International Journal of Advanced Research in Economics and Finance
e-ISSN: 2682-812X | Vol. 7, No. 3, 233-248, 2025
http://myjms.mohe.gov.my/index.php/ijaref

Inflation in Malaysia and Singapore: The Interaction Effect of Overconsumption and Communication Intervention

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Received: 1 September 2025 | Accepted: 13 October 2025 | Published: 1 November 2025

DOI: https://doi.org/10.55057/ijaref.2025.7.3.17

Abstract: *Inflation in Malaysia and Singapore stems from supply constraints, monetary shocks, and global oil price fluctuations, with overconsumption intensifying demand pressures. This study investigates the short-term and long-term determinants of inflation using panel data and econometric methods. The Pedroni cointegration test confirms long-run relationships among variables, while Pesaran's tests show no cross-sectional dependence and consistent effects across countries. Long-run estimates are obtained using Fully Modified Ordinary Least Squares, and short-run effects are analysed through Pooled Ordinary Least Squares. Interaction terms reveal that internet usage moderates the relationship between consumption and inflation. The findings suggest that digital engagement and financial literacy can curb excessive consumption and stabilise prices. By integrating macroeconomic variables, overconsumption indicators, and communication factors, this study enhances understanding of inflation dynamics and supports policy strategies aimed at promoting responsible spending and macroeconomic stability in emerging economies.*

Keywords: Inflation, Consumer Price Index, Communication Intervention, Overconsumption, Household Debt, Energy Consumption

1. Introduction

Inflation refers to the percentage change in the general price level of goods and services over time and is typically measured by the Consumer Price Index and Retail Price Index (O'Neill et al., 2017). Historically, inflation has contributed to macroeconomic instability, including the global recessions of 1975, 1991, and 2009, each associated with oil price fluctuations, demand shocks, and financial crises (Hamilton, 2011; di Giovanni et al., 2023). During the Covid-19 pandemic, global inflation initially fell due to reduced consumption and investment but rose from 3.3 percent in 2020 to 8.7 percent in 2022, driven by supply disruptions, rising oil prices, and monetary shocks (Gourinchas, 2024). The conflict between Russia and Ukraine further intensified pressures (Sun et al., 2024). Global inflation declined to 6.8 percent in 2023 and is projected to fall to 5.9 percent in 2024 and 4.5 percent in 2025 (Gourinchas, 2024). However, the ongoing tariff dispute between the United States and China is expected to increase inflation in open economies, including Malaysia and Singapore, as producers pass higher costs to consumers (Azhar, 2025).

In Southeast Asia, inflation was initially forecast to fall from 3.3 percent in 2023 to 3.2 percent in 2024 but was revised upward to 4.5 percent, reflecting persistent regional pressures (Finck & Tillmann, 2022). Laos and Myanmar are projected to record the highest rates at 25.0 percent and 20.7 percent, while Indonesia and Vietnam are expected to remain moderate at 3.0 percent and 4.4 percent (Ahmad et al., 2024). In Malaysia and Singapore, inflation peaked in 2022 before easing to 1.8 percent and 2.4 percent in 2024 (World Bank Group, 2025). Targeted subsidy reforms in Malaysia and a consistent monetary stance in Singapore have contributed to moderating price pressures.

Maintaining price stability is challenging, as high inflation reduces purchasing power, constrains demand, and affects business performance and consumer welfare (Kang et al., 2020; Doan-Van, 2020; Kajejy & Bayram, 2024). Central banks have responded with flexible monetary instruments, including interest rate adjustments and balance sheet management, while fiscal policy has regained significance in stimulating demand (Feldkircher & Tondl, 2020; Arestis & Sawyer, 2003).

Inflation is typically classified as cost-push, built-in, or demand-pull (Ahmad et al., 2024; Jain et al., 2024; Perry, 2018). While past episodes were linked to supply shocks and monetary expansion (Nguyen et al., 2017), recent trends are mainly demand-driven. Overconsumption, fueled by high household debt, expenditure, and energy use, is a key factor in sustaining price pressures (Ismali et al., 2023; AlShafeey & Saleh, 2024; Kwon et al., 2009). This link between excessive consumption and inflation presents challenges for economic stability, environmental sustainability, and social welfare. Communication-based behavioural strategies show promise in mitigating overconsumption (de Koning et al., 2024), yet their effects on inflation remain underexplored. This study examines the combined influence of oil prices, exchange rates, trade openness, overconsumption, and communication on inflation dynamics in Malaysia and Singapore.

