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Financial Development Dynamics and Economic Growth in Seychelles: Evidence from the Structural Vector Autoregression Model

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Abstract: This study examines the relationship between financial system dimensions and economic growth in Seychelles (1990–2021) using the SVAR model. Findings show that financial system activity, depth, and efficiency significantly impact growth. The study uniquely analyzes Seychelles as an international financial center (IFC) with innovative financial products. Results offer policy guidance, emphasizing savings mobilization, productive investments, and FinTech adoption to enhance financial intermediation and access to services. Policymakers should implement strategies that foster financial development, ultimately driving economic growth in Seychelles and similar economies.

Keywords: financial credit; financial depth; financial efficiency; economic growth; SVAR; Seychelles

JEL classification codes: E44, O16, C32, O11, G21

1. Introduction

1.1. Seychelles Economic Growth and Financial System

Seychelles, an independent nation since 1976, has witnessed remarkable economic transformations. Tourism emerged as a cornerstone of economic growth, driven by investments in infrastructure and marketing (Seychelles National Bureau of Statistics 2021). Simultaneously, the fisheries sector flourished, with sustainable practices boosting seafood exports, particularly tuna (African Development Bank 2023). In the late 1990s and early 2000s, the nation grappled with debt and inflation, prompting significant economic reforms supported by international institutions (Central Bank of Seychelles 2021). Seychelles achieved substantial progress through the Blue Economy initiative (Seychelles National Bureau of Statistics 2021). This transitioned Seychelles from

agrarian roots to a service-centric economy, predominantly led by tourism and fisheries. While these efforts address economic vulnerabilities and environmental concerns, persistent challenges in sustaining economic stability necessitate ongoing policy adjustments (Central Bank of Seychelles 2021).

In the years 2021 and 2022, Seychelles experienced a remarkable economic recovery, with GDP growth rates of 7.9% and 9.5%, respectively. These figures outpaced the East African region's average growth rates of 4.7% and 4.4% (African Development Bank 2023). This robust growth was primarily driven by the tourism and fisheries sectors on the supply side, while household consumption had a pivotal role on the demand side (compare Figure 1, for previous years' trends). However, the economy's heavy dependence on imports left it susceptible to external shocks (African Development Bank 2023). Nevertheless, the central bank maintained monetary policies that resulted in a reduction in inflation from 9.8% in 2021 to 2.8% in 2022 (compare Figure 1, for previous years' trend), though it remained higher than pre-COVID-19 pandemic levels (African Development Bank 2023).

As of December 2021, Seychelles had a highly concentrated financial sector, with the top three firms holding 80% of assets, deposits, and loans. Future GDP growth was 2.5% in 2023 and expected to rise to 4.0% in 2024 and 4.3% in 2025,

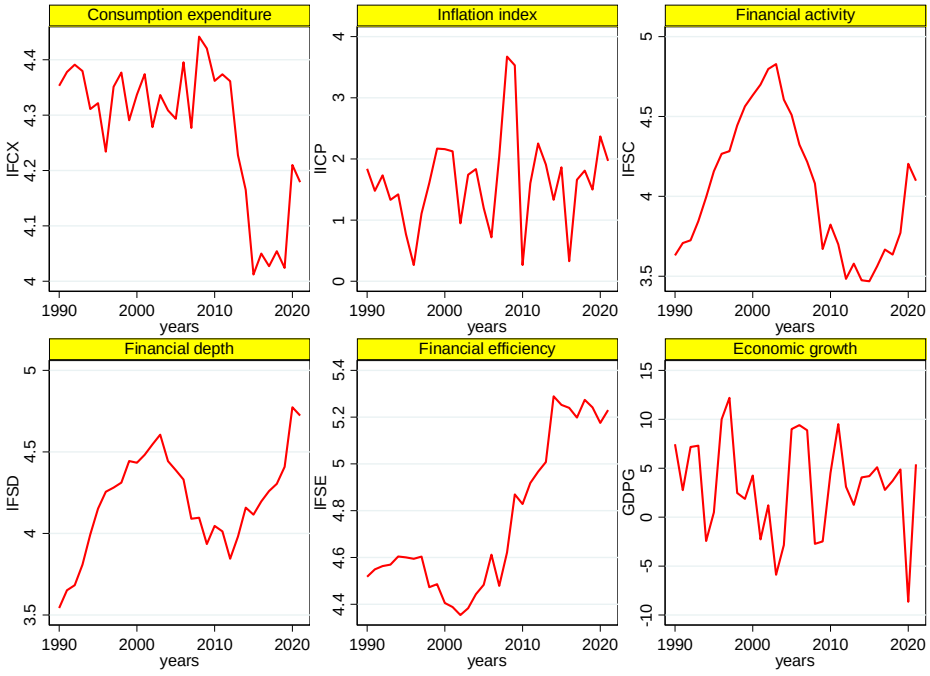

Figure 1: Economic series for Seychelles

driven by tourism and fisheries, with potential in digital finance (African Development Bank 2023, 2024). Inflation was forecasted to rise to 4.3% in 2023 and down to 1.4% in 2024 and 2.2% in 2025, possibly due to tighter monetary policy. The fiscal deficit is projected to decrease to 1.6% of GDP in 2023 and "1.4% in 2024 and "1.3% in 2025, supported by tourism recovery. The current account deficit is expected to narrow to 5.4% in 2023 and "7.2% in both 2024 and 2025, mainly due to tourism. Debt is set to fall below 50% in 2023 due to GDP growth and effective debt management (African Development Bank 2023, 2024). Risks include global economic recovery and supply chain disruptions, highlighting the need for diversification and climate adaptation for resilience.

In December 2021, Seychelles had seven licensed banks, down from eight in 2020. The banking sector's asset base grew mainly from government securities, with a high exposure to tourism. Sectoral credit concentration in domestic banking in 2021 showed significant exposure to tourism (18%), mortgages (15%), private households (11%), real estate (9.5%), and trade (9.1%) (Central Bank of Seychelles 2021). Trends show that between 1990 and 2020, the financial sector credit (activity) and depth had instability (Figure 1), with increasing financial efficiency over time. It is worth mentioning that Seychelles is an international financial center (IFC) alongside Mauritius, Singapore, Antigua and Barbuda, and the Bahamas; it offers diverse financial services to international clients to attract foreign investment and boost economic growth. These IFC islands are known for their commitment to financial innovation, introducing creative financial products like crowdfunding, sustainable bonds, and variable capital companies (Jugurnath et al. 2023).

