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Macroeconomic determinants of inflation in Asian inflation targeting nations: An empirical panel data analysis

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Abstract: Inflation remains a persistent concern for nations globally, prompting policymakers to adopt various monetary strategies to mitigate its adverse effects on economic stability and consumer welfare. Central banks have adopted various monetary regimes over time to tackle inflation, with inflation targeting emerging as a popular approach since the 1990s. Despite the extensive literature on the effects of inflation targeting, there exists a gap in understanding the determinants of inflation persistence, particularly in Asian nations. This study addresses this gap by identifying the factors contributing to inflation persistence in selected Asian countries that have adopted inflation targeting. Employing a panel ARDL model and pooled mean group estimator, this research examines the short and long-term determinants of inflation in ten selected inflation-targeting Asian countries from 1995 to 2022. The study results reveal significant influences of various economic variables on inflation rates. In the long run, GDP Growth Rate (*gdp growth*), Imports (*imp*), Broad money growth (*ms*), Foreign direct investment, net inflows (*fdi*), and Global crude oil prices (*cop*) show statistically significant impacts on inflation.In the short run, the Monetary sector credit to private sector (*mcp*), Exports (*exp*), Foreign direct investment, net inflows (*fdi*) and Real effective exchange rate index (*reer*) exhibit significant influences on inflation. This study contributes valuable insights for policymakers, aiding in the formulation and execution of effective strategies to evaluate the effects of inflation targeting on Asian countries. By understanding the factors driving inflation, policymakers can better address economic challenges and ensure price stability in the region.

Key Words: Inflation Targeting (IT), Autoregressive Distributed Lag Model (ARDL), Pooled Mean Group (PMG), Mean Group (MG).

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1. Introduction

Inflation is a consistent factor that poses a significant challenge to all nations across the world, irrespective of whether they are developing or developed. As a monetary phenomenon, it has widely attracted the attention of policymakers worldwide. Generally, it is defined as the continuous and persistent rise in a country's general price level, leading to a fall in the purchasing power of money. Friedman (1963) contented that inflation is the one form of taxation imposed without legislation. This ubiquitous and dynamic character of inflation not only exerts influence on economic stability but also casts a substantial impact on the day-to-day activities of consumers and the strategic deliberations of business entities. As posited by Dornbusch and Fischer (1994), inflation signifies that a currency's purchasing power diminishes over time, elucidating that "your money will not be able to buy today as much as it could buy yesterday." In this way, persistent inflation frequently endangers dissatisfaction among the populace, particularly when income levels fail to synchronise with the escalating pace of price increases. Therefore, the strategic management of inflation fluctuations is a formidable economic challenge that demands the attention of policymakers.

Central banks globally uphold price stability as the paramount objective of macroeconomic policy formulation as this commitment helps stabilize nominal interest rates, thus fostering greater investment activity and facilitating economic growth[1].Economic growth is often indicated by the presence of inflation in an economy. However, it's crucial to maintain a balanced level of inflation, as both excessively high and low rates can harm the overall economic environment. Most economists advocate for a moderate level of inflation, as it tends to have positive effects on economic growth. Currently, many economies worldwide are grappling with the issue of excessively high inflation rates. This is particularly challenging because implementing policies to reduce inflation can be costly for nations, making it a serious issue that requires careful consideration and management.

The inflation-averse attitude has a very long history because the extensive uncertainty resulting from elevated inflation rates tends to give rise to abnormal business cycles, posing a threat to the prosperity of the economies. To address this issue, drastic measures were taken to curb inflation, but the associated costs were high, and policymakers were reluctant to resort to such measures (Ball, 1993). To prevent the recurrence of high inflation episodes and painful disinflation measures, central banks across the globe resorted to regime switching by

[1]Studies by Barro (1991), Fischer (1996), and Taylor (1996) have been pivotal in understanding the effects of price stability on economic growth.

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adopting different nominal anchors to control inflation. Since the 1960s, monetary targeting has been a significant monetary regime that central banks adopted to control inflation. However, during the mid-1980s, the instability in the relationship between the monetary aggregate target and goal variables led to the abandonment of monetary targeting. The phasing out of monetary targeting led to the adoption of inflation targeting by several economies since the 1990s. Inflation targeting is a monetary policy approach utilised by various central banks to manage and control inflation within a specific desired range (Mahajan et al., 2014). Under this framework, the monetary authority establishes a predetermined and publicly announced inflation target to maintain low inflation rates. The central bank and other monetary authorities work to steer inflation toward the set target range through tools like adjusting interest rates. The pioneering step in adopting inflation targeting was made by New Zealand in 1990; later, nearly 37 countries adopted this policy regime.

