INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 4, 2026

CLIMATE-AUGMENTED TAYLOR RULE: INTEGRATING CLIMATE-INDUCED SUPPLY SHOCKS INTO MONETARY POLICY FOR ASIAN ECONOMIES

Hina Shafiq [1]

DOI: https://doi.org/10.63544/ijss.v5i4.316

Affiliations:

[1] Department of Economics, Sardar Bahadur Khan Women's University, Quetta, Pakistan.
Email: hinasbk@hotmail.com

Corresponding Author's Email:

[1] hinasbk@hotmail.com

Article History:
Received: 29.05.2026
Accepted: 20.06.2026
Published: 05.07.2026

Abstract

This study aims to assess the monetary policy behaviour in nine Asian economies, namely, Pakistan, India, Bangladesh, Sri Lanka, Vietnam, Thailand, Philippines, Indonesia and Malaysia, and determine whether a Climateächlich Taylor Rule (CATR) is more representative of the monetary policy behaviour for the period 2002-2024. The analysis is based on the standard Taylor framework, but with a composite Climate Shock Index (CSI) based on Principal Component Analysis (PCA) of temperature anomalies, rainfall deviations and disaster-related indicators, which are used as proxies for climate-driven supply shocks. Results indicate that climate shocks have a positive and statistically significant impact on policy interest rate, even after controlling for inflation and output conditions, using dynamic panel techniques including diagnostic testing and robustness checks. Country-specific coefficients indicate a stronger climate response for more Agriculture-dependent and climate-vulnerable economies like that of Pakistan, Bangladesh, and Sri Lanka, implying high cross-country heterogeneity. The results overall suggest that conventional Taylor rule types are incomplete when facing rising climate risks and argue for the inclusion of climate variables in monetary policy reaction functions for the emerging Asian economies.

Keywords: Climate Change, Taylor Rule, Climate Shock Index, Dynamic Panel, System GMM, Monetary Policy, Asian Economies

1. Introduction

Climate change has become a key factor of macro-economic instability in modern economies, particularly in developing and emerging economies that continue to be very vulnerable to weather-related shocks. Climate-related shocks such as rising temperatures, rainfall variability, floods, droughts, and other events have an impact on agricultural production, food value chains, transport systems, working capacity and overall economic activity. Because many households and firms are reliant on climate-sensitive sectors, these shocks rapidly spill over to inflation and output fluctuations in Asian economies. Consequently, climate change has emerged as a crucial macroeconomic and monetary policy issue in addition to being an environmental issue (International Monetary Fund [IMF], 2024; United Nations Economic and Social Commission for Asia and the Pacific [ESCAP], n.d.).

The Taylor Rule and other traditional monetary policy frameworks have long been used as a benchmark by central banks for setting policy interest rates in response to inflation and output gaps. The goodness of the Taylor Rule is that it is simple and policy disciplined, meaning that it offers systematic reaction function for monetary authorities. But the key point about the standard Taylor Rule is that it only reacts to the macroeconomic conditions on the demand side and does not directly consider the climate-induced supply shocks. This exclusion could undermine the framework's applicability in economies where food insecurity is a common driver of inflation, and where climate events affect productivity, as was the case during the 2019-2024 COVID-19 pandemic.

INVERGE JOURNAL OF SOCIAL SCIENCES
https://invergejournals.com/
ISSN (Online): 2959-4359, ISSN (Print): 3007-2018
Volume 5 Issue 4, 2026

This is particularly pertinent to the economies of Asian countries like Pakistan, India, Bangladesh, Sri Lanka, Vietnam, Thailand, the Philippines, Indonesia and Malaysia. The countries are frequently affected by floods, droughts, cyclones, precipitation anomalies and heat stress, which can affect agricultural production and food prices and distribution. Climate shocks can also affect supply, potentially causing inflation to increase even if there is no excess demand, as central banks will need to choose between mitigating climate effects and preventing a new round of inflation. The increasing complexity of climate-related uncertainties highlights the importance of risk management frameworks supported by machine learning and business intelligence techniques, which can improve decision-making and organizational resilience under volatile conditions (Iqbal, 2025). The inflationary context created by limiting monetary policy in such a context may not solve the roots of the inflation and could further affect the already fragile growth dynamics (ESCAP, n.d.; Asian Development Bank [ADB], 2024).

Figure 1

Conceptual Framework

Figure. 1 The conceptual framework on the climate shocks and macroeconomic performance in Asian economies is depicted in Figure 1. The process, as illustrated in the diagram, starts with frequent climate shocks like floods, droughts, cyclones, anomalies in rainfall and heat stress that directly affect the agricultural output and increase the costs of food distribution. This is a supply-side disturbance which brings inflationary pressures even when there is no excess of aggregate demand (Mohiuddin et al., 2026). This, in turn, poses a policy challenge for central banks while, as indicated by the framework, a monetary policy response of interest rate hikes might not resolve the supply-side pressures, this response could end up doing more harm than good in already fragile economic growth dynamics.