This current study explores the impact of financial dynamics on Seychelles' economic growth, aligning with another study (i.e., Jugurnath et al. 2023) that found short- and long-term positive changes of financial innovation to GDP per capita. In these studies, various indicators, such as domestic credit to the private sector, broad money, and trade openness, were considered when evaluating economic growth. These insights emphasize the intricate link between financial innovation and economic development in Seychelles, underlining the need for a comprehensive understanding of these factors.

1.2. Theoretical Linkages between Finance and Growth

Research on the connection between economic growth and financial development has evolved, gaining momentum in the 1990s, influenced by King and Levine's work (King and Levine 1993). Schumpeter, as early as 1911, highlighted the vital role of credit markets and banks in fostering economic growth, a view

supported by scholars like Gurley and Shaw (1955), Goldsmith (1969), and Hicks (1969). The significance of financial development in fueling growth was emphasized by McKinnon (1973) and Shaw (1973). However, Robinson (1979) challenged this perspective, proposing that financial sectors should adapt to economic growth demands rather than drive them.

Aluko and Ibrahim (2020) outlined the role of the financial sector in fostering economic growth. Levine (2005) supports this idea by outlining five critical functions of the financial sector that can influence economic growth: providing information on investments, overseeing and enforcing corporate governance, facilitating risk management, mobilizing savings, and promoting trade. Financial development occurs when the financial sector becomes more efficient in fulfilling these functions. Theories explaining the link between finance and economic growth can be broadly categorized into two primary groups: supply-side theories and demand-side theories. Firstly, the perspective that as financial institutions advance, they become more adept at efficiently allocating capital, mobilizing savings, and providing funding for productive investments is considered below (Gurley and Shaw 1960).

This theory has given rise to the supply-leading hypothesis (SLH), suggesting that financial development propels economic growth, thereby implying a one-way causal relationship from finance to economic growth. For instance, in the context of the Indian economy, Tripathy and Mishra (2021) substantiated the SLH by demonstrating a unidirectional causality from financial development to economic growth. Equally, Aziz et al. (2023), supporting the supply-side theories, emphasize the importance of a well-functioning financial sector in reducing transaction costs, eliminating information disparities, and lowering management expenses to achieve economic prosperity. Küçüksakarya (2021) research supports the dominance of the SLH, suggesting that financial development is a prerequisite for economic growth across countries, regardless of their varying levels of financial development and per capita GDP growth. Matei (2020) also found evidence supporting this idea, indicating a linear relationship between financial development and economic growth in the short term, thereby confirming the supply-leading channel.

In contrast, the demand-side theories argue that as an economy expands, there is a corresponding increase in the demand for financial products. Economic growth leads to macroeconomic activity, creating a greater need for the expansion of the financial sector. Ibrahim and Acquah (2021) propose that, in line with the demand-following hypothesis (DFH), financial institutions and services expand alongside growing economic activities and the increasing demand for financial

services driven by economic growth. As businesses thrive and the economy prospers, the need for financial products like loans, investments, and insurance rises, prompting financial institutions to expand. Economic growth also boosts incomes and wealth, encouraging more saving and investment, thus increasing the demand for financial services (Tripathy and Mishra 2021). Additionally, a stronger economic environment can spur a greater appetite for risk, motivating individuals to seek higher-return investment opportunities and financial products. Governments may also introduce policies to support financial development in response to economic growth, further fueling expansion (Hyera and Mutasa 2016). Odhiambo (2008) supports the view that, at its core, the DFH suggests that financial development follows the path of economic growth, as a flourishing economy stimulates the demand for financial services and products, leading to their growth and development.

1.3. Empirical Linkage between Finance and Growth

Empirical evidence regarding the impact of financial development on economic growth in emerging markets is still limited but growing (Nguyen et al. 2022); refer also to Table 1. Recent research, such as that conducted by Nguyen et al. (2022) and Sarwar et al. (2021), affirm a positive effect. Several recent studies also report positive impacts, as seen in the works of Siddikee and Rahman (2021) and Bekele and Degu (2023). Aziz et al. (2023) suggest that the expansion of the financial sector positively influences economic growth in developing countries across Asia. Furthermore, Chen et al. (2020) discovered that positive financial development shocks boost short-term growth, while negative shocks have a more significant hindering effect. Kapaya (2020) studied Tanzania, and confirmed a positive link between financial system depth and short-term economic growth, while financial system liquidity and efficiency showed strong negative associations with both short- and long-term economic growth. Additionally, financial development was found to be cointegrated with economic growth.

Čižo et al. (2020) argue that the established positive effect affirms the interconnectedness of financial development and economic growth within EU countries. Zhang and Zhou (2021) indicate that, over the long term, a small open economy can achieve a growth rate of 6.75% when it attains the optimal level of financial development that maximizes growth. However, the level of financial development that maximizes welfare is considerably lower, resulting in a reduced long-term growth rate of 2.62%. In contrast, Ustarz and Fanta (2021), in their examination of sub-Saharan Africa using sectoral disaggregated measures of economic development, illustrate that financial development positively impacts

the service and agricultural sectors, and that there exists a specific threshold of financial development that must be reached before it can exert a positive influence on the growth of the industrial sector.

Conversely, Aluko and Ibrahim (2020) found that that the growth-enhancing impact of finance is particularly pronounced in countries with weaker institutions, indicating that a well-developed financial sector can also serve as a stabilizing force, influencing economic growth. The results indicate that financial development contributes to economic growth during both periods of high and low economic expansion in Pakistan. However, the influence of financial development on economic growth is notably more robust during high-growth phases. Similarly, Rahman et al. (2020) observed positive effects in both low- and high-growth regimes in Pakistan, with a more potent influence during high-growth periods, suggesting varying responses to financial development in distinct growth regimes.

Notably, in a noteworthy meta-analysis, Valickova et al. (2015) delved into the influence of financial development on economic growth, pooling data from 67 studies with 1334 estimates. The meta-analysis finding indicated a statistically significant and positive impact, although there is notable variability among the individual estimates. These variations in results can be traced back to disparities in research methodologies and the inherent heterogeneity of the underlying effect. It is worth highlighting that studies neglecting to address endogeneity tended to exaggerate the relationship between finance and growth. Interestingly, this effect appears to be less pronounced in less developed nations.

Despite an overwhelming positive impact from previous studies (Table 1), Manu et al. (2020), using a panel-VAR, uncovered mixed results for financial development among regions in Africa. Thus, given the persistent positive impact of financial development on economic growth under different contexts, treatments, and methods, what remains unanswered is what would be the separate effects of financial indicators on economic growth under the light of small single open economy analysis using structural vector autoregressive (SVAR) model by decomposing the contribution over time and assessing the impulse response path, size, and direction to bring specific policy recommendations for Seychelles and other developing countries.