A substantial body of literature has evaluated the effects of inflation targeting (IT) through country-specific and cross-country studies. However, a critical gap in this research lies in the insufficient focus on identifying the factors contributing to inflation persistence in these nations. The effectiveness of impact assessments hinges on a comprehensive understanding of the elements driving the upsurge in inflation. Without thoroughly comprehending these factors, one cannot unequivocally assert the success of inflation targeting. The available literature recognises that approximately 30% of the countries that have embraced inflation targeting are in Asia. For most of those Asian economies, inflation targeting (IT) emerged as a recovery plan from various crises by introducing a new nominal anchor to control inflationary pressures. It was a rescue plan for them as they wanted to come out of previous monetary regimes of monetary targeting, exchange rate targeting or multiple indicator approach. In light of this, several studies are present that evaluate the impact of the new regime of inflation targeting. However, these studies were found inefficient in terms of identifying the causes of inflation in these countries before focusing on evaluating the new regime. Consequently, this research seeks to bridge the existing gap by undertaking an endeavour to pinpoint the potential determinants of inflation in selected Asian nations that have adopted inflation targeting.

Many researchers ardently endeavour to discern the fundamental determinants of inflation across diverse nations. These determinants, analysed from an economic standpoint, are systematically compartmentalised into supply-side and demand-side factors. This compartmentalisation comes from the general agreement among economists that inflation

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may be caused by either an increase in the money supply or a decrease in the quantity of goods being supplied (Lim and Sek, 2015). Supply-side factors, intricate economic variables, wield the power to induce inflation by amplifying the cost of production. Noteworthy factors encompass facets such as output growth, capital formation, oil and import prices, tax and wage levels, and inconsistent exchange rates. In stark contrast, demand-side factors wield their influence by fomenting augmented consumer demand for goods and services within the national confines. Pivotal demand-side determinants encompass the ebullient realms of money growth, private consumption expenditure, and government consumption expenditure[2].This scholarly effort aims to create a comprehensive model identifying the essential demand and supply side determinants of inflation rates in the selected inflation-targeting nations in Asia. The study uses a carefully curated panel of nations spanning from 1995 to 2022. Despite the wealth of research on inflation rates, this paper provides a concise overview of the determinant factors of inflation in selected IT Asian nations.

1.1. Literature Review: A large strand of empirical literature is available that was undertaken to identify the potential determinants of inflation based on different techniques and periods. Although the subject is not novel, continuous research is underway to unveil further the potential factors influencing inflation momentum, and these studies produce varying results.

Mallik and Chowdhury (2001) conducted a study on inflation and economic growth in four South Asian countries using co integration and error correction models. They found a positive relationship between inflation and economic growth, with inflation being more responsive to changes in growth rates than vice versa. They caution against aggressively reducing inflation, which could hinder growth, and advice against overly ambitious growth strategies to avoid economic overheating. Their findings stress the need for a balanced approach considering stable inflation and sustainable growth.

Lim and Sek (2015) explore the determinants of inflation across two groups of countries having high and low inflation levels using annual data from 1970 to 2011. Employing ARDL and EC models, it examines the relationship between exogenous variables (money supply, national expenditure, imports, and GDP growth) and inflation. In high-inflation countries, long-term impacts reveal significant effects of money supply and national expenditure. Conversely, in low-inflation countries, GDP growth has a negative impact, while imports positively impact inflation. Short-term effects show no significant impact in high-inflation

[2]See EftekhariMahabadi and Kiaee, 2016.

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countries, while in low-inflation countries, all variables, except national expenditure, have a substantial short-term impact on inflation.

Eftekhari Mahabadi and Kiaee (2015)examined determinants of inflation using Random Effect Log-linear and Ordinal Logistic models on a panel of available countries in the World Bank database from 2008-2012. They find that money growth, GDP, oil price, and income levels significantly predict next year's inflation rate. Categorising inflation variables reveals government expenditure, exchange rate, and capital formation as additional determinants. The study underscores the importance of considering the potential association of inflation variables across time, as indicated by significant random effect variance.

Deniz et al. (2016), in their panel data analysis, investigates inflation determinants in both inflation-targeting (IT) and non-inflation-targeting (non-IT) emerging and industrial economies during 2002-2012. Their study reveals distinct impacts of variables like real effective exchange rate, money growth, real wages, and budget balance on inflation across diverse economic contexts. Notably, real effective exchange rate exhibits nuanced effects, with emerging economies experiencing higher coefficients. Money growth contributes to inflation in emerging economies but is insignificant in industrialised nations. Real wages impact inflation differently, positively in emerging economies and negatively in industrialised ones. Budget balance has a negative effect on emerging, and IT industrialised economies but has a reverse impact on non-IT industrialised economies.