2. Literature Review and Hypotheses Development

Two foundational economic theories, the Quantity Theory of Money and Keynesian Economics, offer essential perspectives on the causes and management of inflation. The Quantity Theory of Money asserts that the money supply is the primary determinant of price levels and economic activity. Friedman (1989) argues that the value of money depends on its supply relative to demand, and that excessive growth in the money supply leads to inflation. When the money supply increases without a corresponding rise in output, the general price level is expected to rise proportionally, reducing purchasing power (O'Neill et al., 2017).

This theory is expressed through the Fisher equation, MV = PT, where M denotes the money supply, V the velocity of money, P the price level, and T the volume of transactions (Feldkircher & Tondl, 2020). Assuming short-term stability in V and T, an expansion in M directly increases P, resulting in inflation (Fitsum Sharew et al., 2016). Central banks influence the money supply through open market operations, interest rate adjustments, and quantitative easing, thereby controlling liquidity in the economy (Gordon & Leeper, 2006). Equilibrium in the money market occurs when money demand equals money supply, maintaining stable purchasing power (Doan-Van, 2020).

In contrast, Keynesian Economics highlights aggregate demand as the principal determinant of output and price levels. Keynes argued that markets do not automatically achieve full employment or price stability and that weak aggregate demand can cause prolonged recessions

and unemployment (Friedman, 1989). Fiscal policy, through government spending and taxation, is thus required to stimulate demand and stabilise prices (Arestis & Sawyer, 2003). Although Keynesian theory dominated postwar macroeconomic policy, it faced criticism during the stagflation of the 1970s, when high inflation coincided with stagnant growth. This experience gave rise to monetarism, which prioritised monetary control over fiscal stimulus. Nevertheless, Keynesian principles regained relevance during the global financial crisis of 2007–2008, when governments adopted expansionary fiscal measures to support recovery. Contemporary macroeconomic policy continues to draw upon Keynesian ideas, particularly in addressing demand-driven inflation (Kwon et al., 2009).

Oil Price

Between 2001 and 2022, fluctuations in oil prices and global demand shocks accounted for 65 percent of global inflation variability, with 38 percent attributed to oil prices and 28 percent to demand shocks (Ha et al., 2024). Global supply shocks tend to flatten the Phillips curve, while demand shocks steepen it, explaining inflation behaviour during the Great Recession and the period of sustained low inflation in parts of Asia (Finck & Tillmann, 2022). Empirical evidence from seven advanced and twenty-one emerging economies indicates that global shocks, particularly changes in oil prices, have stronger effects on inflation in emerging markets such as Brazil, Indonesia, and Malaysia (Kamber & Wong, 2020). Declining oil prices typically weaken the economies of oil exporters, while the linkages among oil prices, inflation, and exchange rates have become more complex since the Covid-19 pandemic (Bigerna, 2024). A 10 percent increase in oil prices raises energy consumer prices by about 2.3 percent and also exerts moderate upward pressure on food and core prices (Finck and Tillmann, 2022). Similar feedback effects have been documented in the United States (Wu & Ni, 2011).

Hypothesis 1: *Oil price has an impact on consumer price index.*

Exchange Rate

A comprehensive global study spanning the years 1970 to 2022 identifies several key drivers of inflation, including fluctuations in oil prices, shifts in demand and supply, and exchange rate shocks (Ha et al., 2024). Within the Asian context, supply and monetary shocks, particularly those related to exchange rate fluctuations, have emerged as predominant factors influencing inflation in recent decades (Fitsum Sharew et al., 2016). Exchange rates have a direct impact on trade profitability, import costs, investor sentiment, and capital flows, thereby shaping inflation dynamics (Meo et al., 2018). While domestic factors predominantly govern interest rates in Emerging Market Economies, there is an increasing influence of global factors on advanced economies, underscoring the necessity for central banks to closely monitor global price trends (Feldkircher & Tondl, 2020). Currency depreciation elevates import costs and inflation, whereas currency appreciation enhances purchasing power but may adversely affect exports (Fitsum Sharew et al., 2016). In the case of Turkey during the period from 2016 to 2019, exchange rates exerted a more significant influence on inflation than interest rates, primarily due to the country's high dependence on imports. This finding suggests a pressing need to diminish reliance on imports as a strategy for effective inflation management (Özen et al., 2020).

