College of Law and Management Studies

School of Commerce

The exploration of the divine coincidence in South Africa

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This dissertation is submitted in fulfilment of the requirements for the **Master of Commerce in Economics (MCOM-E) degree.**

Abstract

This study looks at the divine coincidence. The study explores the assumption that the central bank does not have to face a trade-off between stabilizing the inflation rate and reducing the output gap. In the context of South Africa, the government has struggled to place the economy on a strong growth trajectory, which has led to a debate about the effectiveness of monetary policy. The sample period under analysis spans from 2000 to 2024 – which is a period in which the South African Reserve Bank (SARB), has been pursuing inflation targeting. The parameters in this study are calibrated using the parameters available in South African literature for the period 2000 to 2024. The study uses a New Keynesian Dynamic Stochastic General Equilibrium (DSGE) framework. The first objective explored whether the divine coincidence holds in the South African economy. The second objective incorporates a technology shock to determine its effect on inflation and output while the central bank stabilizes inflation. In addition, a cost-push shock was incorporated as it is a significant determinant of inflation in South Africa. The third objective to determine the weight the central bank places when responding to the inflation rate. While this is a counterfactual estimation, it allows for policymakers to observe the effects of achieving both price stability and output gap reduction with a technological shock. The results show that the divine coincidence does not hold in South Africa. Secondly, inflation decreases and output increases in the event of a technology shock. Lastly, the central bank puts more weight on stabilizing inflation relative to stabilizing output. The study provides insight on how managing the inflation rate and reducing the output gap simultaneously can lead to economic growth and reduce unemployment as a natural consequence. The non-existence of the divine coincidence is not a crisis for the SARB, however it prompts policymakers to take an approach or adopt strategies that manage the trade-off, while supporting economic growth. This responsibility however, cannot rest solely on the SARB.

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Proverbs 1:5

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Chapter 1 – Introduction

Policymakers face the responsibility of ensuring that through policy decisions, the economy achieves desirable outcomes (Masilela, 2024). This is what we refer to as optimal policy. These decisions can be based on targeting the inflation rate or maximizing output. Similarly, optimal monetary policy refers to the action taken by the central bank to achieve inflation rate goals or reduce the output gap, in spite of market frictions (SARB, 2020b). They do this by managing the money supply or the interest rate. Optimal monetary policy is prone to economic shocks, price rigidities and uncertainty. This challenges policymakers in trying to control the inflation rate, narrow the output gap, and ultimately, make the economy function at its full potential. Thus, policymakers tend to either target the inflation rate or employment, but the divine coincidence argues otherwise.

The divine coincidence - which was discovered by Blanchard and Gali (2007) - argues that under certain New Keynesian assumptions, there is no trade-off between the inflation rate and the output gap (Alves, 2014). In other words, optimal monetary policy can stabilize the inflation rate and the output gap simultaneously, which also reduces unemployment. According to Schularick (2022), this is possible because "keeping inflation close to the target is all that is necessary to support the economy through the cycle, irrespective of the source of the shock." Paez-Farrell (2023) also argues that what allows for the divine coincidence to exist is stabilizing the inflation rate. The divine coincidence breaks down under certain assumptions, which include the presence of rigidities (Blanchard and GalÍ, 2007); particularly real wage rigidities (Abbritti et al., 2012). This means wages do not adjust fast enough to changes in the economy, such as a change in prices or unemployment, and as a result, the divine coincidence disappears.

Pursuing macroeconomic stability is of high importance to policymakers. Ideally, an economy functioning at potential output, full employment and with a stabilized inflation rate is optimal (Friesz, 2010). The divine coincidence offers a framework that argues the possibility of stabilizing the inflation rate and output with one instrument: the nominal interest rate. Furthermore, the coincidence is said to be 'divine' because it is believed that it simplifies the effort for monetary authorities if they have one policy that addresses two macroeconomic variables simultaneously.

In addition, employment would be at the natural rate of unemployment, minimizing cyclical unemployment. Moreover, actual output would be at the potential level. This stabilized environment reduces uncertainty and encourages investment which boosts economic growth (Sultana and Turkina, 2020). In contrast, the divine coincidence is often criticised for being based on simple assumptions. However, as a counterfactual approach to research (Benati, 2010), it can be used to gain insight into the complex relationships between variables in the economy.

In the real economy, however, shocks and rigidities cannot be relaxed. Shocks are exogenous disturbances that impact the inflation rate and the output gap. Furthermore, the output gap and the inflation rate are impacted by other determinants that fiscal or monetary policy tools cannot address directly. As a result of these disturbances, economies may face a trade-off in the short-run (Woodford and Walsh, 2005). Cost-push or mark-up shocks, for example, can create a wedge between the inflation rate and the output gap. To narrow down even further, these shocks can lead to disruptions of supply chains, the level of productivity by firms and the desired profits. Thus, the gap between actual output and the potential level of output widens even further, which slows down economic growth. If the impact of these shocks cannot be efficiently managed by policymakers, the economy may experience stagflation (Kilian, 2009).

In February 2000, South Africa adopted an inflation rate targeting policy ranging from 3% - 6% (SARB, 2023a). The reason for inflation targeting is based on the argument that targeting inflation has more of a permanent effect on the economy than targeting growth (SARB, 2020b). With this policy, Msomi and Ngalawa (2024) are of the view that the central bank aims to guide market expectations and ultimately improve the South African economy, and reduce unemployment. With the use of the interest rate, the inflation rate in South Africa has been kept relatively within the target; however, there have been instances in which it exceeded this target. Annual consumer inflation recorded a peak of 8.0% in May 2009 (StatsSA, 2022), following a currency depreciation during the Financial Crisis of 2008. Between 2010 and 2020, prices increased by 65%, with the annual inflation rate averaging 5.2% (SARB, 2020b). Understanding the inflation rate is crucial for the South African economy because its stability is the SARB’s core objective.

The output gap is the difference between the potential output and the actual output being produced (Fedderke and Mengisteab, 2016). It provides insight into whether an economy is underutilizing or over utilizing its resources. A negative output gap means the actual output is less than what the economy would produce at full potential. The opposite is true for a positive output gap. The output gap, however, is not very easy to determine, and so it is often estimated. As a result, it is subject to distortions or miscalculations, which affect policy decisions (Vermeulen, 2023). Despite this shortcoming, the output gap is an important indicator of an economy's performance as it reflects where the economy is producing relative to its potential output, and it can be argued that it gives insight into the unemployment status of an economy. Ngalawa and Komba (2020b) argue that through the inflation target policy, the SARB is expected to also prioritize output stability. One can support this argument since the SARB plays a crucial part in influencing economic growth through its response to market frictions and the policies it implements. An output gap exists because of fluctuations in aggregate demand (Blanchard, 2017).

A low inflation rate and economic growth can be attributed to technology because technology increases market competition by reducing barriers to entry (Lv et al., 2019). Furthermore, a technology shock – be it temporary, persistent or permanent – has an influence on the fluctuations in the number of hours worked and the amount of output produced during business cycles. Since technology has an effect on productivity, it is reasonable to conclude that it will affect the output gap. Moreover, a positive technology shock is expected to reduce the output gap, as it would increase production and suggest that actual output converges towards potential output (Chen and Górnicka, 2020).

South Africa grapples with high unemployment and low economic growth, (Semosa and Kanayo, 2021) which has led to extensive discussions about the approach to address and attain higher levels of economic growth. As such, one of the public protector's reports advised that the SARB should also pursue economic growth. This led to a legal battle between the public protector and the SARB over its mandate (Zongwe, 2020). The African National Congress (ANC) has been in power for the past 30 years in South Africa (Francis et al., 2021). At the 54th national conference of the ANC it was resolved that its government will work towards broadening the

mandate of the SARB to ensure that the central bank is creating employment and economic growth (ANC, 2017).

According to Modiba et al. (2024), unemployment has an official and extended definition. The extended definition included people who are discouraged – who have lost hope in looking for employment (Aneesa, 2024). Over the past two decades, the unemployment rate has been on the rise in South Africa. In conjunction, the country has recorded the highest unemployment rate of 33.7% among the G20 countries for 2024 (Dyvik, 2025). It can be argued that the macroeconomic variables discussed above question how monetary policymakers can stabilize the inflation rate while reducing the output gap and unemployment. As a result, this is the context in which the divine coincidence becomes relevant.

Stiglitz (2008) argues that inflation targeting is not always successful for developing countries. This is because developing economies face several challenges that are beyond the control of the central bank. Meanwhile, inflation targeting has been the most successful mandate in managing inflation for South Africa for the past two decades (Bonga-Bonga and Lebese, 2019). In addition, a few months after the adoption of inflation targeting, the SARB managed to anchor expectations (SARB, 2001) and gain credibility. Moreover, expectations and cost-push shocks are major determinants of inflation in South Africa (Meyer, 2020). Well-anchored expectations create a suitable environment for the divine coincidence. This is because when expectations are stable, inflation (which reflects demand pressures) becomes a reliable indicator of the output gap (Jorgensen and Lansing, 2021). Furthermore, inflationary pressure in South Africa has become largely influenced by domestic factors relative to external factors (Dery et al., 2025) Therefore, domestic cost-push shocks have a significant effect on inflation.

Problem statement:

In the literature, there is a debate about the effectiveness of monetary policy in stabilizing prices (Bhattacharya and Jain, 2020). Furthermore, the debate expands towards considering whether monetary policy can be used to stabilize or reduce the output gap (Billi, 2020). In the context of South Africa, the government has struggled to place the economy on a strong growth trajectory for decades, which has led to a debate on the effectiveness of monetary policy (Mutwanamba, 2024). In addition, the

impact of technology shocks and cost-push shocks on the inflation rate and the output gap remains underexplored. Meanwhile, several studies (Ziramba, 2008; Nell, 2018; Hassan and Meyer 2020) have claimed that cost-push shocks are a major determinant of inflation. Furthermore, Weber (2018) argues that an output gap of zero is consistent with sustainable employment at its full potential and maximum output.

In the past two decades, the SARB has been successful in stabilizing the financial environment (Bonga-bonga and Lebese, 2019). Therefore, this is associated with conditions that present the economy as a suitable investment destination. Furthermore, price stability is suggestive of a stable economy and therefore, attracts investment (SARB, 2022a). According to Sultana and Turkina (2020), investment creates a channel for countries to adopt new technologies, which increases productivity and boosts economic growth. The literature further shows that economies experience rapid economic growth which can be associated with technological innovation (Boeing et al., 2022). However, despite the SARB successfully stabilizing inflation, low economic growth remains an issue. Therefore, it will be insightful to assess the effect of a technology shock in South Africa and observe the monetary policy response, and the impact of the shock on (output) economic growth.

Alla et al. (2016) argue that the divine coincidence does not hold due to cost-push shocks. The shocks create a trade-off, and policymakers have to choose between targeting inflation and output. In contrast, a study done by Gödl-Hanisch et al. (2024) argues that even with a cost-push channel, the divine coincidence holds, provided that the balance sheet and nominal interest rate are used as policy tools. The contradiction in these findings creates an issue in the literature as the relationship between the inflation rate and cost-push mechanisms is not clear. Therefore, there is a need for further exploration. This gap in understanding also creates an issue for policymakers as they are inadequately informed about the relationships that may exist between the variables they target or use for policy. This hinders making effective policy decisions. Having a monetary policy that is well coordinated with other economic policies is essential for an economy to achieve stability and balanced growth. When these policies do not align, it creates challenges or trade-offs. The main objective of this study is to explore the divine coincidence in South Africa.