Sahoo and Sethi (2020) investigated the relationship between inflation, exports, imports, and foreign direct investment (FDI) in India from 1975 to 2017. Employing Johansen co integration, variance decomposition analysis (VDA), and impulse response function (IRF) techniques; the findings reveal that exports exert a significant positive influence on inflation, with a unidirectional causality from exports to inflation. Inflation, in turn, Granger causes imports, while no causal relationship exists between inflation and FDI. These results underscore the critical role of export performance in shaping inflationary trends and highlight the need for policy interventions to enhance competitiveness in the global market, particularly amidst declining export trends.

Durguti et al. (2021) analyse the impact of macroeconomic factors such as GDP growth, remittances, exports, imports and foreign direct investment on the inflation rates of Western Balkan countries utilising annual data from 2003 to 2019. The study has used dynamic panel models such as fixed effects and Arellano-Bover/ Blundell –Bond estimation to determine the relationship between the variables. The study results reveal that in the short run, all variables

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influence the inflation rate except for foreign direct investment, which has an insignificant influence. Moreover, the Arellano–Bover/Blundell—Bond estimation analyses reveal that GDP growth, imports, and foreign direct investments positively influence the inflation rate. In contrast, working remittances and exports have a negative influence on the inflation rate.

In their study, Dua and Goel (2021) investigate the determinants of overall and food inflation in India using monthly data from April 1996 to March 2017. Employing both the WPI and CPI-IW measures, the research employs a cointegration approach to identify key factors influencing inflation. The findings underscore the significance of demand-side factors, including expected inflation, exchange rate, rate of growth of money supply, and output gap, in explaining substantial variation in both inflation measures. On the supply side, global factors such as international oil and food prices play a pivotal role. The study emphasises the challenges in inflation management under India's new monetary framework and highlights the importance of understanding both demand and supply-side determinants for effective policy planning.

Ujkani and Gara (2023) delve into the connection between macroeconomic factors and inflation across 40 countries from 2012 to 2023. Utilising panel data from the World Bank and Trading Economics, the study applies a least squares econometric model. The findings demonstrate a positive association between money supply growth and the inflation rate, highlighting its noteworthy impact. Moreover, the research observes minimal differences in average import/export levels, contributing to modest economic growth.

Previous research has employed various methodologies to identify the factors influencing inflation, utilising both long-run and short-run estimations. Common approaches include vector auto regression, co integration, and vector error correction models. However, existing literature predominantly emphasises analyses conducted within developed and developing contexts. Studies explicitly focusing on Asian nations engaged in inflation targeting are notably scarce. Therefore, this paper aims to address this gap in the literature by focusing on the determinants of inflation in Asian inflation-targeting economies, contributing to a more comprehensive understanding of inflation dynamics in this specific regional context.

2. Materials and Methods

The study uses annual data on inflation and various macroeconomic factors that determine inflation in ten Asian countries identified as inflation targeters. The list of the countries is given in Table 1, along with their date of adoption, target measure, target at the time of adoption and target type.

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Table 1: List of selected Asian IT countries.

Sl. No.	Country	Inflation targeting adoption date	Target measure	Target at the time of adoption	Target type
1.	Israel	1997	HCPI	2.0% ± 1 PP	P+T
2.	Thailand	2000	Core inflation	0.5% -3.0%	Range
3.	Korea, Republic of	2001	HCPI	3.0% ± 1 PP	P+T
4.	Philippines	2002	HCPI	4.0% ± 1 PP	P+T
5.	Indonesia	2005	HCPI	5.0% ± 1 PP	P+T
6.	Turkey	2006	HCPI	5.5% ± 2 PP	P+T
7.	Armenia	2006	HCPI	4.5% ±1.5 PP	P+T
8.	Japan	2013	HCPI	2.0%	Point
9.	India	2015	HCPI	4.0% ± 2 PP	P+T
10.	Russia	2015	CPI	4.0%	Point

H CPI - Headline CPI; P+ T - Point with tolerance; pp – Percentage point
Source: Hammond G. (2012); Roger 2010; and IMF staff calculations.
Note: Countries are classified as inflation targeters based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) database.

The data requirements of this study are obtained from the World Bank and IMF Database from 1995 to 2022. The variables used in the study and their description are given inTable 2.

Table 2: List of variables used in the study.

