South Africa’s inflation: Monetary or fiscal?

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Abstract

Conventional macroeconomics has viewed inflation as a monetary phenomenon through the Quantity Theory of Money. Ever-increasing sovereign debt globally has caused concern among economists. These concerns follow not from the ability of governments to repay their debt, but rather from the impact of sizeable debt portfolios on price levels. The Fiscal Theory of the Price Level epitomizes these concerns, contrasting the traditional view on inflation by arguing that it is a fiscal phenomenon caused by debt issuance without real backing. This study uses this fiscal inflation theory to analyse South Africa's inflation through a fiscal-monetary VAR model, finding that South Africa's inflation dynamics are accurately described by both monetary and fiscal factors, but more so by the latter.

JEL Classification: E31, E4, E51, E58, E62
Keywords: Monetary and fiscal interactions, Fiscal theory of the price level, Inflation

1 Introduction

The most recent edition of the International Monetary Fund's (IMF, 2024) *Fiscal Monitor* report paints a grim picture of the global state of fiscal policy. The report analyses the latest public finance developments, emphasising the need for global fiscal consolidation to strengthen government debt sustainability and financial stability. Considering that more than eighty countries are set to hold elections in 2024, the fiscal position of the global economy is particularly vulnerable. The report goes on to state,

> Global public debt is projected to approach 99 percent of GDP by 2029, driven by China and the United States where, under current policies, public debt is projected to continue rising beyond historical peaks. Spending pressures to address structural challenges, including demographic and green transitions, are becoming more pressing. At the same time, slowing growth prospects and still-high interest rates are likely to further constrain fiscal space in most economies.

The fiscal conundrum the world economy finds itself in prompts the present paper to revisit inflation theory. Conventional economic theory argues inflation is purely a monetary phenomenon over the long term. This is done through reasoning about the Quantity Theory of Money (QTM).[1] An alternative theory, the Fiscal Theory of the Price

[1] See Section 2 for a detailed theoretical discussion of the QTM and the FTPL.

Level (FTPL), considers the global fiscal context as the reason for inflation. The FTPL posits that monetary authorities should pay attention to the scale of debt issued by their fiscal counterpart, the maturity thereof, and the state of current and future government budget balances. The reason: political deadlock sees fiscal authorities unable to address budgetary shortfalls through increased tax revenue or reduced expenditures – leading to debt issuance. With sizeable sovereign debt levels, adjustments in policy rates by central banks can significantly affect government budget balances, hindering the effectiveness of monetary policy. Even worse, in the case of a possible default, monetary authorities may be required to monetise debt, introducing inflation. Thus, given substantial debt levels, monetary authorities can be restricted in setting policy interest rates to tame inflation. In worst-case scenarios, central banks are forced to bail out governments facing the risk of default by creating more fiat money. In essence, the FTPL views the current global fiscal position as a significant risk to sustained inflationary pressure – a view that does not follow the conventional QTM.

Given the concerns toward the globe's unsustainable fiscal position and the arguments of the FTPL, the South African case is particularly worrying. The data show that the primary budget balance was negative in 11 of the 17 quarters between 2020Q1 and 2024Q1, averaging -1.5% of GDP. Furthermore, during the same period, the value of gross marketable sovereign debt increased by 56% and price levels (GDP deflator) increased by 23% cumulatively. These figures imply that the FTPL's findings may explain the substantial increase in inflation. More importantly, if the FTPL holds true, South Africa (SA) can only reduce inflationary risks by ensuring future fiscal surpluses, and most importantly, convincing debt holders that debt will not be monetised.

This paper highlights how macroeconomics currently views inflation and considers factors that are not yet accounted for by existing theories. In doing so, we show that macroeconomics has mainly taught inflation theory from a monetary perspective – the rather famous words by Friedman (1963) highlight this fact: "inflation is always and everywhere a monetary phenomenon." This paper does not dispute the fact that considerable evidence has been produced highlighting the significant relationship between inflation and money growth. Nor does this paper aim to validate Sargent (2013)'s view that "persistent high inflation is always and everywhere a fiscal phenomenon". What this paper is suggesting, however, is that the QTM and similar monetary perspectives, were formed during an era wherein fiscal deficits and sovereign debt had not yet manifested as serious economic constraints that could be inflationary. We therefore, present a theory that takes an opposite perspective of the QTM, aiming to shed light on the economic shortcomings of current inflation theory in so as to establish a broader perspective on the topic.

The present study attempts to address a significant gap in the existing literature by presenting significant evidence that current inflation should not be viewed exclusively as a monetary phenomenon. Rather, current inflation dynamics, at least in the South African context, is shown to be explained relatively well by the FTPL. That is, current inflation is fiscal in nature, at least partially, and is argued to be a phenomenon of fiscal and monetary policymaking – a finding in contradiction to conventional monetarist perspective inflation theory.

We propose a fiscal-monetary VAR model accounting for 3 of the 4 QTM variables and all of the "simple" FTPL model's variables.[2] The proposed model accounts for

[2]For QTM variables, we exclude velocity of money in equation (1). For FTPL variables, we refer to variables in equation (3).

both monetary and fiscal policy with no restrictions on either active or passive policy rules as in (Leeper, 1991). Our proposed fiscal-monetary VAR model is inspired by Cochrane (2022a), in which the author examines dynamic correlations and co-movements among the components of the government's budget identity. This approach aims not to provide causal inferences on the relationships between component variables. Rather, the methodology provides insight into the patterns hidden in the data that may not be visible when applying rudimentary analysis. It is for this reason that we do not impose any restrictions on the proposed fiscal-monetary VAR models.

The results show that the proposed fiscal-monetary VAR model is relevant as it demonstrates that, over the full-sample period (1994Q1 – 2024Q4), monetary policy in SA is active. The monetary authority controls inflation, while fiscal policy remains passive, with public debt stabilised by primary budget surpluses. Additionally, SA has also experienced active fiscal policy. In the event of a deficit shock, government debt would surge, requiring the fiscal authority to use inflation to stabilise debt, at least partially. While the results of the interest rate shock show no strong evidence that SA's inflation can be explained by either the QTM or the FTPL, the results of the fiscal policy shock show strong evidence of the FTPL. An unexpected negative primary budget balances shock results in a significant increase in both government debt and money, whereas inflation decreases contemporaneously. Furthermore, a negative primary budget balances shock has a substantially greater influence on the economy compared to a monetary shock and the market value of government debt is influenced substantially by both monetary and fiscal policy, whereas other variables do not fluctuate to the same extent.

As shown in Section 3, South Africa's macroeconomic landscape has changed significantly since the global financial crisis (GFC). This underscores the need for further investigation of the post-GFC period. We therefore conduct a comparative analysis between the full-sample and the post-GFC sub-sample. The results from sub-sample analysis reinforce the findings for the fiscal shock from the full-sample analysis. That is, there is much stronger evidence of the FTPL and no evidence of the QTM during the post-GFC period. In contrast, the results of the interest rate shock provide strong evidence of both the QTM and the FTPL during the post-GFC period. Additionally, the results show that interest rate operations by the monetary authority have a significant impact on the fiscal position of the economy. As long as the debt burden does not decrease, South Africa will continue to face a substantial threat of rising inflation, as conventional monetary policy will weaken the fiscal position through the debt service cost channel.

Comparing the results of our proposed fiscal-monetary VAR model and that of Cochrane (2022a) highlights that whether we consider a fiscal-monetary perspective in our proposed model or a more "pure" fiscal perspective from the viewpoint of Cochrane (2022a), the results are largely unchanged. It indicates that our findings are robust. Additionally, this comparison analysis shows that, without monetisation, the economy requires a significant larger increase in primary budget balances, along with a higher economic growth, to stabilise government debt.

The rest of the paper is organised as follows. Section 2 reviews the related literature; Section 3 examines SA's current fiscal position, money growth, and inflation dynamics; Section 4 outlines the methodology and data used in the study; Section 5 presents the results. Section 6 provides a further discussion of study and Section 7 concludes.

2 Literature review

Conventional macroeconomic inflation theory is typically considered from the perspective of the QTM. Surveying popular macroeconomic textbooks (Mankiw, 2012; Romer, 2015; Williamson, 2018; Garín et al., 2018) highlights this fact with price level adjustments and their determinants either being considered using the QTM, or at the very least models echoing the popular theory. Unlike the FTPL, this perspective focuses on central banks as the sole force maintaining fiat money at appropriate levels. This may be a significant oversight in the current context of the world economy, as the main inflation theory taught to economics students does not account for the actions of fiscal authorities in explaining inflation, despite these actions becoming increasingly important.

The QTM can be expressed as the following:

$$M_t \cdot V_t = P_t \cdot Y_t, \tag{1}$$

which states that conditional on the output level, Y_t, and velocity of money in the economy, V_t, the price level, P_t, is determined by the supply of money, M_t, which is determined exogenously by the central bank. A common view is that changes in Y_t and V_t occur so gradually that it is fair to take the variables as constant, allowing for a direct link between price level adjustments and money supply. It is also common to assume that V_t is set exogenously. Nonetheless, rising inflation is said to result from too much money chasing too few goods. In the case of SA, inflation is thus driven by money stock levels as determined by the monetary authority – the South African Reserve Bank (SARB).

The roots of the FTPL, according to Bassetto Bassetto (2008), find themselves in the incompleteness of the QTM in uniquely determining equilibrium price levels. That is, the specification of equation (1) allows P_t to take multiple values that satisfy the equation. In the case of an exogenous i_t, wherein central banks employ an interest rate targeting regime, the QTM becomes particularly indeterminate regarding price levels. This follows from the QTM specifying the influence of the interest rate on the demand for money, but no clear mechanism is specified regarding the supply of money. Consequently, multiple combinations of money supply and price levels could be consistent with the exogenously set interest rate. Sargent and Wallace (1975) show this with the initial price level of the QTM being indeterminate and subsequent inflation being subject to sunspots – uncertainty from self-fulfilling expectations.

Sargent and Wallace (1981) propose one of the first models that would contribute to the FTPL's birth, commonly referred to as the unpleasant monetarist arithmetic. The authors show that under certain conditions the fiscal position of an economy determines inflation. One of these conditions is a fiscal limit existing due to a debt-to-GDP ceiling, which is subject to demand from the private sector. That is, the government faces a limited appetite for its debt. Another condition is that the government remains committed to remaining solvent. Thus, at this fiscal limit if a government runs a budget deficit, solvency is ensured by the central bank through seigniorage revenue – additional fiat money. Consequently, the cost of solvency at the fiscal limit is inflation.

Building on the unpleasant monetarist arithmethic, the simplest form of the FTPL (Leeper, 1991; Sims, 1994; Woodford, 1994) is represented through the government budget constraint:

$$\frac{B_t}{P_t} = \text{Present value of primary budget surpluses as of time } t, \tag{2}$$

where $\frac{B_t}{P_t}$ represents real government liabilities (i.e., debt and fiat money) and the right-hand side of the equation represents real assets. This form of the FTPL assumes that the present value of primary budget balance surpluses is fixed and exogenous, by way of government commitment. Leeper (1991) defines this as an "active" fiscal policy, whereas Woodford (1995) considers it a "Non-Ricardian" fiscal regime.

Given some initial liability level B_0, the FTPL can uniquely identify the initial price level P_0, even in the case of an interest rate targeting regime. The price levels of subsequent periods are also uniquely identified as long as government commitment exists towards the present value of budget balance surpluses. Furthermore, monetary policy-making continues to influence inflation. In the case of an interest rate peg, nominal liabilities, B_t, would adjust as the central bank manages money stock levels, leading to price levels, P_t, adjusting to satisfy equation (2).

Cochrane (1999) consolidates the work of several significant authors (Leeper, 1991; Sims, 1994, 1997; Woodford, 1995, 1996, 1997) by deriving an explicit form of the simple intertemporal equation, which includes additional elements (such as future expectations) compared to the "original" representation of equation (2), that describes the basic dynamics of the FTPL – providing an intuitive explanation of the theory:

$$\frac{B_{t-1}(t)}{P_t} = E_t \sum_{j=0}^{\infty} \frac{1}{r^j} s_{t+j}. \tag{3}$$

$B_{t-1}(t)$ represents the value of outstanding nominal government debt issued in period $t-1$, maturing in period t, P_t shows the period t price level, and $E_t \sum_{j=0}^{\infty} \frac{1}{r^j} s_{t+j}$ represents the expected real present value of future government primary budget balances, with r representing the return on government bonds and s_t representing the real primary budget balance in period t. As in the case of the "simple" FTPL, nominal government debt levels and primary budget balance levels are exogenous, and price levels are endogenous.

To illustrate the dynamics of equation (3), Cochrane (1999) presents two scenarios. The first assumes "bad news" regarding future government primary budget balances comes to light, implying a reduction in $E_t \sum_{j=0}^{\infty} \frac{1}{r^j} s_{t+j}$. Assuming that the government debt level $B_{t-1}(t)$ does not increase, the price level P_t must increase to ensure that the equation is satisfied. That is, changes in future primary budget balances induce contemporaneous price level adjustments. The second scenario assumes a government issues additional debt at time t, whilst the expected present value of future government primary budget balances ($E_t \sum_{j=0}^{\infty} \frac{1}{r^j} s_{t+j}$) remain unchanged. Consequently, because the additional debt only matures in period $t+1$, P_{t+1} increases with no changes to the price level of period t. That is, additionally issued government debt will not have a contemporaneous effect on price levels, however, future price levels will increase.

The present value budget constraint in equation (3) makes a significant assumption – governments issue one-period maturing debt only. This simplification is addressed by accommodating governments issuing both short-term and long-term debt (Cochrane, 2001):

$$\frac{B_{t-1}(t)}{P_t} + \sum_{j=1}^{\infty} \frac{1}{r^j} E_t \left(\frac{B_{t-1}(t+j)}{P_{t+j}} \right) = E_t \sum_{j=0}^{\infty} \frac{1}{r^j} s_{t+j}. \tag{4}$$

Equation (4) follows from equation (3), with the addition of the term $\sum_{j=0}^{\infty} \frac{1}{r^j} E_t \left(\frac{B_{t-1}(t+j)}{P_{t+j}} \right)$, which represents the expected real present value of long-term government debt $B_{t-1}(t+j)$, issued in period $t-1$ that matures in period $t+j$.