The following testable hypotheses are proposed for empirical evaluation:

1.4. Financial Activity and Growth

Numerous studies (Table 1) support a positive impact of financial activity on economic growth, mostly measured by credit to private sector or financial system.

They indicate that the market banking sector is a crucial factor influencing long-term economic growth in South Asian countries. (Sharma and Kautish 2020; Bekele and Degu 2023), thus, in light of the supply leading hypothesis suggesting applicability on developing nations with less developed financial and economic systems, the direction of effects is hypothesized to run from financial development to economic growth, especially since Seychelles is one of the IFC economies, which are well-known for innovations in financial products (Jugurnath et al. 2023). Thus, testing the supply-side hypothesis makes more sense in this case.

H1: Financial activity positively influences economic growth in Seychelles

1.5. Financial Depth and Growth

Hossin (2023), using multivariate Granger causality tests, demonstrates a unidirectional causal relationship between financial depth and economic growth, with causality flowing from financial depth to economic growth. However, Abdullah and Abbas (2022), using the dynamic impact multiplier analysis, reveal that reduced financial depth within financial institutions leads to declining economic growth. Pu'ca'u (2024) supports mixed results as well. Thus:

H2: Financial depth influences economic growth in Seychelles

1.6. Financial Efficiency and Growth

Bekele and Degu (2023) identified a positive impact of efficiency on growth. Manu et al. (2020) showed that financial efficiency significantly enhances economic growth in West African nations but has adverse effects on the economic growth of Central and East African countries. This implies that, all else being equal, rising financial efficiency is likely to boost growth in West African countries, while Central and East African nations may experience reduced growth due to increased financial efficiency. Additionally, Abdullah and Abbas (2022) established a negative relationship, indicating that decreased financial efficiency results in declining economic growth. Thus:

H3: Financial efficiency influences economic growth in Seychelles

Based on the SLH (Figure 2), I develop Models 1, 2, and 3, and the relationships between the variables are depicted through directed connections between columns (input variables) and rows (output variables). Each model illustrates how different financial metrics interact, with arrows indicating the direction of influence. For example, in Model 1, GDP growth (GDPG) receives arrows from final consumption expenditure (FCX), consumer price index (ICP), and financial system credit (FFSC), reflecting that GDP growth is influenced by

these variables. Similarly, FSC influences ICP and GDPG, showing how financial system credit affects both consumer prices and GDP growth. In Model 2, GDPG is influenced by FCX, ICP, and financial system deposits (FSD), with FSD and ICP also affecting each other, demonstrating a more complex interaction. Model 3 further adds financial system efficiency (FSE) as a variable influencing GDPG, highlighting the role of financial efficiency in economic growth. Each model provides a distinct perspective on how financial and economic variables are interrelated, allowing for a comprehensive understanding of their mutual dependencies by incorporating FCX and ICP as relevant control variables affecting both the financial system and economic growth.

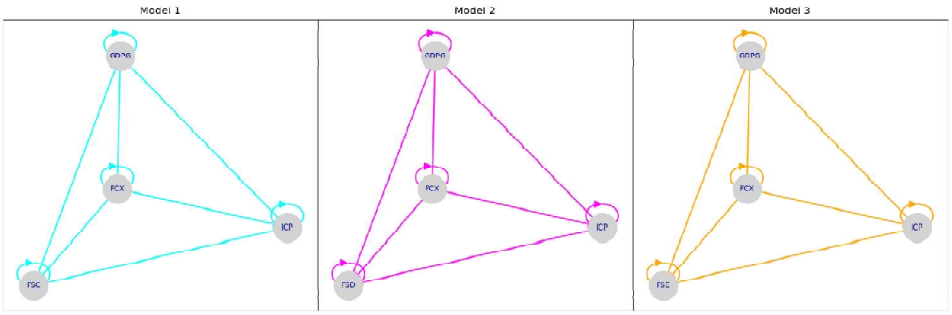

Figure 2: Graphical abstract

2. Materials and Methods

2.1. Data, Variables, and Transformation

To develop this study, I built a dataset for Seychelles that spans from 1990 to 2021. I selected four key variables: financial system credit (FSC), as % of GDP, as used by Murari (2017), Asongu and Nnanna (2020), and Aziz et al. (2023); financial system deposit (FSD), as % of GDP, as used by Asongu and Nnanna (2020) and Asongu and De Moor (2017) as also adapted from money two (M2) as % of GDP conceptualization used by Odhiambo (2008), Murari (2017), and Rioja and Valev (2004) since the two measure are closely related; and financial system efficiency (FSE), as the ratio of FSD to FSC, as used by Asongu and Nnanna (2020), Asongu and De Moor (2017), and Škrinjariæ (2023). These three (FSC, FSD, FSE) measures financial development, while gross domestic product growth rate (GDPG, %), which is used in the aforementioned studies, measures economic growth. Final consumption expenditure (FCX), as % of GDP, and consumer price index (ICP, %) are employed as control variables as used by Asongu and Nnanna (2020), Murari (2017), and Rioja and Valev (2004). These variables are collected at an annual frequency from World Bank Data (2023).

Table 1: Summary of the related literature

	Author(s)	Period(s)	Area of Study	Method(s)	Finance Indicator(s)	Growth Indicator(s)	Finding(s)
1	Aluko and Ibrahim (2020)	1996–2015	28 Sub-Saharan Africa	Two-stage least squares estimator, general method of moments (GMM)	Six lower sub-indices: institutions depth, market depth, institutions access, markets access, institutions efficiency, and markets efficiency	Real GDP per capita	Reveals a disproportionate growth-enhancing effect of finance, higher finance is associated with growth.
2	Aziz et al. (2023)	2001–2017	10 Asian developing economies	Auto-regressive distributed lags (ARDL) model, pooled mean group (PMG), fully modified OLS (FMOLS), dynamic OLS (DOLS)	Domestic credit to private sector (% GDP)	GDP per capita (constant 2010 USD)	Positive long-run relationship between financial expansion and economic progress.
3	Bekele and Degu (2023)	2010–2017	25 Sub-Saharan Africa countries	Two-step system GMM estimation	Domestic credit to the private sector (% of GDP), commercial bank branch per 100,000 adult population, return to assets (proxies for financial sector depth, access, and efficiency, respectively)	GDP per capita	Financial sector depth, access, and efficiency have a positive and statistically significant effect on the GDP per capita.
4	Chen et al. (2020)	1972–2017	Kenya	Nonlinear auto-regressive distributive lag (NARDL)	Financial development index (real interest rates, trade openness, broad money, and domestic credit)	Gross domestic product (GDP) in constant USD	Positive (negative) financial development shocks boost (hinder) short-term growth most significantly.
5	Hossin (2023)	1980–2014	Bangladesh	Cointegration, error correction models, multivariate Granger causality tests	M2/gross domestic product (GDP)	Gross domestic product (GDP)	Only one-way causality between financial depth and economic growth—the flow running from financial depth to economic growth.
6	Küçüksakarya (2021)	2008–2019	16 OECD countries	Panel Granger causality test of the Dumitrescu–Hurlin Test	Domestic credit to the private sector (% GDP)	GDP per capita growth	Supply leading hypothesis holds, financial development is a pre-condition for economic growth.
7	Manu et al. (2020)	1980–2017	33 African countries	Panel vector autoregressive (VAR), panel vector error correction (VEC), panel quantile regression	Financial development index, financial institution efficiency index	GDP per capita	Financial development has mixed effects results.
8	Nguyen et al. (2022)	1980–2020	22 emerging markets	Dynamic common correlated estimator (DCCE) and Granger causality across proxies.	Domestic credit to the private sector (% GDP), domestic credit provided by the financial sector (% GDP)	Real GDP per capita (USD at 2010 constant prices)	Positive linear effect of financial development on economic growth. Bidirectional Granger causality.
9	Paudel and Acharya (2020)	1965–2018	Nepal	Autoregressive distributed lag (ARDL) approach of cointegration	Broad money, domestic credit to private sector, and total credit from banking sector	GDP per capita growth	Financial development causes to economic growth substantially.
10	Rahman et al. (2020)	1980–2017	Pakistan	Markov regime switching model	Financial development index	Real GDP	Financial development augments economic growth in both high- and low- economic-growth regimes.