Objectives of the study:

1. To analyse if the divine coincidence holds in South Africa.

2. To determine the effect of technology and cost-push shocks on the inflation rate and output.

3. To determine what weight the central bank places on price stability.

Research questions:

1. What is the effect of reducing the output gap while stabilizing the inflation rate?

2. How do technological and cost-push shocks impact the inflation rate and output?

3. What weight does the central bank place on price stability?

Hypothesis:

Alves (2014) uses the standard New-Keynesian model to test for the divine coincidence and finds that the divine coincidence will only hold if the inflation rate is set exactly at 0%. This inflation rate, however, is not considered realistic by most central banks – including South Africa. Therefore, in this study, the inflation rate calibrated for South Africa will be more realistic, and will be greater than zero (π>0). Thus, the hypothesis for this study is as follows:

Null hypothesis: the divine coincidence holds in the South African economy

Alternative hypothesis: the divine coincidence does not hold in the South African economy.

Significance and contribution of the study

To the best of my knowledge, there are two studies in the literature that are related to this one, but their focus is on a different concept. The first one was done by Giovanardi and Kaldorf (2024), in which they extended the divine coincidence by analyzing the effect of externalities. While Abbritti et al. (2012) explored the divine coincidence in relation to labour market frictions. This study is different because in the analysis, both the technology and cost-push shocks are included to examine an emerging economy with an inflation-targeting monetary policy framework. In addition,

the study employs a Hybrid New Keynesian Phillips Curve (H-NKPC). This study contributes to the literature by providing findings of the divine coincidence analysis with a technology and cost-push shock for an emerging economy.

This study will be significant for South Africa because the economy faces challenges with economic growth (output) and unemployment, while the SARB has had great success in stabilising inflation over the last two decades. In addition, the divine coincidence focuses on inflation and the output gap, in which South Africa has successfully stabilized the former and is challenged by the latter. Therefore, this study will examine the co-ordinated stabilization of inflation and output, without undermining the existing success in stabilizing inflation. Understanding if the divine coincidence holds will assist policymakers in identifying what action would be optimal to stabilize the economy. Moreover, the findings of the study can be used to inform policy for South Africa.

This study seeks to analyse the inflation and output gap in South Africa, through the lens of the divine coincidence. This will provide insight into the possible reasons as to why the central bank has managed to stabilize the financial environment, yet economic growth remains low. The structure of this study is as follows: Chapter 2 presents a comprehensive literature review that dives deeply into the theoretical foundations of the discovery of the divine coincidence, together with empirical evidence. This chapter also explores monetary policy in South Africa and empirical evidence of technology shocks and cost-push shocks. Chapter 3 outlines the methodology for this study and the specific New Keynesian DSGE model employed. This is followed by chapter 4 which presents the results together with an analysis and discussion of the findings. Finally, chapter 5 concludes and offers recommendations for economies challenged by fostering economic growth.

Chapter 2 – Literature Review

2.1 Theoretical framework

A standard New Keynesian model is often used for monetary policy analysis. This model includes firstly, a New Keynesian Phillips Curve (NKPC) to analyze the relationship between inflation and unemployment or output. Secondly, an IS curve to represent the goods market in the economy, and thirdly, a monetary policy rule which is often the Taylor rule (Walsh, 2016). The New Keynesian model provides a framework that incorporates rigidities – be it rigid prices, rigid wages or both. Furthermore, these rigidities are often modelled from Calvo (1983), who explains how decisions made by firms create rigidity. Moreover, Walsh (2005) argued that it is price rigidity that allows monetary policy to have an impact on real variables in the short-run. New Keynesian models also incorporate rational expectations. All these equations integrate to create a model that represents a real-world economy. In addition, studies add or remove certain assumptions and attempt to understand how variables interact in an economy.

The Taylor rule was developed by John Taylor in 1993 (Nelson, 2025) .It is a monetary policy phenomenon that shows how central banks set the nominal interest rate based on how much the inflation rate and output deviate from their target levels respectively (Martins, 2000). It has however, been criticized on the fact that it relies on unobservable variables such as the natural rate of interest (Schmidt-Hebbel and Walsh, 2009). In addition, Hetzel (2000) questioned the effectiveness of the Taylor rule since it proposes that response is better than prevention. In contrast, it has become a point of reference in policy discussions and is argued to have improved central banking (Asso et al., 2010). The Taylor rule has been commonly used in studies that investigate the divine coincidence since it focuses on the two variables that are the very core of the phenomenon (Marbet 2022; Rubbo, 2023; Gnocchi et al., 2024).

The mid-1980s to 2007 mark a time known as the Great Moderation, in which developed economies experienced less volatility in business cycles, low levels of inflation and sustainable economic growth (Gadea Rivas et al., 2015). The Great Moderation ended with the financial crisis of 2008-2009, which challenged policymakers as existing monetary policy could not keep up with the financial

changes that were taking place. During the Great Moderation however, policymakers could implement monetary policy that could stabilize the inflation rate and enable the economy to operate at full potential (Palek, 2016) – which (Blanchard and GalÍ, 2007) have defined as the divine coincidence. The divine coincidence argues that the policy that stabilizes the inflation rate should reduce the output gap. Similarly, the policy that reduces the output gap should stabilize inflation. Rhee and Turdaliev (2012) challenged this notion and argue that stabilizing the output gap can lead to fluctuations in the inflation rate, making it a challenge for policymakers to implement policy. Therefore according to this argument, having an inflation target that stabilizes both inflation and output is more suitable.

The divine coincidence holds in a standard New Keynesian model provided the central bank follows the Taylor rule, there is nominal price or wage rigidity and that there are no real rigidities (Blanchard and Gali, 2005) such as real wage rigidities. In this way, the central bank can influence the real economy more effectively through monetary policy (Walsh, 2005). In the presence of real rigidities – with real wage rigidities being the most commonly used example – the divine coincidence breaks down (Blanchard and GalÍ, 2007). This is because real rigidities challenge policymakers in implementing policy that will stabilize the inflation rate and reduce or stabilize the output gap simultaneously. The divine coincidence and its breakdown has been the subject of empirical scrutiny. As a result of the simplified rigidities, there is literature that suggests that the divine coincidence lacks real-world applicability (Nguena, 2010). However, studying the divine coincidence remains valuable to economic research because it allows for the evaluation of policy and therefore, fosters new effective ways of designing policy (Shen, 2020).

2.2 Empirical framework

Ahiadorme (2020) mentioned that the Federal Reserve's objectives include encouraging employment to its full potential while maintaining price stability. Furthermore, Michaillat and Saez (2024) used the Beveridgean Phillips curve – which associates the inflation rate gap with the unemployment gap. Their study shows that the divine coincidence exists in the United States (US) for the period 2021-2023. This means that the US was successful in achieving its mandate – stabilizing the inflation rate while simultaneously reducing the unemployment gap. In

addition, Benigno and Eggertsson (2023) found that the divine coincidence holds for the period 2008-2022. Considering that these studies were done for periods during or after a shock (the financial crisis of 2008-2009 and COVID-19), suggests that the Federal Reserve effectively managed to implement policy and stabilize the inflation rate and output.

Hofman et al. (2020) argued that dollar-invoicing – when exports are expressed in dollars (Cook and Patel, 2022) - is what leads to “the lack of divine coincidence in the conduct of monetary policy in Small Open Economies” (SOE). However, Acharya and Challe (2024) study explored the divine coincidence in the case of an SOE. The study found that the divine coincidence holds for SOEs, and a trade-off would only be created by market frictions and differences in income or consumption for households. This result supports the theory that real rigidities break down the divine coincidence. It can be argued that although likely, not every SOE is subject to dollar invoicing and so this may be the reason for the contradicting results. Results for Vietnam for the period 2008 - 2018 show that the trade-off between the inflation rate and output is reduced by foreign capital inflows (Hung, 2021). This suggests that it is possible for Vietnam to stabilize both the inflation rate and output, provided that the inflow of foreign capital boosts economic growth without causing inflationary pressure.

Seo (2024) studied whether monetary policy is optimal through the divine coincidence by using conventional or unconventional monetary policy methods. The study found that conventional and unconventional policy methods were necessary for the divine coincidence to hold. The divine coincidence has been challenged by the argument that it only holds if monetary policy authorities decide to hold the inflation rate at 0% (Alves, 2014). This can be problematic because it limits the scope of monetary policy in that the interest rate cannot go below zero or be in the “zero-lower bound” (Klein, 2017). Although not fully aligned with Klein’s (2017) study, Van der Ghote (2020) study concluded that the divine coincidence can hold between macroeconomic stabilization and financial stability if there is little government intervention in the finance system, and the interest rate is low (lower than the Effective Lower Bound), but still high enough for monetary policy to operate.

Abbritti et al. (2012) argued that they introduce a more realistic labour market into a New Keynesian model. They conclude that a trade-off exits due to labour market structural features such as workers' bargaining power, the separation rate and job finding rate. Therefore, the divine coincidence breaks down. Although the reasons mentioned are not necessarily real wage rigidities, one can argue that these factors contribute to real wage rigidities. Alogoskoufis and Giannoulakis (2025) explored the divine coincidence with a DSGE model defined with a closed economy. The results showed that the divine coincidence does not hold because of real wage rigidities. Therefore, these studies serve as evidence of how the divine coincidence breaks down with the existence of real rigidities.

Rossi and Mattesini (2007) also included the labour market; however, their analysis uses the role played by trade unions as a proxy for nominal wage rigidity and what effect this has on policymakers trying to stabilize the inflation rate and the output gap. Using a New Keynesian DSGE model, their results show that the divine coincidence does not hold. Similarly, Guerrieri et al. (2021) based their study of the divine coincidence in an economy that includes various sectors, wage rigidities, and labour reallocation. The study also included an asymmetric shock (a reallocation shock), and observed the effect on optimal monetary policy. The results show that an endogenous asymmetric shock shifts demand in the different sectors, pushes the inflation rate passed its target and therefore breaks the divine coincidence. This is because for the divine coincidence to hold, the inflation rate would have to be stabilized at the inflation target rate and not exceed it.

Furthermore, Gnocchi et al. (2024) used the Phillips curve and found that in Canada the divine coincidence does not hold, and instead, there is a trade-off between the inflation rate and output. Rubbo's (2023) study is defined by a multi-sector economy in which monetary policy follows the Taylor Rule to set the nominal interest rate. The findings emphasized that the divine coincidence does not hold and monetary policy cannot achieve the first best policy, which is to stabilize both the inflation rate and the output gap. The results found in Sims et al. (2023) emphasize that credit shocks appear in the Phillips curve and as a result, the divine coincidence does not hold.

Targeting both the inflation rate and the output gap however, is not always optimal for a country's economy. Eusepi et al. (2020) argued that stabilising both the inflation

rate and the output gap is not optimal because households do not have rational expectations about the behaviour of interest rates. Similarly, evidence of this is found in Giovanardi and Kaldorf (2024) study of the divine coincidence that includes an emission externality. They concluded that the divine coincidence is not optimal because it ignores externalities (such as pollution) that increase as the economy grows. Therefore, what makes policy optimal is not only that it leads to economic sustainable growth, but the effect on the environment is also considered. The study by Millischer et al. (2023) took a “greening monetary policy” approach, as they tested for the divine coincidence between fossil-fuel prices and the inflation rate. Their empirical analysis neither confirmed nor denied the divine coincidence, which one can argue, further enhances the debate and encourages the need for further research.