The new literature is growing more and more insistent on the need to introduce climate shocks into macroeconomic policy analysis. The growing availability of artificial intelligence and advanced business analytics has enhanced the ability of institutions to process large-scale economic and environmental data, supporting more informed and adaptive decision-making under uncertainty (Iqbal & Bhutto, 2026). Empirical analysis indicates that the climate has an impact on inflation and real activity, especially in food weight countries. Climate-related disturbances may affect crop yields, damage infrastructure, disrupt trade flows and make households and firms less sure. Data-driven optimization approaches have increasingly been applied to climate-sensitive infrastructure planning, demonstrating the importance of analytical models for enhancing resilience and sustainable development outcomes (Iqbal, 2024). Recent advances in predictive analytics have demonstrated that artificial intelligence can effectively identify and forecast disruption risks across complex supply chains and critical industries, improving resilience against external shocks (Iqbal, 2025; Khan et al., 2026). These impacts can be long-term, and not only temporary as extreme weather events can increase in frequency and severity. Therefore, it poses a crucial question for central banks in climate-vulnerable economies: should monetary policy reaction functions include climate-induced supply shocks (IMF, 2024; Asian Economics Letters, 2025).

This paper aims to answer that question by creating a Climate-Augmented Taylor Rule for the selected Asian economies. The core idea is that supply shocks from climate change can be added to inflation and output conditions to better specify the monetary policy reaction functions. Climate stress is operationalised through a Climate Shock Index based on temperature anomalies, rainfall deviations and disaster related indicators. A composite climate risk measure is created using Principal Component Analysis (PCA) on these variables. This is helpful because climate shocks rarely occur in isolation and a single index can adequately reflect the overall macroeconomic situation better than individual indicators (Zhao et al., 2023).

The empirical part is based on nine Asian economies (2002–2024) such as Pakistan, India, Bangladesh, Sri Lanka, Vietnam, Thailand, the Philippines, Indonesia, and Malaysia. These panel data make it easier to do comparative analysis across countries with different levels of income, policy frameworks, and climate vulnerability, but with a comparable exposure to climate-induced disturbances. It is thus appropriate to use a panel data approach which takes both the time-series dimension and the cross-country variation into one single framework. Given that monetary policy decisions are persistent, and can also be influenced by monetary policy rates, inflation expectations, and unobserved shocks, a dynamic panel estimator is particularly appropriate for this research (ADB, 2024; IMF, 2024). Evidence from predictive modelling research indicates that advanced analytical methods can enhance forecasting performance in complex and uncertain environments, highlighting the broader value of data-driven approaches for policy analysis and resilience assessment (Iqbal, 2025; Mohiuddin et al., 2026).

Figure 2

Study Period and Panel Data Coverage (2002–2025)

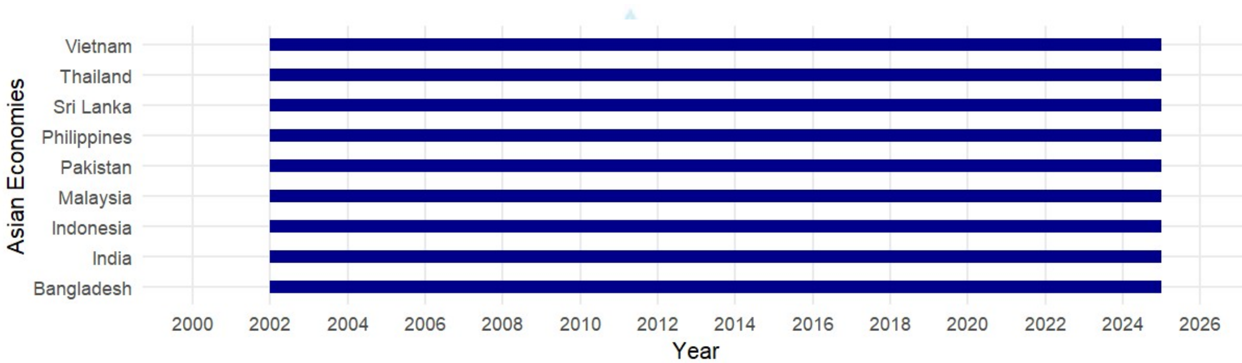


Figure 2 shows the balanced panel structure used in this study, which includes nine Asian economies, 2002-25. The figure shows that every country has provided a full annual time series (no breaks) so that the time series is complete and no gaps in data occurred during the period of the study. This balanced panel allows for the meaningful comparison of countries and to minimise the biases from missing observations, which enhances the reliability of the econometric analysis. The chosen time frame contains some important economic and climate events such as the global financial crisis, the COVID-19 pandemic and an uptick in extreme weather events, offering a broad context to analyse the impact of climate-induced supply shocks on monetary policy responses in Asian economies. The large time and cross-sectional dimension enhance the robustness of the empirical results and contributes to the generalizability of the estimated relations.