11	Sarwar et al. (2021)	2002–2017	83 emerging markets	Two-step system, controlling for effects.	Financial development index	GDP per capita (constant 2010 USD)	Positive impact of financial development on economic growth.
12	Sharma and Kautish (2020)	1990–2016	South Asia (four middle-income countries)	Pooled mean group (PMG) estimation	Market capitalization, market turnover, and domestic credit to the private sector	GDP growth	Stock market and banking sector are vital determinants of long-run economic growth in South Asian countries.
13	Shravani and Sharma (2020)	1990–2015	14 Asian economies	Panel autoregressive distributed lag (P-ARDL) and Dumitrescu–Hurlin test of causality	Domestic credit to the private sector, domestic credit provided by banking sector, broad money	GDP per capita (constant 2010 USD)	Mutual positive long-run relationship among all selected indicators of financial development and economic growth
14	Siddikee and Rahman (2021)	1990–2018	Bangladesh	Granger causality test, vector error correction model (VECM)	Domestic credit to the private sector (% of GDP)	Gross domestic product (GDP)	Financial development is marginally positive in the short term but significantly negative in the long term on GDP.

The dataset includes 32 observations for each economic variable (Table 2). Mean values for FCX has a mean of 72.629, indicating substantial consumer spending with moderate variability (SD = 8.592). ICP has high skewness, implying occasional inflation spikes with considerable SD of 8.194. Jarque–Bera tests confirm normality, ensuring variable reliability for further analysis.

FSE stands out with a high mean of 122.792 and a large SD of 42.464, highlighting significant variations. Policymakers should prioritize enhancing financial sector stability. FSC exhibits moderate peakedness (kurtosis = 2.411), maintaining a balanced credit distribution essential for financial stability. FSD and FSE indicate robust financial intermediation and relatively efficient markets. FSD's mean is 69.388, with a moderate SD of 20.402. GDP growth (GDPG) signifies a robust economy, with a mean of 3.302 and a moderate SD of 4.9, suggesting relative economic stability.

Table 2. Summary statistics

	N	*Mean*	*Min*	*Max*	*SD*	*Skewness*	*Kurtosis*	*Jarque–Bera (X2)*	*p-Value*
FCX	32	72.629	55.27	84.929	8.592	“0.822	2.542	5.16	0.0758
ICP	32	4.759	“2.405	36.965	8.194	3.081	11.927	2.717	0.257
FSC	32	62.595	32.081	124.964	28.014	0.77	2.411	2.504	0.286
FSD	32	69.388	34.565	118.375	20.402	0.462	2.863	0.4879	0.7835
FSE	32	122.792	77.788	198.162	42.464	0.709	1.867	3.73	0.1549
GDPG	32	3.302	“8.649	12.194	4.9	“0.415	2.746	1.005	0.6051

Assessment of unit roots was performed at 5% level of significance to ascertain the series stationarity for suitability of analysis. In particular, the Zivot–

Andrews (ZA), augmented Dickey–Fuller (ADF), and Phillips–Perron (PP) tests were used to assess the stationarity of time series data, but they differ in their approaches (Table 3). The ZA test, introduced by Zivot and Andrews (1992), is designed to detect unit roots while accommodating potential structural breaks or shifts in the data, making it suitable for series with structural changes. In contrast, both the ADF test, as presented by Dickey and Fuller (1979), and the PP test, developed by Phillips and Perron (1988), are general unit root tests that do not explicitly consider structural breaks. Therefore, while the ZA test is tailored for data with structural breaks, the ADF and PP tests are versatile options for general unit root testing, with slight differences in their methodologies and critical values. All three are used for a comparative purpose because all the series in this study are of a mixed behavior and have structural breaks. The ICP and GDPG variables are stationary at level while the rest are stationary after first difference. Therefore, I used the stationary form of the variables I(0) or I(1) to run the VAR framework.

Table 3: Unit root tests

Order	*Variable*	*ZA*			*ADF*	*PP (Z(rho))*
		Break in Intercept	*Break in Trend*	*Break in Both*	*Trend*	*Trend*
I(0)	lFCX	−4.791 (2013) *	−2.957 (2009) *	−4.152 (2014) *	−1.765	−9.672 *
I(0)	lICP	−5.028 (1999) ***	−4.822 (2009) **	−5.102 (2016) ***	−4.542 ***	−25.745 ***
I(0)	lFSC	−3.244 (2006)	−1.810 (2016)	−1.528 (1995)	−1.782	−3.985
I(0)	lFSD	−3.297 (2006)	−2.300 (2016)	−2.151 (2015)	−1.66	−4.532 *
I(0)	lFSE	−3.244 (2009)	−2.997 (2002)	−3.129 (1998)	−1.564	−4.025
I(0)	GDPG	−5.473 (2005) ***	−5.202 (2004) **	−5.918 (2005) ***	−4.934 ***	−27.694 ***
I(1)	dlFCX	−7.977 (2010) ***	−8.277 (2016) ***	−10.206 (2013) ***	−3.599 **	−39.559 ***
I(0)	lICP	−5.028 (1999) ***	−4.822 (2009) **	−5.102 (2016) **	−4.542 ***	−25.745 ***
I(1)	dlFSC	−2.679 (2004)	−4.552 (2010) **	−5.101 (2004) **	−2.382	−23.675 ***
I(1)	dlFSD	−2.813 (2013)	−4.958 (2009) ***	−5.084 (2007) **	−2.584	−25.417 ***
I(1)	dlFSE	−7.022 (2016) ***	−6.727 (2015) ***	−7.114 (2008) ***	−3.786 **	−33.280 ***
I(0)	GDPG	−5.473 (2005) ***	−5.202 (2004) **	−5.918 (2005) ***	−4.934 ***	−27.694 ***
Critical Values (1%, 5%)		−5.34, −4.80	−4.93, −4.42	−5.57, −5.08	−4.343, −3.584	−23.14, −18.28

Note: *** p < 0.01, ** p < 0.05, * p < 0.1.