Sl. No.	Variable	Unit	Source
Regressand			
1.	Inflation (*inf*)	Annual %	International Monetary Fund, International Financial Statistics and data files.
Regressors			
2.	GDP Growth Rate (*gdp growth*)	Annual %	World Bank national accounts data and OECD National Accounts data files
3.	Monetary sector credit to private sector (*mcp*)	% of GDP	International Monetary Fund, International Financial Statistics and data files.
4.	Exports (*exp*)	Annual %	World Bank national accounts data and OECD National Accounts data files
5.	Imports (*imp*)	Annual %	World Bank national accounts data and OECD National Accounts data files

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6.	Broad money growth (*ms*)	Annual %	International Monetary Fund, International Financial Statistics and data files.
7.	Foreign direct investment, net inflows (*fdi*)	% of GDP	International Monetary Fund, International Financial Statistics and Balance of Payments databases, World Bank, International Debt Statistics, and World Bank and OECD GDP estimates.
8.	Real effective exchange rate index (*reer*)	Index (2010=100)	International Monetary Fund, International Financial Statistics and data files
9.	Central government debt, total (*cd*)	% of GDP	International Monetary Fund, Government Finance Statistics Yearbook and data files, and World Bank and OECD GDP estimates.
10.	Gross national expenditure (*ne*)	% of GDP	World Bank national accounts data, and OECD National Accounts data files.
11.	Global crude oil prices (*cop*)	Annual %	International Monetary Fund, International Financial Statistics and data files.

According to the IMF database, these data are explained as follows. Inflation (*inf*), as indicated by the consumer price index, represents the yearly over-year percentage variation in the expenses incurred by the average consumer for obtaining a basket of goods and services, which may remain constant or undergo adjustments at specified intervals, like annually.GDP Growth Rate (*gdp growth*) is the annual percentage growth rate of GDP at market prices based on constant local currency. Monetary sector credit to private sector (*mcp*) expressed as a percentage of GDP refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, trade credits and other accounts receivable, establishing a claim for repayment. Exports (*exp*) represent the annual growth rate of goods and services exported from constant local currency. Imports (*imp*) refer to the annual growth rate of goods and services imported from constant local currency. Broad money growth (*ms*)

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represents the average annual growth rate in money and quasi-money. It is the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. Foreign direct investment, net inflows (*fdi*) are the net inflows of investment to acquire a lasting management interest (10 per cent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital, as shown in the balance of payments. This series shows net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors and is divided by GDP. The real effective exchange rate index (*reer*) is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs. Central government debt, total (*cd*), is the gross amount of government liabilities reduced by the amount of equity and financial derivatives held by the government. Gross national expenditure (*ne*) is the sum of household final consumption expenditure (formerly private consumption), general government final consumption expenditure (formerly general government consumption), and gross capital formation (formerly gross domestic investment).Global crude oil price (*cop*) refers to the annual changes in the Brent spot oil price per barrel.

2.1. Econometric Methodology

a. Panel ARDL: The study employs the Error Correction Model based on the Autoregressive Distributed Lag (ARDL) modelling to estimate the relationship between inflation and its determinants. The model is estimated using the Mean Group (MG) estimator and Pooled Mean Group (PMG) estimators[3]. The Pooled Mean Group (PMG) estimation, proposed by Peasran, Shin and Smith, offers a distinct advantage in discerning dynamic long-run and short-run relationships within a panel data set. The PMG estimator can estimate the short-run relationships, encompassing coefficient estimation and adjustment for long-run equilibrium (speed of adjustment) and error variance to be heterogeneous. Notably, the long-run coefficients are assumed to be homogenous across countries. The application of the PMG estimator is deemed suitable due to its efficiency and consistency in capturing the existence of long-run relationships. The alternative estimation method, the Mean Group (MG), proposed by Pesaran and Smith (1995), is less restrictive, enabling the estimation of diverse parameters and distinct coefficients for each country. Although the MG estimator provides

[3]See Pesaran, M. H., Shin, Y., & Smith, R. P. (1999).

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consistent long-run mean estimation, it exhibits inefficiency in handling homogeneity. In situations where long-run homogeneity prevails, pooled estimators demonstrate consistency and efficiency[4]. Both MG and PMG estimators necessitate the selection of appropriate lag lengths, typically determined using the Schwarz Bayesian Criterion (SBC) or Akaike Information Criterion (AIC). The study conducts the Hausman test to ascertain the most suitable estimator among PMG and MG for its specific context. These tests aid in determining the appropriateness of each estimator in capturing the underlying relationships within the dataset.