The implication of introducing long-term debt into the fiscal theory framework is that governments are able to shift price level adjustments between periods. That is, by issuing long-term government debt in period t which matures in period $t + j$, inflation can be postponed to period $t + j$. This is illustrated by revisiting the “bad news” scenario put forward by Cochrane (1999, 2001), in which future primary budget balances decrease. Equation (4) shows that expected future price levels $E_t(P_{t+j})$ could increase or, equivalently, real long-term bond prices, given by $q_t\,(t + j) = \frac{1}{r^j} \cdot E_t\left(\frac{1}{P_{t+j}}\right)$, could decrease as to restore equilibrium. Intuitively, if future government budget balances decrease and long-term sovereign debt is issued without explicit real backing, such as raised future taxes, inflation will rise once the issued long-term debt must be redeemed by seigniorage income from the central bank.

One important element of the FTPL that has so far been neglected in this discussion is the role of expectations (Cochrane, 2011). Since the 2008 financial crisis and again during the COVID-19 pandemic, the US has enacted various large-scale fiscal stimulus plans, generally funded by the issuance of government debt. Equation (4) suggests that price levels should increase, as government debt has increased and primary surpluses have decreased. Cochrane (2011), however, shows that if the general populace believes that future primary balances will improve, through increased taxes or decreased government expenditure – then inflation might not increase. That is, according to the FTPL, fiscal stimulus only inflates if people believe additionally issued government debt will be repaid by seigniorage income. Herein lies the paradox of fiscal stimulus: government debt is typically issued with the expectation that it will be repaid through some form of fiscal backing, such as increased taxes. This is especially true for a developed economy such as the US, where debt defaults are rare. Therefore, recessionary fiscal stimulus falls victim to its own reputation of financial responsibility in that government bond investors expect the debt to be financed by budget surpluses, which in turn implies inflation may not increase.

The FTPL has not been without controversy since its genesis. The price level, according to the QTM, is defined as the inverse of the value of money. The FTPL, however, defines the price level as the inverse of the value of government debt. Buiter (2002), however, highlights that the value of money and that of government debt need not coincide. Restricting debt monetisation in the case of a fiscal deficit could devalue government debt due to investors anticipating a possible default, but it would not necessarily affect the value of money. Rather, for equation (4) to hold, primary budget balances would need to adjust according to the value of debt. When unlimited debt monetisation is assumed, like in the case of an interest rate peg, defaulting on nominal debt is ruled out as the central bank commits to the exchange of arbitrary amounts of money for maturing debt. Thus, in the absence of an institutional commitment from the central bank to avoid a debt default through debt monetisation, the FTPL fails to explain inflation.

Empirical considerations of the FTPL are of rather short supply – prominent contributors to the FTPL, such as Cochrane (1999), argue that the present value budget constraint in equation (4) is an equilibrium condition and can, therefore, not be tested through traditional macroeconomic techniques (like the VAR). That is, equation (4) does not specify causality between variables; rather, it is based on specific theoretical assumptions regarding exogeneity that may not hold true in reality. As a consequence, the FTPL has faced the curse of perceived non-testability.

Cochrane (2022a) abstracts from the theoretical assumptions of the FTPL by deriving a set of identities to deliver a means to test the FTPL’s validity. These identities, which make use of asset pricing techniques, build on the same principles of the FTPL by initially specifying a government budget flow identity. Using this government budget flow identity, additional identities are derived that closely reflect the FTPL.[3] The novel contribution of Cochrane (2022a) follows from the specification of testable *flow identities*, as opposed to the un-testable *equilibrium conditions* found in equation (3) and (4). The identities derived by Cochrane (2022a) imply that the market value of government debt must decline if budget balances or economic growth decreases, or if discount rates and ex-post real return on government debt increase. Cochrane (2022a)'s results for the post-war US from 1947 to 2018 show that the typical FTPL perspective – where fiscal surpluses (deficits) coincide with decreased (increased) price levels – does not necessarily hold true. Rather, the value of government debt can adjust to accommodate changes in fiscal positions. As Cochrane (2022a, p. 30) states,

> Thinking in all contexts has focused on the presence or absence of surpluses, or surplus to GDP ratios, not discount rate effects, time-varying returns. Thinking in all contexts has considered one-period unexpected inflation, to devalue one-period bonds, not a rise in expected inflation that slowly devalues outstanding long-term bonds.

Thus, Cochrane (2022a) shows that the FTPL in equation (4) fails to account for a key dynamic: the market value of government debt can adjust in the face of inflation, instead of government budget balances. This follows from equation (4) only considering the nominal value of government debt and not the market value thereof. The results indicate that for a 1% unexpected rise in inflation, the US present value of budget balances decreases by 1.6%. This 1.6% decrease is composed of a 1% increase in the real discount rate, and 0.6% decrease in the GDP growth rate. Thus, the budget balance accounts for none of the decrease in the present value of future budget balances.

Cochrane (2022b) extends the model derived in Cochrane (2022a) by specifying the *fiscal theory of monetary policy*. In doing so, Cochrane (2022b) specifies a more realistic FTPL model by incorporating both fiscal and monetary policy with the novel addition of policy rules that, in effect, produce an active fiscal policy. That is, government budget balances respond to adjustments in output gaps, inflation and the market value of government debt. Monetary policy, which follows the Taylor rule, plays a more passive role as its control over inflation is limited given unexpected inflation can be influenced by fiscal policy shocks. Another novel addition of Cochrane (2022b) follows from the specification of s-shaped fiscal responses to government debt shocks. This feature allows the model to mimic the gradual repayment of sovereign debt. Overall, Cochrane (2022b) produces a model which yields observational equivalence to those that are monetary policy active. This is argued to be a feature of the *fiscal theory of monetary policy*, as it shows that in equilibrium, realistic models can be constructed that explain data accurately while differing from each other from a regime perspective. Given these findings, future research should focus on fitting the data better with greater emphasis on the institutions behind policy and how they implement rules and commitments in the face of inflation.

[3] We discuss the identities derived by Cochrane (2022a) in Section 4.

3 The South African context

SA's fiscal position has followed a path similar to that of the global trends discussed in the IMF (2024)'s *Fiscal Monitor*. That is, the country has also experienced a worsening fiscal position, albeit from before the COVID-19 pandemic. The National Treasury's (NT, 2024) macroeconomic policy review shows that since 2018 the economic growth rate has been well below that of the effective interest on gross government debt, with the exception of the post-pandemic growth surge in 2021. The effect has been an ever-increasing gross debt-to-GDP ratio, and one that will continue to grow unless the government can bring the primary budget balance to zero or a surplus. This follows from economic growth not being able to reduce the debt burden as fast as additional debt is acquired to repay interest expenses.

Figure 1 highlights SA's steadily increasing debt burden. The increasing debt levels have coincided with frequent and persistent primary budget deficits since the 2008 financial crisis, with surpluses appearing occasionally. The figure also shows that the large COVID-19-induced budget deficit was largely funded with debt issuance. Additionally, Figure 1 also shows a steadily increasing separation in the paths of the nominal and market value of marketable government debt - an important consideration from the perspective of Cochrane (2022a).

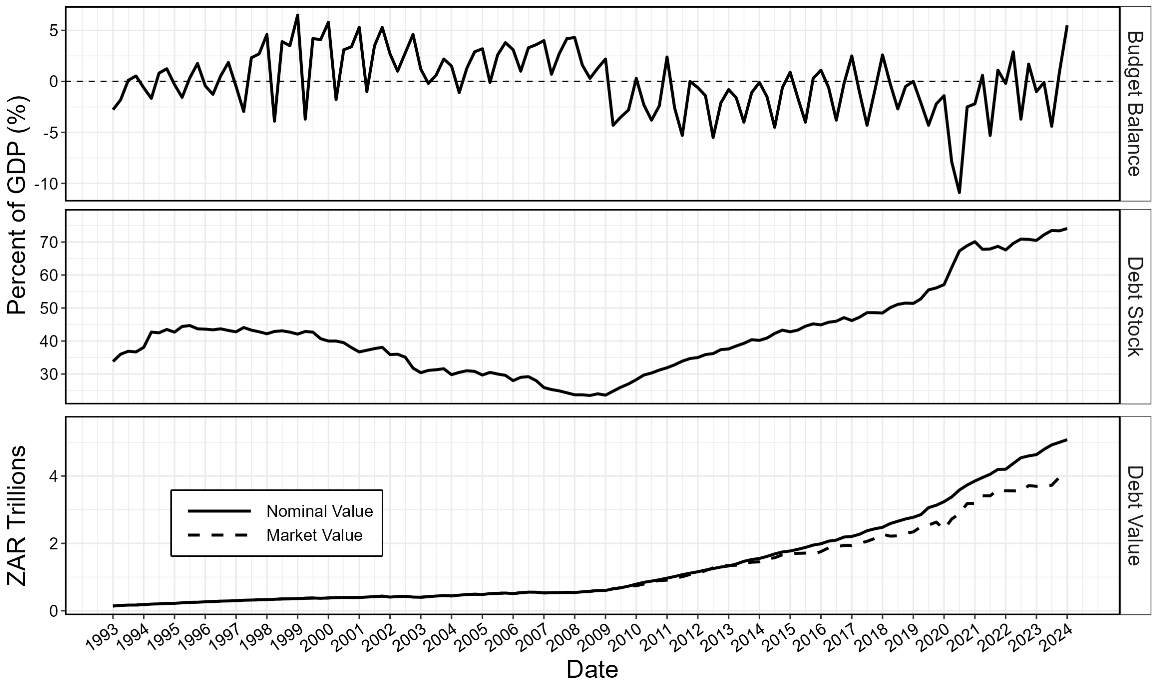

Figure 1: Government primary budget balance-to-GDP, total gross debt-to-GDP and the total value of marketable gross debt. Data Source: SARB and BIS.

The South African fiscal authority has been well aware of the risks depicted in Figure 1. Since 2013, fiscal consolidation – the reduction of the primary budget deficit – has been a main fiscal policy goal (NT, 2024). Two main measures have been taken to address fiscal consolidation: the first, imposing ceilings on government expenditure, and the second, increasing tax rates. These measures did not succeed to the extent that policymakers had hoped, for several reasons. Firstly, the efficacy of expenditure ceilings has been undermined by lower-than-expected economic growth. In effect, government expenditure has outstripped revenue growth. Secondly, organised labour negotiated for increased cost-of-living compensation – increasing the wage bill. Lastly, state owned companies required substantial recapitalisation. Overall, these effects led to government expenditure exceeding the budget.

Another key contributor to the failed fiscal consolidation efforts lies in the composition of government expenditure (NT, 2024). That is, as the government debt burden has increased, so has the proportional spending on debt servicing. During the 2007-08 fiscal year, debt servicing costs stood at R50 billion. This figure is projected to increase toward R400 billion by 2025-26. This implies that debt service costs as a percent of overall expenditure are set to increase from approximately 10% to over 16% over the same period. Consequently, to reduce the budget deficit, government expenditure allocated to areas that promote economic growth must decrease. Specifically, investment spending on capital goods such as growth-enhancing infrastructure, has decreased considerably over time.

The efficacy of the second approach to fiscal consolidation, i.e., tax reforms, has been similarly muted too (NT, 2024). Between the 2015-16 to 2019-20 fiscal years, several tax reforms were implemented ranging from increased value-added tax rates, to above-inflation increases in excise duties on alcohol and tobacco. Overall, increased taxes resulted in almost no change in government revenues – between 2015-16 and 2019-20 tax revenue sat consistently at 23.8% of GDP, even declining slightly during the period. Disappointing economic growth and administrative inefficiency on behalf of the South African Revenue Service (SARS) left these tax reforms with little effect on the budget deficit.

Applying the FTPL to SA's fiscal position makes for an insightful case study: The country faces an ever-present budget deficit with no clear path to its reduction, and ever-increasing public debt. Given the country's situation, the FTPL's view is simple – there should be significant price increases. That is, equation 3 implies that with decreasing present value future primary budget balances ($E_t \sum_{j=0}^{\infty} \frac{1}{r^j} s_{t+j}$) and increasing government debt ($B_{t-1}(t)$) price levels are bound to increase.[4]

Figure 2 depicts the key variables of the FTPL for SA. The COVID-19 pandemic induced a large primary budget deficit, which remained the case for some time with small occasional surpluses occurring. The deficit was funded by a substantial issuance of debt with a quarter-to-quarter rise in debt-to-GDP of 27%. Shortly afterwards, an initial decline in inflation was followed by a sharp rise in inflation that continued to increase over the pandemic period. Thus, inflation increased during the same period of substantial government debt issuance that had no real backing, suggesting a correlation between the variables as the FTPL predicts. Figure 2, however, paints a convenient picture. If we are to assume the FTPL predicts to correct inflation dynamics, it must also be that the counterfactual, that is the QTM, does not hold empirically.

Figure 3 depicts the key variables of the QTM (assuming a constant velocity of money and GDP growth). A cumulative quarter-to-quarter increase in M2 money stock of 26% occurred during the COVID-19 pandemic, whilst inflation increased in similar fashion. Thus, Figure 3 shows that the QTM can be found in SA's macroeconomic data as well.

We find ourselves with an economic quagmire: the South African macroeconomic data considered in Figures 2 and 3 can be viewed as reflective of both the QTM and FTPL. Both, however, strongly oppose each other theoretically. Thus, either inflation is caused

[4] We refer to equation 3 instead of equation 4 due to limited debt maturity data for SA sovereign debt.

