should be complementary (Ho & Iyke, 2017). Regarding substitutability, several studies suggest that banks are more efficient than equity markets in delivering financial services, such as corporate governance, information acquisition, and risk sharing (Levine, 2005; Allen & Gale, 2000). However, Levine (2005) suggests that banks and stock markets should work collaboratively to offer growth-enhancing financial services by providing tailored risk management services and enhancing market liquidity.

Trade credit is a viable alternative to bank borrowing (Petersen & Rajan, 1997). A developed banking system facilitates accessing debtor information and remedies, while vendors are better at collecting a buyer's financial data but may lack the skills to collect information about a buyer's financial health. Fama (1985) suggests that public debt holders depend on publicly available information, while banks have access to inside information. The

bank lending channel hypothesis suggests that central banks can decrease real economic activity by tightening credit availability through higher interest rates imposed on banks. As a result, banks may not lend to borrowers, causing companies to prefer stock market funding over bank loans for expansion (Williamson, 1988).

4.7 Exchange rate

The modern portfolio theory suggests that the impact of currency risk on the cost of capital and the firm's value is negligible if it can be diversified. (Jorion, 1991). However, Ross (1976) argues that investors will pay a premium for companies that adopt aggressive hedging strategies if certain variables are fundamental to the economy and correctly priced. A company's cost of capital can be lowered through hedging strategies if foreign exchange and stock markets price foreign currency risk correctly. Investors will only agree to these strategies if the foreign currency market is separate from the stock market and if foreign exchange risk is considered in stock prices. Failure to account for exchange rate risk can negatively affect stock values. Given the globalized nature of the economy, a company's choice of IPO location is crucial, and it may choose to issue an IPO in its domestic market, foreign market, or both (Doidge, Karolyi, & Stulz, 2013; Kim & Weisbach, 2008). Foreign exchange rates become crucial in international IPO decisions (Colak, Jens, Knill, & Syvrud, 2014).

4.8 Trade openness

There has been controversy over the influence of trade openness on the stock market. Some scholars argue that trade openness positively affects stock market development via the supply and demand sides (Niroomand *et al.*, 2014; Ho & Odhiambo, 2018). Conversely, trade openness negatively impacts stock market development (Kim, Lin, & Suen, 2011; Ho & Odhiambo, 2018). Rajan and Zingales (2003) provide supporting evidence for the supply-side argument that trade openness enhances financial market development by promoting bank lending and investment. In contrast, the demand-side argument emphasizes that exposure to external shocks and competition rises when the trade opens up, necessitating the development of new financial products for risk diversification (Svaleryd & Vlachos, 2002). Rigobon and Rodrik (2005) claim that adopting trade openness may heighten an economy's susceptibility to competition, external shocks, and new global technological advancements, leading to increased uncertainties and reduced investment. This, in turn, could hinder economic development and IPO activities.

4.9 Stock market index (SMI)

In today's interconnected world, communication networks have facilitated the rapid dissemination of information among investors across global financial markets. Negative news tends to lead to downward pressure on stock prices, while positive or less negative news typically forecasts greater trade volume and higher returns. Market timing and investor sentiment theories suggest that sentiment impacts stock markets, affecting IPO volume as well. The stock index mirrors market sentiment, which affects the cost of issuing shares. When stock prices rise, companies find it cheaper to go public, resulting in more IPOs. Conversely, low market sentiment may undervalue companies, limiting the number of IPOs (Kovandová & Zinecker, 2015). Executing an IPO is closely linked to the expected returns and profitability of such a move for companies and prospective investors. Ameer (2012) states that macroeconomic conditions, stock market activity, and business cycles influence IPO frequency and earnings in emerging economies. There is often a lag between changes in the stock market index and new IPO decisions in most developing economies. Furthermore, Ogbuabor, Onuigbo, Orji, and Ojonta (2021) found that economic policy uncertainty significantly impacts stock market performance in developing economies, highlighting the importance of considering broader economic factors when analyzing IPO activities.

4.10 Stock market liquidity (SML)

A liquid secondary market is crucial for the success of an IPO. A liquid market lowers transaction costs and uncertainty in the available after-market, benefiting investors. The relationship between stock market development and stock market liquidity has been the subject of extensive research (Bayar, 2016; Yartey, 2010; Şükrüoğlu & Nalin, 2014). According to Corwin, Harris, and Lipson (2004), the liquidity of a company's stock impacts the costs of accessing external equity capital markets, especially investment banking costs related to the new stock offering. Investment banks charge less for companies with more liquid equity. However, accepting the shares may expose the underwriting syndicate to inventory risk and adverse selection risk, and the investment banks may suffer sunk costs in finding investors and closing transactions. Investment banking charges are determined by the issuing firms' stock market liquidity, as a well-liquid underlying stock market lowers intermediate costs for arranging a new equity issue (Ellul & Pagano, 2002; Corwin *et al.*, 2004).