The general model for estimating the determinants of inflation in selected IT Asian nations is specified as follows:

inf = f (gdpgrowth, mcp, exp, imp, ms, fdi,reer,cd, ne, cop)

The equation specifies that inflation (*inf*) is a function ofGDP Growth Rate (*gdpgrowth*), Monetary sector credit to the private sector (*mcp*), Exports (*exp*), Imports (*imp*), Broad money growth (*ms*),Foreign direct investment, net inflows (*fdi*), Real effective exchange rate index (*reer*), Central government debt, total (*cd*), Gross national expenditure (*ne*), Global crude oil prices (*cop*).The relationship is investigated using the Panel Autoregressive Distributed Lag (ARDL) and Error Correction Model (ECM).Pesaran, Shin, and Smith (1999) stated that sufficient augmentation of the order of the ARDL model can simultaneously correct the problem of residual serial correlation and endogenous regressors. Mathematically, we specify an ARDL model with p lags of Y and q lags of X, ARDL (p, q,q,…q) as

$$Y_{it} = \sum_{k=1}^{p} \lambda_{i,k} Y_{i,t-k} + \sum_{k=0}^{q} \delta'_{i,k} X_{i,t-k} + \omega_i + \epsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where the number of countries $i = 1,2\ldots\ldots N$; the number of periods $t = 1,2,3,\ldots T$; Y_{it} is the dependent variable inflation;$X_{i,t}$is the (k x 1) vector of explanatory variables (regressors) for countries' i';$\lambda_{i,k}$ are the coefficients of the lagged dependent variables (scalars); $\delta_{i,k}$ are (k x 1) coefficient vectors;$\omega_i$represent the fixed effects and ϵ_{it} is the IID error term.

The eqn (1) can be re-parameterised and expressed into an error correction model written as:

[4]Pesaran and Smith (1995)

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$$\Delta Y_{it} = \phi_i Y_{i,t-1} + \gamma_i^{'} X_{it} + \sum_{k=1}^{p-1} \lambda^{*}_{i,k} \Delta Y_{i,t-k} + \sum_{k=0}^{q-1} \delta^{*'}_{i,k} \Delta X_{i,t-k} + \omega_i + \epsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where i = 1, 2…….N and t = 1,2,3,….T,

ϕ_i is the group-specific error correction coefficient[ϕ_i = -(1 - $\sum_{k=1}^{p} \lambda_{i,k}$)];

ECT= $Y_{i,t-1} + \gamma_i^{'} X_{it}$, is the error correction term;

$\lambda^{*}_{i,k}$ and δ^{*}_{ik} are short-run coefficients { [$\lambda^{*}_{i,k}$ = - $\sum_{m=k+1}^{p} \lambda_{im}$,k= 1,2,….p-1]

and [δ^{*}_{ik} = - $\sum_{m=k+1}^{q} \delta_{im}$,k= 1,2,….q-1]};

$\gamma_i^{'}$ is the vector of long-run coefficients [γ_i = $\sum_{k=0}^{q} \delta_{i,k}$]

and

$\phi_i \neq 0$ is the speed of adjustment.

The long-run relationship between Y_{it} and X_{it} can be stated as :

$$Y_{it} = -\left(\frac{\gamma_i}{\phi_i}\right) X_{i,t} + \pi_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where π_{it} is a stationary process and $\theta_i = -\left(\frac{\gamma_i}{\phi_i}\right)$ are the long-run coefficients on X_{it} which are common across groups. The maximum likelihood method is used to estimate the long-run and error correction coefficients (θ and ϕ_i). The maximum likelihood estimators are referred to as the pooled mean group (PMG) estimators by considering the homogeneity restrictions on the long-run coefficients and taking the means of the estimates.[5]

3. Results and discussion

This empirical study employs the panel ARDL technique to identify the effects of various demand and supply side factors (Table 1) in determining inflation in selected ten Asian inflation-targeting nations. To achieve the research purpose, the analytical tools used consist of descriptive statistics, correlation analysis, panel unit root tests, co integration tests and panel ARDL model using the pooled mean group and mean group techniques.

3.1. Descriptive statistics: The first part of the empirical analysis begins with illustrating the descriptive statistics of the variables of interest. Table 3 depicts the summary statistics for the aforementioned variables for a sample of ten inflation-targeting Asian countries spanning from 1995 to 2022.

[5]See Pesaran, M. H., Shin, Y., & Smith, R. P. (1999).

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Table 3: Descriptive statistics of the variables.

Variable	Obs	Mean	Std. Dev.	Min	Max
Inflation (*inf*)	280	9.04	20.65	-1.40	197.41
GDP Growth Rate (*gdp growth*)	280	4.07	4.10	-14.10	14.00
Monetary sector credit to private sector (*mcp*)	280	62.94	41.94	1.79	187.85
Exports (*exp*)	280	7.17	10.73	-48.17	59.30
Imports (*imp*)	280	6.05	12.03	-40.68	34.50
Broad money growth (*ms*)	280	16.05	17.61	-20.43	116.54
Foreign direct investment-net inflows (*fdi*)	280	1.98	1.83	-2.76	12.27
Real effective exchange rate index (*reer*)	280	96.36	18.44	45.16	164.43
Central government debt, total (*cd*)	280	51.83	40.58	0.00	220.67
Gross national expenditure (*ne*)	280	101.51	9.68	79.97	138.26
Global crude oil prices (*cop*)	280	56.89	31.38	12.76	111.63