2.2. Utility of SVAR Models and Its Applicability

The choice of the structural vector autoregressive (SVAR) model (Figure 3) is suitable for this analysis due to its ability to capture the interdependencies and causal relationships among these economic variables (Anttonen et al. 2024). Additionally, the annual frequency aligns with the research objectives and the

nature of the economic phenomena being investigated, because the data are annually spaced and variables impacts are annually anticipated. The model is a widely used econometric model in the field of time series analysis finance and macroeconomics (Carriero et al. 2024).

SVAR models, stemming from Christopher Sims' work, focus on identifying structural shocks in VAR models (Sims 1986). They emphasize the importance of understanding and interpreting these shocks (Christiano et al. 2005). SVAR models disentangle causal relationships among variables, shedding light on how changes in one economic variable affect others-a critical insight for policymakers and analysts (Sims 1986). SVARs enable the assessment of policy interventions by simulating their impact on the economy.

In the current case, I examine how changes in FCX, ICP, FSC, FSD, FSE, and GDPG influence GDPG and each other. SVAR models also find application in economic forecasting. By incorporating lagged values and interactions among variables, they generate forecasts, aiding businesses, financial institutions, and governments in informed decision-making (Lütkepohl and Poskitt 1991). In sum, SVAR models are versatile and invaluable tools in econometrics and macroeconomic analysis due to their flexibility and structured framework. They facilitate understanding causal relationships, conducting policy experiments, and making informed economic forecasts, making them indispensable for economists, policymakers, and analysts.

$$\underline{Model\ 1 \rightarrow}\begin{bmatrix}\varepsilon_t^{dlFCX}\\ \varepsilon_t^{lICP}\\ \varepsilon_t^{dlFSC}\\ \varepsilon_t^{GDPG}\end{bmatrix}=\begin{bmatrix}1 & 0 & 0 & 0\\ * & 1 & 0 & 0\\ * & * & 1 & 0\\ * & * & * & 1\end{bmatrix}\begin{bmatrix}\mu_t^{dlFCX}\\ \mu_t^{lICP}\\ \mu_t^{dlFSC}\\ \mu_t^{GDPG}\end{bmatrix};\ \underline{Model\ 2 \rightarrow}\begin{bmatrix}\varepsilon_t^{dlFCX}\\ \varepsilon_t^{lICP}\\ \varepsilon_t^{dlFSD}\\ \varepsilon_t^{GDPG}\end{bmatrix}=\begin{bmatrix}1 & 0 & 0 & 0\\ * & 1 & 0 & 0\\ * & * & 1 & 0\\ * & * & * & 1\end{bmatrix}\begin{bmatrix}\mu_t^{dlFCX}\\ \mu_t^{lICP}\\ \mu_t^{dlFSD}\\ \mu_t^{GDPG}\end{bmatrix};\ \underline{Model\ 3 \rightarrow}\begin{bmatrix}\varepsilon_t^{dlFCX}\\ \varepsilon_t^{lICP}\\ \varepsilon_t^{dlFSE}\\ \varepsilon_t^{GDPG}\end{bmatrix}=\begin{bmatrix}1 & 0 & 0 & 0\\ * & 1 & 0 & 0\\ * & * & 1 & 0\\ * & * & * & 1\end{bmatrix}\begin{bmatrix}\mu_t^{dlFCX}\\ \mu_t^{lICP}\\ \mu_t^{dlFSE}\\ \mu_t^{GDPG}\end{bmatrix}$$

where $\varepsilon_t^{dlFCX}, \varepsilon_t^{lICP}, \varepsilon_t^{dlFSC}, \varepsilon_t^{dlFSD}, \varepsilon_t^{dlFSE}$, *and* ε_t^{GDPG} are the structural disturbances or shocks for the respective variables. $\mu_t^{dlFCX}, \mu_t^{lICP}, \mu_t^{dlFSC}, \mu_t^{dlFSC}, \mu_t^{dlFSE}$ *and* μ_t^{GDPG} are the residuals in the reduced form equations, representative of unanticipated disturbances (specified information in the systems) (Narayan et al. 2012).

Figure 3: SVAR models

2.3. SVAR Model Specification, Identification, and Estimation

The SVAR model begins with the specification of a vector autoregressive (VAR) model (Equation (1)). The VAR model captures the joint dynamics of the selected variables over time. In the current case, three SVAR models with four lags through Akaike information criterion are specified compactly as follows:

$$Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + A_3 Y_{t-3} + A_4 Y_{t-4} + \varepsilon_t \quad (1)$$

where
Y_t is a vector of the four variables: [FCX_t, ICP_t, FS_t, $GDPG_t$], $FS_t = FSC_t$, FSD_t, FSE_t substituted into three different SVAR models (Figure 2); A_1, A_2, A_3, & A_4 are coefficient matrices to be estimated (Amisano and Giannini 1997); ε_t is a vector of white noise error terms.

The SVAR model choice is apt here, as it captures the simultaneous interactions among these variables, depicting their dynamic interplay (Cordoni et al. 2024). Identification is pivotal in SVAR modeling, entailing the recognition of the structural shocks underlying the VAR model's observed dynamics. This process frequently relies on economic theory and prior knowledge (Demetrescu and Salish 2024). Common identification techniques encompass Cholesky decomposition and sign restrictions (Carriero et al. 2024), with the former applicable to the three just-identified models (Figure 2) in the current study. The VAR model is then estimated using ordinary least squares (OLS). The estimated coefficients A_1, A_2, A_3, and A_4 capture the contemporaneous and lagged relationships between the variables.