The interplay between fiscal policy and macroeconomic fundamentals also merits consideration. Eigbiremolen, Nchege, and Orji (2015) examined the dynamics of budget deficits and macroeconomic fundamentals. it highlights the potential relevance of fiscal factors in shaping the economic environment for IPOs in developing economies like Sri Lanka. While our study focuses on macroeconomic factors, it's worth noting that firm-level characteristics also play a crucial role in IPO performance. Orji, Onyia, and Ani (2013) examined how macroeconomic uncertainty affects private investment in Nigeria, finding that reducing uncertainty can stimulate investment. Goyal and Dhiman (2024) analyzed SME IPOs' post-listing performance using both financial and non-financial disclosures, highlighting the multifaceted nature of IPO success factors. This underscores the importance of considering a broad range of variables when studying IPO dynamics. Akwimbi, Ochieng, and Lishenga (2024) examined how macroeconomic variables, along with corporate governance and investment strategy, affect the financial performance of pension schemes in Kenya. Their study highlights the interconnectedness of macroeconomic factors with various aspects of financial markets in emerging economies. While focused on pension schemes, this research underscores the broader impact of macroeconomic variables on financial decision-making, which is pertinent to understanding IPO dynamics in similar developing markets like Sri Lanka.

5. Methodology

5.1 Sample, data, and operationalization of variables

This study collects macroeconomic data from 1990 to 2020. Because the stock market data such as the number of IPO, the amount raised in IPO, turnover, liquidity, and the market capitalization before 1990 are not available. The amount raised in IPO is used as the dependent variable and employs annual data for the analysis. The IPO is not happening regularly in CSE. Very few numbers of companies are listed in the CSE every year. The number of annual listing range from one to five (zero in 2017). Therefore, monthly/quarterly observations are not suitable for this analysis. Table 1 summarizes the variables, their proxy indicators, data sources, and literature support used in the study.

5.2 Principal component analysis (PCA)

This study uses ten independent variables to measure macroeconomic variables. However, considering all of these variables simultaneously in a statistical model can lead to a violation of assumptions and complexity. In this regard, PCA is employed as a data reduction technique to transform the independent variables into principal components. PCA is preferred over other dimensionality reduction techniques such as Factor Analysis or Independent Component Analysis (ICA) due to its ability to handle multicollinearity and its interpretability in the context of macroeconomic variables. Our use of PCA aligns with recent research trends in

Table 1. Operationalization of variables

	Variable	Proxy indicator	Source	Literature support
1	Economic Growth	GDP growth rate	CBSL	Mehmood *et al.* (2020, 2021), Carp (2012)
2	Interest Rate	91 days treasury bill rate	CBSL	Mehmood *et al.* (2020), Tran and Jeon (2011)
3	Foreign Direct Investment	Foreign direct investment, net inflows to GDP	WB	Mehmood *et al.* (2020, 2021), Ho and Iyke (2017)
4	Inflation	Consumer prices (annual %)	CBSL	Mehmood *et al.* (2020, 2021), Omran and Pointon (2001), Tran and Jeon (2011), Marques, Fuinhas, and Marques (2013)
5	Bank Sector Development	Domestic credit to the private sector by banks to GDP	CBSL	Levine, Loayza, and Beck (2000), Sehrawat and Giri (2016)
7	Trade Openness	Sum of export and imports of goods and services to GDP	CBSL	Ho and Odhiambo (2020), Wassal (2005), Niroomand *et al.* (2014)
8	Stock Market Return	Annual return on ASPI	Data library	Mehmood *et al.* (2021), Tran and Jeon (2011)
9	Stock Market Liquidity	Stock turnover to market capitalization	Data library	Ho and Odhiambo (2020), Tran and Jeon (2011)
10	Stock Market Development	The market capitalization of listed companies to GDP	Data library	Ho and Odhiambo (2020), Şükrüoğlu and Nalin (2014)
11	IPO Activity	Total amount raised in IPO to market capitalization	Data library	Ameer (2012), Mehmood *et al.* (2020), Tran and Jeon (2011)

Source(s): Authors' own creation

analyzing economic development factors. Shinozaki, Miyakawa, and Arahan (2024) employed a probabilistic PCA to identify factors affecting micro, small, and medium-sized enterprise development in developing Asia, demonstrating the technique's effectiveness in distilling complex economic data into key components. PCA is considered an effective method to deal with high-dimensional data sets and can provide better insights into the underlying structure of the data. The foundational assumptions of PCA in this study are critical for its use. We assume linear associations exist between macroeconomic variables suitable for most economic variables. The statistical relevancy of our dataset PCA performance is adequately founded on the number of samples we have taken for the study. Preliminary data analysis confirms that our variables are moderately to strongly interrelated, thus confirming the appropriateness of the PCA technique. The impact of potential outliers has been handled through comprehensive data pre-processing, and all the variables are normalized before applying PCA to give equal weight to all variables. From the PCA procedure, the eigenvalues and eigenvectors of the correlation matrix are computed as underlying Gries, Kraft, and Meierrieks (2009) to transform the data into a set of orthogonal axes. This allows us to analyze the data much more efficiently and effectively.