The phrase ‘divine coincidence’ has also been used to refer to exploring relationships or trade-offs between other variables other than inflation and the output gap. For instance, a study by Del Negro et al. (2025) looks at the trade-off between stabilizing inflation and consumption. The study found that the divine coincidence holds for the rich and not for the poor. The trade-off for the poor is firstly due to the fact that inflation negatively affects real wages. Secondly, the poor are affected more by aggressive monetary policy responses, which further reduce real wages and increase unemployment. Van der Ghote (2020) investigated the divine coincidence in terms of financial stability and economic stabilisation. Acharya and Challe (2024) found that the divine coincidence holds in a Small Open Economy where risk is a-cyclical due to the absence of hand-to-mouth households. However the divine coincidence breaks down when terms-of trade clash with stabilising producer prices and the output gap. This is to say, trade affects domestic prices and output which means the implementation of domestic monetary policy is challenged by trade mechanisms. This is the reality for several emerging economies.

2.3 Technology shocks

Technology shocks refer to a form of innovation that takes place in the economy and affects productivity. A distinction between a positive technology shock and a negative technology shock is important to understand how each affects the economy. A positive technology shock, for example, a car company creates an

automation that can assemble car parts more quickly, means that the car company can increase their production. This increase in production increases output (Romer, 2012). A negative technology shock, decreases production and therefore output. The theory presented by the Solow growth model states that technological innovation significantly boosts economic growth and therefore, reduces the output gap, as the economy is producing closer to its potential (RA, 2020). The advantages of positive technology shocks include a decrease in production costs and potentially higher wages (Carlsson and Smedsaas, 2007). It may also create new job opportunities which in turn decreases unemployment (Alexopoulos, 2011). However, despite these advantages, studies that analyse the impact of technology shocks on output, inflation and employment have presented contrasting results.

A study by Jenkins (2008) found that despite an increase in global integration, South Africa still experiences high unemployment and technological change has a negative impact on employment. Similarly, Fedderke et al. (2012) found that in South African manufacturing, technology shocks negatively impact capital and labour. These findings are similar to the findings of Gali (1999), in which he concluded that positive technology shocks decrease employment in the short run. Overall, the findings of these studies contradict the Real Business Cycle theory. Moreover, the mentioned studies suggest that although theory may show that technology has a positive impact on economic growth, it harms employment in some economies. More recent studies share the same conclusions as the above mentioned studies (Fiorelli, 2018; Bessen, 2019). This further emphasizes the notion that technological improvements may exacerbate unemployment, as improved machinery and processes can do the work that was initially done by labour.

In contrast, Ahmad et al. (2020) conducted a study that analyzed the effect of aggregate domestic consumption spending and technological innovation on industrialization. Their results showed that a positive technology shock has a positive effect on industrialization, not only in the short run, but also in the long run. This suggests that technological shocks tend to be persistent in the South African economy. Furthermore, Boakye (2023) study explored how agricultural technologies impact maize yield in rural South Africa, and found that they have a positive impact on increasing maize yields. Maize is South Africa’s main imported grain and therefore, if farmers can yield more crop output, it can lead to economic growth

(Geyser et al., 2024). Improvements in digital technologies have also been found to have positive effects on government efficiency and business operations (Boakye, 2024). One can argue that improved efficiency and business operations can boost sustainable economic growth.

Segal (2017) found that a positive technology shock raises both output and potential output, and potential output increases more. The study by Furlanetto et al. (2023) found that potential output reacts strongly to a positive technology shock and actual output has a greater response to the shock. According to these findings, it is evident that a technology shock is sensitive to whether a study uses estimated or observed values of potential and actual output. Another factor that may contribute to the difference in the results is the type of shock an economy experiences. A persistent shock lasts for several periods in the economy while a permanent shock may move the economy to a new steady state Sims (2012). Therefore, this suggests that in instances where potential output increases more than actual output may be caused by a permanent shock. Concurrently, when actual output is greater than potential, it may be the result of a persistent shock.

Sims (2012) argues that under the Taylor rule, a technology shock will increase productivity and the natural interest rate will rise temporarily. The central bank will implement an expansionary monetary policy and decrease the interest rate. As a result, output and the number of hours worked increase by more than they would if prices were flexible because the central bank responds by trying to boost economic activity. A study done by Edoun and Fotso (2019) analyzed the impact of Information and Communication Technology (ICT) on South Africa's current balance account and economic growth. The study found that ICT impacts all sectors, making a contribution of 3.0% to GDP. As a result, the study recommended the incorporation of smart technology in trade policy, together with political stability and sound policy strategies for economic growth.

With an increase in businesses and companies that automate their production processes, more individuals are losing their jobs (Balleer, 2012). This increases the level of unemployment. This form of unemployment is referred to as structural unemployment. This is when changes in technology or global competition alter the skills needed to perform jobs or change the location of jobs (Parkin et al., 2020). It

also leaves workers with inadequate skills required for the innovation and this is known as a skills mismatch. Skills mismatch remains a persistent issue for South Africa, which slows down economic growth (Luke and Heyns, 2019).

Economies may experience negative demand shocks, which can take the form of pandemics, natural disasters and financial crises (Benguria and Taylor, 2020). This widens the output gap as output decreases. Negative shocks raise uncertainty and therefore reduce investment and consumer confidence (Barrela et al., 2022). This leads to a decline in demand. The COVID-19 pandemic for example, was both a demand and supply shock that led to an economic downturn in many economies and also the global economy (Corrado et al., 2021).

2.4 Cost-push shocks

A cost-push shock occurs when the cost of production for firms increases, and reduces the supply of goods and services (Mankiw, 2013). Cost push shocks are a supply-side phenomenon, and tend to arise from oil price shocks, increase in the cost of raw materials, wages or energy prices. As a result of the increase in input costs, firms may decrease supply and therefore, output decreases (Sharma et al., 2019; Yakubu et al., 2019; Majenge et al., 2025; Ndou and Gumata, 2025; Reserve Bank of Australia, 2025). In addition to this, firms increase the price paid by consumers for goods and services (Adhikari et al., 2025).

From a theoretical perspective, one can analyse the goods market, which shows the combinations of aggregate supply and aggregate demand that are at equilibrium in the economy. If there is a disturbance or shock, the economy undergoes a transmission process in order to re-establish equilibrium. A cost-push shock decreases the supply of goods and services produced by firms. This leads to disequilibrium in the goods market. This means that firms supply less output at a higher price. The output gap widens while inflation increases. If cost-push shocks are not managed well by policymakers, it could lead to stagflation – persistent inflation whereby output continues to decrease or is stagnant while inflation increases (Parkin et al., 2020).

In the past sixty years, global economies have experienced multiple cost-push shocks. One of the first examples is the oil crisis of 1973. The Organisation of the

Petroleum Exporting Countries (OPEC) decreased oil supply, causing oil prices to reach one of their highest recorded points. The cost-push shock was a result of an embargo that OPEC imposed on the USA during an Arab-Israeli war (Covi, 2015). Furthermore, the increase in energy prices significantly affected the productivity of labour, capital utilization, energy consumption and wages in countries such as the USA, Canada, France and Germany (Nasseh and Elyasiani, 1984). This left global economies with high inflation, rising unemployment and lasting political and economic consequences.

A more recent example is COVID-19 – which led to huge disruptions in supply chains, increasing transportation costs and inflation. Furthermore, COVID-19 also led to a decrease in demand for goods and services. As is frequently the case, emerging economies suffered the most and endured more inflationary pressures than developed economies. For example, Nigeria endured a sharp increase in the inflation rate and the central bank hesitantly tightened monetary policy which led to persisting inflation. This is an example of the challenges policymakers face when trying to manage the inflation rate after a cost-push shock. (Ahadu, 2020; Barua, 2020; del Rio-Chanona et al., 2020; Hernandez et al., 2022)

More recently, the Russia-Ukraine war did not only create cost-push shocks in oil but also in gas and grain (Arndt et al., 2023). This also heavily impacted global supply chains, significantly increasing transportation costs. As a result of this war, developed economies such as Germany implemented relief packages to cushion the shock's impact and prevent a deep recession (Liadze et al., 2022). In contrast, in emerging countries such as Pakistan, the war intensified the balance of payments crisis, while the central bank had to raise interest rates to manage inflation (Noor, 2025). This severely affected economic growth. It is clear that cost-push shocks leave emerging countries with fewer effective policy options.

As discussed in the empirical examples of cost-push shocks, it can be observed that emerging countries are more vulnerable to the effects of cost-push shocks. Furthermore, the pass-through of the increase in input costs to the price paid by consumers is higher in developing countries relative to developed countries (Aastha and Misra, 2024). A possible reason why emerging countries endure heavier effects from cost-push shocks is because of structural constraints in the economy that

hinder the successful transmission of policy (Kandil, 2006). Furthermore, if monetary policy does not respond effectively, inflation becomes more persistent. The close succession between the COVID-19 pandemic and the Russia-Ukraine war, has given policymakers a major challenge, as they try to recover from one shock and manage the impact of another.

In the South African context, several studies have claimed that cost-push shocks are a major determinant of inflation (Ziramba, 2008; Nell 2018; Hassan and Meyer 2020). An example of a domestic cost-push shock in South Africa is load shedding. Load shedding is a method that reduces the load of electricity on the national grid (Mbomvu et al., 2021). This structural challenge increases the price of electricity, making many firms and businesses invest in generators which increase costs, together with the diesel for the generator to function (Hernandez et al., 2022). South Africa is heavily saturated by Small Medium Enterprises (SMEs) that cannot afford the additional costs of generators, diesel or the increase in electricity itself (Viljoen and Struweg, 2016). As a result, many enterprises are forced to shut down and this means economic growth continues to suffer, as the contributors to Gross Domestic Product (GDP) decrease. Policymakers are then faced with the challenge of managing the inflation rate, but in a manner that still leaves room for the economy to grow.

2.5 Monetary policy in South Africa

In South Africa, the execution of monetary policy has taken various approaches. Between 1960 and 1998, several monetary policy frameworks were adopted. This included exchange rate targeting, discretionary monetary policy, monetary-aggregate targeting and an eclectic approach (Wolassa, 2015). Prior to the inflation targeting regime, the inflation rate was often high and volatile (Phiri, 2012). From the 1960s to the 1970s, the central bank made use of direct control to manage inflation. This included credit ceilings, consumer credit controls and liquid asset requirements (Muyambiri and Odhiambo, 2014). The aim of direct control was to manage the inflation rate by limiting the amount of money circulating in the economy (Bhorat et al., 2013). However, these direct methods were not as effective as anticipated, as inflation remained high.

From the early 1970s, the inflation rate continued to rise. This led to money supply growth targets which were executed from the early 1980s to the mid-1980s. This approach was unsuitable because an empirical analysis found that money supply was endogenously determined regardless of the monetary policy mandate implemented (Nell, 2000). Before the 1970s, the South African rand exchange rate was pegged to the British pound (Khomo and Aziakpono, 2016). In 1985, the central bank implemented a dual exchange rate system (Schaling, 2009). The system set an exchange rate for capital account payments and another for current account payments (SARB, 2020a). In 1995, the dual exchange rate system was abolished guided by the De Cock Commission recommendations (Mtonga, 2011). Inflation continued to rise, reaching a high of 18.7% in 1986 (Sangweni and Ngalawa, 2023).