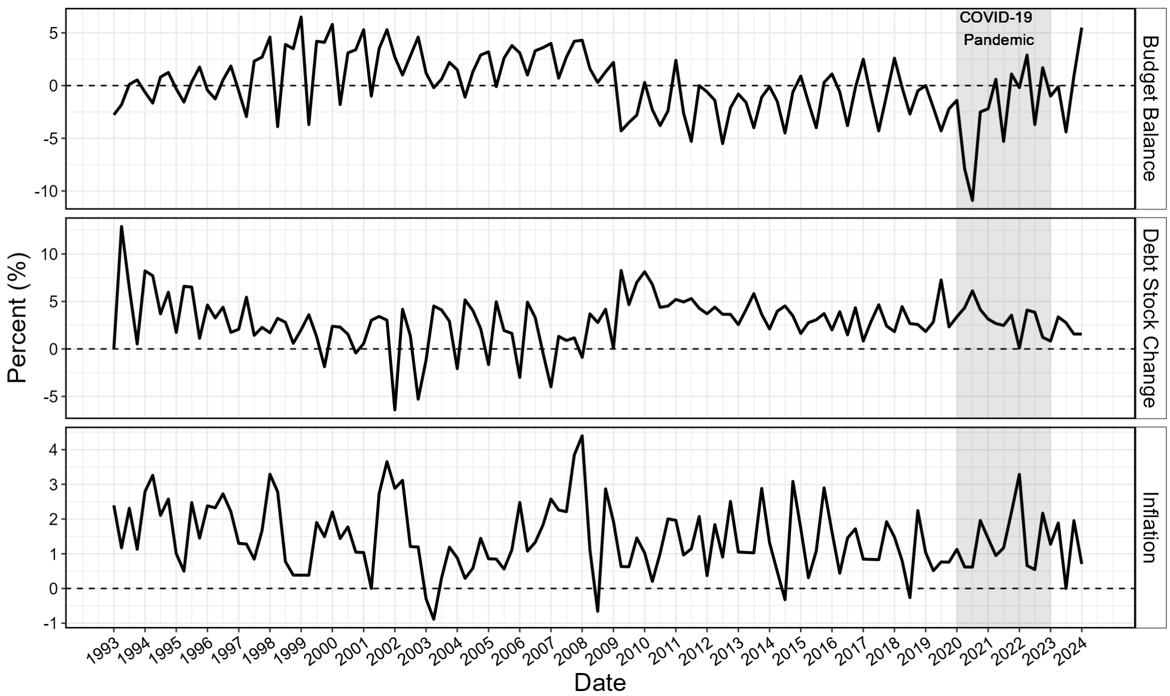

Figure 2: Government primary budget balance-to-GDP, total general government liability change and Inflation. Notes: Nominal government liabilities change and inflation are quarter-on-quarter estimates. Inflation is calculated using headlined CPI. Data Source: SARB, Stats SA and BIS.

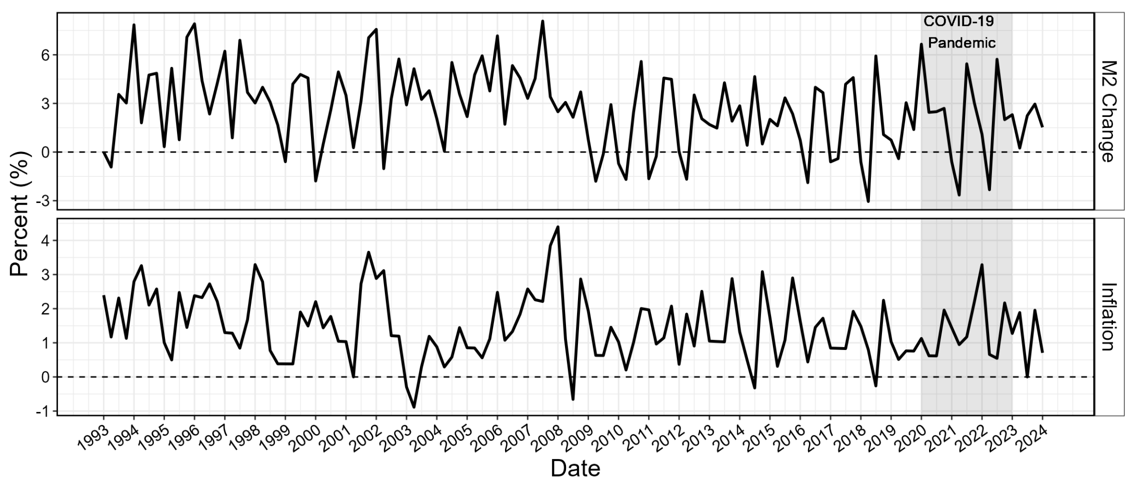

Figure 3: M2 change and Inflation. Note: Figures are calculated as quarter-on-quarter change. Inflation is calculated using headlined CPI. Data source: SARB and Stats SA.

by SA's weak fiscal position or by the SARB printing too much money (possibly even both). We investigate further by turning to our methodology.

4 Methodology and data

4.1 Methodology

The methodology adopted in the present paper is based on Cochrane (2022a). In that paper, the author specifies an initial government budget flow identity, which states that the total value of the government's liabilities at the end of period t must be equal to the total value of the government's liabilities at the end of period $t+1$, plus the primary surplus in period $t+1$. Using the government budget flow identity, the government debt present value identity is derived:

$$v_t = \sum_{j=1}^{\infty} \rho^{j-1} s_{t+j} + \sum_{j=1}^{\infty} \rho^{j-1} g_{t+j} - \sum_{j=1}^{\infty} \rho^{j-1} \left(r^n_{t+j} - \pi_{t+j} \right), \tag{5}$$

where the market value of debt to GDP, v_t, is equal to the present value of future surplus to GDP ratios, s_{t+j}, discounted at the ex-post real return on the portfolio of government debt, $r^n_{t+j} - \pi_{t+j}$, and adjusted for GDP growth, g_{t+j}.

Taking time $t+1$ innovations $\Delta E_{t+1} \equiv E_{t+1} - E_t$, and rearranging Equation (5), the unexpected inflation identity is given as follows:

$$\begin{aligned} \Delta E_{t+1}\pi_{t+1} - \Delta E_{t+1} r^n_{t+1} = &- \sum_{j=0}^{\infty} \rho^j \Delta E_{t+1} s_{t+1+j} - \sum_{j=0}^{\infty} \rho^j \Delta E_{t+1} g_{t+1+j} \\ &+ \sum_{j=1}^{\infty} \rho^j \Delta E_{t+1} r_{t+1+j}, \end{aligned} \tag{6}$$

where $r_{t+1} \equiv r^n_{t+1} - \pi_{t+1}$ represents the ex-post real return on government debt.

Using equation (5), Cochrane (2022a) explains that the market value of government debt must decline in the case of budget balances or economic growth declining, or discount rates and ex-post real return on government debt increasing. Further, from equation (6), the reduced debt value will either originate from increased inflation or decreasing nominal government debt returns.

In order to focus on inflation, nominal government debt return, r^n_{t+1}, is eliminated from equation (6) by linearising the return of the government bond portfolio around a geometric maturity structure, with the face value of maturity j debt declining at rate ω^j. We then have the decomposed inflation identity:

$$\begin{aligned} \sum_{j=0}^{\infty} \omega^j \Delta E_{t+1} \pi_{t+1+j} = &- \sum_{j=0}^{\infty} \rho^j \Delta E_{t+1} s_{t+1+j} - \sum_{j=0}^{\infty} \rho^j \Delta E_{t+1} g_{t+1+j} \\ &+ \sum_{j=1}^{\infty} (\rho^j - \omega^j) \Delta E_{t+1} r_{t+1+j}. \end{aligned} \tag{7}$$

Utilising identities (5) and (7) we can test the FTPL by considering the interactions of budget balances, government debt and inflation.

Extending the work of Cochrane (2022a), we propose a fiscal-monetary VAR model of order $p = 4$ using the the standard notation,

$$\mathbf{x}_{t+1} = \mathbf{A}\mathbf{x}_t + \epsilon_{t+1},$$

where $\mathbf{x}_t = (\pi_t, v_t, g_t, m_t, s_t, r_t^n)'$, $\mathbf{A}$ is a matrix of intercept and coefficient terms, and ϵ_{t+1} is a matrix of error terms. From $\mathbf{x}_t$, the proposed model includes the following variables: inflation, π_t, the market value of government debt, v_t, GDP growth, g_t, M2 money stock growth, m_t, government primary budget balances, s_t, and the nominal return on government debt, r_t^n.

We use the same VAR specification to estimate a second model as in Cochrane (2022a), where $\mathbf{x}_t^c = (\pi_t, v_t, g_t, s_t, r_t^n)'$. The proposed VAR model differs from the model replicating the work of Cochrane (2022a) from the inclusion of m_t. This difference in specification allows us to explicitly incorporate the QTM perspective.

The models we use in extending and replicating the work of Cochrane (2022a) differ somewhat from the original specification. Cochrane (2022a) uses short - and long-term government bond yields as control variables. Furthermore, using r_t^n and v_t, Cochrane (2022a) derives s_t from the government budget constraint, $s_t = v_{t-1} \cdot (1 + r_t^n) - v_t$. Due to data availability constraints, and in contrast to Cochrane (2022a), we calculate r_t^n in a simpler, however representative manner, as the value weighted average of short - and long-term government bond yields, based on SARB domestic debt issuance statistics.[5] Additionally, we use s_t data directly, instead of deriving the measure from the government budget constraint, given our more rudimentary calculation of r_t^n. Finally, due to multicollinearity concerns, we exclude short- and long-term government bond yields from our model, as r_t^n is derived directly from these measures.

The frequency of the data used in our estimations are an additional point of departure from Cochrane (2022a). We use quarterly data as opposed to the annual frequency used in Cochrane (2022a). The difference in data frequency allows us to analyse patterns at a more granular level – this is a novel contribution. Cochrane (2022a, p. 39) notes that in using quarterly data, improved measurement of correlations and shock orthogonalisation is allowed. This does, however, leave us with the task of dealing with strong seasonality in the data, which is especially true for s_t (see Figure 1).

4.2 Data

Our data sample consists of observations from the first quarter of 1994 to the final quarter of 2024.[6] Our sample period is of relevance for two reasons. Firstly, two major events of economic tumult – the GFC and the COVID-19 pandemic – form part of the sample. Secondly, the two periods of tumult were characterised by substantially different inflationary experiences. The inclusion of these events provides suitable conditions to study the extent to which the fiscal theory of the price level holds.

The measurements of our data are as follows: π_t is proxied by the quarterly change in headline CPI. s_t is measured according to primary budget balance data, calculated using revenue, expenditure and interest expense data. Further, v_t is represented by the measure for the total market value of South African general government debt. r_t^n is the value weighted average of short- and long-term government debt discount rates,

[5] We calculate r_t^n using short-term and long-term bond yields, assigning a weight of 0.9 to the long-term yield since 90% of South Africa's outstanding public debt has a maturity longer than 10 years.

[6] See Appendix A for data sources.

with the weights determined according to value of short-term debt relative to long-term debt.[7] Additionally, s_t, v_t and m_t are taken as a proportion of real household consumption, scaled by the mean ratio of real consumption to real GDP. We do so as Cochrane (2022a) argues that macroeconomic variables like primary budget balances are typically divided by real GDP for reasons pertaining to stationarity. However, GDP is a variable subject to substantial variation and dynamics that may render the ratios to GDP non-stationary. Furthermore, Cochrane (2022a) argues that ideally, economists wish to view a country's fiscal position relative to its taxing power – such as real household consumption. Thus, Cochrane (2022a) proposes taking primary budget balance data, and other macroeconomic variables as proportions of real consumption, scaled by the mean ratio of consumption to GDP, to account for the fact that consumption is a fraction of GDP.[8] Finally, g_t and m_t are calculated using the logarithmic change in real GDP and money stock data, respectively.

Our data necessitates significant transformations for two reasons: there is substantial non-stationarity in the trend, likewise in terms of seasonality. Stationarity is ensured by removing the trend component from non-stationary data series using the Hodrick–Prescott filter (Hodrick and Prescott, 1997). We do so for v_t and r_t^n. Furthermore, seasonality is dealt with by differencing at the fourth lag – only s_t required such treatment.[9] A final data consideration remains, the market value of government debt data is only available from 2009Q4. For those missing values, we impute nominal value of government debt. This should not have serious consequences, as the nominal and market debt data series only begin to diverge from each other from 2015 onward.[10]

5 Results

The present section presents the impulse response functions (IRFs) of the proposed model following a positive interest rate shock and a negative fiscal balance shock, followed by the comparison analysis between the full-sample and the post-GFC sub-sample. We also conduct the robustness analysis by comparing the dynamics of the proposed fiscal-monetary VAR model with that of Cochrane (2022a)'s model following the same shocks.

The objective of the present study, in a similar vein to that of Cochrane (2022a), is to examine dynamic correlations among the components of the government's budget identity. Neither the significance of the estimation nor the causal relationships among the variables in the model are the key focus here.

5.1 VAR coefficients

Before presenting the IRF analysis results, this section reports the estimated coefficients of the proposed fiscal-monetary VAR model. The coefficients at the first lag are shown in Table 1.[11] Focusing on the determinants of inflation, π_t, at the first lag, primary

[7] The SARB defines short-term debt as those securities issued at a maturity of less than one year, and long-term debt as those securities with maturities greater than one year.

[8] The summary statistics for these variables are reported in Table 2 in Appendix B. Only π_t and g_t, are in terms of quarter-on-quarter change.

[9] We identify seasonality using autocorrelation functions.

[10] See Figure 1 to view how the nominal and market value measures compare.

[11] In Appendix B, table 3 presents the coefficients for all four lags, given that the model is estimated using quarterly data.

budget balances, s_t, affect price levels negatively, albeit insignificantly. Government debt, v_t, has no effect on inflation. Money stock, m_t, has a significantly positive influence on inflation. These findings are in support of the QTM. Additionally, interest rate is negatively correlated with inflation, but not significantly.

v_t is negatively affected by inflation, albeit insignificantly. In terms of s_t, the variable is significantly positively affected by its own lagged value and that of π_t.