Hypothesis 2: *Exchange rate has an impact on consumer price index.*

Trade Openness

Trade openness measures the engagement of a country in international trade. The relationship between trade openness and inflation is negatively correlated. For example, economies that are

more open to international trade tend to have lower inflation. This statement is supported by another study where a panel data approach in conducted with data of 152 countries over the years between 1950 and 1992. The findings indicate that there is negative relation between inflation and trade openness (Sachsida et al., 2003). Another study emphasises that trade openness has a strong and lasting effect on economic growth in Brazil, Russia, India, China and South Africa (BRICS) nations, as their growing involvement in international trade has led to increased production and a greater contribution to the global economy. From 1991 to 2014, these countries saw significant growth in both exports and imports, reflecting deeper global economic integration. Overall, the findings indicate that trade openness plays a crucial role not only in driving economic progress but also in shaping inflation trends, highlighting the vital role of trade policy in ensuring economic stability and development (Raghutla, 2020). Consumer price index in OECD countries has reduced alongside the increment of international trade. As goods are imported, the price will not be increased as the supply of the goods is high in the country (Pain et al., 2008).

Hypothesis 3: *Trade openness has an impact on consumer price index.*

Household Debt, Loans and Debt Securities

Consumer credit, which encompasses household debt, loans, and debt securities, plays a significant role in facilitating personal consumption, albeit with a limited influence on business activities and production (Halim et al., 2022). Financial innovations such as the dollar system, liability management strategies, and the emergence of Eurocurrency markets during the late 1960s and 1970s contributed to an expansion of credit availability, which subsequently fuelled inflationary pressures (Earley, 1981). The proliferation of credit card usage has been shown to increase the money supply and consumer spending, thereby driving inflation and diminishing economic efficiency. This dynamic has necessitated that monetary authorities strike a balance between controlling inflation and fostering economic performance. While liquidity in non-financial sectors was not the primary driver of inflation, several liquidity-related factors have been identified as contributing elements, underscoring the need for targeted policy interventions. In Jamaica, public debt escalated from 80% to nearly 140% of GDP. Despite the implementation of stringent monetary policies, inflation remained persistently high, in part due to credit expansion associated with the dollar system (Kwon et al., 2009). Between 2017 and 2020, inflation eroded purchasing power, while consumption credit played a crucial role in sustaining it (Halim et al., 2022). In Australia, elevated inflation levels tend to dissuade borrowing due to a decrease in loan value, whereas low inflation conditions encourage borrowing through the facilitation of lower interest rates (Meng et al., 2013).

Hypothesis 4: *Household debt, loans and debt securities have an impact on consumer price index.*

Household Final Consumption Expenditure

Domestic factors, such as aggregate demand and inflation expectations, have significantly influenced inflationary trends in Asian countries (Ismail et al., 2023; Jongwanich & Park, 2009). Research indicates that over 60% of the Consumer Price Index (CPI) inflation in Asia can be attributed to these demand-side factors (Coibion et al., 2020). Elevated consumption levels may lead to overconsumption, resulting in production bottlenecks that compel firms to increase investment and raise prices, thereby exacerbating inflationary pressures (Platitas & Ocampo, 2024). The increasing significance of demand-side pressures highlights the necessity for policymakers to reconcile inflation control with economic growth objectives (Osorio & Unsal, 2013). In Australia, inflation has catalysed a shift toward more sustainable consumption

practices, with a notable increase in second-hand purchases and repairs, which contribute to reduced demand and alleviated financial burdens (Wesley et al., 2024). In a similar vein, in Ghana, augmented government expenditure, predominantly through wage increases, has enhanced aggregate demand and purchasing power, thereby stimulating production and facilitating GDP growth (Agalega & Acheampong, 2013).

Hypothesis 5: *Household final consumption expenditure has an impact on consumer price index.*

Electric Power Consumption

Between 1950 and 1973, residential electricity use grew eight times with most of the increase due to higher consumption per household rather than more households. This rapid growth was driven by rising incomes, the spread of electric appliances, effective marketing, lower real electricity prices, and pricing structures that reduced the cost per unit with higher usage. Electricity use stabilized between 1973 and 1974. Electricity prices generally declined from 1950 to 1970 but rose by 9% between 1970 and 1974. The Consumer Price Index (CPI) for electricity did not accurately reflect actual price changes, mainly due to limited sampling, lack of adjustments for consumption changes, and urban bias. As a result, actual prices fell more than the CPI suggested. Between 1960 and 1970, usage growth and price declines balanced out (Hirst, 1976). Electricity prices are a substantial component of the CPI, especially in energy-intensive sectors. In the UK, energy costs contribute approximately 6.6% to the CPI, with sectors like restaurants and hotels exhibiting higher energy intensity (2.7%) compared to clothing and footwear (0.3%). Similarly, in the Euro area, electricity price increases have a strong positive effect on inflation. A 1% rise in electricity prices correlates with a 6% increase in the Harmonised Index of Consumer Prices (Kathryn Keane, 2023).