In addition, it was the De Cock Commission in 1985 that made recommendations for monetary policy to target inflation stability (Mohr, 1985). Prior to February 2000, South Africa had an informal target range of 1% to 5%. However, it was not effective as it could not be expected to produce the same level of commitment that would follow if it were formally implemented. Finally, in February 2000, the SARB introduced a flexible inflation targeting mandate. The inflation rate target in South Africa is a range between 3% - 6%. With this mandate, the SARB aims to protect the value of domestic currency – the rand (De Wet, 2002). In addition, the SARB uses the interest rate to manage the inflation rate. More specifically, the repo rate – the rate central banks charge commercial banks (Faure, 2011) - is used as it influences the borrowing of commercial banks, which, in turn, influences the economy at large (SARB, 2020b). Furthermore, one of the reasons why the SARB chose to target inflation is based on the notion that the effects of monetary policy on economic growth are temporary, whereas the effects on stabilizing prices are more permanent (SARB, 2023a). Inflation targeting also means central banks are more accountable and transparent about their operations since the targets are made available to the public (Mishkin, 2001).

The years 2000 to 2005 mark the first five years of the implementation of the inflation targeting regime in South Africa. In this period, significant changes were observed. In 2001, the exchange rate and protecting the rand were still the main priorities. This is not only evident in the 2001 annual report, but also in the 2001 economic report. Interest rate stability and M3 money supply were often used (SARB, 2001b). In

conjunction with these reports, it is revealed that the transition to inflation targeting was a challenge. For example, the SARB deployed a 25 basis point hike in October 2000 to ease the concerns about future inflation (SARB, 2001a). This underscores a significant shift in monetary policy as it highlights the shift towards managing inflation expectations. As a result, long-term bond yields fell, which suggests that the SARB's commitment to the new inflation target was gaining credibility. Moreover, the inflation target band was set to 3% - 5% in 2004 and 2005. It was then revised in 2006 to 3% - 6% (SARB, 2023a). During this period, inflation in South Africa was largely influenced by both global and domestic factors.

The period from 2006 to 2010 is one of the most significant periods not only for South Africa, but for global economies. With a new inflation targeting mandate the SARB's capability and credibility to maintain inflation within the target was put under pressure. The years 2006 and 2007 were characterized by tightened monetary policy, due to pressure from cost-push shocks (in increasing oil and food prices) (SARB, 2007). Furthermore, inflationary pressure also came from the exchange rate which depreciated by 22% (SARB, 2006). Despite the pressure on inflation, the SARB remained committed to its target. This was to avoid de-anchoring inflation expectations that remained within the target band. In 2008, the inflation target regime was severely tested. The Global Financial Crisis of 2008 hit global economies and South Africa's Consumer Price Index (CPIX) inflation reached a high of 13.6% in 2008 (SARB, 2008).

Not only was the inflation rate exceeding the target band, but the deviation of actual output from potential output was increasing. Furthermore, firms and trade unions faced challenges with price and wage negotiations due to an increase in uncertainty about future inflation (SARB, 2008). As a response, the SARB implemented a 50 basis point hike. This means interest rates were higher, the cost of borrowing was higher and agents in the economy decreased spending. This would slow down economic activity and bring the inflation rate back within the target band. Between December 2008 and August 2009, the SARB aggressively decreased the repo rate by 500 basis points (SARB, 2009). In contrast to its initial response, cutting the repo rate meant agents in the economy were encouraged to increase spending, which would increase aggregate demand and boost the economy.

In 2010, the economy continued to recover from the Financial Crisis, with the inflation rate back within the target range. The 2010 monetary policy report does not extensively discuss the impact the 2010 FIFA World Cup may have had on monetary policy decisions and the economy at large. Du Plessis and Venter (2010) argued that this is because the FIFA World Cup did not have a significant impact on the economy. This was because predictions about overcrowding and an increase in the cost of goods and services discouraged potential tourists (Du Plessis and Maennig, 2011). Therefore, the positive impact on GDP and economic growth was lower than expected. However, the 2011 report does mention that the World Cup did result in consumption distortions (SARB, 2011). The world cup was a positive shock to the economy, but it was not as impactful as anticipated. The reason could be that the economy was still in the process of recovering from the Financial Crisis of 2008. In addition, one can argue that this serves as an example of loss aversion. The negative shock (Financial Crisis) demanded more thorough monetary policy than the positive shock that is the World Cup.

The period from 2011 to 2015 reflects a challenging era for South African monetary policy. This period is characterised by persistent inflation (which could be core or headline inflation) and stagnating growth. In 2011, cost-push inflation pressure came from the increase in global oil prices, and GDP growth decreased from 4.5% in quarter one, to 1.3% in quarter two (SARB, 2011). As a result, this widened the output gap. Furthermore, the Monetary Policy Committee acknowledged that inflation was under control however, economic growth was slowing down. This was followed by a 50 basis point repo rate cut (SARB, 2012) , which allowed the SARB to support growth without jeopardising inflation stability. However, headline and core inflation increased significantly, exceeding the 3%-6% target. This was indicative of the rising impact of cost-push shocks on inflation. The report mentions that the SARB attributed this pressure on inflation to supply-side factors rather than increases in domestic demand (SARB, 2013). Thereafter, monetary policy took a more contractionary stance. Growth continued to deteriorate, with the output gap widening to -1.8% of potential GDP (SARB, 2015).

2016 was marked by a decline in structural growth and persistent inflation. Inflation averaged around 6.4% (SARB, 2016), which was driven by both a drought, which spiked food inflation, and the depreciation of the Rand. The increase in inflation due

to a natural disaster suggests that cost-push shocks influenced price-setting behaviour. In conjunction, potential growth decreased. Once again, the SARB was faced with a trade-off between a declining growth rate and high inflation. With a commitment to managing inflation, the SARB implemented contractionary monetary policy. In 2017, the inflation rate fell back within the target at the beginning of the second quarter. The SARB analysed that the lower inflation "created some space for monetary easing" (SARB, 2017). With monetary easing, the SARB could address the negative output gap which existed since 2015.

In 2018, growth still remained low, mainly due to structural issues which are beyond the control of monetary policy (SARB, 2018). Now that the inflation rate was within the target band, the SARB reduced interest rates. With this approach, the SARB could maintain the inflation rate within the target while trying to close the output gap. The 2019 report illustrates that headline inflation was very close to the middle of the target band (4.5%) (SARB, 2019). The possible reasons for the low inflation rate discussed in the report include that wages increased moderately and there were expectations of lower inflation. In 2020, global economies experienced the COVID-19 pandemic (a shock in the economy). As a result, output was affected significantly with potential output sharply falling to -3.2% (SARB, 2020c). The SARB responded by significantly reducing the repo rate. Essentially, many economies implemented similar monetary policies. Monetary policy in 2019 demonstrated successful management of inflation and effective anchoring of expectations. This allowed the SARB to decrease the repo rate to decrease the severity of the pandemic. If inflation was high, the SARB would have had a narrow space through which to implement policy, which could raise questions regarding its capability and credibility in managing inflation.

The SARB annual report (2020d) shows that during the peak of the COVID-19 pandemic, South Africa's real GDP decreased by 7%. The main decreases came from manufacturing, trade, accommodation, transport and storage. The decreases in trade and accommodation follow logically because travel bans and restrictions were imposed to reduce the spread of the virus (Handoyo, 2020). As a result of these restrictions, tourism suffered significantly. On the contrary, the agricultural sector was cushioned from the effects of the pandemic as governments provided subsidies (Popoola and Yusuf, 2021). Furthermore, the level of unemployment increased to

32.5% (SARB, 2020d) as many jobs were lost and businesses shut down. It has since been challenging for unemployment to recover as the negative impact of the pandemic was severe.

The headline inflation expectation for 2021 was 4.2% where the headline inflation in 2020 was 3.3% (SARB, 2020d). One can argue that the expectation of higher future inflation indicates that agents expect the central bank to reduce the interest rate. The decrease in the interest rate will stimulate aggregate demand, output and prices (Chugh, 2015). This is plausible given that the economy has to recover from the negative impact of the pandemic, and there is a need to stimulate aggregate demand. In contrast, core inflation was expected to be lower, from 3.3% to 3.0%. Expectations of the future inflation rate have a significant impact on monetary policy, as they play an important role in the behaviour of price and wage setting (Kaihatsu and Shiraki, 2016).

Since two years after the COVID-19 pandemic, South Africa's GDP grew by 4.9% (SARB, 2021). This is the highest it has been since 2007 before the Financial Crisis. The economy was able to achieve this real GDP despite the disruptions from the July Riots in KwaZulu-Natal and Gauteng, which impacted several businesses and therefore output (Mbandlwa, 2023). However, the real GDP for the first quarter of 2022 was expected to decrease due to the floods in KwaZulu-Natal and the increase in load-shedding. Both negatively impact the storage and transportation of goods. Load-shedding in particular negatively impacts the production of output as it costs more to produce goods (van Rensburg and Morema, 2023). This often leads to cost-push shocks.

The pandemic severely impacted construction, transport and trade industries, whose output levels remain lower than the pre-COVID-19 period (SARB, 2021). Furthermore, load-shedding constraints led to slow sectoral growth, leading to further delays in demand and therefore, limiting economic growth. As expected, headline inflation increased from 3.3% to 4.9% in 2021(SARB, 2021). The increase mainly came from the increase in the prices of food and fuel. Food inflation was largely driven by the Russia-Ukraine war (Lin et al., 2023), which disrupted the supply of grains and oils. Core inflation decreased from 3.3% in 2020, to 3.1% in 2021. Domestic inflation was expected to increase if geopolitical tensions continued or if

expectations of the future inflation rate drifted higher. The findings discussed in the 2021 and 2023 reports illustrate the extent to which cost-push shocks affect inflation.

Real GDP decreased to 2.0% in 2022 from 4.9% in 2021 (StatisticsSA, 2023). The growth of the real GDP in 2021 is attributed to rebound growth – the growth that occurs after a negative shock in the economy (Lange and Berner, 2022). Therefore, despite the sharp decline, the slowdown was expected. According to the SARB's annual report (2022b), the economy's recovery from the pandemic was supply-driven, as restrictions were relaxed. Further contributing to slow economic growth, load-shedding intensified. The annual report also claims that South Africa will not experience long-term growth until load-shedding decreases. Furthermore, the shortage of electricity supply raises prices (cost-push), restricting economic growth (Mbomvu et al., 2021) and leads to stagflation.

Headline inflation reached a high of 7.8% (2022b), which is higher than the inflation target range. In January of 2023, inflation dropped to 6.9%, only to increase again in March to 7.1%. This fluctuation suggests the presence of economic uncertainty (Dery et al., 2025), given that there was geopolitical tension taking place. Domestic inflation was high as a result of a weaker exchange rate, foot and mouth disease affecting meat production and heavy rains affecting crops (Bowen, 2023). The supply of electricity continued to be a major challenge in 2023, and electricity prices were expected to increase over the next few years. The SARB moved to a new Monetary Policy Implementation Framework (MPIF). This aligns with the global trend of major central banks (such as the Federal Reserve Bank) that adopted new policy frameworks to strengthen their control over short-term interest rates. Thereafter, the SARB moved from a money market shortage to a surplus. This suggests that the new MPIF improved the central bank's operational efficiency and resilience in trying to moderate inflation.

The years 2022 and 2023 have reflected the challenge global economies faced in having to recover from the pandemic. South Africa was not spared this challenge as inflation remained high (SARB, 2023b). As mentioned in the previous discussion, load-shedding negatively impacted economic growth as production costs increased output decreased and some businesses shut down (Mbomvu et al., 2021). This means that the South African economy was heavily burdened as it was not only

dealing with recovery from the pandemic, but also structural challenges (Twinoburyo and Odhiambo, 2018). This hinders economic growth and may be a contributing factor as to why South Africa experiences low economic growth. In contrast, employment increased and surpassed the employment level that existed before the pandemic.