Table 1: Coefficients: Proposed fiscal-monetary VAR model (1-lag).

	s_t	v_t	r_t^n	m_t	g_t	π_t
s_{t-1}	0.20^{**}	-0.07	0.02	-0.28	-0.12	-0.04
v_{t-1}	-0.00	0.35^{***}	-0.01	-0.16^{**}	0.06^{***}	-0.00
r_{t-1}^n	-0.03	0.46	0.53^{***}	0.17	-0.03	-0.24
m_{t-1}	0.00	0.14	0.01	0.64^{***}	0.06^{*}	0.07^{*}
g_{t-1}	0.01	-0.53	0.10	-0.63	0.13	0.21
π_{t-1}	0.05^{*}	-0.59	0.17^{***}	0.22	-0.09	0.28^{***}
R^2	0.54	0.54	0.60	0.58	0.35	0.32
Adj. R^2	0.43	0.43	0.50	0.47	0.18	0.15
Num. obs.	120	120	120	120	120	120

Note: Significance levels are indicated as follows: $^{***}: p < 0.01$; $^{**}: p < 0.05$; $^{*}: p < 0.1$

5.2 Interest rate shock

The present paper now turns to an interest rate shock through a 1% unexpected increase in r_t^n.[12] Figure 4 presents the IRFs of the variables to the interest rate shock.[13]

Overall, In the first quarter, the interest rate shock affects v_t to the greatest extent, followed by m_t. The market value of government debt, v_t, decreases approximately 1.1%, while money growth, m_t, increases to around 0.55%. Primary budget balances, s_t, GDP growth, g_t, and inflation, π_t, remain essentially unchanged.

From the second quarter onward, v_t increases to a positive level, reaching a maximum of 0.54% at the third quarter ahead. Thereafter, v_t converges to its steady state. m_t, continues to increase for one more quarter, reaching its maximum level of 0.67% before converging to its steady state. π_t, reduces to -0.185% at the second quarter ahead, before returning to its steady state. Finally, g_t reduces to a slightly negative level at the second quarter before returning positive and remaining so, reaching a maximum level of 0.07% at the fourth quarter.

[12] Such a shock generally comes from one of the two possible events: increased monetary policy rates or an overall steepening of a country's yield curve.

[13] In Appendix B we provide the IRFs with statistical significance intervals.

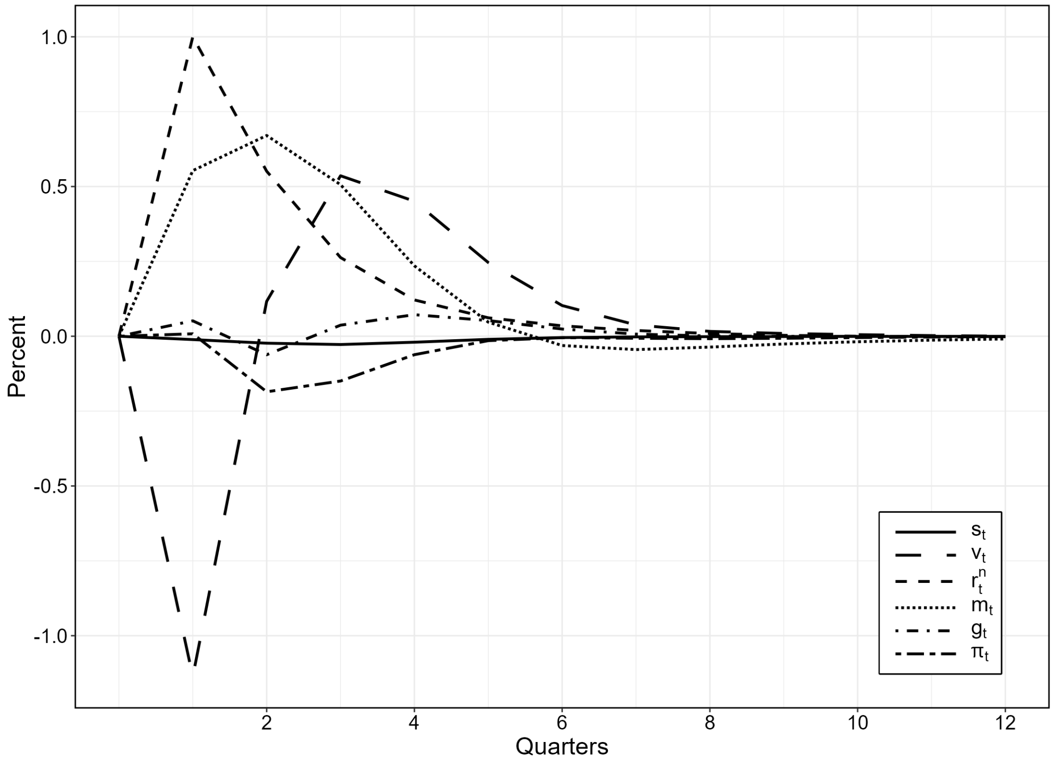

Figure 4: Impulse responses to 1% r_t^n shock. Variables are expressed as % deviation from steady states.

In accordance to Cochrane (2022a), the cumulative effects of the interest rate shock are as follows: m_t increases 1.83% over 12 quarters, whereas g_t increases only slightly by 0.18%. Further more, π_t decreases by 0.44% and s_t decreases marginally by 0.1%. Finally, v_t increases by 0.39%.

The results show that the interest rate shock decreases inflation contemporaneously, in spite of money growth increasing. From the QTM perspective, these results are counter intuitive. The theory expects increased inflation to be accompanied by increased money stock levels. The results, however, are in contradiction to what the theory stipulates. On the other hand, the results also show that, following the shock, the market value of government debt decreases significantly in the first quarter, which is in line with the FTPL. The FTPL argues that reductions in the present value of future budget balances, brought about a interest rate shock, should be accompanied by either reduced debt burdens, or increased inflation. Figure 4, indicates that debt stock indeed decreases.

An unexpected increase in interest rates weakens the government's fiscal position by increasing debt service costs – interest expenses, which are not included in the primary budget balance – hence the muted response from s_t. The eroded fiscal position necessitates additional debt issuance, although the shock reduces the value of debt initially. As inflation begins converging to its steady state, the value of debt starts recovering and turns into positive two quarters after the shock occurs. The increased debt levels are accompanied by additional money stock – the increased m_t may follow from central bank purchasing newly issued government debt.

5.3 Fiscal policy shock

The IRFs to a negative 1% shock in government primary budget balances, s_t, are depicted in Figure 5. In the first quarter following the shock, v_t rises sharply to approximately 2.3%. m_t also increases significantly, by approximately 1.6%. π_t, on the other hand, decreases about 0.26%. Further, g_t and r_t^n all change only marginally.

From the second quarter ahead, most variables start converging to their steady states. In fact, only g_t and π_t have not started converging at the second lag – g_t finds itself reaching it's maximum level of 0.35%, whereas π_t moves to an overall positive level of 0.17% at the third quarter ahead.

Once again in accordance with Cochrane (2022a), the cumulative effects of the budget deficit shock are as follows: m_t increases 2.8% over 12 quarters, whereas g_t increases by 0.5%. Further more, π_t increases marginally by 0.06% and in similar fashion r_t^n increases by a mere 0.18%. Finally, v_t increases by 4%.

An unexpected negative primary budget balances shock results in a significant increase in both government debt and money stock, at initial impact, whereas inflation decreases contemporaneously. This suggests that the correlation between inflation and money are inconsistent with the QTM. One could argue that, after the first period, the subsequent increase in inflation could be attributed to the initial increased money stock levels, possibly indicative of a delay in the response of inflation to money stock adjustments.

In contrast, it seems that the FTPL is more suitable to explain inflation in South Africa. Fiscal deficits necessitate the issuance of additional government debt and require the central bank to purchase the newly issued government debt with additional money stock. Furthermore, with primary deficit, the FTPL requires higher inflation to stabilise government debt. This appears to be the case depicted in Figure 5. However, it appears that increased government debt is stabilised by inflation with policy lags. Moreover, economic growth also contributes to the stabilisation of government debt, and with policy lags too.

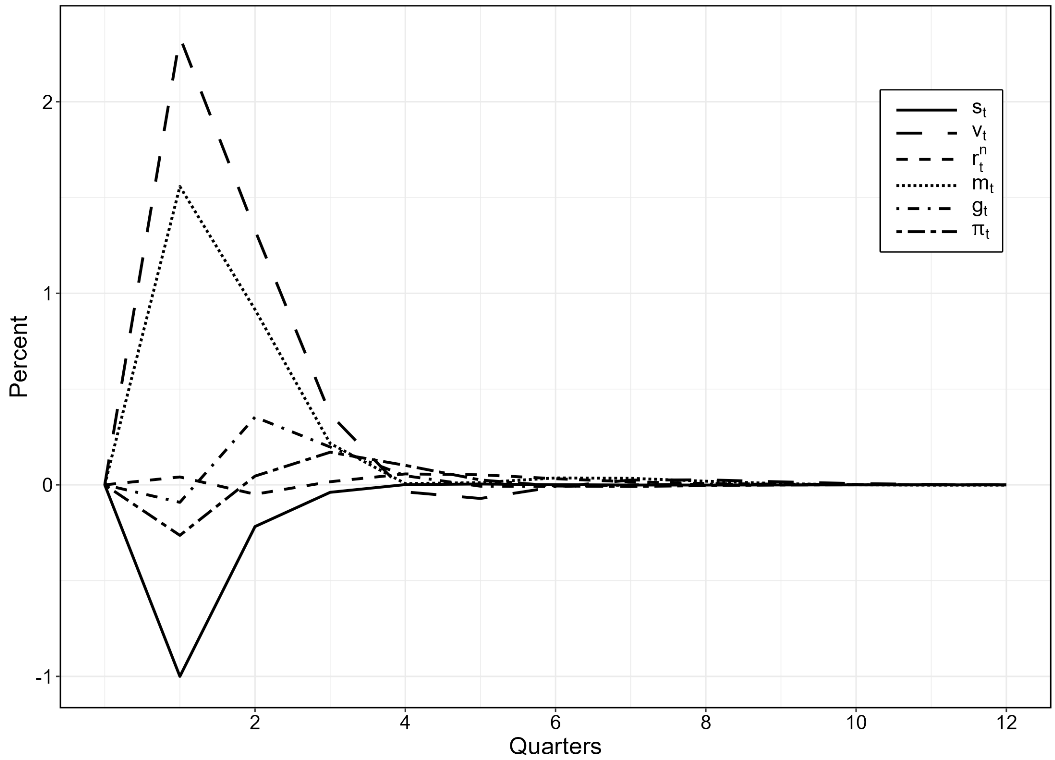

Figure 5: Impulse responses to -1% s_t shock. Variables are expressed as % deviation from steady states.

5.4 Sub-sample analysis: Full-sample versus Post-GFC

Figures 1 and 2 show that democratic South Africa has seen the primary budget balance has remained almost consistently above the 0% mark, with debt levels decreasing and inflation rising substantially – particularly during the late 1990s and early 2010s. I.e., there seems to have been periods wherein the FTPL did not hold entirely. These same periods, however, coincided with significant increases in money stock. These findings may imply that the late 1990s and early 2010s were most likely "QTM-dominated", whereas later on, specifically from the Great Recession, the FTPL has been more dominant. In order to establish the validity of these interpretations, we compare IRFs between the full-sample and a sub-sample (2009Q1 -2024Q4), following the same shocks.[14]

[14]See Appendix B for a table VAR coefficients and IRFs with confidence intervals.

5.4.1 Interest rate shock

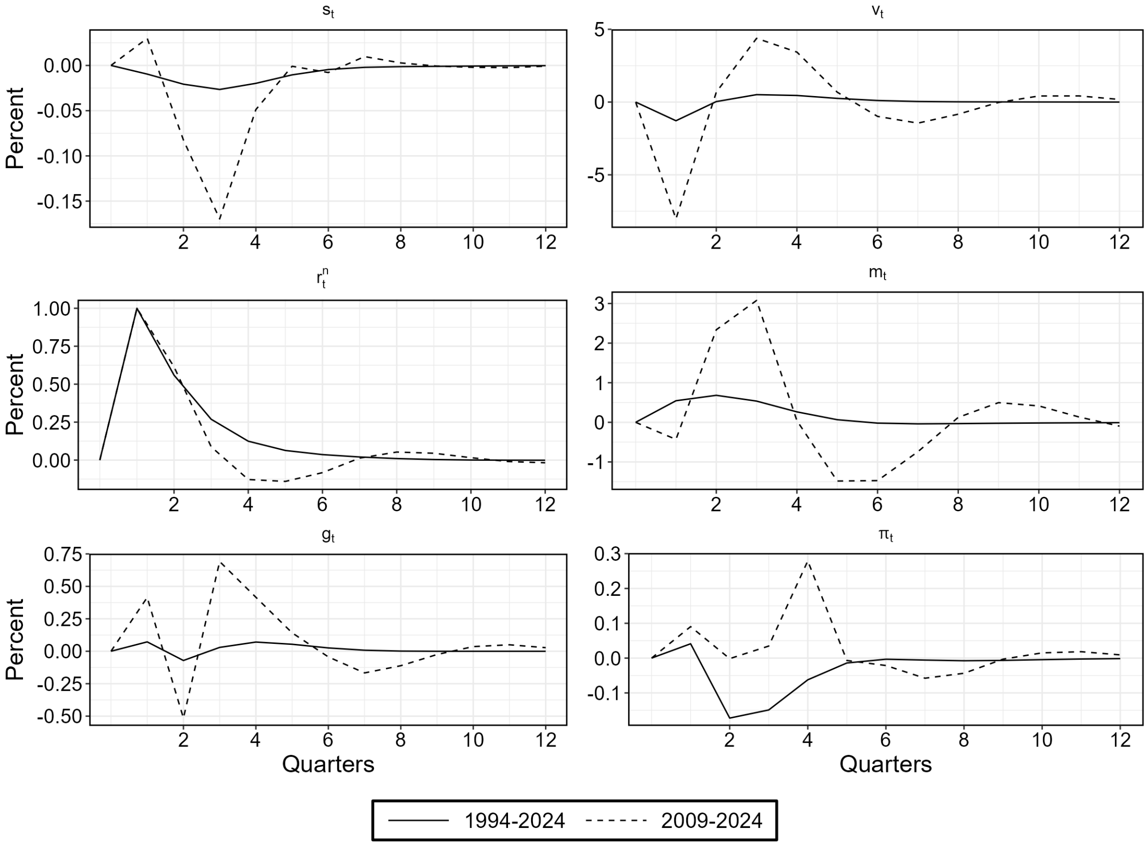

Figure 6: Impulse responses to 1% r_t^n shock. Variables are expressed as % deviation from steady states.