Hypothesis 6: *Electric power consumption has an impact on consumer price index.*

Energy Use

Between 1950 and 1973, household gasoline consumption for automobile is tripled. This growth was driven by higher incomes, wider car availability, lower real gasoline prices, demographic changes, and highway expansion. However, consumption dipped slightly in 1973–1974 due to the Arab oil embargo and a sharp rise in gasoline prices. Gasoline prices remained stable from 1950 to 1965, then fell by 14% through 1972, before rising 3% in 1973 and 22% in 1974. Overall, real fuel prices declined until 1970 but rose sharply afterward, especially for gasoline and fuel oil, leading to an increase in household fuel spending from 7% to 8% between 1972 and 1974 (Hirst, 1976). Global energy prices has increased drastically from 2020 to 2022 due to supply disruptions from Covid-19 pandemic and the Russian-Ukraine war. Despite large spike, the impacts on advanced economies is lessened over time (Bettarelli et al., 2023). Another study conducted in United States, Europe and China on greenhouse gas emissions, which is a byproduct of energy usage. A particularly important observation is that at a 4.4% inflation rate, all three regions experience a rise in GHG emissions, indicating a shared global economic pattern affecting the environment. This emphasizes the importance of coordinated international economic and environmental strategies (AlShafeey & Saleh, 2024).

Hypothesis 7: *Energy use has an impact on consumer price index.*

Communication Intervention

Communication intervention is a set of communication actions designed to change a particular behavior pattern. These interventions often rely on intuitive and common sense understandings

of behavior, despite conducting formal analysis of the target behavior and the expected mechanisms of action (Michie et al., 2009). Effective communication interventions should provide structured information and recommendations to enhance motivation and capabilities (Albarracin et al., 2018). Julia de Koning (2024) explored the influence of a communication intervention to address clothing overconsumption. Young adults often consume clothing to stay in fashion trends, particularly within the fast fashion industry. A survey experiment using different framing strategies showed that communication intervention increased young adults' awareness of the consequences of clothing consumption and motivated them to reduce purchases (de Koning et al., 2024). In Australia, the "right to repair" campaign encourages consumers to extend product life by repairing and reusing electronic items instead of replacing them, which helps reduce overconsumption of electronics (Wesley et al., 2024). Internet usage is considered an indicator of communication intervention. A higher percentage of Internet users means greater access to public information on economic conditions (Bucy, 2000). With such access, users are more likely to adjust their consumption behavior in response to inflation.

From the review above, many variables drive inflation or an increase in the consumer price index, including oil prices, exchange rates, trade openness, and consumption-based factors. Variables such as household debt, loans, consumption expenditure, electricity consumption, and energy use can lead to overconsumption. Communication intervention, measured through Internet usage, will be examined as a moderator between consumption-related variables and the consumer price index.

Hypothesis 8a: *Communication intervention moderate the relationship between household debt, loans and debt securities, and consumer price index.*
Hypothesis 8b: *Communication intervention moderate the relationship between household final consumption expenditure and consumer price index.*
Hypothesis 8c: *Communication intervention moderate the relationship between electric power consumption and consumer price index.*
Hypothesis 8d: *Communication intervention moderate the relationship between energy use and consumer price index.*

The conceptual framework presented in Figure 1 has been developed utilising the theories previously discussed. The oil price serves as an indicator of global shocks, while exchange rates reflect monetary shocks. Conversely, household debt represents the excess money supply available in accordance with the quantity theory of money. Consumption-based variables, including household debt, household final consumption expenditure, electric power consumption, and energy use, signify aggregate demand. Additionally, communication interventions exemplify government intervention as described in Keynesian economic theory.