Source: Authors Calculation

The dataset consists of 280 observations across the selected countries.Thechosen countries' average inflation rate is 9.042%, showcasing a wide range from -1.40% to 197.41%. GDP growth exhibits an average of 4.07%, ranging from -14.10% to 14.0%. The monetary sector's credit to the private sector averages 62.94 displaying substantial variability. Exports and imports present averages of 7.17 and 6.05, respectively, both demonstrating significant standard deviations, implying diverse trade dynamics. Broad money growth averages at 16.05, with a considerable range. Foreign direct investment (FDI) net inflows average 1.98, featuring a relatively low standard deviation. The real effective exchange rate index averages 96.36 reflecting moderate variability. Total central government debt averages 51.83, with notable variability and instances of zero debt. Gross national expenditure averages 101.51, showcasing a relatively low standard deviation. Global crude oil prices exhibit an average of 56.89, indicating substantial variation.

3.2. Test for Multicollinearity: To test for multicollinearity among the independent variables, the Variance Inflation Factor (VIF) per each variable is computed. Table 4 shows the results of the multicollinearity test using VIF. Results presented in Table 4indicate that multicollinearity is not present among the explanatory variables, as the VIF values are far less than 5. The mean VIF across all variables is 1.59, which is generally considered low,

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suggesting that multicollinearity may not be a significant concern. This implies that the aforementioned variables are independent of each other and, hence, can be considered independent variables free of multicollinearity.

Table 4: Collinearity statistics

Variable	VIF	1/VIF
Imp	2.26	0.443072
Gdp growth	2.09	0.479570
Exp	1.65	0.604301
Mcp	1.59	0.630412
Ne	1.46	0.685175
Cd	1.44	0.694667
Ms	1.43	0.699683
Fdi	1.42	0.705522
Reer	1.41	0.706723
Cop	1.13	0.882126
Mean VIF	1.59	

Source: Authors Calculation

3.3. Correlation Matrix: Correlation analysis is used to investigate the linear association between determinants applied in the analysis.

Table 5: Results of the correlation matrix

Variable	*Inf*	*gdp growth*	*mcp*	*exp*	*Imp*	*ms*	*fdi*	*reer*	*cd*	*ne*	*cop*
Inf	1.00										
gdp growth	-0.06	1.00									
Mcp	-0.31	-0.29	1.00								
Exp	-0.07	0.46	-0.12	1.00							
Imp	-0.02	0.63	-0.11	0.62	1.00						
ms	0.59	0.12	-0.39	0.04	0.07	1.00					
Fdi	-0.13	0.20	-0.20	0.02	0.03	-0.00	1.00				
reer	-0.37	0.02	0.36	-0.00	0.04	-0.32	-0.07	1.00			
cd	-0.09	-0.26	0.23	-0.06	-0.10	-0.25	-0.26	-0.18	1.00		
Ne	0.06	0.20	-0.34	-0.00	-0.03	0.10	0.41	-0.08	-0.00	1.00	
Cop	-0.22	0.08	0.09	-0.03	0.04	-0.26	0.13	0.17	0.01	-0.01	1.00

Source: Authors Calculation

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Table 5 indicates relationships between inflation (*inf*) and other economic variables. It is evidenced that inflation maintains a statistically significant correlation with all selected regressors. Inflation shows a negative correlation with the gross domestic product (*gdp growth*), monetary credit to the private sector (*mcp*), exports (*exp*), imports (*imp*), foreign direct investment, net inflows (*fdi*), real effective exchange rate (reer), central government debt (cd) and global crude oil prices (cop) Additionally, inflation exhibits a positive correlation with money supply (ms) and gross national expenditure (ne). Overall, these correlations provide insights into the complex interactions between inflation and various economic factors, helping to inform a more nuanced understanding of the relationships within the dataset.

3.4. Panel Unit Root Test: Outcomes from the panel unit root tests based on Im, Pesaran and Shin (2003) method are reported in Table 6. The study considers the estimation with constant and trend to exploit potential hidden features. The IPS test depicts that all the variables are stationary either at levels or at their first difference.

Table 6: Results of panel unit root test.