Based on the discussion above, one can observe that there is a difference in the manner of response by the SARB to the Global Financial Crisis of 2008 and the COVID-19 pandemic. This is because the Financial Crisis was primarily a demand shock and the pandemic was a supply and demand shock. Therefore, since the Financial Crisis significantly increased interest rates, the SARB responded initially by implementing contractionary monetary policy (SARB, 2008). The pandemic on the other hand, disrupted supply chains and decreased demand. As a result, the central bank responded by cutting the repo rate aggressively (SARB, 2020c). Both these responses illustrate how the SARB worked to manage inflation so that it remained within the target range. In addition, one can also observe that the SARB's ability to manage inflation emphasized its credibility and paved the way for the central bank to anchor expectations.

In addition, the Financial Crisis led to high inflation which meant the SARB had to increase the interest rate (SARB, 2008). The increase in the interest rate decreased demand, spending and therefore output. As a result, the central bank faced a trade-off – inflation and output were moving in opposite directions. Therefore, the divine coincidence did not hold. Furthermore, although the pandemic was both a negative supply and demand shock, it had opposing effects on inflation. As a supply shock it increased inflation due to cost-push shocks and as a demand shock it reduced inflation. Once again, this led to a trade-off for the central bank.

Overall, South African monetary policy has evolved over the past 24 years. The approach began with a transition from having to prioritize the exchange rate to focusing more on the inflation rate. Furthermore, South Africa's inflation was largely impacted by external factors such as cost-push shocks from changes in oil prices. The Financial Crisis challenged monetary policy effectiveness. While cost-push shocks from oil prices remained and the global COVID-19 pandemic still influenced inflation significantly, more domestic challenges started to contribute to inflation

dynamics. These include load-shedding, the July riots (Mbandlwa, 2023) and natural disasters such as the KwaZulu-Natal floods (Bowen, 2023). In conjunction, economic growth slowed down and the output widened, reaching negative values. This reflects the trade-off between inflation and the output gap that policymakers often face, and that the divine coincidence argues can be eliminated.

However, inflation targeting has received criticism. A strand of literature argues that inflation targeting pursues price stability at the expense of economic growth and output (Cordero, 2008; Khan, 2022; Sukharev and Voronchikhina, 2024). Comert and Epstein (2011) claimed that after the Global Financial Crisis of 2008, inflation targeting raised a few questions. Firstly, is inflation targeting really effective or does it depends on global conditions? Secondly, how does focusing on inflation impact employment and asset prices? Lastly, could reliance on the interest rate by central banks be limiting when trying to achieve targets? Furthermore, Abubakar (2016) argued that central banks run the risk of setting unattainable targets, which questions a country's credibility. In addition, it may also lead to the implementation of policy that may exacerbate inflation. Moreover, an empirical study found that inflation targeting improved social indicators, however, the exchange rate becomes more volatile (Libman, 2022). However, inflation targeting in South Africa remains as the most successful monetary policy approach.

Successful flexible inflation targeting requires transparency, communication and the ability to manage expectations (Weber, 2018). For example, if there is a shock in the economy that causes inflation to rise above the target level, agents must trust that the central bank is committed to managing inflation and will implement the correct policy to bring it back to an acceptable level. In addition, this serves as forward guidance for agents which allows the central bank to anchor expectations and allows the bank room to be flexible. A flexible target is favourable because policymakers can avoid creating excessive volatility in output (Mishkin, 2002).

There is a debate in the literature about whether the SARB should target a lower or higher inflation rate. In point of fact, this debate has been long-standing and seems to have gained more attention recently. Phiri (2013) provided evidence that in order to achieve at least 6% economic growth, inflation should be lower than 3.08%. In contrast, Klein (2012) argued that inflation targeting has shifted towards the upper

limit which suggests that the central bank tolerates higher inflation, which also allows economic growth. Similarly, Faul et al. (2014) suggested that the SARB should revise the inflation target to accommodate higher inflation. Kumo (2015) challenged the prevailing debate by arguing that South Africa has successfully stabilized inflation however, economic growth requires structural reform. This suggests that economic growth remains a structural issue and therefore the responsibility for fostering economic growth lies beyond the central bank.

The most recent discussions suggest the end of a flexible target and a move to strict inflation targeting set at 3% (Bricco et al., 2025). The reason for this is because the SARB is confident that revising the inflation rate to 3% would result in less risk and more reward. This is based on the argument that, the sacrifice ratio will be lower than what agents in the economy anticipate. However, the possible effects this revision may have on unemployment and economic growth have created a division between those who are for and those who are against the new inflation target.

Views that support the new inflation target argue that when South Africa is compared to other emerging economies, its inflation target is an outlier (Ndou and Gumata, 2024). Other emerging economies have inflation targets that are at 2% or 3% (Ahiadorme, 2020). Secondly, a lower inflation target will reduce borrowing costs and therefore encourage spending. This increase in spending will boost economic growth. Furthermore, it will lead to sustainable economic growth as low inflation would create the confidence that is required for investment (Snowdon and Vane, 2005). This investment will be a solution for the negative output gap that is challenged by structural challenges. Thirdly, a strict and lower inflation target may allow the SARB to better anchor inflation expectations (Ndou and Gumata, 2024).

The notion of a new lower inflation target has also received some criticism. One of the arguments is that reducing the inflation target to a lower target of strictly 3% is more likely to create a larger negative output gap. This will increase unemployment and therefore lower economic growth in the short-run. In other words, it leads to a higher sacrifice ratio. In conjunction, Semosa and Kanayo (2021) argued that unemployment is already high (32%) (StatisticsSA, 2024) and the aim should be trying to reduce the output gap. This would still be plausible because inflation would increase but remain in the higher end of the current band.

What is clear from both perspectives is that a new inflation target will result in distinct effects in the short-run and long-run. The argument for a lower inflation target shows that the long-term benefits will outweigh the higher unemployment and low economic growth that will occur in the short-run. In contrast, the argument against a lower inflation target demonstrates that unemployment and economic growth will only become more severe. Reports show that the SARB has managed to stabilize inflation however, the transition to the new target may not be smooth. The timing of wanting to implement a new policy is also questionable, given that the economy is still in recovery from COVID-19 (SARB, 2024). Furthermore, South Africa is already dealing with high unemployment and low economic growth (Semosa and Kanayo, 2021) and a new inflation target may make that more severe. Simultaneously, the SARB's credibility in managing inflation over the years suggests that it will remain committed to targeting inflation, even with the new target (Bonga-bonga and Lebese, 2019).

Inflation and output are two significant factors in monetary policy in which South Africa is managing the former better than the latter. Using the preposition that is the divine coincidence allows the study to analyse both of these factors for South Africa, and seek to understand their behaviour in the economy (especially since economic growth remains low) (Semosa and Kanayo, 2021). Moreover, the divine coincidence is often considered to be a counterfactual preposition however, one cannot ignore that it brings insight on the notion that policy must be designed and implemented in a manner that considers both effects on inflation and output. Lastly, studying the divine coincidence allows for the analysis of monetary policy making it relevant to South Africa since there is an active debate on changing the current inflation target.

Vincent (2021) investigated inflation targeting in South Africa and Nigeria under the Taylor Rule. The study found that South Africa has a significant inflation rate and output gap compared to Nigeria. The study concluded that the difference in the results is based on the fact that South Africa adopted an inflation rate targeting policy and Nigeria did not. The study suggested that the policymakers in both countries must clearly define what affects their interest rate decisions. During the 'hard' lockdown for COVID-19 in 2020, South Africa recorded a negative output gap of -4.1% for the year. It remained negative in 2021 suggesting a loose monetary policy stance (Vermeulen, 2023). According to Kumo (2017) the slow growth in South

Africa's Total Factor Productivity (TFP) results from of skills shortages, structural constraints and weak domestic competition.

Semosa and Kanayo (2021) argue that South Africa is battling with the difficulties between inflation and unemployment. There is a negative relationship between inflation and unemployment. South Africa has a high unemployment rate due to shortages of skilled labour (Naidoo, 2023). The primary drivers for unemployment in South Africa – with the unemployed majority being the youth – include inadequate education and disadvantages due to one's social and economic situation (StatsSA, 2024). Another issue has been the skills mismatch, which recorded more than 50% in 2019 (SSACI, 2024). Potgieter (2010) argues that the inflation targeting policy is not appropriate for South Africa because of the economic challenges that include increasing unemployment. An argument can be made that South Africa needs to stimulate economic growth by increasing output. Thus, this will also help reduce unemployment.

By definition, the output gap is the difference between actual (current) output and potential output (Walsh, 2016). More specifically, potential output is the output produced by an economy at full employment. Output gaps can be positive or negative. The former means actual output is greater than potential output. The latter means actual output is less than potential output. In addition, a negative output gap reflects that an economy is underutilizing resources such as labour, capital and/or raw materials (Mankiw, 2013). The manner in which the output gap and more specifically potential output are measured remains contested in the literature as it is difficult to estimate. If potential output is measured based on the output that is currently being produced relative to the amount of resources, then one can argue that potential output is difficult to achieve. This is because if the firms in the economy start to produce more because of tech advancements, it would mean that potential output would also have to increase. This is because firms would expect to produce more in the future given the innovation that allows for such to take place.

There was an expectation for South Africa's GDP to be 1.7% in 2022 and 1.8% in 2023, according to the SARB Governor (Hlogwane and Daw, 2022). South Africa managed to reach 1.9% GDP growth in 2022 however, it dropped to 0.7% in 2023 (Statista, 2024). This may be a result of the heavy load-shedding the country

experienced, which has a negative impact on production. According to Fedderke and Mengisteab (2016), South Africa underutilizes labour and as a result, will not experience rapid growth in output. Naidoo (2023) argues that South Africa's output gap has declined but only because of a decrease in the economy's ability to grow at a sustainable rate. Several studies mentioned that the output gap is subject to miscalculations or mis-estimations, as they are sensitive to the type of model used (Honohan and Orphanides, 2022; Vermeulen, 2023). As a result, the mentioned studies investigate the output gap under different models and observed how it behaved. This is because potential output is unobservable (Fedderke and Mengisteab, 2016).

The Phillips curve remains significant in the macroeconomic analysis of an economy because it reflects the performance of the economy to policymakers (Omer Mustafa, 2021). Jeza et al. (2023) study found the Phillips Curve and the New Keynesian Phillips curve to be absent in South Africa. From 1994Q1-2019Q4, there seemed to be no causality running from unemployment and inflation, but there was negative causality from inflation. This means there were small decreases in the unemployment rate when the inflation rate increased. In contrast, du Rand et al. (2023) found the Phillips curve in South Africa as their results reveal that short-run expectations and economic activity influence inflation. Similarly, Botha et al. (2020) find that the Phillips curve is still relevant to analyse South Africa's macro-economy. The Phillips curve is important for South Africa as an inflation rate targeting economy. It shows the relationship (or lack thereof) between the inflation rate and output or employment. These crucial aspects must be critically analysed, as they influence economic growth. As a result, the central bank must form policies that mitigate the challenges faced by inflation, output and unemployment.

2.6 DSGE models

DSGE models are macroeconomic models that construct an economy from microeconomic foundations and illustrate the economy's behaviour (Okot, 2020). DSGE models are structural, in which each equation has an economic interpretation (Peiris and Saxegaard, 2007). The core building blocks of the model include that firstly, the model is dynamic – as it shows how the economy behaves overtime. Secondly, it has a stochastic nature that allows for the analysis of shocks in the

economy. Lastly, the general equilibrium component shows when all the markets in the economy clear simultaneously. The model is often used to predict or forecast economic activity and inform policy decisions (Vetlov, 2011). In addition, the model assumes that agents in the economy have rational expectations. The general idea behind DSGE models is that agents optimize their objectives – be it utility or profits – and the economy will reach a state where all the agent's choices are consistent with each other.