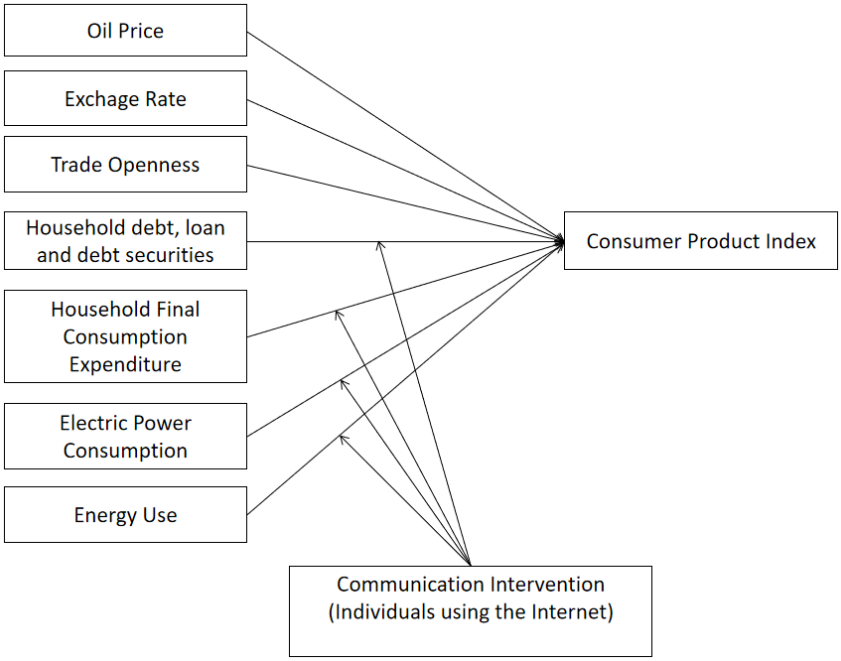

Figure 1: Conceptual Framework
Source: Author's Own Work

3. Data and Method

This study employed a quantitative methodology to examine the interrelationships among variables and to test the hypotheses outlined in Section 2, utilising balanced panel data from 2000 to 2023 for Malaysia and Singapore. The availability of high-quality data, significant trade openness, and the roles of both countries as regional economic leaders render them particularly suitable for analysing both domestic and external drivers of inflation within diverse economic contexts. The dataset incorporated the consumer price index, oil prices, exchange rates, trade openness, various consumption-based indicators, and data on communication interventions. After the evaluation of descriptive statistics and correlation characteristics, stationarity tests were conducted. Variables that were found to be cointegrated of the same order supported the existence of long-run relationships. The Pesaran unit root test addressed cross-sectional dependency, while the Pesaran-Yamagata test identified slope heterogeneity. The Pedroni panel cointegration test was employed to investigate long-term relationships, leveraging its flexibility and capacity to account for heterogeneity. For estimation purposes, Pooled Ordinary Least Squares (OLS) was utilised for short-run analysis, while Fully Modified Ordinary Least Squares (FMOLS) was employed for long-run analysis, correcting for serial correlation and endogeneity. Additionally, country-specific linear regression analyses were conducted to explore the effects and provide insights specific to each country. All these methodologies were employed to investigate the relationships among dependent and independent variables.

Independent variables and indicators are discussed as follow.

a) Consumer Price Index (CPI)
   The CPI tracks changes in the average prices of a fixed basket of goods and services, reflecting inflation trends. It is updated periodically to match changing consumption patterns and follows the UN's COICOP standard, allowing international comparison. Most countries' CPI data come from the World Bank (Finck & Tillmann, 2022).

b) Oil Price
The price of oil, often referred to simply as the oil price, is defined as the spot price for abarrel of benchmark crude oil (Sek et al., 2015).

c) Exchange Rate
Exchange rates are a representation of the relative worth of one currency in comparison to another (Fitsum Sharew et al., 2016).

d) Trade Openness
Trade openness, measured as the ratio of exports and imports to GDP, indicates how integrated an economy is with global markets. This standardized measure, often sourced from the World Bank, enables cross-country and time-based comparisons (Kamin et al., 2006).

e) Household Debt, Loans, and Debt Securities
Household debt reflects credit access and spending capacity. Higher debt levels can boost consumption and inflation, while declining debt may signal weaker demand and lower inflation. Excessive debt can also strain household finances and economic stability (Halim et al., 2022).

f) Household Final Consumption Expenditure
This refers to household spending on goods and services such as food, housing, energy, and health. Representing about 60% of GDP, it is a key measure of consumer demand and economic activity (Wahyuni, 2023).

g) Electric Power Consumption
This indicator measures per capita electricity use (kWh), enabling comparison across countries. Data are obtained from the World Bank or national energy agencies (Kathryn Keane, 2023).

h) Energy Use
Energy use captures total primary energy consumed per capita (in kilograms of oil equivalent), including oil, gas, coal, and renewables. It reflects energy demand and production efficiency, with data often from the World Bank (Bettarelli et al., 2023).

i) Individuals Using the Internet
The percentage of Internet users reflects access to information and communication. Higher usage can improve consumer awareness and spending decisions, potentially stabilizing demand and easing inflationary pressures (World Bank Group, 2024).

Table 1 presents a summary of the variables, their respective data sources and the abbreviations utilised for each variable within the model specification.