5.3 Autoregressive distributed lag (ARDL)

A considerable number of studies reveal that certain macroeconomic variables affect the going public decision of companies and IPO activities at stock markets in different economies directly and indirectly (Angelini & Foglia, 2018; Thanh, 2020; Ameer, 2012; Tran & Jeon, 2011; Meluzín & Zinecker, 2014; Mehmood *et al.*, 2020, Mehmood, Mohd-Rashid, Ong, & Abbas, 2021; Kovandová & Zinecker, 2015; Amorim, Camargos, & Ferreira, 2021; Islam & Ahona, 2021; Narayanan & Unni, 2021). This study investigates how companies' IPO activities respond to the macroeconomic variables in Sri Lanka. The macroeconomic variables

may impact IPO activities in the long run and or short run. Pesaran and Shin (1999) established the Autoregressive Distributed Lag (ARDL) technique, often known as the Bounds test. Several factors made it necessary to choose the ARDL model over other models, such as VECM or VAR. First, ARDL points to the ability of model variables with different degrees of integration, namely I(0) and I(1), which is especially useful in the context of macroeconomic investigations since, in most cases, variables suffer from mixed integration characteristics. Also, ARDL enables examining both short-run and long-run associations, providing a holistic view of the connections between IPO activities and macroeconomic variables. Moreover, ARDL performs well with a small sample size, which may be a crucial feature for our Sri Lankan IPO dataset since observational data may be limited. An Error Correction Model (ECM) and a linear transformation technique incorporate short-term adjustments into the long-term equilibrium analysis without losing information about the extended time horizon. (Ali, Abdullah, & Azam, 2017). The ARDL technique is more effective for small samples than Johansen and Juselius' cointegration methods (Paul, Uddin, & Noman, 2011).

5.3.1 ARDL test procedure. The first step is the unit root analysis to determine the level of integration for each variable, which is done by the Augmented Dickey-Fuller (ADF) test. The second step chooses the appropriate lag length for the Unrestricted Error Correction Model (UECM) using the Akaike information criterion (AIC) to ensure sufficient explanatory power and avoid overfitting. The chosen lag length is then used in the subsequent analysis. The UECM Equation (1) is the basic model for this ARDL bounds test framework.

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \gamma_1 \Delta Y_{t-i} + \sum_{i=1}^{q} \gamma_1 \Delta X1_{t-i} + \delta_1 Y_{t-1} + \delta_2 X_{t-1} + \varepsilon_1 \quad (1)$$

The Δ is the operator for the first difference. The ε is the residual, which must be white noise: it should be serially independent (no serial correlation), homoscedastic (constant residuals), and normally distributed. All γ and δ coefficients should be statistically different from zero.

The F-statistic is used in the third step of the ARDL bounds to examine a potential long-run relationship between the variables. The ARDL equivalent of the UECM if cointegration is established in Equation (1). The joint null hypothesis that the coefficients of the lagged variables are zero will be tested using the *F*-test. The ARDL bounds test procedure investigates cointegration under the following hypothesis.

$$H_n{:}\delta_1 = \delta_2 = \delta_n = 0$$

$$H_a{:}\delta_1 \neq \delta_2 \neq \delta_n \neq 0$$

The bounds test determines the appropriate analysis model - either a short-run model or an Error Correction Model (ECM). Specifically, if the findings from the bounds test confirm the existence of cointegrated variables, the ECM is formulated and estimated. In contrast, if the bounds test fails to establish cointegration, the short-run ARDL model is utilized instead. In instances where the long-term relationship among the variables in the model is present, the ECM model captures the short-term dynamics, as specified by Equation (2). This analytical framework enables a more precise and robust data analysis, as the appropriate model is selected based on the empirical evidence of cointegration, thereby providing more accurate inferences about the short- and long-run relationships among the variables.

$$\Delta Y_t = \alpha_0 + \sum_{i=1}^{p} \gamma_1 \Delta Y_{t-i} + \sum_{i=1}^{q} \gamma_1 \Delta X1_{t-i} + \eta_1 ECT_{t-1} + \varepsilon_1 \quad (2)$$

The speed of adjustment parameter is indicated or measured by η ECM coefficient. It is often anticipated to be negative and significant, implying the presence of cointegration or a long-term relationship between the series. Indications of cointegration mean that the variables have a long-run relationship and that their linkage is not temporary but permanent, which can be restored whenever there is an interruption. The equation for a long-term relationship is given in Equation (3):

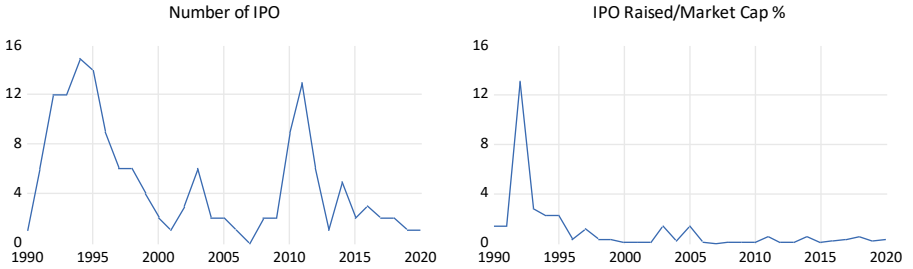
$$Y_t = \alpha_0 + \sum_{i=1}^{p} \gamma_1 Y_{t-i} + \sum_{i=1}^{q} \gamma_1 X1_{t-i} + \varepsilon_1 \quad (3)$$

The final step in the ARDL test involves conducting models' diagnostic and stability tests to ensure that the results are statistically robust. These tests help to identify any potential issues with the model specification or underlying data which could compromise the validity of the results. The diagnostic tests include testing residuals for serial correlation, heteroscedasticity and normality.