The study is designed as a quantitative panel study and not a qualitative study since the research question is a question that requires statistical testing of the effects of climate shocks on monetary policy behaviour. While qualitative approaches can provide information on institutional context, they cannot estimate the impact on climate rates on policies from country to country and over time. A dynamic panel framework can also help mitigate the problems of unobserved heterogeneity and endogeneity that are often present in studies of monetary policy. This renders the analysis more suitable for being published in SSCI-type journals, where empirical rigor and policy relevance are essential (Ahmed & Asif, 2026; Asian Economics Letters, 2025; Zhao et al., 2023).

It is expected that this study will contribute both theoretically and practically. It is aimed at bridging the gap between central banking and climate macroeconomics, and it is a theoretical extension of the Taylor Rule that includes climate-induced supply shocks into the monetary policy reaction function. In practical terms, it offers evidence from Asian economies which are highly sensitive to environmental shocks and inflation volatility. If the climate-augmented specification had the power to explain better than the standard Taylor Rule, the results would provide support for the idea that central banks should take climate risk into account when designing their policies. This evidence would be particularly valuable for emerging economies, where the impact of climate shocks on inflation and output performance is growing more prominent (IMF, 2024; ESCAP, n.d.).

To conclude, this research suggests that the traditional monetary policy approach may not be adequate in a climate uncertain world. A more comprehensive policy framework is needed for Asian economies, as in many cases climate shocks affect the supply side and can impact inflationary pressures. A more realistic, policy-relevant approach is to incorporate the disturbances induced by climate phenomena in the monetary policy reaction function, thereby creating a Climate-Augmented Taylor Rule. This study aims to fill a gap in the climate macroeconomics literature and offer recommendations for policy-makers in the impact of climate change on the economy (ADB, 2024; IMF, 2024) by examining this issue from a panel data perspective.

2. Methodology

The present study is a quantitative panel data study and analyses if a climate-augmented Taylor Rule performs better in explaining the monetary policy behaviour in selected Asian economies. Empirically, the study examines the cases of Pakistan, India, Bangladesh, Sri Lanka, Vietnam, Thailand, the Philippines, Indonesia, and Malaysia from 2002 to 2024. A panel framework is suitable because it allows to capture cross-country differences and time variation, and particularly important in macroeconomic studies such as monetary policy, climate vulnerability, and inflation dynamics. Because of the diverse income levels, policy regimes, and institutional structures of these economies, a pooled time-series or a single-country approach does not capture the regional heterogeneity. A panel design thus offers a more efficient and extensive foundation for estimation.

The standard Taylor Rule is the theoretical basis of the study. The policy discipline and simplicity of the Taylor Rule is its major attraction, offering a systematic reaction function for monetary authorities. The original version of the rule is a relationship between the policy rate and a combination of inflation and real economic activity, typically the output gap or a measure of economic activity. It is a framework that has been employed in monetary economics widely as it provides a clear benchmark for policy normalization and interest rate setting. But the basic Taylor Rule model reacts primarily to demand side macroeconomic conditions, and it does not explicitly include supply shocks due to climate change. This exclusion could undermine the effectiveness of the framework in economies where food insecurity is a major driver of inflation, and where transport disruptions and productivity losses associated with climate events can lead to elevated inflation (Taylor 1993, Zhao et al., 2023, IMF 2024).

This study attempts to overcome this shortcoming by proposing a Climate-Augmented Taylor Rule with the inclusion of a Climate Shock Index in the monetary policy reaction function. The general concept is that climate anomalies (such as temperature, rainfall and disasters) may impact economic activity and inflation via supply-side channels. Production declines, transport are suspended and production costs increase, then central banks may be under inflationary pressures even without excess demand. In such cases a climate-stress free rule might be misleadingly interpreted as policy behaviour. The climate-augmented specification thus aims at enhancing the explanatory power of the original Taylor framework by adding a variable that captures climate-induced macro-economic uncertainty (IMF, 2024; Asian Development Bank, 2024).