2.4. Robustness Checks

The inclusion of robustness checks underscores the suitability of the SVAR model, as it ensures the reliability of the model's findings and conclusions (Demetrescu and Salish 2024). Essential diagnostic tests, such as stability tests (roots of the companion matrices) (Figure A1 in Appendix A), and heteroscedasticity, non-normality (Table 2). The Lagrange multiplier test results (Table 4) show no significant autocorrelation at lags 1, 2, and 3 for all models, with p-values ranging from 0.102 to 0.852. This indicates that the models do not exhibit significant serial correlation, suggesting they are well-specified and no adjustments for autocorrelation are necessary. With the possible effects of variables of mixed stationarity, to ensure that the dynamics and shocks are accurately understood, the following measures are taken: when interpreting impulse response functions (IRFs) in an SVAR model with variables of mixed stationarity, I ensure that shocks are accurately propagated through both stationary and differenced series, and validate the IRFs against theoretical expectations and data characteristics. I assess whether the IRFs reflect plausible long-term impacts and check for consistency with economic theories. I run sensitivity tests by experimenting with different lag lengths and model specifications to confirm robustness, and verify the stability of the model by checking residuals for autocorrelation and

heteroskedasticity, as well as testing eigenvalue stability conditions to avoid unreliable results.

Table 4: Lagrange multiplier test

	Model 1		*Model 2*		*Model 3*	
lag	*chi2*	*Prob > Chi2*	*chi2*	*Prob > Chi2*	*chi2*	*Prob > Chi2*
1	16.716	0.404	16.726	0.404	19.824	0.228
2	23.445	0.102	23.446	0.103	21.252	0.169
3	19.552	0.241	10.279	0.852	19.51	0.243

Note: H0: no autocorrelation at lag order.

2.5. Structural Impulse Response Analysis for Policy Analysis and Interpretation (SIRF)

SIRF is primarily concerned with the causal and structural relationships between variables in a mul-tivariate time series model. It aims to identify and quantify the effects of exogenous shocks or inter-ventions on the endogenous variables, considering the underlying economic or theoretical structure of the system. An SIRF analysis helps understand the dynamics of these factors and their impact on economic growth in the short to medium term. Once the SVAR model is estimated, the SIRF analysis is conducted to examine how each variable responds to structural shocks. Impulse responses show the dynamic effects of shocks on the variables over time (Carriero et al. 2024).

The SVAR model's aptness lies in its capacity to unveil the propagation of exogenous shocks within the system, facilitating policy-related insights (Cordoni et al. 2024). Following SVAR model estimation, policy analyses are undertaken, evaluating the effects of exogenous shocks on the relevant variables. For example, one may inquire about the short and long-term impact of an FCX shock on GDPG or FSC. These results are interpreted in alignment with economic theory and the identified structural shocks (Narayan et al. 2012).

3. Results and Discussion

3.1. Structural Vector Autoregression (SVAR)

The SVAR analysis (Model 1) (Table 5) indicates several key insights from the coefficients of the varia-bles. Firstly, concerning final consumption expenditure, the positive coefficient suggests that changes in final consumption expenditure are influenced by their own past values, indicating a persistence in consumer spending behavior. The same temporal dependence is evidenced for financial system credit, financial system depth, financial system efficiency, and economic

growth. Additionally, the positive FCX suggests that consumer spending can influence inflation, possibly through increased demand for goods and services.

The positive coefficient of ICP with FSC (Model 1) implies that inflation affects financial system credit, likely due to central bank policies responding to inflationary pressures. The positive coefficient with GDPG underscores the importance of financial system credit in driving GDP growth, emphasizing the role of credit availability in economic expansion. The coefficient of FSC on GDP growth (GDPG) is 4.889, significant at the 5% level. This shows that an increase in financial system credit positively affects GDP growth. The availability of credit stimulates economic activities, leading to growth.

For Model 2 (Table 5), the positive coefficient of ICP with FSD suggests that changes in inflation po-tentially causes shifts in consumer savings behavior in response to inflation. Most notably, the highly significant positive coefficient between FSD and GDP growth highlights the crucial role of savings and deposit accumulation in driving GDP growth, underscoring that a higher level of savings and deposits can stimulate economic expansion. The coefficient of FSD on GDPG is 9.155, significant at the 1% level. This indicates a strong positive relationship between financial system depth and GDP growth. A deeper financial system, characterized by more assets and financial services relative to the economy, facilitates economic expansion by providing more investment opportunities and resources.

For Model 3, the significant negative coefficient of ICP with FSE indicates that changes in the inflation can negatively impact financial system efficiency, possibly reflecting disruptions or regulatory re-sponses to inflationary pressures. The coefficient of FSE on GDPG is 1.666, but statistically insignificant, which suggests that, in this model, financial system efficiency does not have a direct or significant impact on GDP growth. Even though efficient financial systems are important for allocating resources effectively, they might not contribute directly to economic growth in this specific context due to possibly negative impacts of inflation on financial system efficiency, as highlighted in the results.

These results support the supply leading hypothesis proposed before. The supply-leading hypothesis (SLH) posits that the development of the financial system precedes and drives economic growth (Tripathy and Mishra 2021). It argues that the expansion of financial institutions and markets supplies the necessary capital and financial services, stimulating investment, innovation, and overall economic activity. The positive and significant effect of FSC on GDP growth supports the supply-leading hy-pothesis. An increase in financial system credit enhances access to capital, enabling businesses and households to finance

consumption, investment, and expansion. This aligns with the SLH, as credit availability (a supply-side factor) stimulates economic growth by facilitating productive investments. In Model 1, the financial system is actively "leading" growth by providing the necessary capital that fuels expansion, as proposed by the hypothesis.

In Model 2, the strong positive and highly significant impact of FSD on GDP growth is a direct affir-mation of the supply-leading hypothesis. FSD, which reflects the overall size and depth of the financial sector, is a critical supply-side factor. A deeper financial system provides more avenues for savings, investment, and capital allocation, thereby driving economic growth. In Model 3, the insignificant impact of FSE on GDP growth presents an interesting challenge to the supply-leading hypothesis. FSE reflects how effectively the financial system allocates resources, as supported by a positive significant coefficient (13.675), but the results indicate that, in this model, efficiency alone is not enough to drive GDP growth significantly. This suggests that even though a financial system might be efficient, without sufficient depth (FSD) or adequate credit (FSC), its contribution to growth may be limited. From the SLH perspective, it implies that financial efficiency needs to be accompanied by other factors, such as a robust credit market and a deep financial system, to truly lead economic growth. Figure 4 models are updated hypothetical representation based on data findings.