Figure 6 compares the IRFs of an r_t^n shock for the full-sample and sub-sample periods. All variables show substantially different responses between the sample periods. Specifically, the sub-sample responses indicate the post-GFC period is influenced to a much greater degree by the interest rate shock than the full-sample. s_t differs between the two samples in the magnitude of its response over the first 4 quarters ahead. The sub-sample s_t response increases to approximately 0.03% at the first lag ahead, whereas the full-sample variable decreases slightly. Thereafter, sub-sample s_t moves toward a negative response of -0.17% at the third quarter ahead and remains negative as the variable converges to zero. Full-sample s_t behaves in a similar fashion, however, with significantly decreased magnitude – a minimum of -0.021% is reached in the third quarter ahead. Further, v_t decreases at the first lag for both sample periods. However, the extent of the decrease differs significantly between the two samples – v_t decreases to -8% for the sub-sample, whereas the full-sample only decreases toward -1.3%. In the sub-sample, the periods after the initial response see v_t move to positive levels, reaching 4.4% before steadily converging to zero in a cosine-like fashion. For the full-sample, v_t also moves toward a positive level, reaching a maximum level of 0.51% at the third quarter ahead before converging to its steady state. Sub-sample m_t declines in the first lag toward -0.4%, whereas the variable increases by 0.54% for the full-sample. From the second quarter ahead, sub-sample m_t moves toward a positive level of 2.3% before continuing toward a maximum level of 3.1% at the third quarter ahead. Alternatively, full-sample m_t reaches a maximum of 0.68% in the second quarter before converging to its steady state. From the third quarter onward, sub-sample m_t adopts a similar cosine convergence path toward its steady state as v_t. g_t shows greater volatility and depths in its peaks and troughs in the sub-sample, even though the variable follows a similar path with the full-sample. The full-sample, however, does not show any significant response. Finally, π_t, between the sample periods diverge in their responses – the sub-sample indicates an overall increase in inflation, reaching a maximum of 0.28%, whereas the full-sample indicates a reduction with a minimum of -0.17%. Another significant difference in π_t's reaction follows from the timing of the peak of the response, where the sub-sample sees the largest increase in inflation taking place at the forth quarter ahead versus the full-sample's largest decrease occurring at the second lag ahead.

On aggregate, Figure 6 seems to indicate that with the exception of some variables at the first and second lag, the sudden increase in interest rates induces substantially greater reactions over the sub-sample in comparison to the full-sample. When considering the substantial rise in debt stock from 2009 onwards, these results should not be surprising. That is, as government debt has increased, so has interest expenses. Comparatively, shocks in interest rates would naturally induce greater economic turbulence in high debt environments than in lower debt environments as the government experiences a substantially greater negative effect on their fiscal position. The greater the debt burden of the government, the more severe the effects of interest rate hikes on budget balances, and the more debt needs to be issued. The greater the debt stock, the less the government spends on growth promoting investments and the greater the pressure on the private sector's appetite for government debt instruments. This relationship holds only when budget deficits are not funded by increased revenue or decreased expenditure. However, as Section 3 highlights, SA has rather unsuccessfully tried to improve its fiscal position, in a sense leaving the country in a similar position described in the *unpleasant monetarist arithmetic* (Sargent and Wallace, 1981).

5.4.2 Fiscal policy shock

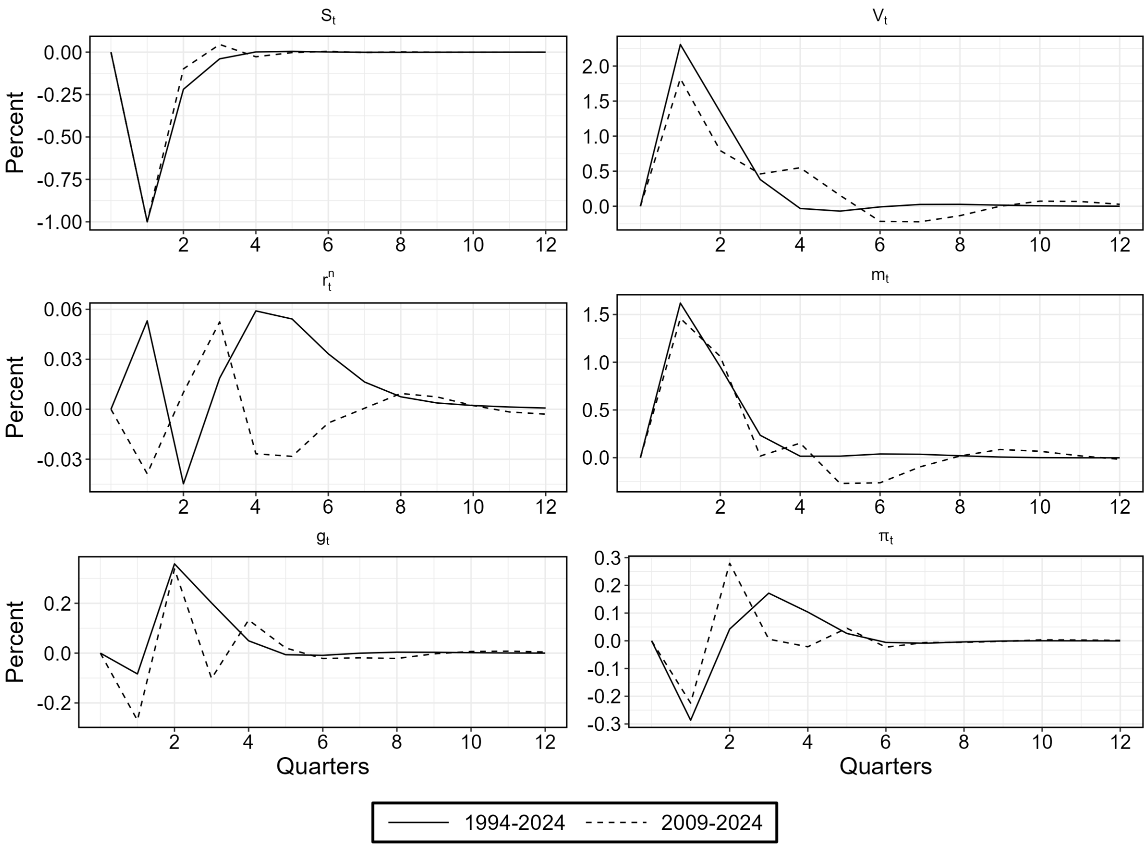

Figure 7: Impulse responses to -1% s_t shock. Variables are expressed as % deviation from steady states.

Figure 7 compares the IRFs of the two sample periods following a negative government budget balance shock. For both sample periods, the responses of most variables are nearly identical. Only two variables' responses are worth noting – r_t^n and π_t. The sub-sample r_t^n results move in a nearly inverse fashion relative to the full-sample results. In the first quarter ahead, sub-sample r_t^n declines to -0.03%, whereas the full-sample r_t^n increases to 0.05%. Over the second to fourth quarters ahead, the full and sub-sample r_t^n results both reverse in signs reaching similar levels compared to first quarter results. From the fourth quarter ahead, however, both sample periods converge to their steady states. Sub-sample π_t deviates from the full-sample between the second and fourth quarters – the sub-sample results see π_t rising more sharply towards 0.28% at the second quarter and converging toward the steady state comparatively earlier, from the third quarter onward.

The overall findings of Figure 7 are quite interesting: the results suggest that the FTPL was not necessarily less dominant than the QTM in the early years of SA's democracy, as both the full-sample and the sub-sample show the that fiscal shock induces substantially similar effects across the economy. Rather, when considering both the fiscal and monetary policy shock results, it seems that the deterioration of SA's fiscal position has led to a situation wherein the actions of monetary policymakers significantly affect the position of fiscal policymakers. That is, inflation may have very well been both a phenomenon of the QTM *and* the FTPL, however, with the significant increase of the country's debt burden, the "distance" between the two theories has reduced. I.e., the channel between the actions of respective policymakers and the economy has become increasingly intertwined to the extent that the action of one has come to significantly affect the other – leaving theoretical expositions on causal relationships between variables, like money stock and inflation, rudimentary and short-sighted. This is precisely the *unpleasant* part of Sargent and Wallace (1981)'s *unpleasant monetarist arithmetic*.

5.5 Robustness analysis: The proposed model versus the Cochrane model

In this section, we conduct robustness analysis through a variable-on-variable comparison between our proposed fiscal-monetary VAR model and a model replicating Cochrane (2022a) using the South African data.[15]

5.5.1 Interest rate shock

Figure 8 shows that the responses to a 1% interest rate shock between the two model variables are quite similar.

The main differences lie in the responses of s_t, g_t and π_t, as the rest of the variables' responses are nearly identical between the proposed and *Cochrane* models. s_t increases significantly over the first three lags in the case of the *Cochrane* model, where the proposed model declines over the same horizon. g_t and π_t sees the results of both models following similar paths, the main difference being at the first and second quarters ahead – the *Cochrane* model is slightly more positive and negative at the respective quarters ahead.

From these observations, it seems that whether we consider a fiscal-monetary perspective in our proposed model or a more "pure" fiscal perspective from the viewpoint of Cochrane (2022a), the results are largely unchanged. The differences in the responses in s_t, g_t and π_t suggest that, without monetisation, the economy requires a significant larger increase in primary budget balances, along with a higher economic growth, to stabilise government debt.

[15] See Section 4 for the differences between the two models. For the sake of space, we only consider the full-sample period for the robustness analysis.

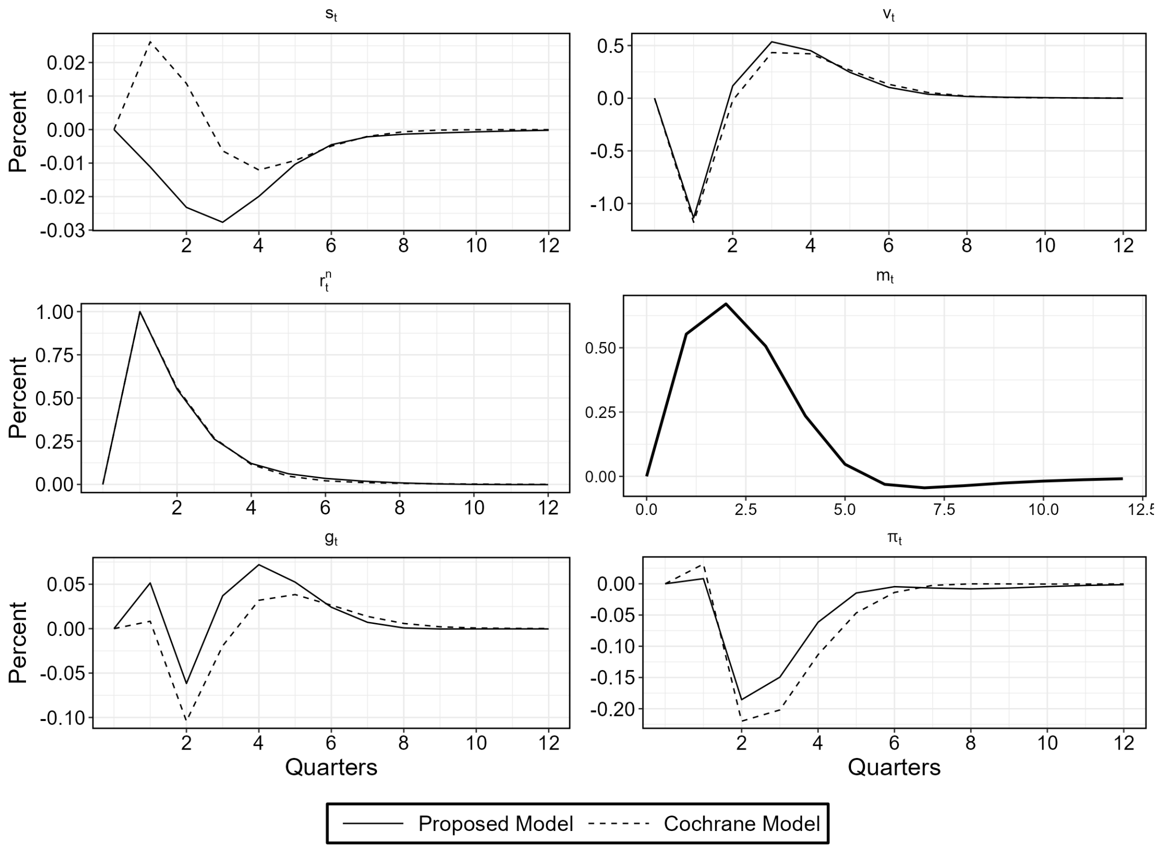

Figure 8: Impulse responses to 1% r_t^n shock. Variables are expressed as % deviation from steady states.

5.5.2 Fiscal policy shock

Figure 9 depicts the responses of the proposed model and the *Cochrane* model to an unexpected negative s_t shock. Similar to the results of the interest rate shock, the fiscal policy shock yields nearly identical responses across the variables between the two models. The most visible differences are the responses of r_t^n and g_t, where both series see the *Cochrane* model with slightly greater absolute values. This implies that, without monetisation as in the *Cochrane* model, the economy requires a lower interest rate and a higher growth to achieve to the same levels of s_t, v_t, and π_t.