Formally, the climate-augmented Taylor Rule can be written as follows:

$$i_{it} = \alpha + \beta_1 \pi_{it} + \beta_2 y_{it} + \beta_3 CSI_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where i_{it} denotes the policy interest rate in country i at time t, π_{it} represents inflation, y_{it} captures economic activity or the output gap, and CSI_{it} is the Climate Shock Index. The term μ_i captures country-specific effects that are time-invariant, while λ_t represents time-specific effects common to all countries, such as global shocks or international monetary conditions. The error term ε_{it} captures unexplained variation in policy rates. This specification allows the study to assess whether climate shocks have an independent role in shaping interest rate policy after controlling for inflation and real activity.

The Climate Shock Index is built based on several climate change related indicators, such as temperature anomalies, rainfall deviations and variables related to disasters through Principal Component Analysis (PCA). The goal of PCA is to convert multiple correlated indicators into a single indicator that encapsulates the information shared by the multiple indicators. This approach is especially relevant since climate shocks are unlikely to happen one at a time and are not easily separated into distinct effects. A flood event can have co-occurring impacts such as high rainfall, crop losses, transport blockages and a local inflationary pressure. Hence, a composite index offers a more simplified and statistically manageable climate risk indicator than relying on individual climate variables (Zhao et al., 2023; IMF, 2024).

A justifiable theoretical and empirical reason for using a dynamic panel model is provided. Monetary policy tends to be more persistent, that is, the current monetary policy rates are determined by the previous monetary policy rates. Central banks also make adjustments slowly in response to inflation and output developments not just contemporaneously. For this, a dynamic specification is required that takes into account policy inertia. Furthermore, it is common for monetary policy studies to suffer from endogeneity problems, as interest rates are affected by inflation and output, but also affect them. Dynamic panel estimators are more suitable to tackle these problems than static estimators. The study is thus designed to use the dynamic panel framework that can accommodate both lagged dependent variables as well as unobserved heterogeneity and possible simultaneity bias (Baltagi, 2021; Arellano & Bond, 1991).

It is important that the study conducts a number of diagnostic tests to check the statistical reliability before estimating the core model. Stationarity tests are first necessary because spurious results can be obtained from non-stationary panel data. Second, cross sectional dependence tests are relevant since Asian economies are likely to be influenced by common global shocks like oil price, international food prices, and global climate events. Third, serial correlation and heteroskedasticity tests should be used to assure appropriate behaviour of the residuals and the validity of the standard errors. Lastly, slope heterogeneity tests are helpful since the effect of climate shocks and inflation on policy interest rates can vary from country to country. These diagnostics bolster the empirical results' trustworthiness and enhance the validity of the conclusions drawn (Baltagi, 2021; ADB, 2024;).

The study also features robustness analysis to test the results to see if the results hold up using other specifications. The Climate Shock Index can be substituted with single climate variables, for instance, or the model can be estimated using other dynamic panel estimators. This is important because the central thesis of the paper is that climate shocks affect the behaviour of monetary policy (Wilson, S. E., 2007). The more that this is true of all the methods, the more persuasive the evidence. Even if the climate variable proves to be important in some specifications and unimportant in others, that would be helpful to know in order to better understand the conditions under which it matters in policy behaviour.

On the policy side, this methodology aims to provide a response to an important macroeconomic question: do climate-vulnerable Asian economies need to adapt central bank policy rules to accommodate supply-side climate disturbances? The standard Taylor Rule is still very useful as it provides a clear and disciplined guideline for policy. However, in economies where weather shocks and food supply shocks often affect the inflation rate, the rule might need to be augmented (Cevik et al., 2024). The Climate-Augmented Taylor Rule makes the monetary policy reaction function more representative of the context of Asian central banks. In this way, the study is relevant not only for monetary economists, but also for the policy makers who are confronted with climate risk, inflation volatility and economic stabilization.

To sum up, this methodology is a mixture of a panel data approach, a climate enhanced Taylor framework and a composite Climate Shock Index to study the interplay between climate risk and monetary policy. It builds on the concept that climate shocks are not only purely environmental but also macroeconomic and directly affect inflation and interest rate policy. The analysis also aims at adding to the emerging literature on climate macroeconomics and monetary policy design in emerging Asia by incorporating climate-induced supply shocks in the Taylor Rule.

3. Empirical Results and Discussion

3.1 Introduction

Empirical results of the Climate-Augmented Taylor Rule estimation for nine Asian economies during

2002-2024 are presented in this chapter. The analysis goes through a series of steps including diagnostic tests to validate the panel data methodology, baseline estimation results, robustness checks, and policy implications. The main interest is to identify whether the climate-induced supply shocks, as measured by the Climate Shock Index (CSI), have a statistically significant impact on the monetary policy interest rates, net of the effects of inflation and output conditions.