Built from microeconomic foundations, the model includes households, firms (which can be divided into intermediate and final good producers), monetary policy and fiscal policy. Rigidities in the form of prices or wages are often included in the model. Stochastic shocks can be demand side, supply side, preference or policy shocks, which lead to changes in inflation, output, interest rates, marginal costs and/or unemployment (Bhatnagar, 2023). A general equilibrium is established once there have been adjustments in the price. In order for the model to operate and produce results, parameters are needed. These can be calibrated – taking the value of parameters that is already available in the literature – or they can be estimated using Bayesian techniques (Du Plessis et al., 2014).

One of the advantages of DSGE models include that these models offer fairly accurate forecasts for the medium-term or long-term (Du Plessis et al., 2014). Furthermore, the model is built on microeconomic foundations, also making it immune to the Lucas Critique (1976). Building the model from microeconomic foundations ensures the parameters are deep and invariant to policy changes. DSGE models allow economists to simulate and evaluate the effects of different policy decisions. The general equilibrium nature also captures the interconnectedness of variables in the economy, allowing for the observation of a shock across variables, and a cohesive narrative for economic fluctuations. One of the limitations of DSGE models includes that the model can be mis-specified, especially if the assumptions or parameters contradict real-world data (Dotsey, 2013). Additionally, the model assumes that consumption, output and investment grow at the same rate. A common critique is that the model relies on strong assumptions that can sometimes be unrealistic (Stiglitz, 2018), which has prompted accusations of a disconnection of the model from real-world conditions.

With a DSGE model, one can either calibrate the parameters or estimate them. When calibrating, parameters are taken from studies in the literature that have also either calibrated or estimated the parameters. The literature to choose parameters from depends on whether one is focusing on a specific country or is conducting a regional study. What calibration does is build a theoretical laboratory, in which the values represent the facts specific to a country or region. The values of the parameters are derived from microeconomic studies, which ensure consistency with the existing empirical knowledge (El Ouazzani et al., 2024). The process of calibration is based on a few factors. One of those factors is that the parameters must make economic sense from a microeconomic level. For example, factors such as intertemporal elasticity of substitution and Frisch elasticity of substitution are often required parameters. In addition, the calibrated parameters are based on long-run averages of a country or region. As a result, parameters that are built on microeconomic foundations and long-run averages ensure that the model's steady state will match long-run data (Vetlov, 2011).

Calibration has a few advantages that make it favourable compared to estimation. One of the advantages of calibration is transparency. The values are easily and readily available in the literature, and they have a clear economic interpretation. Secondly, values maintain economic theory foundations, as one has to justify why they chose particular parameters. Thirdly, calibration is also useful for policy experiments (Kemp and Hollander, 2020). To expand further, one can use calibrated parameters to determine the implications of a certain policy in a controlled environment. Similarly, it is useful in testing theories. In contrast, calibration also has its limitations. Calibration is often criticised to be a subjective approach. This is because the choice of parameters largely depends on the purpose of the model, and therefore, some parameters may be deemed unnecessary. This also brings limitations into the holistic representation of an economy. Similarly, calibrated parameters maybe a poor fit and fail to capture the true dynamics of data (Vetlov, 2011).

Estimation in DSGE models often follows a Bayesian estimation approach. The process involves combining prior beliefs about parameters (which are adopted from the literature similarly to calibration) with information from the data to produce posterior results. This can be seen in several studies (Gupta and Sun, 2020; Kemp

and Hollander, 2020; Vajrapatkul and Thepmongkol, 2022). One of the advantages of estimation is that it provides a measure of how well the model fits the data. There is also parameter uncertainty control – using Marginal Likelihood – and allows for model comparison to real data. The major advantage that estimation has over calibration is that models with estimated parameters can be used for forecasting. This is one of the primary reasons why central banks make utilize DSGE models. In addition, these models have been found to produce fairly accurate forecasts (Du Plessis et al, 2014) in the long-run. With regards to disadvantages, estimated parameters may be influenced by prior estimates that can be misunderstood or misinterpreted. Additionally, estimation can be a costly process, as it requires substantial computing power and expertise (El Ouazzani et al., 2024). When compared to calibration, estimating parameters is more time-consuming, as it requires long, high-quality time series.

There is no consensus on whether calibration or estimation is the better approach (Vetlov, 2011). However, having analysed the purpose, advantages and disadvantages of calibration and estimation, it follows that the approach one selects depends on the purpose of the model. For instance, if the aim of the model is to analyse policy, then calibration would be more suitable. On the contrary, if the aim is to forecast, estimation would be a more suitable approach.

DSGE models are being used globally in research and by policy institutions. For example, the Federal Reserve, the European Central Bank, Bank of England use DSGE models to assist in formulating and evaluating policy (Dotsey, 2013). These institutions make use of DSGE models for the purpose of forecasting and analysing policy. At a global level, DSGE models are largely used by institutions that include the International Monetary Fund (IMF), the Federal Reserve and the European Central Bank (Vetlov, 2011). These institutions heavily rely on Bayesian estimation as compared to calibration. This suggests that these institutions are forward-looking, and prioritize forecasting. In addition to forecasting, the mentioned institutions use DSGE modelling to analyse risks (at a global level for institutions such as the IMF), to coordinate monetary policy and to analyse the effect of shocks on the economy. However, there are developed countries that only use calibration, and Bhatnagar's, (2023) study on monetary policy with non-Ricardian households serves as an example.

In the African context, DGSE models are not as widely used. This is because of data constraints. As a result, this makes Bayesian estimation more challenging. Compared to developed countries and well developed financial institutions, there are several structural differences. These differences even affect the way in which countries model DSGE. For instance, standard models often have to be modified to include the informal sector, which is a significant part of African economies. This is the case for Ahiadorme's (2020) study. While developed economies prefer Bayesian estimation, there is a bias towards calibration for African economies. The difference in estimation and calibration between developed and developing (or underdeveloped) economies suggests that developed countries are more concerned with the impact of monetary policy on the economy's future dynamics. While it suggests that African countries are more concerned with analysing the effects of certain policies. However, there are studies that estimate and calibrate DSGE models such as the monetary policy analysis study in Uganda (Okot, 2020).

As an emerging economy, the SARB uses DSGE for both policy analysis and forecasting. This is similar to developed economies (Dotsey, 2013). Several studies strictly take on a calibrating approach to analyse the New Keynesian Phillips curve in South Africa and inflation dynamics with public debt respectively (Du Plessis and Burger, 2006; Wang 2021; Sangweni and Ngalawa, 2023). However, there are studies that make use of both calibration and estimation (Gupta et al., 2015; Kemp and Hollander, 2020). These studies analyse forecasting output growth, fiscal policy and monetary policy in South Africa. South African DSGE models are often modified to reflect high unemployment, inequality, energy crisis and exchange rate dynamics.

DSGE models have also been used widely in South African research. Ngalawa and Komba (2020b) use a DSGE model to analyse the inflation rate, output and monetary policy. Gupta et al. (2020) forecast output growth in the South African economy. Several studies have analysed South Africa as a closed or open economy, as a small open economy or a medium open economy (Du Plessis et al., 2014; Kemp and Hollander, 2020; Holtemöller and Sardone, 2024). The mentioned studies either make fiscal policy or monetary policy the core focus of the study. Overall, one can observe that DSGE models have become suitable for analysing policy and its impact on the economy.

There are several different methodologies used in studies that explore the divine coincidence and optimal monetary policy. The study by Del Negro et al., (2025) used a medium-scale Heterogeneous Agent New Keynesian (HANK) model. This model captures the channels in which aggregate shocks and macroeconomic policies influence variables (such as household consumption in the particular study). The model's downfall however is that it is not analytically tractable. That is, it is unclear what drives its results. Similarly, Acharya and Challe (2024) used a Small Open Economy (SOE) HANK. Using a Rank model, Davila and Schaab (2023) found that there is no trade-off and it is optimal to stabilise inflation and the output gap simultaneously. The study also employs a HANK model in which the divine coincidence does not hold (even in the absence of cost-push shocks). A few other studies employ the basic New Keynesian model. For example Alla et al., (2021) investigated unconventional policy methods and the divine coincidence breaks down. These findings suggest that the divine coincidence is not only based on the assumptions, but it may also be sensitive to the type of model used.

Following the discussion in the literature, this study aims to explore the proposition that the divine coincidence is achievable, especially in the case of South Africa since the SARB is pursuing inflation targeting. In addition, minimal consideration has been given to the inclusion of a technology shock while examining the argument of the divine coincidence. The studies conducted in the last 18 years, since the proposition of the divine coincidence, are silent about its achievability in emerging economies. This project will integrate the proposition of the divine coincidence and also include a technology shock. Thereby, this study will provide a reliable quantitative analysis of the proposition of the divine coincidence. It is important (for the literature and policy making) to understand what effect technology has on the macro-economy as it influences output and inflation, and as a result, the effectiveness of monetary policy.

Chapter 3 – Methodology

3.1 The model

The model employed in this study presents a general equilibrium framework with New Keynesian assumptions. These assumptions include a market where the central bank has a policy or subsidy to offset market power, the market is perfectly competitive and prices are sticky (Blanchard and GalÍ, 2007). Incorporating price rigidities creates a role for monetary policy (Walsh, 2005). Together with these assumptions, South Africa will be analysed as a closed economy – there is no foreign sector. This is with the intention to understand the effectiveness of domestic monetary policy, without the influence of a foreign sector.

The economy in this model includes households which consume goods and services. Households also supply labour to firms in a manner that maximizes their utility function, but within the confines of their budget. There are intermediate and final goods firms, in which final good firms combine intermediate goods to produce final goods. Finally, there is the central bank that implements monetary policy that follows the Taylor rule. The model is further developed following several studies (Du Plessis and Burger 2006; Alves 2014; Marbet, 2022; Rubbo, 2023).

Households

Following Marbet (2022), households will choose consumption C_t and supply labour N_t, to maximise their utility as shown below

$$\max\{C_t, N_t,\} \quad \mathrm{E}_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{{C_t}^{1-\sigma}}{1-\sigma} - \chi \frac{N_t^{1+v}}{1+v} \right) \tag{1}$$

Where $\beta \, \epsilon \, (0,1)$ represents the discount factor, $\sigma > 0$ which is the coefficient representing relative risk aversion, $v > 0$ represents the inverse labour supply elasticity and χ is the preference for labour. Consumption is given by C_t and labour supply is given by N_t.The budget constraint below shows the trade-off households face between consumption and labour supply based on the hours they are willing to work and how they discount the future. Households are subject to the following nominal budget constraint

$$P_t C_t + B_t = W_t N_t + R_{t-1} B_{t-1} + P_t \Pi_t \tag{2}$$

where P_t is the price and consumption and bonds must be equal to the wage W_t earned for supplying labour N_t, the nominal R_{t-1} interest rate earned on bond holdings B_{t-1} (nominal savings) since households do not spend all their income in the current period. Real profit income is given by Π_t, where $\Pi_t = \frac{P_t}{P_{t-1}}$.

Having solved the first-order conditions, we obtain the Euler equation which is given by

$$C_t^{-\sigma} = \beta E_t \left[C_{t+1}^{-\sigma} \cdot \frac{R_t}{\pi_{t+1}} \right] \tag{3}$$

The Euler equation illustrates how households make their decisions with regards to consumption in the current period relative to consumption in the future.

In addition, having solved the first order condition with respect to labour, the labour supply equation is given by

$$\frac{W_t}{P_t} = \chi N_t^{\varphi} C_t^{\sigma} \tag{4}$$

Firms

The firms are divided into two producers: intermediate producers and final good producers.