6. Findings and discussion

6.1 Descriptive statistics

The CSE witnessed the admission of 151 IPOs during the sampling period. Figure 1 shows a significant IPO boom from 1992 to 1996. However, several adverse factors, such as civil war, genocide, terrorism, social security issues, volatile production growth, high political unrest, hyperinflation, and high-interest rates, led to a sharp drop in the stock market and IPO activities. A second boom occurred from 2010 to 2012, attributed to the end of the 30-year civil war. However, IPO activity decreased again due to political unrest and significant international pressure on the government. Table 2 presents the macroeconomic variables' descriptive statistics, which shows the data structure and relationship among the macroeconomic indicators. The correlations among variables confirm their strong associations among some macroeconomic indicators. This analysis forms the foundation for the subsequent principal component analysis (PCA), which identifies the principal components/factors and reveals the data's underlying structure. The results of the PCA can be used to construct a more concise and parsimonious econometric model.



Source(s): Authors' own creation

Figure 1. IPO trends

Table 2. Descriptive statistics

	BANK	EXR	FDI	GDPR	INDEX	INFR	INTR	OPEN	SMD	SMLIQ
BANK	1	0.060	0.052	−0.177	−0.341	−0.392	−0.560	0.804	0.072	−0.359
EXR	0.060	1	0.139	−0.284	−0.088	−0.095	0.142	−0.121	−0.346	−0.381
FDI	0.052	0.139	1	0.264	−0.188	0.246	0.074	0.167	−0.013	0.107
GDPR	−0.177	−0.284	0.264	1	−0.028	0.037	0.092	0.137	0.463	0.420
INDEX	−0.341	−0.088	−0.188	−0.028	1	−0.125	−0.256	−0.351	0.339	0.399
INFR	−0.392	−0.095	0.246	0.037	−0.125	1	0.643	−0.315	−0.316	0.063
INTR	−0.560	0.142	0.074	0.092	−0.256	0.643	1	−0.519	−0.337	−0.124
OPEN	0.804	−0.121	0.167	0.137	−0.351	−0.315	−0.519	1	0.426	−0.199
SMD	0.072	−0.346	−0.013	0.463	0.339	−0.316	−0.337	0.426	1	0.220
SMLIQ	−0.359	−0.381	0.107	0.420	0.399	0.063	−0.124	−0.199	0.220	1
Mean	30.539	0.052	1.253	4.889	0.157	8.956	11.852	0.384	19.597	14.932
Std.Dev	10.852	0.054	0.490	2.568	0.401	5.017	4.840	0.075	7.145	7.861

Source(s): Authors' own creation

6.2 Principal component analysis

It employs PCA to reduce ten macroeconomic variables into meaningful factors without losing information in the data. Inclusion of many variables as they are cause multicollinearity issues and a reduction in the parsimony of the model. The Kaiser-Meyer-Olkin (KMO) test evaluates data suitability for PCA. This study has an overall MSA value of 0.53, which is acceptable for PCA as it exceeds 0.5 Williams, Onsman, and Brown (2010). According to Kaiser (1960), only eigenvalues ≥1.0 should be retained. Accordingly, as shown in Table 3, three components can be retained. The first component accounts for 28.4% of variations, and the second and third components account for 23.4% and 16.6% of the data set variation. Therefore, all these three components accounts 68.83% of variations in the data set.

After identifying the underlying structure of the data and determining the principal components, it is necessary to label each factor based on the variables that load highly on it. This helps to interpret and understand the factors and their relationship to the original variables. Table 4 presents the rotated factor loadings and factor scores obtained from Orthogonal varimax in the PCA. It reveals that variables, such as banking sector development (BANK) and trade openness (OPEN), have higher factor loadings with Factor 1, which is labeled as "Trade openness and banking sector development" (TOBD). The variables economic growth rate (GDPR), stock market liquidity (SMLIQ) and stock market development (SMD) have higher factor loadings with Factor 2, which is labeled as

Table 3. Eigenvalues

Number	Value	Difference	Proportion	Cumulative value	Cumulative Proportion
1	2.842	0.506	0.284	2.842	0.284
2	2.336	0.681	0.234	5.179	0.518
3	1.655	0.670	0.166	6.834	0.683
4	0.985	0.202	0.099	7.819	0.782
5	0.783	0.183	0.078	8.603	0.860
6	0.601	0.260	0.060	9.203	0.920
7	0.341	0.107	0.034	9.544	0.954
8	0.234	0.082	0.023	9.778	0.978
9	0.152	0.082	0.015	9.930	0.993
10	0.070	–	0.007	10.000	1.000