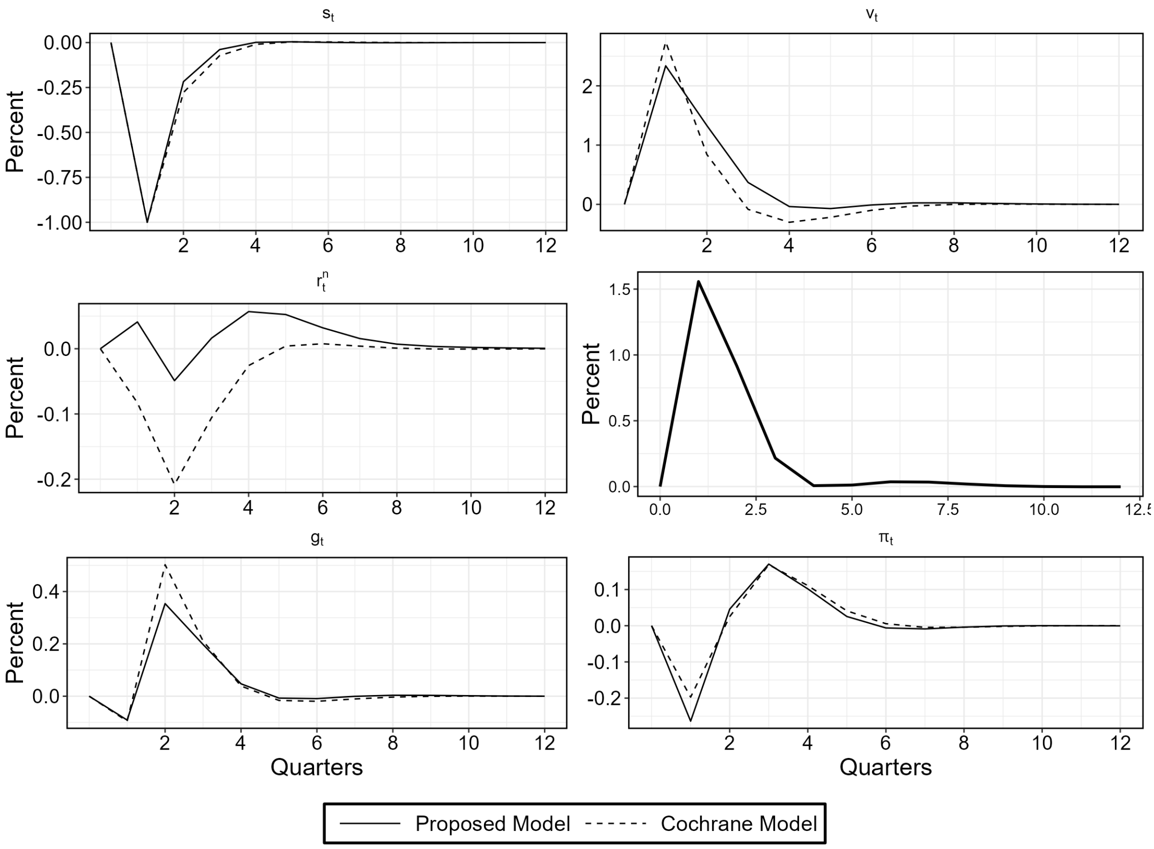

Figure 9: Impulse responses to -1% s_t shock. Variables are expressed as % deviation from steady states.

The results of the two models imply that an unexpected fiscal deficit leads to additional debt issuance, money stock and inflation, with a policy lag. In other words, while the actions of fiscal policymakers may indeed be inflationary, they are not the only factors that induce inflation. That is, the reaction of monetary policymakers to the consequences of fiscal policymakers' actions, are most likely also a contributor to inflation. However, the subsequent reduction in money stock levels from the second quarter ahead implies the inflationary pressure may mostly be from the additional government debt.

6 Discussion

Based on the literature review and the results presented in the previous section, one may conclude that the present paper argues that the QTM is less effective than the FTPL in explaining the forces driving inflation in South Africa. However, this would be a misinterpretation. The objective of this paper is to highlight how macroeconomics currently views inflation and to consider factors that are not yet accounted for by existing theories. In doing so, we show that macroeconomics has mainly taught inflation theory from a monetary perspective – the rather famous words by Friedman (1963) highlight this fact: "inflation is always and everywhere a monetary phenomenon." This paper does not dispute the fact that considerable evidence has been produced highlighting the significant relationship between inflation and money stock levels. What this article is suggesting, however, is that the QTM and similar monetary perspectives, were formed during an era wherein fiscal deficits and sovereign debt had not yet manifested as serious economic constraints that could be inflationary. We therefore, present a theory that takes an opposite perspective of the QTM, aiming to shed light on the economic shortcomings of current inflation theory in so as to establish a broader perspective on the topic.

The FTPL had long been confined to a "fringe theory" before it recently started receiving substantial attention. For instance, John Cochrane, an influential contributor to the FTPL, published one of the first detailed discussions and derivations of the FTPL in 1999 (Cochrane, 1999). Even further back, the influential *unpleasant monetarist arithmetic*, a key starting point to the development of the FTPL, was published in 1981 (Sargent and Wallace, 1981). In spite of this, the FTPL only garnered significant attention in the last two years as Cochrane published his book titled, *The Fiscal Theory of the Price Level*, which went on to receive the *Economist's Best Book of the Year* award in 2023. The timing of Cochrane's book publication was quite apt, as it followed a period of substantial fiscal deficits and debt issuance due the COVID-19 pandemic, which shortly afterward was followed by record high inflation rates. Before the pandemic-induced economic turbulence, inflation had remained low and stubbornly so, even as money stock levels increased and sovereign debt rose following the 2008 financial crisis. The QTM failed to explain the post-2008 inflationary experience.

The use of the FTPL by Cochrane (2022a) to explain US inflation rightfully caught the attention of many economists. However, this attention followed also from concerning implications by the theory toward economies with a reduced capacity to recover from weak fiscal positions. That is, in spite of the FTPL's usefulness in explaining the inflation dynamics of the world's largest economy, much attention toward the FTPL followed from the grim picture it paints for those economies caught in the midst of the *unpleasant monetarist arithmetic*. In practical terms, the FTPL argues countries like South Africa that are faced with substantial debt burdens, stagnant economic growth and persistent fiscal deficits will face substantial inflation, either today or in the future, depending on the maturity of government debt and the ability of fiscal policymakers to convince debt holders that fiscal surpluses will eventually reduce the debt burden. Even worse, with substantial debt burdens, adjustments in interest rates exert significant influence over the fiscal position of the economy as tax revenue and interest expenses of the government debt are affected by the stance of monetary policy.

The results of the present article establishes from its results that inflation in South Africa is most likely both monetary and fiscal phenomena. More specifically, our results show that inflation dynamics are explained by both the actions of fiscal and monetary policymakers from the co-movements of relevant QTM and FTPL variables. Even more so, we argue that although both perspectives share substantial validity in explaining inflation, the significant erosion of South Africa's fiscal position presents a greater threat to inflationary pressures than money stock levels.

7 Conclusion

This paper explores the urgent need for coordination between monetary and fiscal authorities in response to rising global and local inflation, exacerbated by increasing government debt. By examining the South African context through the FTPL, the study seeks to critically evaluate traditional inflation theories, comparing the QTM with the FTPL. Using a fiscal-monetary VAR model accounting for both QTM and FTPL, we show that the dynamics of the central fiscal theory equation – the present value government budget constraint – describe SA's inflation relatively accurately according to the underlying theory. That is, inflation in South Africa is driven by both monetary and fiscal factors, with a greater influence attributed to the FTPL. Over the sample period, monetary policy in South Africa is active. Monetary authority controls inflation, while fiscal policy remains passive, with public debt stabilised by primary budget surpluses. Additionally, South Africa has also experienced active fiscal policy. In the event of a deficit shock, government debt would surge, requiring the fiscal authority to use inflation to stabilise debt, at least partially.

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A Appendix: Data

A.1 Data sources

The data for this project has been gathered from the following sources: Bank for International Settlements (BIS), the South African Reserve Bank (SARB) and Statistics SA (Stats SA). The web links to the respective data repositories can be found below:

Abbreviated Name	Link
BIS	https://data.bis.org/topics/DSS
SARB	https://www.resbank.co.za/en/home/what-we-do/statistics/releases/online-statistical-query
Stats SA	http://www.statssa.gov.za/

A.2 Data descriptives

- **Debt securities issued by general government, in domestic market at market value stocks**
  - **Source**: BIS
  - **Unit**: ZAR Millions
  - **Code**: Q.N.ZA.XW.S13.S1.N.L.LE.F3.T._Z.ZAR._T.M.V.N.C01
- **Debt securities issued by general government, in all markets at nominal value stocks**
  - **Source**: BIS
  - **Unit**: ZAR Millions
  - **Code**: Q.N.ZA.XW.S13.S1.N.L.LE.F3.T._Z.ZAR._T.N.V.N._T

- **91-day Treasury bill interest rates**
  - **Source**: SARB
  - **Unit**: Percentage
  - **Code**: KBP1574W
- **Government bond nominal yields: 10 to 15 years**
  - **Source**: SARB
  - **Unit**: Percentage
  - **Code**: KBP2003M
- **GDP Deflator**
  - **Source**: Own calculations using Stats SA GDP data
  - **Unit**: Index (Base year = 2015)
  - **Code**: NA
- **GDP at Constant 2015 prices & current prices**
  - **Source**: Stats SA
  - **Unit**: ZAR Millions
  - **Code**: QRS1000; QNS1000
- **Primary Balance**
  - **Source**: Own calculations using SARB national government revenue, expenditure and interest expense data
  - **Unit**: ZAR Millions
  - **Code**: KBP4597M, KBP4599M, KBP4601M
- **Primary balance as percentage of GDP**
  - **Source**: SARB
  - **Unit**: Percentage
  - **Code**: KBP4419K
- **National government total gross loan debt as percentage of GDP**
  - **Source**: SARB
  - **Unit**: Percentage
  - **Code**: KBP4116K
- **Money supply: M2**
  - **Source**: SARB
  - **Unit**: ZAR Millions
  - **Code**: KBP1373M

- **Consumption expenditure by households at constant 2015 prices**
  - **Source**: Stats SA
  - **Unit**: ZAR Millions
  - **Code**: QRS2011
- **BEASSA Government bond index (GOVI)**
  - **Source**: SARB
  - **Unit**: Index (Base year = 2000-06)
  - **Code**: KBP2013M

B Appendix: Results

B.1 The proposed fiscal-monetary VAR model

Table 2: Summary statistics of variables.

Variable	Mean	Median	Std. Dev.	Min	Max
π_t	0.014172	0.012012	0.009827542	-0.008876	0.043981
s_t	-0.000034	0.000150	0.003376062	-0.010531	0.008920
v_t	0.001318	0.007010	0.043784425	-0.155506	0.131376
r_t^n	0.000249	-0.000344	0.007294916	-0.015808	0.034837
g_t	0.006095	0.005939	0.007409505	-0.016346	0.027183
m_t	-0.000682	-0.001617	0.033750433	-0.062901	0.127493

Table 3: Coefficients: Full-sample proposed fiscal-monetary VAR (4-lags).

	s_t	v_t	r_t^n	m_t	g_t	π_t
s_{t-1}	0.20^{**}	-0.07	0.02	-0.28	-0.12	-0.04
v_{t-1}	-0.00	0.35^{***}	-0.01	-0.16^{**}	0.06^{***}	-0.00
r_{t-1}^n	-0.03	0.46	0.53^{***}	0.17	-0.03	-0.24
m_{t-1}	0.00	0.14	0.01	0.64^{***}	0.06^{*}	0.07^{*}
g_{t-1}	0.01	-0.53	0.10	-0.63	0.13	0.21
π_{t-1}	0.05^{*}	-0.59	0.17^{***}	0.22	-0.09	0.28^{***}
s_{t-2}	0.25^{**}	-0.80	0.05	0.00	-0.03	0.41
v_{t-2}	0.02^{**}	0.29^{**}	-0.04^{**}	-0.01	0.02	0.03
r_{t-2}^n	-0.01	0.46	-0.39^{***}	-1.06^{*}	0.04	-0.07
m_{t-2}	0.01	-0.14	-0.02	-0.08	-0.00	-0.09^{**}
g_{t-2}	0.03	-0.16	-0.17^{**}	-0.44	0.27^{***}	-0.10
π_{t-2}	-0.05	-0.50	0.19^{***}	-0.54^{*}	0.11	-0.15
s_{t-3}	-0.08	-0.56	0.03	0.36	0.06	0.03
v_{t-3}	0.01	-0.02	0.02	0.02	-0.03	-0.05^{*}
r_{t-3}^n	0.02	-0.22	0.32^{***}	0.10	0.03	-0.26
m_{t-3}	-0.00	0.36^{**}	0.02	0.17	-0.06	0.04
g_{t-3}	0.04	-0.23	-0.14^{*}	0.20	0.16	0.14
π_{t-3}	0.07^{*}	-0.06	-0.05	0.64^{**}	-0.04	0.06
s_{t-4}	-0.18^{*}	-1.72	0.10	-1.05	-0.03	-0.09
v_{t-4}	0.01	0.27^{**}	0.00	-0.01	-0.00	0.02
r_{t-4}^n	-0.02	0.20	-0.26^{***}	0.00	-0.01	0.15
m_{t-4}	0.01	-0.32^{**}	0.03	-0.09	-0.00	-0.03
g_{t-4}	0.00	0.53	-0.12	0.11	-0.15	-0.12
π_{t-4}	-0.02	-0.77^{*}	0.03	0.43	-0.11	0.25^{**}
$const$	-0.00	0.03^{***}	-0.00	-0.01	0.01^{**}	0.01^{**}
R^2	0.54	0.54	0.60	0.58	0.35	0.32
Adj. R^2	0.43	0.43	0.50	0.47	0.18	0.15
Num. obs.	120	120	120	120	120	120