Final good producer:

Final good-producing firms operate in a perfectly competitive market. Some of the characteristics of this market include many buyers and sellers in the economy, the sale of differentiated goods and services and no barriers to entry]. The final good producer seeks to minimize costs following

$$min \int_0^1 P_{it} Y_{it} di \tag{5}$$

Following El Ouazzani et al. (2024), a final good producer's production function combining intermediate inputs through technology, $Y_{i,t}$; i ∈ [0,1] and a Constant Elasticity of Substitution (CES) aggregator is

$$Y_{it} = \int_0^1 \left(\hat{Y}_t^{\frac{\varepsilon-1}{\varepsilon}} \right)^{\frac{\varepsilon}{\varepsilon-1}} \quad (6)$$

Where ε is the elasticity of substitution between the goods.

Demand for the intermediate good *i* is

$$Y_{it} = \left(\frac{p_{it}}{p_t} \right)^{-\varepsilon} y_t \quad (7)$$

An expression for the economy's price level P_t subject to Calvo pricing (El Ouazzani et al., 2024), can be derived by substituting equation (1) into the production function to get

$$p_t = \int_0^1 (p_{it}^{1-\varepsilon} di)^{\frac{1}{1-\varepsilon}} \quad (8)$$

Firms set their prices infrequently and at random intervals. Some firms reset their prices while others leave them unchanged. This is what creates nominal price rigidity in the economy, and is known as Calvo pricing (Calvo, 1983).

Intermediate good producer:

Intermediate good producers operate in a monopolistic competition framework and choose prices taking demand given by equation (11). Good i will be produced using k_t capital and n_t labour according to

$$Y_t = Z_t K_t^{\alpha} N_t^{1-\alpha} \quad (9)$$

Equation 9 is the Cobb-Douglas production function which illustrates that output production is a function of technology, capital and labour. The technology shock is defined in equation 10, where technology z_t follows

$$\ln z_t = \bar{z} + gt + e_t \quad (10)$$

Where $\bar{z}$ is technology at the steady state, gt is the growth rate of technology and e_t is distributed normally with a mean of 0, and variance ω_z. This is modelled as an autoregressive process that influences the production function given by equation (7).

The intermediate good producer's cost function is given by

$$TC_{it} = W_t N_t + R_t^k K_{it} \quad (11)$$

Where TC_{it} is the total cost incurred by the individual firm and R_t^k is the nominal rental rate of capital. The intermediate good producing firm chooses capital and labour to produce output that minimizes costs.

Solving the first order condition with respect to capital and labour, we solve to obtain the capital-to-labour ratio which is defined by

$$\frac{K_{it}}{N_{it}} = \frac{\alpha}{1 - \alpha} \cdot \frac{W_t}{R_t^k} \quad (12)$$

Where $\frac{\alpha}{1-\alpha}$ is the steady-state capital share to labour share ratio .

The capital-to-labour ratio that a firm employs will depend on the relative costs of both capital and labour (inputs). For instance, if capital becomes more expensive relative to the cost of labour, the firm may substitute towards labour.

Substituting the capital-to-labour ratio and first order conditions into the production function shows that the real marginal cost is given by

$$mc_t = \frac{1}{A_t}\left(\frac{\frac{W_t}{P_t}}{1 - \alpha}\right)^{1-\alpha}\left(\frac{\frac{R_t^k}{P_t}}{\alpha}\right)^{\alpha} \quad (13)$$

IS Curve

Following Alves (2014), the New Keynesian IS curve which represents the goods market, is given by

$$Y_t = \mathrm{E}_t Y_{t+1} - \frac{1}{\sigma}(i_t - \mathrm{E}\pi_{t+1} - r_t^n) \quad (14)$$

Where $\mathrm{E}_t Y_{t+1}$ is expected output, $\frac{1}{\sigma}$ is the elasticity of substitution, i_t is the nominal interest rate, $\mathrm{E}\pi_{t+1}$ is expected inflation and r_t^n is the natural real interest rate. The natural real interest rate is the rate of interest that exists if there are no nominal rigidities, which would equate actual output to the potential level of output. Furthermore, it is largely driven by technology shocks. As Segal (2017) argues,

positive technology shocks increase the natural real interest rate as agents expect income to be higher in the future.

Hybrid New Keynesian Phillips Curve (H-NKPC)

To illustrate the effects of trend inflation on monetary policy, we incorporate a Phillips curve into the model. As the hypothesis states, the steady state inflation rate for the South African economy in this study will not be set equal to zero ($\pi > 0$). Therefore, the study uses the H-NKPC, adopted from Du Plessis and Burger (2006) study. The H-NKPC is defined by

$$\pi_t = \frac{\beta}{1 + \beta\psi}\,\pi_{t+1} + \frac{\psi}{1 + \beta\psi}\pi_{t-1} + \kappa\,.mc_t + e_t \qquad (15)$$

Where $\frac{\beta}{1+\beta\psi}\,\pi_{t+1}$ is the forward looking component, $\frac{\psi}{1+\beta\psi}\pi_{t-1}$ is the backward looking component, κ is the slope of the Phillips curve and mc_t is the marginal cost in the current period.

The original Phillips curve often used in New Keynesian models cannot be used in studies that assume inflation is greater than zero. In other words, it is not suitable for non-linear models. In addition, inflation has been found to be influenced by its past, for which the G-NKPC cannot account. The H-NKPC is an empirical fit for this study because it considers that current inflation is influenced by both the past and expected inflation.

A few studies have found that the H-NKPC is suitable for the South African economy (Phiri, 2016; Sangweni and Ngalawa, 2023). The forward-looking component implies that the inflation rate in the current period does not only rely on current economic conditions, but also on the expectations of what agents in the economy expect inflation to be in the future. In a similar manner, the backward-looking component implies that inflation in the current period does not only depend on current economic conditions, but also on the behaviour of the inflation rate in the previous period. The study includes a cost-push shock, e_t, since cost push shocks have a major influence in determining inflation in South Africa (Ziramba, 2008; Nell 2018; Hassan and Meyer 2020). In addition, the study includes a cost-push shock because of the lack of clarity about the relationship between the divine coincidence and cost-push mechanisms.

Monetary policy (the Taylor Rule)

The central bank employs a Taylor rule to determine the nominal interest rate in the current period. The Taylor rule is defined by

$$R_t = \tilde{R}\left(\frac{\pi_t}{\tilde{\pi}}\right)^{\emptyset_\pi} \left(\frac{Y_t}{\tilde{Y}}\right)^{\emptyset_y} \quad (16)$$

Where $\phi_\pi > 1$ indicates how strongly the central bank responds to the inflation rate given by π_t, $\tilde{\pi}$ is the inflation rate target and $\emptyset_y$ reflects how strongly the central bank responds to deviations of output from the steady state, $\tilde{R}$ is the nominal interest rate at the steady state. Therefore, the nominal interest rate is a function of inflation and its deviation from the target inflation, as well as output and its deviation from potential output.

Equilibrium

At equilibrium, the markets clear through Calvo pricing and monetary policy.

$C_t^{-\sigma} = \beta E_t\left[C_{t+1}^{-\sigma}\ \frac{R_t}{\pi_{t+1}}\right]$ (Euler equation)

$\frac{W_t}{P_t} = \chi N_t^{\varphi} C_t^{\sigma}$ (Labour supply)

$\frac{W_t}{P_t} = (1 - \alpha) \cdot mc_t \cdot \frac{Y_t}{N_t}$ (Labour demand)

$Y_t = Z_t K_t^{\alpha} N_t^{1-\alpha}$ (Production function)

$\frac{K_{it}}{N_{it}} = \frac{\alpha}{1-\alpha} \cdot \frac{W_t}{R_t^k}$ (Capital-to-labour ratio)

$B_t = 0$ (Bonds market)

$mc_t = \frac{1}{A_t}\left(\frac{\frac{W_t}{P_t}}{1-\alpha}\right)^{1-\alpha}\left(\frac{\frac{R_t^k}{P_t}}{\alpha}\right)^{\alpha}$ (Real marginal cost)

$\pi_t = \frac{\beta}{1+\beta\psi}\pi_{t+1} + \frac{\psi}{1+\beta\psi}\pi_{t-1} + \kappa . mc_t + e_t$ (Hybrid New Keynesian Phillips Curve)

$Y_t = C_t + I_t$ (Goods market)

$$Y_t = \mathrm{E}_t Y_{t+1} - \frac{1}{\sigma}(i_t - \mathrm{E}\pi_{t+1} - r_t^n) \quad \text{(IS Curve)}$$

$$K_{t+1} = (1 - \delta)K_t + I_t \quad \text{(Capital accumulation)}$$

$$R_t = \tilde{R}\left(\frac{\pi_t}{\tilde{\pi}}\right)^{\emptyset_\pi}\left(\frac{Y_t}{\tilde{Y}}\right)^{\emptyset_y} \quad \text{(Taylor rule)}$$

3.2 Estimating technique

The study will use a New Keynesian DSGE model framework, in which the parameters will be calibrated using the parameters that are available in South African literature. Calibration is commonly used to adapt DSGE models to empirical data and it is a method in which specific values are assigned to structural parameters (El Ouazzani et al., 2024). The DSGE model is suitable for this study because the general equilibrium framework shows how agents in the economy seek to optimize utility, subject to their budget constraints (Ngalawa and Komba, 2020a). The stochastic framework shows how shocks influence the behaviour of variables that may be significant to policymakers, and it is a model used by central banks (Du Plessis et al., 2014) for forecasting and analysing policy. Therefore it is suitable for the optimal monetary policy study done by this study. Furthermore, the DSGE model does not succumb to the Lucas critique (1976) when compared to other econometric models, and it maintains theoretical consistency. Finally, the model is also rooted in both microeconomic and macroeconomic theory.

Blanchard (2017) illustrates how an economy can stabilize inflation and output using the Phillips curve and the Taylor rule. With the former, the central bank aims to achieve the target inflation and have unemployment at its natural rate – which by implication means the economy is producing at its potential output. With regards to the latter: if the inflation rate in an economy is equal to the target inflation rate, the central bank will set the nominal interest rate equal to its target value. The divine coincidence will only hold if the central bank determines and aims to achieve the most suitable inflation target.

In order to answer the first research question, on whether the divine coincidence holds in South Africa, monetary policy under the Taylor rule will be observed. If the divine coincidence holds, one can expect to see stabilization of both the inflation rate and the output gap. That is, the inflation rate and the output gap will move in the

same direction when analysing impulse response functions. Impulse response functions illustrate how a variable responds to shocks to itself and other variables (Brooks, 2019). If the divine coincidence does not hold, a trade-off will be observed. To address the second research question, the impulse response functions will illustrate how a technology shock influences the inflation rate and the output gap. Finally, the third research objective, the study will analyse the standard deviation of the inflation rate and output, to identify whether the SARB places more weight on price stability or output stability.

A majority of the studies that explore the divine coincidence are either done in developed economies or the study does not explicitly state for which country it is being conducted. This creates a gap in the literature as such studies in emerging economies are limited. This study aims to close this gap and contribute to the literature by exploring the divine coincidence in an emerging economy. The findings can illustrate the relationship between inflation and output in South Africa and inform policy-making. Secondly, studies that analyse the divine coincidence use the original expectations augmented Phillips curve and the G-NKPC. This study uses the H-NKPC, which has a forward-looking and backward-looking component. Hassan and Meyer (2020) found that the inflation rate does not only depend on future expectations, but past inflation also has an influence.