Kaiser's MSA: 0.533504

Source(s): Authors' own creation

Table 4. Rotated factor loadings and factor coefficients

Rotated loadings				Factor coefficients		
	F1	F2	F3	F1	F2	F3
BANK	0.873	−0.203	−0.157	0.261	−0.295	−0.120
EXR	0.011	−0.496	0.095	0.029	−0.124	0.010
FDI	0.145	0.202	0.360	0.012	0.055	0.128
GDPR	0.026	0.711	0.181	0.029	0.284	0.120
INDEX	−0.466	0.216	−0.615	−0.116	0.016	−0.280
INFR	−0.367	0.056	0.628	−0.084	0.113	0.220
INTR	−0.484	−0.094	0.707	−0.002	−0.020	0.505
OPEN	0.926	0.211	−0.054	0.657	0.326	0.339
SMD	0.229	0.674	−0.374	−0.051	0.343	−0.229
SMLIQ	−0.328	0.588	−0.160	−0.043	0.282	0.014

Source(s): Authors' own creation

"Economic and market development" (ECMD). Finally, interest rate (INFR), inflation rate (INTR), and stock market index return (INDEX) have higher factor loadings with Factor 3, which is labeled as "Returns on investment" (RTOI). Factor scores reflect an individual's position on identified factors and are computed using Thurstone's regression.

6.3 Autoregressive distributed lag model (ARDL)

The ADF unit root test was performed on the data series for the three factors identified through PCA, and the results are shown in Table 5. The test demonstrates that the IPO amount (IPOAMT) and RTOI are stationary at level, while TOBD and ECMD become stationary at first difference. It indicates that the ARDL model is appropriate for the investigation as all necessary prerequisites are satisfied.

Lag lengths are determined based on AIC values from 500 unrestricted VAR models of ARDL, using up to four lags for the dependent variable and three regressors. The best model for further analysis is ARDL (3,2,2,4) after analyzing the AIC values. The ARDL estimation Equation (4) is established accordingly.

$$\Delta IPOAMT_t = \alpha_0 + \sum_{i=1}^{3} \gamma_1 \Delta IPOAMT_{t-i} + \sum_{i=1}^{2} \gamma_4 \Delta TOBD_{t-i} + \sum_{i=1}^{2} \gamma_6 \Delta ECMD_{t-i} + \sum_{i=1}^{4} \gamma_8 \Delta RTOI_{t-i} + \delta_1 IPOAMT_{t-1} + \delta_2 TOBD_{t-1} + \delta_2 ECMD_{t-1} + \delta_2 RTOI_{t-1} + \varepsilon_1 \quad (4)$$

where.

IPOAMT Amount raised in IPO to market capital

TOBD Trade openness and banking sector development

Table 5. Augmented Dickey-Fuller (ADF) test

	At level	IPOAMT	TOBD	ECMD	RTOI
With constant	*t*-statistic	−4.1663	−1.9394	−2.5831	−4.0416
	Prob.	*0.0029*	*0.3101*	*0.1082*	*0.0044*
With constant and trend	*t*-statistic	−3.5388	−3.7071	−2.4833	−4.972
	Prob.	*0.0538*	*0.0385*	*0.3331*	*0.0023*
Without constant and trend	*t*-statistic	−2.4027	−1.8151	−2.6384	−4.138
	Prob.	*0.0181*	*0.0667*	*0.0103*	*0.0002*
	At first difference	d(IPOAMT)	d(TOBD)	d(ECMD)	d(RTOI)
With constant	*t*-statistic	−8.7734	−5.6681	−6.0151	−4.2515
	Prob.	*0.0000*	*0.0001*	*0.0000*	*0.0031*
With constant and trend	*t*-statistic	−8.6105	−5.6838	−5.8238	−4.1345
	Prob.	*0.0000*	*0.0005*	*0.0003*	*0.0173*
Without constant and trend	*t*-statistic	−8.9314	−5.106	−6.1301	−6.016
	Prob.	*0.0000*	*0.0000*	*0.0000*	*0.0000*

Source(s): Authors' own creation

ECMD Economic and market development

RTOI Return on investment

Δ First difference operator

α_0 Intercept

γ_i Short-run coefficient

δ_i Long run coefficient

ε_1 Error term

Table 6, Panel A displays the ARDL bound test and the critical values of Pesaran, Shin, and Smith (2001) and Narayan and Smyth (2005). The F-statistic of the ARDL model is 10.13964, which exceeds the upper bound critical values at 1%, demonstrating a significant long-run relationship between the IPO amount and the regressors. The ECM is suitable for analyzing long and short-run relationships.

Table 6, Panel B presents level equation estimates for each independent variable, long-run coefficients, and significant values. The coefficient of TOBD is −0.220893 (p = 0.2176), revealing that TOBD has no significant long-run relationship with IPO activities in Sri Lanka. Previous findings in other contexts reveal that trade openness (Hassan & Islam, 2005; Niroomand *et al.*, 2014) and banking sector development (Ho & Iyke, 2017) have an inconclusive effect on IPO activities, ranging from positive to negative impacts depending on country-specific factors such as market maturity and institutional quality. This ambiguity in the literature can be attributed to the complex interplay between financial market development and economic openness, as highlighted by seminal work in financial development by Rajan and Zingales (2003) in their influential study on the political economy of finance.