Table 1: Variable Description of Independent and Dependent Variable

Variable	Abbreviation	Data Format	Data Sources
Consumer Price Index	*cpi*	Index Score	World Bank Group, 2024
Oil Price	*oilprice*	Dollar per Barrel	U.S. Energy Information Administration, 2025
Exchange Rate	*excrat*	Index Score	World Bank Group, 2024
Trade Openness	*tradop*	Index Score	World Bank Group, 2024
Household Debt, Loans and Debt Securities	*hshdebtloan*	Percentage of GDP	International Monetary Fund, 2024
Household Final Consumption Expenditure	*conexpgdp*	Percentage of GDP	World Bank Group, 2024
Electric Power Consumption	*conelec*	kWh per Capita	World Bank Group, 2024
Energy Use	*eneruse*	kg of Oil Equivalent per Capita	World Bank Group, 2024
Individuals using the Internet	*internet*	Percentage of Population	World Bank Group, 2024

Source: Author's own work.

The unit of analysis of this study is country. The consumer price index is a function of oil price, exchange rate, trade openness, household debt, loans and debt securities, household final consumption expenditure, electric power consumption and energy use, and moderates by communication intervention indicated by individuals using the Internet.

Hence, a functional basic model can be derived as follow:

$$cpi_{it} = \alpha_0 + \alpha_1 oilprice_{it} + \alpha_2 excrat_{it} + \alpha_3 tradop_{it} + \alpha_4 hshdebtloan_{it} + \alpha_5 conexpgdp_{it} + \alpha_6 conelec_{it} + \alpha_7 eneruse_{it} + \varepsilon_{it}$$

and an interaction model is as follow:

$$cpi_{it} = \alpha_0 + \alpha_1 oilprice_{it} + \alpha_2 excrat_{it} + \alpha_3 tradop_{it} + \alpha_4 hshdebtloan_{it} + \alpha_5 conexpgdp_{it} + \alpha_6 conelec_{it} + \alpha_7 eneruse_{it} + \theta_1 (hshdebtloan * internet)_{it} + \theta_2 (conexpgdp * internet)_{it} + \theta_3 (conelec * internet)_{it} + \theta_4 (eneruse * internet)_{it} + \varepsilon_{it}$$

Note: cpi = Consumer Price Index; oilprice = Oil Price (Dollar/Barrel); excrat = Exchange Rate; tradop = Trade Openness; hshdebtloan = Household Debt, Loans and Debt Securities (% of GDP); conexpgdp = Household Final Consumption Expenditure (% of GDP); conelec = Electric Power Consumption (kWh per Capita); eneruse = Energy Use (kg of Oil Equivalent per Capita); internet = Individuals using the Internet (% of Population).

4. Results

Table 2 shows the descriptive statistics of the variables. Log transformations in certain variables are made during the analysis to balance the influence of outliers and leads to more robust statistical measures and model estimate. *tradop* has the highest mean (260.6312) compared to other variables whereas *lnhshdebtloan* has the lowest standard deviation (0.1609) with the least number of observations. The negative minimum value of *cpi* (-1.1387) indicates occurrence of deflation phenomenon or significant drop of prices relative to the base period.

Table 2: Descriptive Statistics

Variable	Obs	Mean	Std Dev.	Min	Max
cpi	48	1.9773	1.7583	-1.1387	6.6278
excrat	48	2.6133	1.2099	1.2497	4.5606
tradop	48	260.6312	105.7625	116.7882	437.3267
lnhshdebtloan	42	4.0544	0.1609	3.7314	4.3348
lnoilprice	48	4.0634	0.4273	3.2573	4.6019
lnconexpgdp	48	4.0005	0.1745	3.6299	4.3037
lnconelec	46	8.6598	0.4486	7.9281	9.2321
lneneruse	46	8.2281	0.3992	7.6508	8.9053

Source: Author's own work.

The correlation matrix is presented in Table 3. It is common to observe correlations among variables in time-series data (Gujarati & Porter, 2004). Although some correlation coefficients exceed the conventional threshold of 0.75, they remain acceptable for panel data analysis as long as the variables are not perfectly correlated (correlation = 1) (Hong et al., 2019).

Table 3: Correlation Matrix

	excrat	*tradop*	*lnhshdebtloan*	*lnoilprice*	*lnconexpgdp*	*lnconelec*	*lneneruse*
excrat	1.0000						
tradop	-0.9293	1.0000					
lnhshdebtloan	0.5094	-0.6399	1.0000				
lnoilprice	0.0650	-0.1489	0.1371	1.0000			
lnconexpgdp	0.9022	-0.8150	0.5095	-0.1083	1.0000		
lnconelec	-0.8888	0.8654	-0.3263	-0.1958	-0.7918	1.0000	
lneneruse	-0.9041	0.8754	-0.4052	-0.2778	-0.8156	0.9454	1.0000

Source: Author's own work.