The SVAR results have important economic implications for Seychelles and other developing countries. In Seychelles, the persistence of final consumption expenditure and inflation suggests the need for vigilant policymaking to monitor and manage consumer spending and inflation trends to maintain economic stability. The positive impact of financial system credit on GDP growth underscores the sig-nificance of ensuring accessible credit for businesses and individuals to stimulate economic expansion. For other developing countries, it

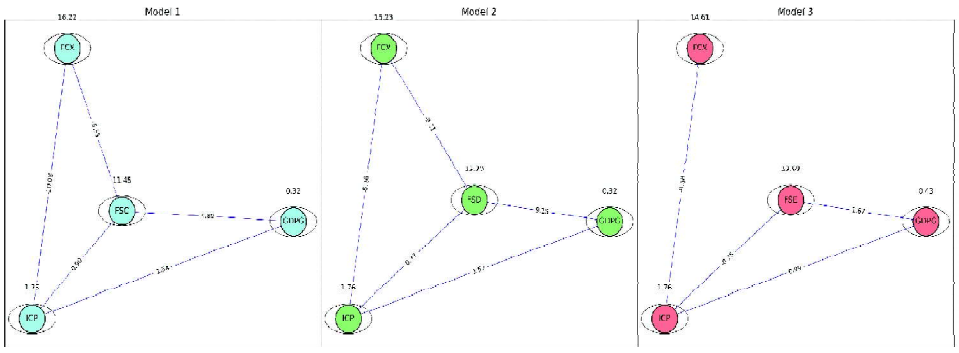

Figure 4: Revised relationships based on statistical significance

is crucial to recognize the persistence of inflation and its potential impact on consumer spending, necessitating effective inflation control measures and fiscal policies to maintain price stability and support consumption.

Table 5: Structural vector autoregression results

Model 1	*FCX*	*ICP*	*FSC*	*GDPG*
FCX	16.217 *** (2.167)			
ICP	–10.077 *** (3.348)	1.75 *** (0.234)		
FSC	–8.55 ** (3.785)	0.899 ** (0.352)	11.453 *** (1.530)	
GDPG	4.527(4.000)	1.544 *** (0.425)	4.889 ** (2.261)	0.32 *** (0.043)
Model 2	FCX	ICP	FSD	GDPG
FCX	15.226 *** (2.035)			
ICP	–5.257 * (2.962)	1.757 *** (0.235)		
FSD	–9.208 *** (3.283)	0.77 ** (0.348)	13.302 *** (1.778)	
GDPG	0.081(3.506)	1.524 *** (0.416)	9.155 *** (2.796)	0.318 ***(0.043)
Model 3	FCX	ICP	FSE	GDPG
FCX	14.612 *** (1.988)			
ICP	–9.381 *** (3.088)	1.758 *** (0.239)		
FSE	5.538(3.426)	–0.751 ** (0.353)	13.675 *** (1.861)	
GDPG	24.128 *** (4.805)	0.988 ** (0.392)	1.666 (2.641)	0.432 *** (0.059)

Note: standard errors in brackets *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The observed relationship between financial system deposits and inflation suggests that changes in consumer behavior in response to inflation can impact savings and deposit accumulation. Encouraging a culture of savings and promoting sound financial practices among individuals can contribute to economic stability and growth. The strong positive impact of financial system deposits on GDP growth highlights the pivotal role of savings and deposit mobilization in stimulating economic expansion.

The relationship between financial system efficiency and inflation implies that changes in financial sector efficiency may be influenced by regulatory responses to inflation. Governments and regulators should strive to strike a balance between financial stability and efficiency, ensuring that the financial sector remains robust while effectively serving the real economy's needs. Therefore, the development and maintenance of a well-functioning financial system with effective intermediation and risk management are crucial for fostering sustained economic growth.

3.2. Structural Impulse Response Function (SIRF)

The SIRF graph (Figure 5) shows declining GDP growth rate in response to a shock on GDP itself; it suggests a possible scenario where various factors might

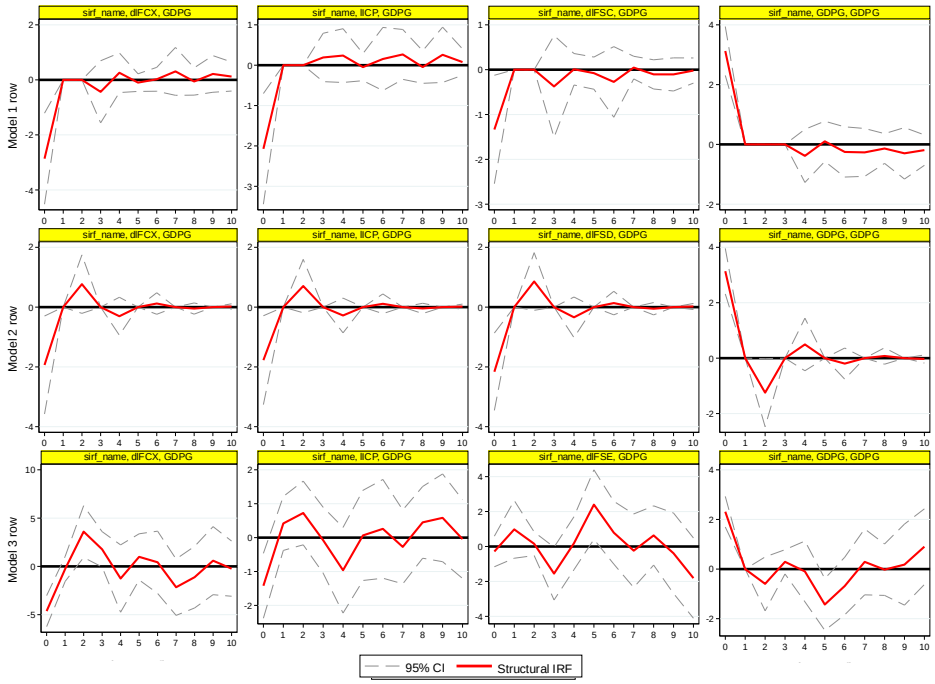

Figure 5: Structural impulse response function.

contribute to this decline. Economic overheating, caused by unsustainable growth, prompts monetary tightening to control inflation, which hampers economic expansion. Fiscal tightening, driven by high public debt, reduces government spending and contracts economic activity. Others are exchange rate depreciation, which increases import costs, dampening domestic demand and GDP growth.

Alternatively, financial crises may lead to credit contractions and reduced lending, stifling economic growth. External shocks, like global recessions or plummeting commodity prices, negatively affect the country's GDP growth. Policy uncertainty discourages investment, hampering economic expansion. Crowding out occurs when high government borrowing leads to higher interest rates, reducing private sector investment and GDP growth. Structural issues, such as regulations and labor market rigidities, limit economic potential. High external debt servicing diverts income from domestic investment. Negative investor sentiment triggers capital flight and reduced foreign investment, causing a decline in GDP growth.