Allen and Gale (2000) and Levine (2005) claim that banks are better than stock markets in delivering financial services like corporate governance, risk sharing, and information gathering. Therefore, banking development negatively influences IPO activities since it serves as a substitute to the stock market. This "bank-based vs market-based" debate in the financial

Table 6. ARDL bound test and level equation

Panel A: F-bounds test

Test statistic	Value	Signif.	Asymptotic: n = 1,000		Finite sample: n = 30	
			I(0)	I(1)	I(0)	I(1)
F-statistic	10.13964	10%	2.37	3.20	2.676	3.586
k	3	5%	2.79	3.67	3.272	4.306
		1%	3.65	4.66	4.614	5.966

Panel B: levels equation

Variable	Coefficient	Std. Error	*t*-statistic	Prob.
TOBD	−0.220893	0.167876	−1.315813	0.2176
ECMD	−0.189722	0.101604	−1.867268	0.0914
RTOI	−0.634349	0.204245	−3.105832	0.0111
C	0.200257	0.09027	2.218427	0.0508

EC = IPOAMT−(−0.2209*TOBD−0.1897*ECMD−0.6343*RTOI + 0.2003)

Source(s): Authors' own creation

development literature offers a conceptual background for the potential nonlinear negative relation between banking sector development and IPO activities. This bank-led financial development perspective is particularly valid in the Sri Lankan context since the banking institutions have dominated the credit supply and may not let the equity markets develop further. The bank-based financial systems might consequently slow down the formation and growth of the capital markets since it will be cheaper for the banks to finance projects rather than issuing new equities in the underdeveloped market relied on by the investor (Levine, 1999).

Furthermore, Rigobon and Rodrik (2005) also state that when an economy is open to trade, this may lead to more external shocks, competition and new technological changes, leading to more risks and less investment. Therefore, trade openness could negatively affect economic development and IPO activities. This perspective can be considered as well as the "volatility view" of trade openness, which presumes that open economies are sensitive to outside shock. This increased vulnerability is also consistent with empirical evidence from emerging markets where firms may be discouraged from issuing equity through IPOs because they experience higher uncertainty and risk when accessing global capital markets (Stiglitz, 1985). This study's result supports the assertions made by Allen and Gale (2000), Levine (2005), and Rigobon and Rodrik (2005) that trade openness and banking sector development are detrimental to IPO activities. However, it lacks key evidence of the long-run scenario in the Sri Lankan context. This lack of significance in the Sri Lankan context may be due to country-specific factors or the stage of financial market development, as suggested by the "financial structure view". In Sri Lanka, where the capital market is still emerging, the impact of global economic forces may be dampened by domestic challenges, including regulatory inefficiencies, political instability, and limited market liquidity.

The ECMD coefficient is -0.189722 ($p = 0.0914$), significant at a 90% confidence interval. It reveals that the ECMD and IPOs have a significant long-run relationship in Sri Lanka. Many studies reveal that economic growth significantly affects companies when they make the going public decision (La Porta *et al.*, 1997; Mehmood *et al.*, 2020; Angelini & Foglia, 2018; Breinlinger & Glogova, 2002; Wassal, 2013). This relationship can be understood through the "market timing theory" proposed by Baker and Wurgler (2002), which suggests that firms are more likely to issue equity when macroeconomic conditions are favorable. In the Sri Lankan context, where economic growth fluctuates, market timing plays a critical role. Further, the stock market development potentially dampens the cost of equity for the economy, enhances corporate operational effectiveness, and increases cash flow on the stock market. A highly developed stock market, in particular, offers opportunities for increasing investment productivity and lowering information costs, which increases the public finance advantage (Subrahmanyam & Titman, 1999). This aligns with the "information production theory" of financial markets, as discussed by Grossman and Stiglitz (1980), which emphasizes the role of markets in aggregating and disseminating information. Aktas *et al.* (2019) suggest that companies that operate in countries with more established stock markets benefit more from the funding function of IPOs than those with weaker established stock markets. Furthermore, high liquidity in the secondary market is necessary for a successful IPO. Investors may benefit financially from a liquid market because it reduces transaction costs and uncertainty in the instantly accessible after-market. It is humbler to arrange an equity issuance in a well-liquid market than in a less liquid market (Corwin *et al.*, 2004; Ellul & Pagano, 2002). However, low liquidity in Sri Lanka's secondary market may present challenges. This liquidity effect is consistent with the "liquidity premium theory" in asset pricing, as discussed by Amihud and Mendelson (1986), which suggests that more liquid assets command higher prices, but this premium is likely reduced in less liquid, emerging markets like Sri Lanka.