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

Table 4: Coefficients: Sub-sample proposed fiscal-monetary VAR (4-lags).

	s_t	v_t	r^n_t	m_t	g_t	π_t
s_{t-1}	0.06	0.74	−0.14	−0.23	0.04	−0.18
v_{t-1}	−0.03	0.49*	−0.06**	−0.20	0.14***	0.01
r^n_{t-1}	−0.31	4.94	0.14	1.62	0.74	0.05
m_{t-1}	0.02	0.40	0.02	0.60***	−0.01	0.03
g_{t-1}	0.03	−0.29	0.03	−1.58**	−0.31*	0.18
π_{t-1}	0.14	−0.80	0.19*	0.14	−0.37*	−0.40**
s_{t-2}	0.24	−0.50	−0.00	−0.58	−0.02	0.23
v_{t-2}	0.00	0.74**	0.00	0.33	0.07	0.09*
r^n_{t-2}	−0.07	1.13	0.35	1.46	−0.30	0.63
m_{t-2}	0.03	−0.66*	−0.01	−0.19	0.02	−0.06
g_{t-2}	0.02	1.45	−0.14	−0.52	−0.06	−0.12
π_{t-2}	0.12	−2.29*	0.27**	−1.57*	−0.22	−0.49***
s_{t-3}	−0.06	0.29	−0.04	0.30	0.10	0.23
v_{t-3}	0.01	−0.43	0.04	0.03	−0.01	0.03
r^n_{t-3}	0.13	−4.23	0.07	−2.69	0.22	−0.38
m_{t-3}	−0.01	0.66*	−0.04	0.28	−0.05	−0.00
g_{t-3}	0.05	1.45	−0.08	0.82	−0.08	0.18
π_{t-3}	0.21*	−0.66	0.11	0.70	−0.24	−0.44**
s_{t-4}	−0.25	−0.66	−0.12	−1.10	0.03	0.25
v_{t-4}	0.02	0.14	−0.02	−0.19	−0.01	−0.02
r^n_{t-4}	0.12	1.85	−0.28	−1.05	−0.12	−0.37
m_{t-4}	0.02	−0.53*	0.04	−0.14	0.01	0.03
g_{t-4}	0.04	0.78	−0.00	0.30	−0.33**	0.03
π_{t-4}	0.09	−1.98	0.19*	−0.20	−0.13	0.17
const	−0.01*	0.06	−0.01*	0.01	0.02**	0.03***
R^2	0.61	0.54	0.63	0.58	0.62	0.69
Adj. R^2	0.35	0.22	0.37	0.29	0.36	0.47
Num. obs.	60	60	60	60	60	60

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

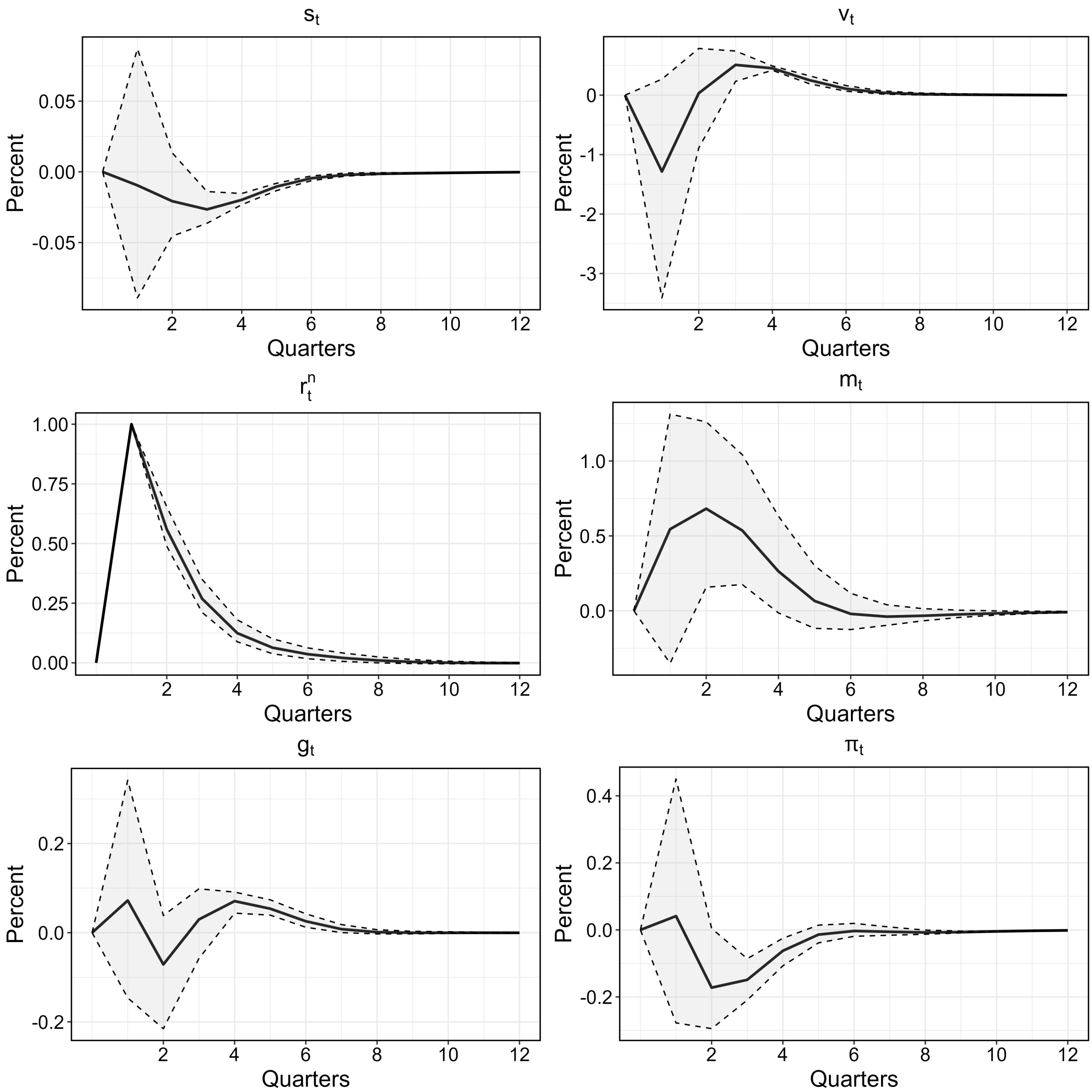

Figure 10: Full-sample proposed model i_t shock IRFs. Note: The dashed lines indicate the 95% confidence interval.

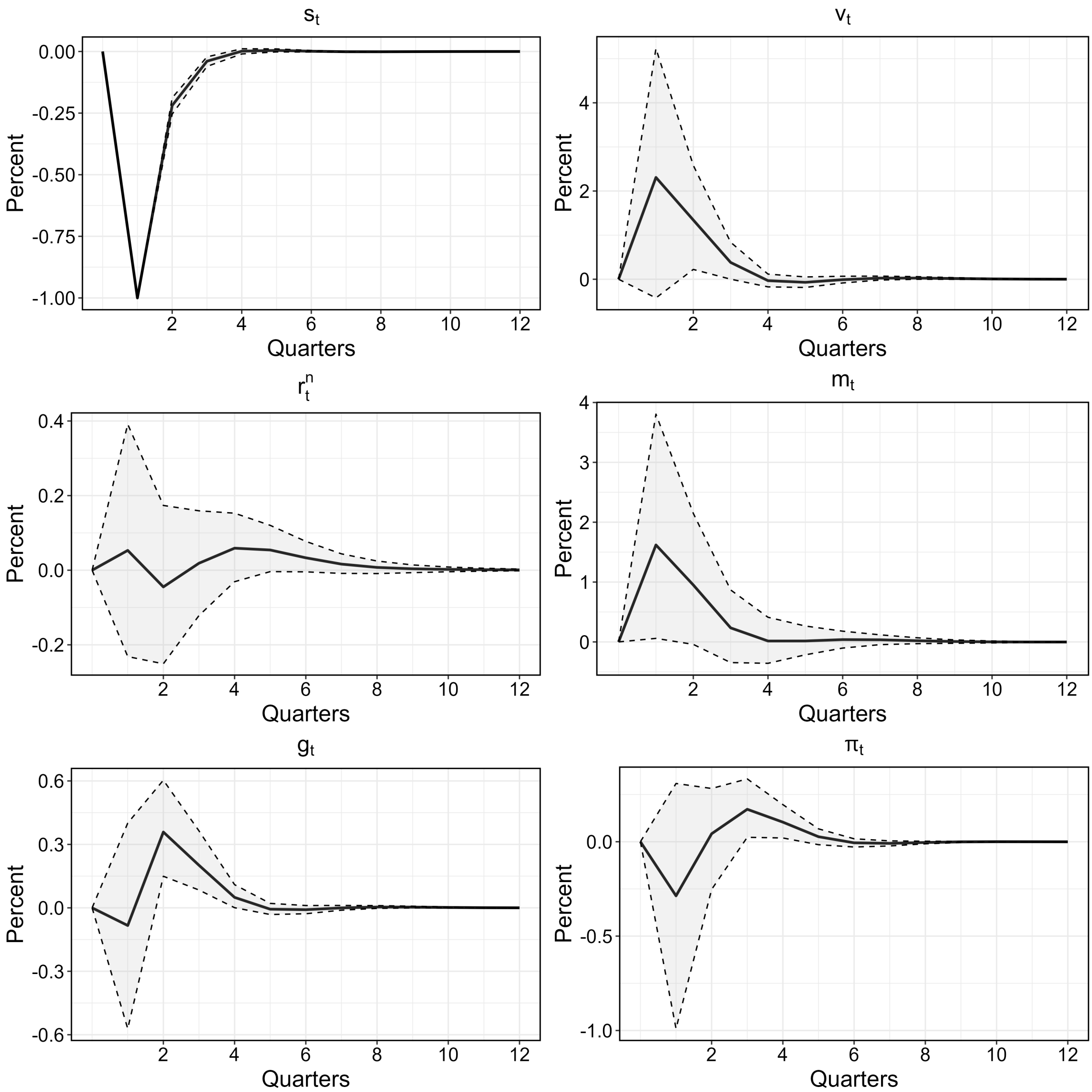

Figure 11: Full-sample proposed model s_t shock IRFs. Note: The dashed lines indicate the 95% confidence interval.

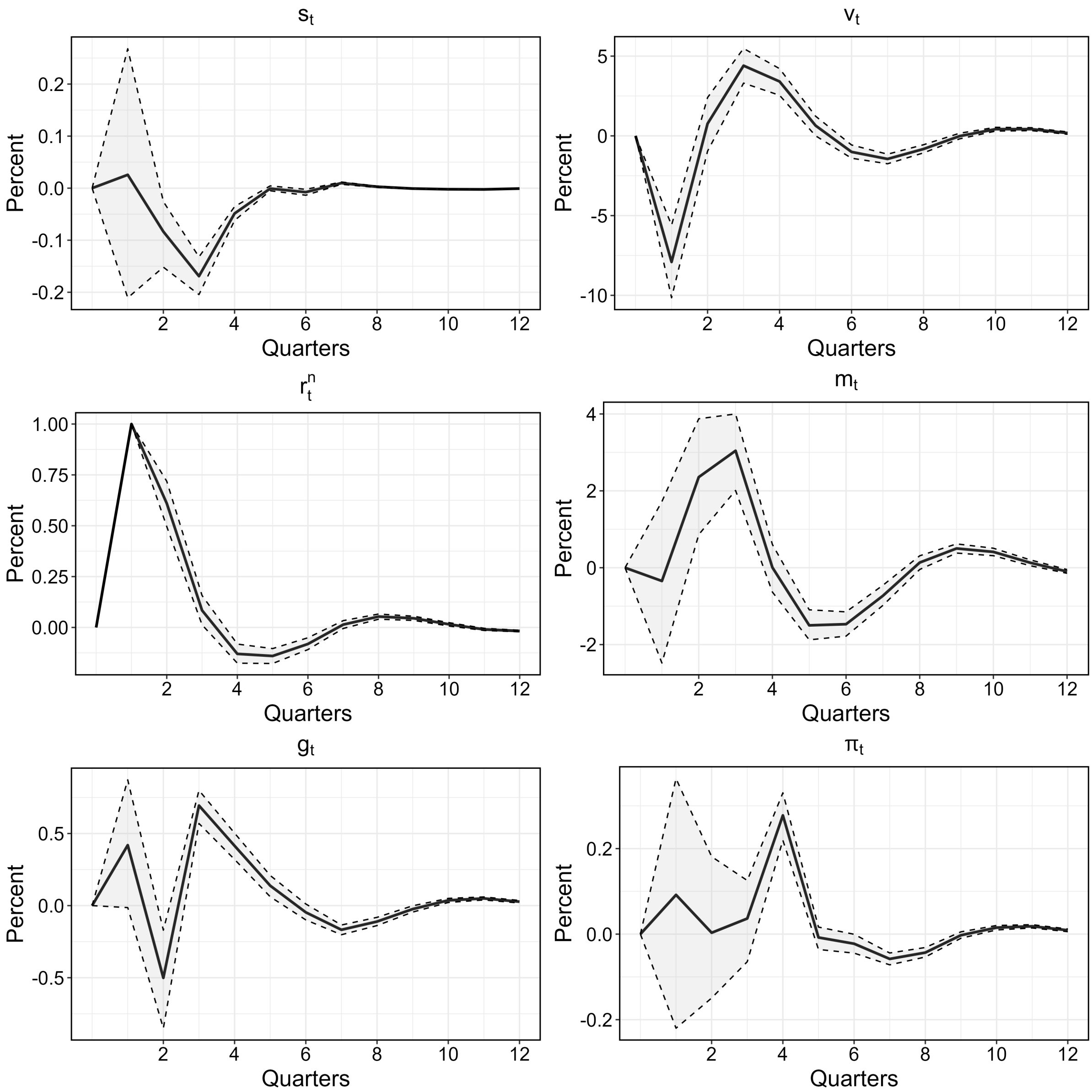

Figure 12: 2009-2024 Sub-sample proposed model i_t shock IRFs. Note: The dashed lines indicate the 95% confidence interval.