The economic implications of the SIRF (Figure 5) highlighting rising responses of GDP growth to various impulses, can be summarized as follows: impulses on consumption result in increased consumer spending, which drives

economic expansion, potentially leading to higher GDP growth rates. Policies stimulating consumer spending can positively impact overall economic growth; impulses on inflation have mixed implications for GDP growth. Moderate inflation reflecting healthy demand can boost economic growth, but excessive inflation can erode purchasing power and dampen GDP growth. The magnitude and sustainability of inflation are crucial considerations.

A positive impulse on financial system credit, indicating increased lending by financial institutions, stimulates economic activity and contributes to rising GDP growth. Initially, the response is positive and not strictly negative; instead, it oscillates between positive and negative values. It is arguably gradually moving toward a more positive state over time. Therefore, credit expansion facilitates investment, business expansion, and consumption, positively impacting GDP growth. A positive impulse on financial system deposit may suggest rising savings within the economy, providing a stable source of funds for investment and lending. However, it may also imply reduced short-term consumer spending, potentially slowing the rise in GDP growth. A positive impulse on financial system efficiency, indicating improved financial intermediation and resource allocation, positively affects GDP growth. Enhanced financial efficiency leads to better capital allocation, reduced transaction costs, and improved overall economic productivity, contributing to sustained GDP growth. Positive impulses of FSC, FSD, and FSE on GDP growth highlights the active roles of financial system channels on economic growth, supporting a SLH.

4. Conclusions and Policy Recommendations

This study investigated the financial system dimensions and their respective impacts on economic growth among other factors. Financial system activity, financial system depth, and financial system efficiency are all found to both economically and statistically significantly affect economic growth in Seychelles, with the exception of statistically significant for financial efficiency on economic growth. Conclusions and policy actions are delineated below.

The SIRF analysis underscores the significance of policies and conditions that encourage consumer spending, maintain moderate inflation, promote increased lending, and enhance financial system efficiency. These factors can lead to rising GDP growth in developing countries. Policymakers must carefully assess trade-offs and potential risks associated with each policy or condition to achieve balanced and sustainable economic growth. For impulses on consumption, one effective policy action involves implementing income support programs that target low- and middle-income households. Such programs can

include direct cash transfers, unemployment benefits, or food assistance initiatives to boost disposable income and stimulate consumer spending.

Additionally, governments can introduce temporary tax incentives, such as lower sales tax rates or tax credits for specific purchases, aimed at encouraging consumer spending and fostering increased demand for goods and services. In response to impulses on inflation, adopting an inflation targeting framework is a valuable policy option. This entails setting a transparent and credible inflation target and adjusting interest rates accordingly to maintain price stability. Concurrently, governments can pursue supply-side reforms, focusing on improving infrastructure, reducing trade barriers, and enhancing productivity to mitigate cost-push inflation.

To address impulses on financial system credit, the establishment of credit guarantee schemes can be a beneficial step. These schemes can help mitigate lending risks for financial institutions, particularly when they are extending credit to small and medium-sized enterprises and startups. Simultaneously, regulatory reforms should be implemented to enhance financial regulations, promoting responsible lending practices while safeguarding financial stability. Encouraging financial institutions to broaden access to credit, especially to underserved sectors of the economy, is crucial.

Regarding impulses on financial system deposit, governments can consider promoting financial literacy and inclusion programs. These programs can educate the population about financial matters, fostering a savings culture and encouraging individuals to deposit their savings in the formal financial system. Adjusting interest rates on savings accounts to make them more attractive to depositors is another policy option, providing incentives for individuals and businesses to keep their funds in the banking system.

Finally, for impulses on financial system efficiency, policy actions should encompass regulatory reforms aimed at streamlining processes and reducing bureaucratic hurdles to enhance financial system efficiency. Simplifying licensing, permit, and compliance procedures for financial institutions is vital. Moreover, encouraging the adoption of modern financial technology (FinTech) solutions can significantly improve the efficiency of financial intermediation, payment systems, and access to financial services, thereby promoting economic growth.

Therefore, to support economic growth, policymakers should prioritize policies that promote GDP growth, such as investments in infrastructure, education, and innovation, along with initiatives to encourage private sector development. Additionally, policies that bolster consumer confidence and disposable income, such as targeted income support programs and tax incentives

for consumer spending, should be implemented. Vigilant inflation management through transparent and credible inflation targeting frameworks is essential. Simultaneously, fostering responsible lending practices and financial stability by enhancing financial regulations and supervision is crucial.

To manage the feedback relationships effectively, policymakers should adopt a holistic approach to economic policy. This approach should include comprehensive policies that promote economic stability, consumer confidence, financial system soundness, and efficiency. By considering the interplay of these variables, policymakers can harness these feedback relationships to drive positive economic outcomes and mitigate potential risks.

Policymakers should consider implementing measures to control inflation, such as effective monetary policy and supply-side reforms, to bolster consumer purchasing power. Moreover, acknowledging the relationship between financial system credit and GDP growth, these countries should consider policies that promote a healthy financial system and facilitate access to credit for productive investments. Policymakers should strive to implement policies and financial instruments that not only encourage savings but also channel these deposits into productive investments, thereby driving economic growth. Ultimately, policymakers in both Seychelles and other developing countries should tailor their strategies based on these SVAR results while considering their unique economic conditions.

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Data Availability Statement

The data for this study were sourced at the World Bank Group, world development indicators website. The general handle at https://databank.worldbank.org/source/world-development-indicators.

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Appendix A

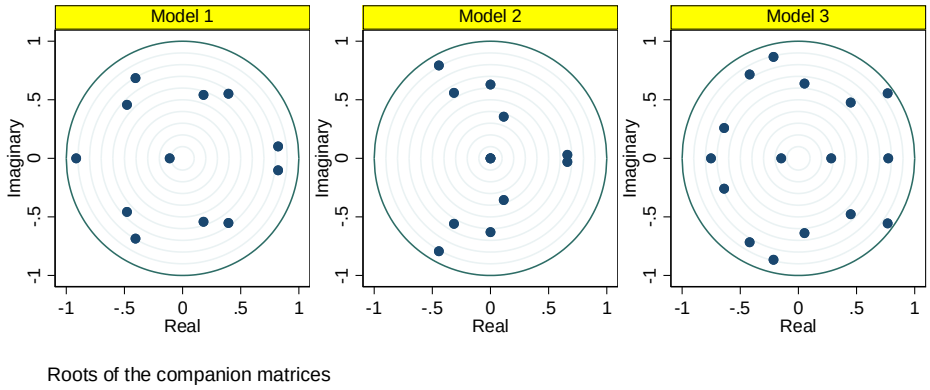

Figure A1: Roots of companion matrices

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