The stationarity test confirms that cpi and lnoilprice are stationary at level, indicating stable statistical properties over time, while the remaining variables become stationary after first differencing due to the presence of unit roots. The Pesaran test for cross-sectional dependence yields a p-value of 0.6055, suggesting no dependence across units, supporting the use of pooled estimators. The Pesaran-Yamagata slope homogeneity test (p = 0.696) indicates homogeneous slopes, implying consistent effects of explanatory variables on inflation across countries. The Pedroni cointegration test confirms a long-run equilibrium relationship among variables, as the Modified Phillips-Perron (p = 0.1808) and Augmented Dickey-Fuller (p = 0.0935) statistics exceed 0.05, indicating that variables move together over time.

Table 4 reports the estimation results using FMOLS for long-run effects and Pooled OLS for short-run analysis. In the long run, lneneruse is insignificant (t = 0.73), while excrat, tradop, lnconexpgdp, and lnconelec negatively affect inflation, and lnoilprice and lnhshdebtloan have positive effects. In the short run, lneneruse is significant, whereas tradop and lnconexpgdp are not. Only lnoilprice and lnhshdebtloan show consistent effects across both time horizons.

Table 4: Short-Run and Long-Run Data without Interaction Effect

Variables	**Short-Run (Pooled OLS)**		**Long-Run (FMOLS)**	
	Coefficient (t-stat)	**Robust Standard Error**	**beta**	**t-stat**
excrat	1.3669*	0.7974	-0.88	26.95***
tradop	0.0069	0.0043	-0.08	-22.67***
lnhshdebtloan	-3.6426***	1.3499	4.49	7.90***
lnoilprice	3.2449***	0.4625	5.50	29.97***
lnconexpgdp	-2.2911	3.4456	-30.86	-27.88***
lnconelec	0.2871***	0.0065	-10.67	-12.19***
lneneruse	0.2520***	0.0197	-0.91	0.73

*** significance level at 1% , ** significance level at 5% * significance level at 10%
Source: Author's own work.

Table 5 presents the estimation results for long-run effects employing FMOLS alongside Pooled OLS for short-run relationships for variables with interaction effect. For the long-run analysis, *excrat* is not significant as the t-stat value of 1.26 is less than two. The remaining variables are significant despite having mixed effects. *tradop, lnconelec, lnhshdebtloan_internet, lnconexpgdp_internet* and *lneneruse_internet* have negative long-run effect on *cpi* whereas *lnoilprice, lnhshdebtloan, lnconexpgdp, lneneruse* and *lnconelec_internet* have positive long-run effect on *cpi.* Conversely, for the short-run analysis, *excrat* is significant. *tradop, lnoilprice, lnconexpgdp, lnconelec, lneneruse, lnconexpgdp_internet, lnconelec_internet and lneneruse_internet* have similar effect on both short-run and long-run relationship. Other variables are having opposite effect.

Table 5: Short-Run and Long-Run Data with Interaction Effect

Variables	Short-Run (Pooled OLS)		Long-Run (FMOLS)	
	Coefficient (t-stat)	Robust Standard Error	beta	t-stat
excrat	2.2095***	0.2526	-9.48	-1.26
tradop	-0.0002	0.0087	-0.06	-28.21***
lnhshdebtloan	-13.4749	36.7445	119.88	18.78***
lnoilprice	4.1043***	0.9523	2.12	15.88***
lnconexpgdp	30.3169	70.4687	159.49	19.74***
lnconelec	-140.7400***	25.7535	-276.84	-29.46***
lneneruse	144.7461***	12.7939	139.80	18.84***
lnhshdebtloan_internet	2.7868	8.3129	-26.91	-18.59***
lnconexpgdp_internet	-8.3161	14.6141	-44.35	-21.12***
lnconelec_internet	34.9421***	5.9561	65.30	28.36***
lneneruse_internet	-34.6742***	3.0378	-34.36	-19.46***

*** significance level at 1% , ** significance level at 5% * significance level at 10%
Source: Author's own work.

Table 6 shows the linear regression results on Malaysia and Singapore respectively. This analysis is conducted to differentiate panel data analysis and simple time series analysis. *lnconexpgdp_internet* and *lneneruse_internet* has significant negative and positive relationship, respectively, on *cpi* in Malaysia's context. In Singapore's context on the other hand, *lneneruse_internet* has marginally significant positive effect on *cpi.*