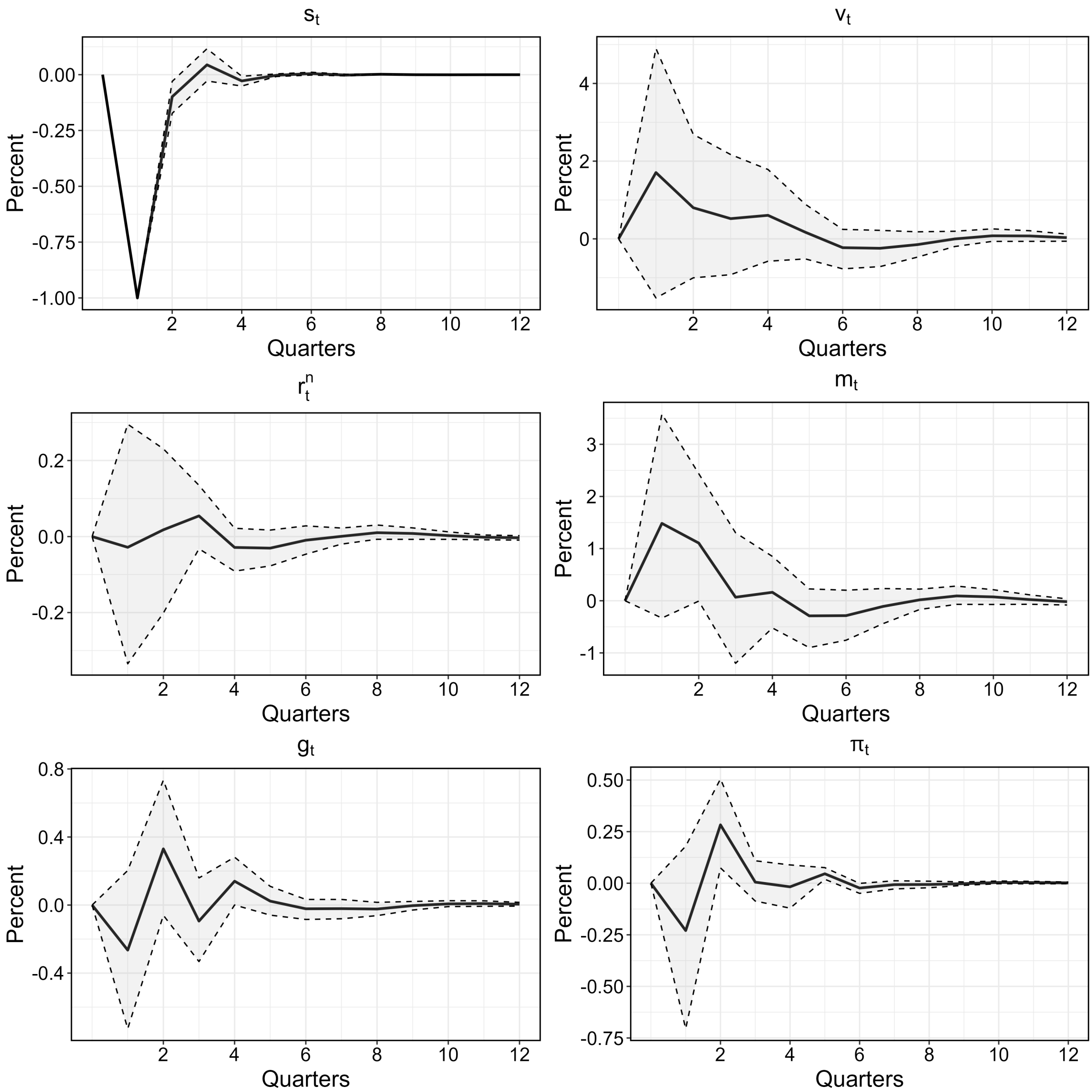

Figure 13: 2009-2024 Sub-sample proposed model s_t shock IRFs. Note: The dashed lines indicate the 95% confidence interval.

B.2 Cochrane model

Table 5: Coefficients: Cochrane replication model VAR (4-lags).

	s_t	v_t	r_t^n	g_t	π_t
s_{t-1}	0.26^{**}	0.29	0.12	-0.32	-0.07
v_{t-1}	-0.00	0.36^{***}	-0.00	0.07^{***}	0.00
r_{t-1}	0.00	0.42	0.55^{***}	-0.02	-0.22
g_{t-1}	0.00	-0.40	0.08	0.12	0.19
π_{t-1}	0.06^{*}	-0.73^{*}	0.14^{***}	-0.04	0.26^{**}
s_{t-2}	0.20^{*}	-1.72	0.26	0.09	0.55
v_{t-2}	0.02^{**}	0.27^{**}	-0.04^{**}	0.01	0.01
r_{t-2}	-0.01	0.32	-0.37^{***}	0.04	-0.11
g_{t-2}	0.02	-0.12	-0.16^{**}	0.20^{*}	-0.12
π_{t-2}	-0.05	-0.12	0.16^{***}	0.11	-0.13
s_{t-3}	-0.09	-0.65	-0.01	0.10	-0.03
v_{t-3}	0.00	-0.01	0.02	-0.03	-0.04
r_{t-3}	0.04	-0.14	0.32^{***}	-0.05	-0.32^{*}
g_{t-3}	0.03	-0.56	-0.14^{*}	0.17	0.12
π_{t-3}	0.06^{*}	-0.17	-0.03	-0.08	0.01
s_{t-4}	-0.22^{**}	-1.21	-0.05	-0.01	-0.08
v_{t-4}	0.01	0.23^{**}	-0.01	-0.00	0.01
r_{t-4}	-0.02	0.03	-0.21^{**}	-0.01	0.17
g_{t-4}	-0.00	0.60	-0.17^{**}	-0.13	-0.09
π_{t-4}	-0.01	-0.62	0.03	-0.07	0.32^{***}
const	-0.00	0.03^{**}	-0.00	0.00^{**}	0.01^{**}
R^2	0.52	0.52	0.58	0.29	0.27
Adj. R^2	0.42	0.42	0.50	0.14	0.12
Num. obs.	117	117	117	117	117

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$

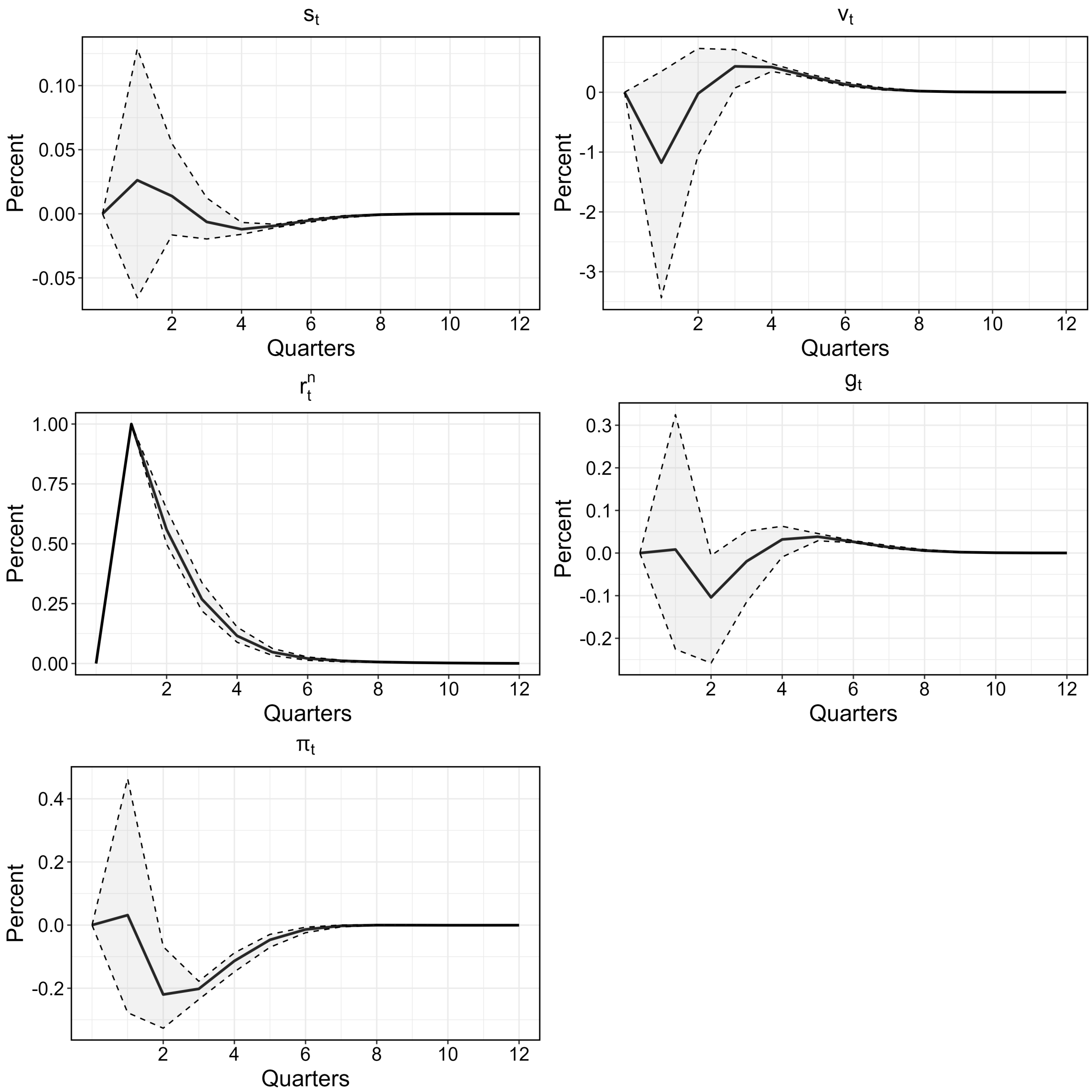

Figure 14: Cochrane model i_t shock IRFs. Note: The dashed lines indicate the 95% confidence interval.

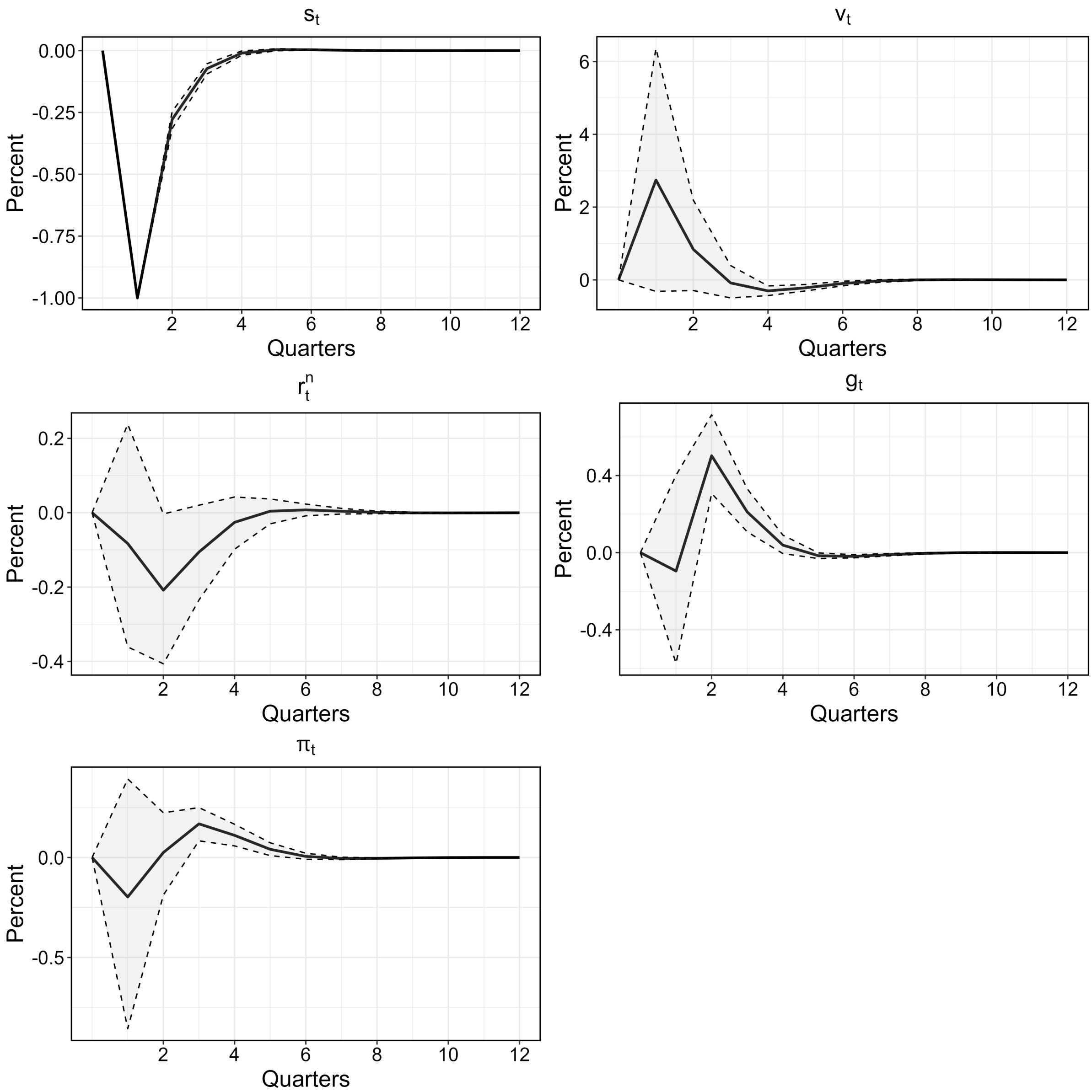

Figure 15: Cochrane model s_t shock IRFs. Note: The dashed lines indicate the 95% confidence interval.