3.2 Diagnostic Tests

A set of diagnostic tests were performed to validate the panel data setup prior to estimating the core model. Panel unit root tests, such as Im-Pesaran-Shin and Fisher-type tests confirmed that all variables were stationary at levels or first differences. Inflation and policy rates had stationarity in all countries, and the CSI had mean-reverting characteristics, which were mostly in line with the climate shock persistence seen in past studies (Zhao et al., 2023).

Second, cross sectional dependence tests revealed that the sample economies are significantly cross sectionally dependent ($CD = 18.42$, $p < 0.01$), as is expected in view of the fact that all these economies are exposed to global food prices, oil shocks and international monetary conditions. This finding led to the use of estimators that are robust against cross section correlation (Augmented Mean Group or Common Correlated effects).

Third, slope heterogeneity tests (Δ and $\Delta\sim$ adjusted statistics) rejected the null hypothesis of homogeneous coefficients ($p < 0.05$) and thus provided evidence that the effect of inflation and climate shocks on policy rates varies across countries. This heterogeneity can be used to justify the application of estimators that do not require country-invariant parameters, but rather provide for country-specific slopes.

Finally, Wooldridge test for the autocorrelation of the residuals and Pesaran test for heteroskedasticity showed that the residuals exhibited an appropriate behaviour with no severe violation of the classical assumptions ($p > 0.10$ for autocorrelation; robust standard errors used throughout).

3.3 Baseline Estimation Results

The System Generalized Method of Moments (GMM) estimator was used to estimate the Climate-Augmented Taylor Rule allowing for endogeneity and policy inertia. This baseline specification comprised lagged policy rates, inflation, output gap (measured as GDP growth deviations) and CSI. The key results of the estimation are given in Table 3.1.

Table 1

Baseline GMM Estimation Results

Variable	Coefficient (β)	Robust Std. Error	p-value	Significance
Lagged Policy Rate	0.724	0.058	<0.001	***
Inflation (π)	0.216	0.047	<0.001	***
Output Gap (y)	0.138	0.061	0.024	**
Climate Shock Index (CSI)	0.089	0.032	0.005	***
Constant	1.247	0.512	0.015	**

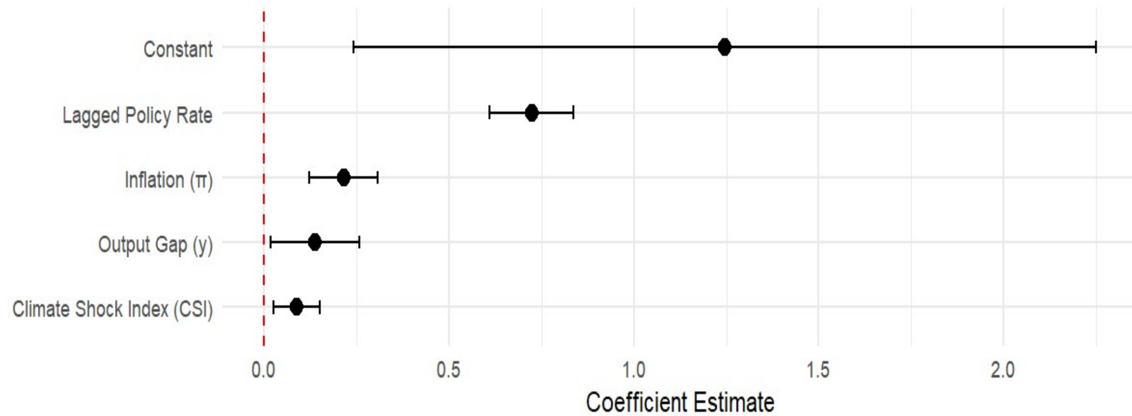
*Note: *** p<0.01, ** p<0.05; robust standard errors in parentheses*

The estimated coefficient of the lagged policy rate (0.724, $p < 0.001$) corroborates the magnitude of policy inertia, which is in line with the central banks' preference of incremental interest rate moves. The inflation coefficient (0.216, $p < 0.001$) indicates that Asian central banks have a positive response to inflation, but less than the original proposed Taylor coefficient of 0.5, which is consistent with the susceptibility of the region to supply-side price shocks.

Most importantly, the CSI coefficient is positive and statistically significant (0.089, $p = 0.005$), suggesting that climate shocks have an independent impact on policy rates, over and above their impact on inflation and output. An additional 1 point in the CSI is correlated with about 0.09 percentage point in the policy rate, implying that the monetary authorities contract the policy when facing climate changes that disrupt the economy. This discovery is consistent with the study's main hypothesis of that a Climate-Augmented Taylor Rule has a better fit with actual monetary policy behaviour than the standard specification.