The RTOI coefficient is -0.634349 ($p = 0.0111$), significant at a 95% confidence interval. It reveals that the RTOI has a significant long-term relationship with Sri Lankan IPOs. This finding confirms previous studies. A higher interest rate lowers the discounted future cash flow

value, negatively impacting IPO volume and firm valuation (Tran & Jeon, 2011; Ameer, 2012). According to Jovanovic and Rousseau (2004), when real interest rates rise, future cash inflows will be highly discounted, and companies will be less motivated to go public. This negative relationship between interest rates and IPO activity is consistent with the "cost of capital theory" in corporate finance, which posits that firms' financing decisions are influenced by the cost of different sources of capital. Fund managers and institutional investors seeking high-risk-adjusted returns are worried about rising inflation because it increases the possibility of higher interest rates. Investors in the market are concerned about upcoming monetary policies and expect a reward for taking risks. Further, stock returns are negatively associated with inflation in a country with high inflation (Boyd, Levine, & Smith, 2001). Kwofie and Ansah (2018) find a long-term positive association between stock market returns and inflation. Kolluri and Wahab (2008) claim a negative relationship between stock returns and inflation during low inflation but a positive one during high inflation. These mixed findings on the relationship between inflation and stock returns can be understood through the "proxy hypothesis", which suggests that the observed negative relationship between stock returns and inflation is proxying for the positive relationship between stock returns and real economic activity.

Furthermore, the stock market index represents investors' desire to invest and causes changes in IPOs (Tetlock, 2007). The market timing theory and investor sentiment hypothesis agree that pessimism and optimism impact stock markets. According to the theories, a stock index conveys market sentiments, which impact the expenses associated with issuing shares and cause changes in IPOs over time. Companies issue new equities as stock values increase. On the other side, when the market is depressed, investors may undervalue companies, which would reduce the number of IPOs (Kovandová & Zinecker, 2015). This sentiment-driven behavior in financial markets aligns with the "behavioral finance" perspective, which emphasizes the role of psychological factors in asset pricing and market dynamics. Previous empirical studies reveal that the stock index considerably impacts the number of IPOs (Loughran & Ritter, 2002; Pagano, Panetta, & Zingales, 1998; Rees, 1997).

$$\Delta IPOAMT_t = \alpha_0 + \sum_{i=1}^{3} \gamma_1 \Delta IPOAMT_{t-i} + \sum_{i=1}^{2} \gamma_4 \Delta TOBD_{t-i} + \sum_{i=1}^{2} \gamma_6 \Delta ECMD_{t-i} + \sum_{i=1}^{4} \gamma_8 \Delta RTOI_{t-i} + \vartheta\, ECT_{t-1} + \varepsilon_1 \quad (5)$$

The short-term coefficient of variables and error correction term (ECT) are shown in Table 7 Panel A, which were calculated using the error correction model (ECM) from Equation (5). The ECT represents the speed of adjustment toward the equilibrium in the long run. The coefficient of ECT in the ECM is -0.966590 ($p = 0.0000$), suggesting the deviances from equilibrium (errors) in the previous periods are corrected at a speed of 96.66% in the present period. This finding is consistent with Ho and Odhiambo (2018). The high speed of adjustment indicates a strong equilibrium relationship among the variables, consistent with the "cointegration theory" in econometrics.

The significance of the short-run coefficients was tested employing the joint Wald test (Table 7 Panel B). Accordingly, the lagged IPOAMT, TPBD & RTOI coefficients are statistically different from zero. It suggests that the lagged IPO amount, TPBD & RTOI have a significant short-run relationship with IPO (Granger causality toward IPO), consistent with previous findings. Stiglitz (1985), Levine (2005), Sehrawat and Giri (2016), and Acquaah (2015) argue that banking sector development promotes IPOs. This positive short-run effect of banking sector development on IPOs can be explained by the "financial intermediation theory", which emphasizes the role of banks in reducing information asymmetries and

Table 7. ARDL error correction regression and Walt test

Panel A: ARDL error correction regression

Variable	Coefficient	Std. Error	*t*-statistic	Prob.
D(IPOAMT(−1))	−0.439355	0.087067	−5.046171	0.0005
D(IPOAMT(−2))	−0.148913	0.039182	−3.800541	0.0035
D(TOBD)	0.402868	0.237726	1.694677	0.1210
D(TOBD(−1))	0.844861	0.243283	3.472742	0.0060
D(ECMD)	0.259966	0.098667	2.634772	0.0250
D(ECMD(−1))	0.215086	0.094543	2.275012	0.0462
D(RTOI)	−0.327689	0.084125	−3.895256	0.0030
D(RTOI(−1))	0.296126	0.073960	4.003847	0.0025
D(RTOI(−2))	0.282017	0.101435	2.780280	0.0194
D(RTOI(−3))	0.160029	0.074675	2.143007	0.0577
CointEq(−1)*	−0.966590	0.114731	−8.424812	0.0000

Panel B: Wald test

Test statistic	Value	df	Probability
Null hypothesis: c(1) = c(2) = 0			
F-statistic	5.802149	(2, 10)	0.0212
Chi-square	11.6043	2	0.003
Null hypothesis: c(3) = c(4) = 0			
F-statistic	9.089229	(2, 10)	0.0056
Chi-square	18.17846	2	0.0001
Null hypothesis: c(5) = c(6) = 0			
F-statistic	2.653931	(2, 10)	0.119
Chi-square	5.307863	2	0.0704
Null hypothesis: c(7) = c(8) = c(9) = c(10) = 0			
F-statistic	4.029351	(4, 10)	0.0336
Chi-square	16.11741	4	0.0029

Source(s): Authors' own creation

facilitating capital allocation. Shahbaz and Rahman (2010) argue that increased trade openness speeds up technological advancements, improves resource allocation, and increases a country's market size, potentially enabling domestic businesses to capitalize on economies of scale. This positive effect of trade openness aligns with the "endogenous growth theory", which emphasizes the role of international trade in promoting innovation and productivity growth.