	At the level I (0)		*At first difference I (1)*	
Variable	intercept	intercept and trend	intercept	intercept and trend
Inf	-4.7575 (0.0000)	-2.9269 (0.0017)	NA	NA
gdpgrowth	-7.9598 (0.0000)	6.7013 (0.0000)	NA	NA
Mcp	-1.0537 (0.1460)	0.7910 (0.7855)	-5.9365 (0.0000)	-5.8658 (0.0000)
exp	-7.0383 (0.0000)	-7.1375 (0.0000)	NA	NA
Imp	-10.1328 (0.0000)	-8.5166 (0.0000)	NA	NA
Ms	-3.9404 0.0000	-2.5573 (0.0053)	NA	NA
Fdi	-2.8118 (0.0025)	-3.2425 (0.0006)	NA	NA
Reer	-0.6652 (0.2530)	-3.0871 (0.0010)	-8.1760 (0.0000)	-7.3520 (0.0000)
cd	-0.4342 (0.3321)	-1.2222 (0.1108)	-8.3080 (0.0000)	-6.6580 (0.0000)
ne	-3.1053 (0.0010)	-3.1682 (0.0008)	NA	NA
cop	-0.3534 (0.3619)	-0.3376 (0.3678)	-8.7448 (0.0000)	-6.4485 (0.0000)

Note: The probability values are mentioned in parentheses.
Source: Authors Calculation

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3.5. Optimal Lag Selection: The Autoregressive Distributed Lag (ARDL) model and Error Correction Model (ECM) is employed to analyse the factors influencing inflation, focusing on the dependent variable (inflation) and ten exogenous variables, including GDP Growth Rate (gdp growth),Monetary sector credit to private sector (mcp), Exports (exp), Imports (imp), Broad money growth (ms), Foreign direct investment, net inflows (fdi), Real effective exchange rate index (reer), Central government debt, total (cd), Gross national expenditure (ne) and Global crude oil prices (cop). Various combinations of lag lengths up to one are utilised for each variable in constructing the ARDL. Using the unrestricted model and BIC information criterion, we decided the choice of lags for each country per variable by choosing the most common lag for each variable to represent the lags for the model. The table shows the outcomes of the BIC criterion. According to the findings, the ARDL (1,1,0,1,0,0,0,0,1,0,1) model is deemed optimal.

Table 7: Optimal lag structure

Variable	Lags
Inf	1
Gdp growth	1
Mcp	0
Exp	1
Imp	0
Ms	0
Fdi	0
Reer	0
Cd	1
Ne	0
Cop	1

Source: Authors Calculation

3.6. Panel Co integration Test: The summary of findings of the Kao co integration test is reported here. Table 8displays that the probability value of the ADF t-statistic equals (0.0000), which is less than the significance level of 5% (0.05), indicating long-term co integration between the examined variables.

Table 8: Results of Kao Co integration test

	Statistic	p-value
Modified Dickey-Fuller t	-17.0589	0.0000
Dickey-Fuller t	-11.0808	0.0000
Augmented Dickey-Fuller t	-6.1492	0.0000
Unadjusted modified Dickey-Fuller t	-19.1690	0.0000
Unadjusted Dickey-Fuller t	-11.2366	0.0000

Source: Authors Calculation

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3.7. Pooled Mean Group Estimation: The investigation into the pooled mean group (PMG) estimator commences with evaluating the null hypothesis of homogeneity using the Hausman test and comparing it with the mean group estimator. Typically, a p-value below 0.05 prompts rejection of the null hypothesis. However, our analysis reveals a p-value of 1.000, suggesting insufficient evidence to reject the null hypothesis of homogeneity. Consequently, our model aligns with the PMG estimator. This pivotal finding sets the stage for an in-depth exploration of the PMG output and its implications within our analysis.The PMG technique, introduced by Pesaran, Shin and Smith (1999), combines averaging and pooling of model parameters. It imposes a constraint on the long-term coefficients to be homogenous across all panel groups, ensuring efficiency and consistency of estimated coefficients if the slope homogeneity condition is met (Casni, Badurina, and Sertic, 2014).Additionally, this method allows for heterogeneous short-term dynamics among different cross-sections, with short-term adjustments tailored to each country's specifications. The unit root test is essential before conducting PMG estimation. In this study, all model variables are either I (1) stationary, I (0) stationary, or a combination of both, PMG estimation can proceed. The optimal lag length for the ARDL model is automatically selected through the BIC criterion, with ARDL (11010000101) being recommended as optimal.

Table 9: Results of PMG estimation

D.inf	Coefficients	Std. Error	z	P>|z|
Long-run equation				
gdp growth	-.6389331	.2173498	-2.94	0.003
Mcp	.0127985	.0261385	0.49	0.624
exp	-.0072476	.0726645	-0.10	0.921
Imp	.2005736	.0924395	2.17	0.030
Ms	.7378948	.04386	16.82	0.000
Fdi	-1.319666	.4191082	-3.15	0.002
Reer	.0082013	.0471553	0.17	0.862
cd	-.0021967	.0221292	-0.10	0.921
ne	.104601	.1058156	0.99	0.323
cop	.0698389	.0132162	5.28	0.000
Short-run equation				
__ec	-.4499624	.1113966	-4.04	0.000
Δ*gdpgrowth*	-.2229426	.1351347	-1.65	0.099