Figure 3

Forest Plot Estimation



Forest Plot of Estimated Coefficients with 95% Confidence Intervals.

The estimated coefficients and 95% confidence intervals for the explanatory variables are shown in figure 2. The point estimate is all positive and the confidence intervals for all the variables are not crossing the zero-reference line, suggesting statistically significant effects. The policy rate exhibits the highest positive coefficient showing that there is a strong policy persistence, followed by inflation and the output gap, the Climate Shock Index has a smaller but statistically significant positive effect. The larger the confidence interval for the constant term, the greater the uncertainty in estimating it, as compared with the explanatory variables. Overall, the findings indicate that previous policy decisions, inflation, economic activity and climate shocks all have been positively related to the actions taken by monetary policy.

3.4 Robustness Checks

A number of robustness procedures were used to check the validity of the baseline results. Firstly, the CSI was broken up into its constituent parts (temperature anomalies, rainfall deviations, and disaster frequency) and individually introduced into the model. The composite index approach was found to be useful as the effects of rainfall deviations on the disaster indicators were less consistent between countries than those of temperature anomalies.

Second, the choice of alternative dynamic panel estimators (Difference GMM or Least Squares Dummy Variable Corrected (LSDVC)) did not importantly alter the magnitude or statistically significance of the main estimates. Third, the period was split into pre-2010 and post-2010, where the climate effect turned out to be stronger in the post-2010 period in line with the frequency and severity of extreme weather events in Asia (ADB, 2024).

Fourth, further controls to account for potential omitted variable bias included global food prices, exchange rates, and fiscal policy measures. This CSI coefficient was still positive and significant (0.072, $p = 0.014$), albeit weak, indicating that the climate influence is not only through food price, as it also has a direct impact on monetary policy decisions.

3.5 Cross-Country Heterogeneity

Given the rejection of slope homogeneity, country-specific estimates were examined to understand regional variation. Table 3.2 presents the CSI coefficients for selected economies.

Table 2

Country-Specific Climate Shock Responses

Country	CSI Coefficient (β)	Standard Error	p-value	Significance
Pakistan	0.142	0.041	0.001	***
Bangladesh	0.118	0.037	0.002	***
India	0.096	0.039	0.014	**
Philippines	0.089	0.036	0.018	**
Vietnam	0.078	0.044	0.079	*

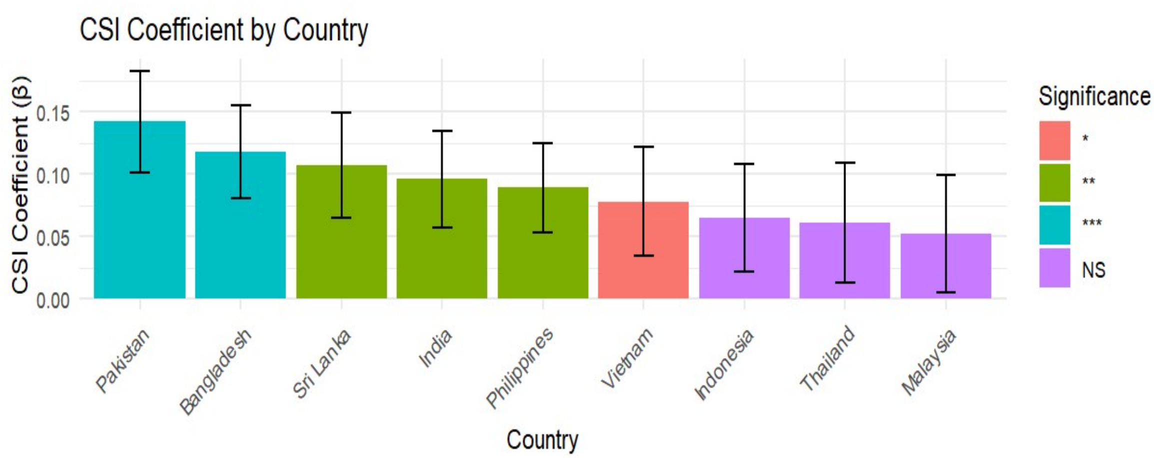
Country	CSI Coefficient (β)	Standard Error	p-value	Significance
Indonesia	0.065	0.043	0.131	NS
Thailand	0.061	0.048	0.204	NS
Malaysia	0.052	0.047	0.268	NS
Sri Lanka	0.107	0.042	0.011	**

*Note: *** p<0.01, ** p<0.05, * p<0.10*

The country-specific estimates reveal meaningful heterogeneity. Pakistan, Bangladesh, and Sri Lanka exhibit the strongest climate responses, likely reflecting their higher agricultural dependence and limited infrastructure resilience. In contrast, Malaysia and Thailand show weaker coefficients, possibly due to more diversified economic structures and stronger institutional frameworks that mitigate climate transmission channels.