Table 6: Linear Regression for Malaysia and Singapore

Variables	Malaysia		Singapore	
	Coefficient	Robust Standard Error	Coefficient	Robust Standard Error
excrat	3.0871	2.1524	-12.4918	8.1430
tradop	-0.0283	0.0316	0.0056	0.0200
lnoilprice	2.2843	1.9485	2.3076	2.3273
lnhshdebtloan_internet	1.9657	1.5265	-2.2857	1.5198
lnconexpgdp_internet	-12.0854***	2.9650	0.0477	2.2224
lnconelec_internet	1.5703	1.6839	-0.9075	0.8072
lneneruse_internet	3.6045*	1.6586	1.3812*	0.7421

*** significance level at 1% , ** significance level at 5% * significance level at 10%
Source: Author's own work.

5. Discussion and Implications

In the short run, consumption behaviour reflects immediate demand pressures, while internet usage may influence these effects. Over time, consumption variables capture structural patterns, and the moderating role of internet access becomes more evident in shaping price movements. Household debt does not significantly affect inflation in the short run, possibly because borrowing delays consumption or repayment obligations limit spending. Although borrowing may temporarily increase purchasing power (Halim, 2022), internet usage does not significantly alter this relationship. In the long run, debt-financed consumption contributes to inflation, but internet access reduces this effect through improved financial awareness and access to online budgeting and credit information.

Household consumption exerts inflationary pressure due to stronger demand. Internet access may lessen this impact by improving access to price information and supporting more efficient consumption decisions (Wesly, 2024). Persistent increases in household expenditure raise long-term inflation, yet broader internet usage can moderate this effect by enhancing consumer awareness. Electricity use shows a short-run deflationary effect, possibly due to higher energy efficiency. When combined with internet usage, however, electricity consumption becomes inflationary as digital activity increases energy demand. Energy consumption overall raises inflation, though internet use helps offset this by promoting efficiency.

Policy Implication

Persistent oil price inflation requires policies that reduce energy dependence and market risks. Expanding renewable infrastructure, diversifying energy sources, and promoting electric vehicles can stabilise prices. Malaysia should phase out fuel subsidies and reinvest in renewables, while Singapore can strengthen regional power grids and green energy investments to offset import-related volatility. Exchange rate fluctuations drive short-run inflation, calling for managed float regimes and targeted interventions. Malaysia and Singapore should maintain adequate reserves and adjust exchange rate frameworks promptly to contain imported inflation.

Rising household debt fuels long-run inflation, underscoring the need for stricter lending standards and financial literacy programmes. Digitalisation mitigates energy-related inflation by improving efficiency. Policies supporting smart grids, IoT systems, and AI-based energy management can enhance stability. Malaysia should tighten loan-to-value ratios, and Singapore should continue applying its TDSR framework while monitoring household leverage. Energy use remains inflationary, demanding stronger energy efficiency and renewable initiatives. Malaysia can modernise its grid and support industrial efficiency, while Singapore should expand time-of-use pricing and integrate AI into energy governance. Prudent public spending on healthcare, education, and green infrastructure can raise productivity and limit inflation. Fiscal discipline through outcome-based budgeting is essential. Policymakers should combine long-run modelling tools like FMOLS with short-term country-specific analysis to balance structural and cyclical inflation management.

6. Conclusion

In conclusion, overconsumption through debt, expenditure, and energy use contributes to long-term inflation, while internet usage helps moderate these effects by improving consumer behaviour and supporting macroeconomic stability (de Koning et al., 2024). This study enhances understanding of inflation dynamics by integrating macroeconomic variables and overconsumption indicators, including household debt, expenditure, electricity consumption, and energy use, into inflation models for Malaysia and Singapore. The moderating influence of internet usage introduces a new theoretical perspective that links communication interventions with macroeconomic stability, particularly in reducing the inflationary effects of overconsumption. The findings underscore the importance of financial literacy and communication-based interventions in improving consumer decision-making and managing inflation in emerging economies.

Nevertheless, the study is limited by its small sample of two countries and a short data period. Some short run coefficients were not statistically significant, possibly due to delayed effects or data variability. Future research should include more ASEAN economies, investigate nonlinear and threshold effects, and conduct sectoral analysis to guide policy development. Incorporating

financial technology indicators could further clarify how digital tools influence consumption and inflation dynamics.

Acknowledgement
The authors would like to express sincere gratitude to everyone who contributed, both directly and indirectly, to the completion of this study.

Conflict of Interest Statement
The authors declare that there is no conflict of interest regarding the publication of this study.

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