Further, Brau *et al.* (2003) state that the interest rate also affects the choice of an IPO for a new company takeover. Because buying companies may use extra borrowing to acquire the target while interest rates are low, so there will be fewer IPOs and many takeover activities. Ameer (2012) claims that a 1% increase in interest rates causes a 10% decrease in IPO activity. The interest rate and number of IPOs are inversely correlated. As a result, businesses avoid IPOs when interest rates appear to rise. According to Kaya (2013), interest rates have influenced IPOs, with most IPOs appearing when rates are low. It may be argued that when interest rates rise, so does the cost of capital. Businesses were deterred from going public during high inflation, which caused a high cost of equity capital for newly listed stocks. Furthermore, when inflation is high, a high rate of return is expected. However, due to the stricter funding requirements, high-risk premiums often make it more challenging to attract new investments in the future (Ameer, 2012). Tran and Jeon (2011) suggest a positive relationship between IPO activity and inflation. These mixed findings on the relationship between inflation and IPO activity can be understood through the "Fisher effect" in monetary

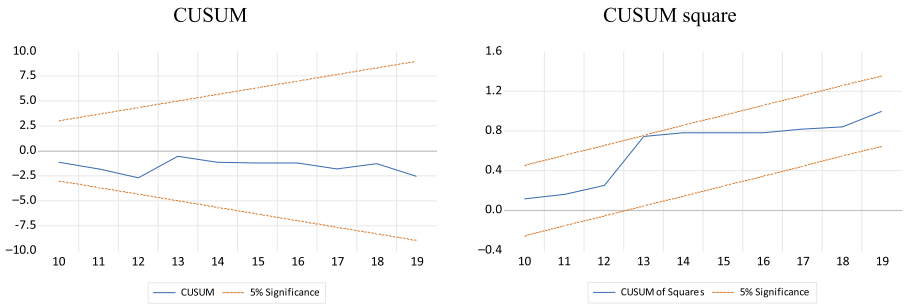
economics, which suggests that nominal interest rates adjust to expected inflation, potentially affecting firms' financing decisions. However, the ECMD has an insignificant short-run relationship with IPO activities (Granger causality toward IPO) in Sri Lanka. This lack of short-run significance for ECMD may be due to the "time-varying market integration" phenomenon, which suggests that the degree of market integration can change over time, affecting the short-term relationship between economic conditions and financial market activities.

Table 8 shows that the Breusch-Pagan-Godfrey F-statistic is 2.046268, ($p = 0.1292$); the Breusch-Godfrey, serial correlation LM test F-statistic is 0.516372, ($p = 0.6153$). Jarque-Bera test statistic is 0.08753 ($p = 0.6455$). Suggesting the model does not have heteroscedasticity, serial correlation, and non-normality problem in the residuals. Parameter stability is checked using the CUSUM and CUSUM of the square control chart to assess the long-run and short-run estimates' stability. Figure 2 confirms the stability of parameters and accuracy of estimates, as the lines fall within the upper and lower limits. It concludes that the model satisfies the model-good-fit requirements.

Table 8. Diagnostics tests

Panel A: heteroscedasticity test: Breusch-Pagan-Godfrey			
F-statistic	2.046268	Prob. F(14,10)	0.1292
Obs*R-squared	18.53132	Prob. Chi-Square(14)	0.1836
Scaled explained SS	1.608831	Prob. Chi-Square(14)	1.0000
Panel B: Breusch-Godfrey serial correlation LM test			
F-statistic	0.516372	Prob. F(2,8)	0.6153
Obs*R-squared	2.858334	Prob. Chi-Square(2)	0.2395
Panel C: Jarque-Bera normality test			
Jarque-Bera statistic	0.875346	Prob.	0.645537

Source(s): Authors' own creation



Source(s): Authors' own creation

Figure 2. Stability test

7. Conclusion

This study employed PCA and ARDL to examine the association between IPO activities and macroeconomic variables in Sri Lanka. Three principal factors were identified from the given ten variables, of which two factors have a significant long-run association with IPO activities: "return on investment (RTOI)" and "economic and market development (ECMD)." However, "trade openness and banking sector development (TOBD)" have no significant long-run association. In the short run, "trade openness and banking sector development (TOBD)", and "return on investment (RTOI)" were significantly associated with IPO activities in Sri Lanka. The study was based on thirty years of observations, which passed all diagnostic tests but may be insufficient for generalizing the findings. Future studies could use high-frequency data (monthly or quarterly) to increase the number of observations and repeat the method and analysis. Additionally, while the symmetrical ARDL method was used in this study, an asymmetrical ARDL method may provide more insightful results and interpretations. The study provides insight into the macroeconomic factors that influence IPO activities in Sri Lanka and highlights the importance of considering long- and short-term associations. The findings may be useful for policymakers and investors seeking to understand the relationship between macroeconomic factors and IPO activities in Sri Lanka.

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