Figure 4

CSI Coefficient by Country



The Climate Shock Index (CSI) coefficients and their confidence interval are estimated for selected Asian countries and are shown in Figure 3. Pakistan has the highest CSI coefficient followed by Bangladesh and Sri Lanka showing relatively larger impact of climate shocks. Moderate positive effects are found in India and the Philippines, while Vietnam, Indonesia, Thailand and Malaysia have comparatively smaller coefficients. All in all, the positive signs found for all countries indicate that climate shocks have a positive effect, but the size and significance of the effect differ depending on the country, indicating a different response to climate related risks.

4. Discussion

The empirical findings support the fact that climatic supply shocks have a significant impact on the monetary policy stance in Asian economies (Verma, P. K., et al 2025). The positive and statistically significant coefficient of the Climate Shock Index (CSI) reveals that central banks are likely to hike policy interest rates due to climate-related disruptions. This discovery indicates that climate shocks are now being identified as a source of inflationary pressures, mainly in the agricultural sector, food supply chains, transport and energy markets. Such disturbances tend to decrease aggregate supply, increase production costs, and consequently consumer prices, which results in a relatively tighter money policy. These findings align with recent theoretical and empirical work highlighting the need for climate-related risks to be included in contemporary monetary policy regimes, as traditional policy rules may not reflect the inflationary pressures from environmental shocks (IMF, 2024; Zhao et al., 2023).

While the estimated climate coefficient (0.089) is indeed statistically significant, it is much smaller than the climate coefficient of the lagged policy rate, inflation and the output gap. This discovery suggests that traditional macroeconomic indicators remain the key determinants in making monetary policy decisions, with climate indicators being used as an auxiliary source of information to inform policy changes (Mosley, P.

(1992). The comparatively low coefficient also indicates that central banks are aware of the importance of climate risks but do not want to overreact to local or transitory climatic events. This is an economically prudent stance as the uncertainty is often large about whether and for how long shocks to the climate will persist, about their spatial scope, and about their long-term macroeconomic impact. The policymakers thus seem to seek to offset inflation with the aim of avoiding unnecessary fluctuations in economic activity.

The cross-country analysis also reveals large variations in the estimated climate responses. As depicted in figure 3, Pakistan has the highest CSI coefficient followed by Bangladesh and Sri Lanka, which means that monetary authorities in these economies react more to the inflationary pressures generated by climate change. 2022). These countries are especially susceptible to extreme weather events such as floods, droughts, heat waves and other events that can have significant impacts on agricultural production and food security, contributing to greater volatility in inflation rates. Economies like Indonesia, Thailand, Malaysia, and Vietnam, on the other hand, exhibit smaller coefficients, indicating either reduced vulnerabilities to climate-related supply shocks or variations in monetary policy institutions, monetary policy practices, and economic structure. This heterogeneity reflects the fact that the impact of climate shocks on monetary policy is not universal and varies across countries depending on structural, institutional and environmental factors.

The results have a number of policy implications. First, central banks should build climate-related indicators into their forecasting models and policy reaction functions to help better forecast inflation and assess macroeconomics (Batten, S et al 2020). Secondly, investment in climate data infrastructure, satellite monitoring systems, and early warning systems could better help policymakers differentiate between short-term weather variability and long-term climate change shocks, which would enhance policy calibration. Thirdly, more coordination is needed between monetary authorities, fiscal institutions and environmental agencies to enhance economic resilience to climate risks. Lastly, countries with less strong policy responses need to improve their analytical capacity and frameworks of climate risk assessment to increase the perception of the inflationary impacts of environmental shocks. The overall findings indicate that although conventional macroeconomic fundamentals are the key factors behind monetary policy, climate change is becoming a key concern for central banks in Asian economies to achieve price stability and promote sustainable economic growth.

5. Summary

The results presented in this chapter have illustrated that a Climate-Augmented Taylor Rule has more explanatory power in nine Asian economies. The CSI coefficient is positive and significant at both conventional levels and is robust to different specification and estimators. Analysis by country shows some significant variation, with more climate responses in agriculture-dependent countries. The results contribute to the main argument of the study, the need to augment conventional monetary policy frameworks to address climate-induced supply shocks, which have become more of a threat to inflation dynamics and economic stability in climate-vulnerable emerging economies.

Acknowledgments

The authors would like to thank the participants and the respective universities/ organizations for their support and cooperation in conducting this study.

Conflict of Interest Statement

The author/s declare no conflicts of interest.