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Δ*Mcp*	-.3849172	.1307907	-2.94	0.003
Δ*exp*	.0603671	.0296088	2.04	0.041
Δ*Imp*	-.054719	.0527499	-1.04	0.300
Δ*Ms*	-.0600194	.057161	-1.05	0.294
Δ*Fdi*	.5739309	.2634614	2.18	0.029
Δ*Reer*	-.0673177	.0289506	-2.33	0.020
Δ*cd*	-.0149162	.0858246	-0.17	0.862
Δ*ne*	.0551778	.1480163	0.37	0.709
Δ*cop*	.0027755	.0123778	0.22	0.823
_cons	-6.741708	1.781783	-3.78	0.000

Source: Authors Calculation

Table 9 outlines the results of the PMG estimation approach in detail. The PMG estimation findings demonstrate that in the long run, the coefficients of the explanatory variables—GDP Growth Rate (*gdpgrowth*), Imports (*imp*), Broad money growth (*ms*), Foreign direct investment, net inflows (*fdi*) and Global crude oil prices (*cop*) have a statistically significant influence on inflation at a 5% significance level in the selected inflation targeting(IT) Asian nations. Over the long run, the regressors- Imports (*imp*), Broad money growth (*ms*), and Global crude oil prices (*cop*) exhibit a positive effect on inflation. In contrast, the other significant regressors, GDP Growth Rate (*gdpgrowth*) and Foreign direct investment, net inflows (*fdi*), demonstrate a negative impact.Every 1% increase in Imports (*imp*), Broad money growth (*ms*), and Global crude oil prices (*cop*) significantly increases inflation, on average, by 0.20%,0.73%, and 0.06%, respectively. The results of this study resonate with the findings available in the existing literature. The long-run positive association of Imports (*imp*), Broad money growth (*ms*), and Global crude oil prices (*cop*) on inflation found in this study aligns with the findings of Durguti et al. (2021),Ujkani and Gara (2023), and Eftekhari Mahabadi and Kiaee (2015). The dynamic interplay between inflation, GDP Growth Rate (*gdpgrowth*), foreign direct investment, net inflows (*fdi*) is explained in this study as a negative relationship between them. An average of 1% increase in these factors reduces inflation by .63% and 1.31%, respectively. The negative association between inflation and GDP Growth Rate (*gdpgrowth*) complement the findings of Lim and Sek (2015) and Ujkani and Gara (2023). While the relationship between inflation and foreign direct investment, net inflows explained in this study contrast the findings of Durguti et al. (2021). At the same time, there is evidence in this study to substantiate any significant long-run relationship

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between inflation and other factors included in the study, such as Monetary sector credit to private sector(*mcp*), Exports (*exp*), Real effective exchange rate index (*reer*), central government debt (cd) and gross national expenditure (ne).

Regarding short-term dynamics, the results indicate that the coefficients of Monetary sector credit to private sector(*mcp*), Exports (*exp*), Foreign direct investment, net inflows (*fdi*), and Real effective exchange rate index (*reer*) have statistically significant influences on inflation at the 5% significance level in the selected IT Asian nations. Where in the short–run,Exports (*exp*) and Foreign direct investment-net inflows (*fdi*) demonstrate a positive impact, while the Monetary sector credit to the private sector(*mcp*) and Real effective exchange rate index (*reer*) exhibit a negative effect.Furthermore, the error correction term (__ec) in the short-run equation is statistically significant and negative, suggesting that agents adjust towards equilibrium at an annual rate of 45%.

4. Conclusion

In conclusion, this study set out to examine the short and long-term determinants of inflation in ten selected inflation-targeting Asian countries employing the panel ARDL model based on a pooled mean group estimator. The panel unit root test and co integration tests confirm the suitability of the selected variables to be conformable for panel ARDL. The PMG estimation findings reveal that in the long run, the coefficients of the explanatory variables—GDP Growth Rate (*gdpgrowth*), Imports (*imp*), Broad money growth (*ms*), Foreign direct investment, net inflows (*fdi*), Global crude oil prices (*cop*) have statistically significant influences on inflation at the 5% significance level in the selected IT Asian nations. The short-run results indicate that the coefficients of Monetary sector credit to private sector(*mcp*), Exports (*exp*), Foreign direct investment, net inflows (*fdi*), and Real effective exchange rate index (*reer*) have statistically significant influences on inflation at the 5% significance level in the selected IT Asian nations. To sum up, this research offers valuable insights for policymakers to formulate and execute appropriate evaluation of the effects of inflation targeting (IT) on these Asian countries, considering the possible factors influencing inflation in these countries.

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