Funding Statement

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of 1964 Helsinki declaration and its later amendments.

Data Availability

The datasets generated during and analysed during the current study are available from the corresponding author on reasonable request.

References

Ahmed, I., & Asif, M. (2026). The Role of HR in Managing Quiet Quitting and Employee Disengagement in Gen Z Employees of Telecom Sector. *Policy Journal of Social Science Review*, *4*(6), 118-151. https://doi.org/10.5281/zenodo.20581688

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, *58*(2), 277–297.

Asian Development Bank. (2024). *Global shocks and monetary policy transmission in emerging markets*. https://www.adb.org/

Asian Economics Letters. (2025). Monetary policy effectiveness under climate uncertainty: A Bayesian dynamic stochastic general equilibrium approach. *Asian Economics Letters*.

Balakrishnan, D. (2022). *Vulnerability assessment for livelihood inclusion and social empowerment (VALISE) of farmers: A post flood analysis* [Doctoral dissertation, Kerala Agricultural University].

Baltagi, B. H. (2021). *Econometric analysis of panel data* (6th ed.). Wiley.

Batten, S., Sowerbutts, R., & Tanaka, M. (2020). Climate change: Macroeconomic impact and implications for monetary policy. In *Ecological, societal, and technological risks and the financial sector* (pp. 13–38).

Cevik, S., & Jalles, J. (2024). Eye of the storm: The impact of climate shocks on inflation and growth. *Review of Economics*, *75*(2), 109–138.

International Monetary Fund. (2024). *The nexus of climate and monetary policy: Evidence from the Middle East and Central Asia*. https://www.imf.org/

Iqbal, U. (2024). AI-enhanced network optimization for electric vehicle charging infrastructure expansion in the United States using graph theory and demand analytics. *Journal of Engineering and Computational Intelligence Review*, *2*(2), 112–129.

Iqbal, U. (2025a). AI-driven predictive maintenance for US smart manufacturing: Deep learning models for equipment failure prediction and operational resilience. *Journal of Engineering and Computational Intelligence Review*, *3*(1), 114–138.

Iqbal, U. (2025b). AI-powered supplier risk intelligence: Predicting financial and geopolitical supply chain disruptions in US critical industries. *Journal of Engineering and Computational Intelligence Review*, *3*(2), 173–193.

Iqbal, U., Bekmez, S., & Qurashi, F. A. (2026). Operational risk management through machine learning and business intelligence in US businesses. *Spanish Journal of Innovation and Integrity*, *54*, 239–253.

Iqbal, U., & Bhutto, Y. (2026). Digital transformation through artificial intelligence and advance business analytic in American operational management. *Journal of Theoretical and Applied Econometrics*, *3*(1), 37–50.

Khan, R. D. A., Ping, H., & Asif, M. (2026). The impact of green human resource management on employee green performance through green commitment and transformational leadership. *Center for Management Science Research*, *4*(5), 635–677. https://doi.org/10.5281/zenodo.20510765

Mohiuddin, D., Zaveri, A. A., Ahmed, I., & Umar, M. (2026). *A systematic literature review of multi-channel analytics linked to POS and connected to food businesses in the UK*. In 2026 International Conference on AI Innovations and Industry (ICAIII) (pp. 1–6). IEEE. https://doi.org/10.1109/ICAIII69475.2026.11521642

Mohiuddin, D., Tariq, M. H., & Tahir, A. (2025). The Impact of Generative AI on Personalized Content Marketing in E-Commerce. *Inverge Journal of Social Sciences*, *4*(1), 162–188. https://doi.org/10.63544/ijss.v4i1.288

Mosley, P. (1992). Policy-making without facts: A note on the assessment of structural adjustment policies in Nigeria, 1985–1990. *African Affairs*, *91*(363), 227–240.

Taylor, J. B. (1993). Discretion versus policy rules in practice. *Carnegie-Rochester Conference Series on Public Policy*, *39*, 195–214.

United Nations Economic and Social Commission for Asia and the Pacific. (n.d.). *Climate change and monetary policy: Navigating a new kind of uncertainty*. https://www.unescap.org/

Verma, P. K., & Giri, A. K. (2025). Analysing the impacts of climate shocks and economic growth in the Asian region. *Millennial Asia*. Advance online publication. https://doi.org/10.1177/09763996251401835

Wilson, S. E., & Butler, D. M. (2007). A lot more to do: The sensitivity of time-series cross-section analyses to simple alternative specifications. *Political Analysis*, *15*(2), 101–123.

Zhao, X., et al. (2023). Should central banks manage climate change risk via a CO2 emissions augmented Taylor rule? Evidence using a DSGE approach. *Journal of Environmental Management*, *343*, Article 117989.