Chapter 4 – Results and Discussion

4.1 Calibration

The calibrated parameters for this study are summarized in Table 1. The values of the parameters can be found in existing literature (Du Plessis and Burger 2006; Gupta and Sun 2020; Kemp and Hollander 2020). The intention of this study is to analyze policy rather than forecast. Therefore, calibration is more suitable for this study. In addition, the study acknowledges that the values of the parameters are subject to change, given any structural changes that may take place in the economy. However, there is no indication of a significant structural transformation in the South African economy in the period following the mentioned studies

Symbol	Parameter	Value
β	Discount factor	0.994
θ	Calvo price stickiness	0.861
π	Steady-state inflation	1.011
α	Capital share	0.3
z	Technology shock	0.914
u	Cost-push shock	0.4425
$\emptyset_\pi$	Central Bank response to a change in inflation from the target	1.767
$\emptyset_\gamma$	Central Bank response to a change in output from the target	0.262
σ_f	Frisch elasticity	0.282
ψ	Backward-looking component	0.431
σ	Intertemporal Elasticity of Substitution	0.5
ε	Elasticity	1.5

Table 1: Calibrated parameters. Du Plessis and Burger (2006),Gupta and Sun (2020) and Kemp and Hollander (2020).

Source: Author's compilation

The discount factor – which indicates how much consumers value present consumption versus future consumption – is set to 0.994. This high value is of importance because it ensures that the steady-state nominal interest rate remains within an economically reasonable range. The Calvo pricing value of 0.861 suggests that there is a 13.9% probability that intermediate firms will change their price in a given period. In addition, it suggests that on average, prices remain fixed for 5 to 7 periods. Steady-state inflation is equal to 1.011 which is equivalent to the 4.5% midpoint of South Africa's 3%-6% inflation target. A capital share of 0.3 suggests that

about 30 percent of income from production goes towards capital. This further suggests that South Africa is labour intensive.

The technology shock is 0.914 which is the persistent technology shock parameter value found in Kemp and Hollander (2020). This high value suggests that technology shocks have long-lasting effects on the economy, which lead to sustainable economic growth. The cost-push shock parameter (0.4425) is taken from Gupta and Sun (2020), in which their study investigates housing market spillovers in South Africa. That is, the parameter is biased to the housing sector. However, it is still a relevant parameter for this study. This is because the housing market is a core component of real estate, which makes it one of the top three sectors that contribute significantly to South Africa's GDP (StatisticsSA, 2024).

The central bank's response to inflation and output deviations from their target levels, are set to 1.767 and 0.262 respectively. The value for the central bank's response to deviations of inflation (1.767) suggests hawkish behavior by the SARB. This hawkish behavior is evident in the 2008 and 2020 monetary policy reports (SARB, 2008; SARB, 2020d). The value for the central bank's response to deviations of output (0.262) suggests a minimal reaction to fluctuations in output or GDP growth.

The value of the Frisch elasticity which represents how labour supply responds to temporary wage changes is equal to 0.282 (Elminejad et al., 2023). This indicates that households are not very responsive to changes in wages, and only a few people will enter the workforce if wages increase. The backward-looking component for the H-NKPC is 0.431. This suggests that inflation in the previous period has a moderate effect on current inflation. This may be because the response of the central bank to changes in inflation is subject to lags. As a result, past inflation lingers and is embedded in the current inflation.

Intertemporal elasticity of substitution (IES) measures the responsiveness of consumption when the expected real interest rate changes (Patterson and Pesaran, 1992). Taken from Gupta and Sun (2020), the intertemporal elasticity of substitution is equal to 0.5. This indicates that the spending habits of households do not change much in response to changes in the interest rate.

Elasticity measures the percentage change in demand relative to the percentage change in prices and it has been set to 1.5 (Mankiw, 2013). This indicates that demand by households is elastic – it is sensitive to changes in the price. For instance, it suggests that a 1% increase in the price of goods and services will decrease quantity demanded by 1.5%.

The calibrated parameters in Table 1 are then used to construct a model that is simulated to analyze the economy's behaviour, and its response to technology and cost-push shocks.

4.2 Results and analysis

Eigenvalues:

Table 2 below shows the eigenvalues for this study. Eigenvalues provide insights into the mathematical properties of a system. The Blanchard-Khan condition is a stability requirement that indicates whether a model can produce a unique solution (Brooks, 2019). A model that fails to produce a unique solution compromises policy analysis. This is because having multiple solutions instead of one misleads policymakers in that they will not know the effect (or effectiveness) of their actions. It results in an indeterminate model that leads to unreliable predictions. In order for the Blanchard-Khan condition to be satisfied, the number of forward-looking values must equal the number of eigenvalues that are greater than one. Table 2 shows two stable eigenvalues and two forward-looking eigenvalues. Therefore, the results in table 2 indicate that the model satisfies the Blanchard-Khan condition.

Modulus	**Real**	**Interpretation**
0.4425	0.4425	stable
0.914	0.914	stable
1.04	1.04	forward-looking
1.511	1.511	forward-looking

Table 2 :Eigenvalues
Source: Author's compilation.
The eigenvalues >1 ensure a unique solution (Blanchard-Kahn condition).

Steady State results:

The steady-state represents the long-run equilibrium of the model, where the variables are constant. In this way, it illustrates the behaviour of the economy in the absence of shocks – hence both the technology shock and cost-push shock are 0.0 at the steady state. The steady-state results in Table 3 show a positive inflation rate of 2.16983 which allows the central bank enough flexibility to implement monetary policy without being confined by the zero lower bound (Ball, 2014). The marginal cost 0.366067 is less than one, which confirms that the intermediate firms have pricing power.

Variable	**Steady-state value**
Output (y)	0.468116
Inflation (pi)	2.16983
Interest rate (r)	2.17587
Marginal cost (mc)	0.366067
Technology (a)	0.0
Cost-push (u)	0.0

Table 3: Steady-state Results
Source: Author's compilation

Cost-push shock

Table 4 shows the variance decomposition results for output and inflation. Variance decomposition shows how much (percentage) each shock contributes to the fluctuations in the model's variables. This study analyses the effect of a technology and cost-push shock on output and inflation. The variance decomposition exceeds 100% in total contribution for both the technology and cost-push shock. This suggests that the dynamics of the shocks are not completely orthogonal. This is possible because both shocks are persistent (0.914 and 0.4425 respectively). This is known to occur in models with highly persistent shocks and does not invalidate the core insights of the model (de Antonio Liedo, 2011; Ferroni et al., 2019).

Table 4, together with figures 4.2.1 and 4.2.2, shows that the divine coincidence does not hold in the South African economy. In table 3, a cost-push shock has a significant impact on both output and inflation, with the value of 96.28 and 101.34, respectively. Therefore, there is a trade-off between output and inflation (see Figure 4.2.1 and 4.2.2) due to the cost-push shock. This result is consistent with other empirical findings (Alla et al., 2016; Guerrieri et al. 2021).

Variable	Technology Shock	Cost-push Shock	total contribution
Output	15.02	96.28	111.30
Inflation	0.28	101.34	101.61

Table 4: Variance Decomposition
Source: Author's compilation

Most studies in the literature focus on open economies and therefore attribute cost-push shocks to changes in oil prices (Majenge et al., 2025; Ndou and Gumata, 2025), or import prices (Yakubu et al., 2019; Sharma et al., 2019). However, this study assumes there is no foreign sector, and therefore, it is important to identify how a cost-push shock may occur in a closed economy. Cost-push shocks in a closed economy may arise from an increase in energy prices, increases in the price of raw materials, and natural disasters (Reserve Bank of Australia, 2025). However, these examples are not limited to closed economies. Based on the monetary policy reports one could observe that South Africa faced pressure from cost-push shocks since 2006 which became more aggressive in 2012 and 2022 (SARB, 2006; SARB, 2022). In addition, the cost-push shocks started to become more domestic than a result of external factors.

Figure 4.2.1 shows how output responds to a cost-push shock. As Figure 4.2.1 illustrates, a cost-push shock has a negative impact on output. The cost-push shock increases marginal costs and therefore, increases the cost of production for firms (Mankiw, 2013). As a result, firms decrease output as the cost of producing each unit increases (Reserve Bank of Australia, 2025). The steepness of the slope suggests an aggressive response by the central bank. Secondly, recall that the calibrated parameter for price stickiness (0.861) suggests that on average, prices remain fixed for five quarters. In figure 4.2.1, one can observe that the slope peaks at about (or just after) 5 periods. Therefore, the impulse response functions validate the model's calibrated structure.

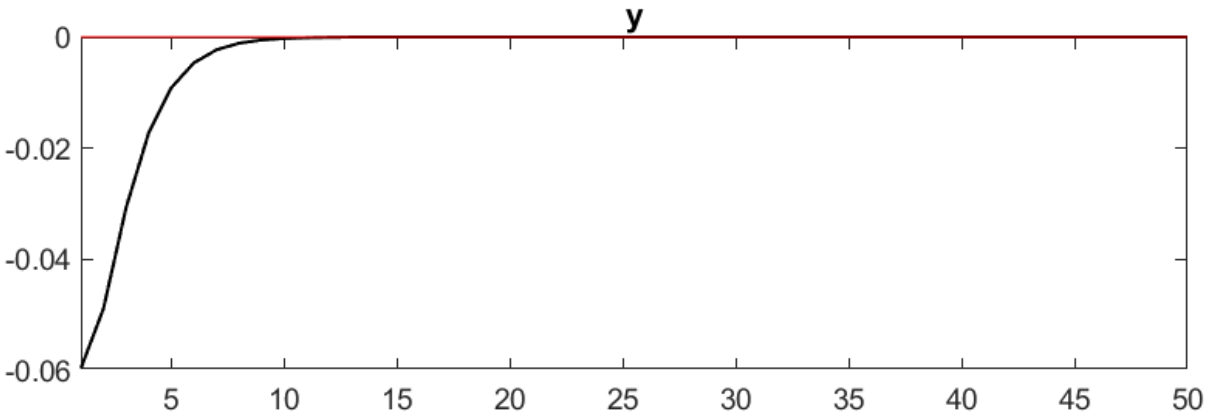

Figure 4.2.1: Impulse response function of output to cost-push shock

Source: Author's compilation

While a cost-push shock causes output to fall, inflation rises as depicted in figure 4.2.2. Since the cost of production for firms increases, they increase the price paid by consumers for goods and services (Adhikari et al., 2025). This increase in the price leads to a decrease in the aggregate demand for goods and services (theory of demand). However, the graph shows a steep convex slope, which suggests the central bank responds by increasing the interest rate to reduce inflation (see figure 4.2.3). Moreover, the steep shape suggests an aggressive response which is plausible because keeping the inflation rate within the target is the SARB's priority. In the event of a cost-push shock, the results show that output decreases while inflation increases. The trade-off indicates that the central bank cannot stabilize prices and the output gap. In other words, the central bank cannot rely on the notion that stabilizing the inflation rate will also stabilize the output gap.

Therefore, we reject the null hypothesis that the divine coincidence holds, and conclude that the divine coincidence does not hold in the South African economy. The economy experiences cost-push inflation. In addition several studies found that cost-push shocks are a determinant of inflation in South Africa (Nell 2018; Hassan and Meyer 2020). As reflected by the annual reports, the SARB has gained credibility because it aims to stabilize prices. In this way, the agents in the economy can revise their expectations downwards. Distinctly for a closed economy, Sutherland (2005) argues that the existence of a cost-push shock suggests that the central bank allows some prices to rise in an attempt to stabilise the output gap. Moreover, figure 4.2.2 is consistent with the price stickiness parameter.

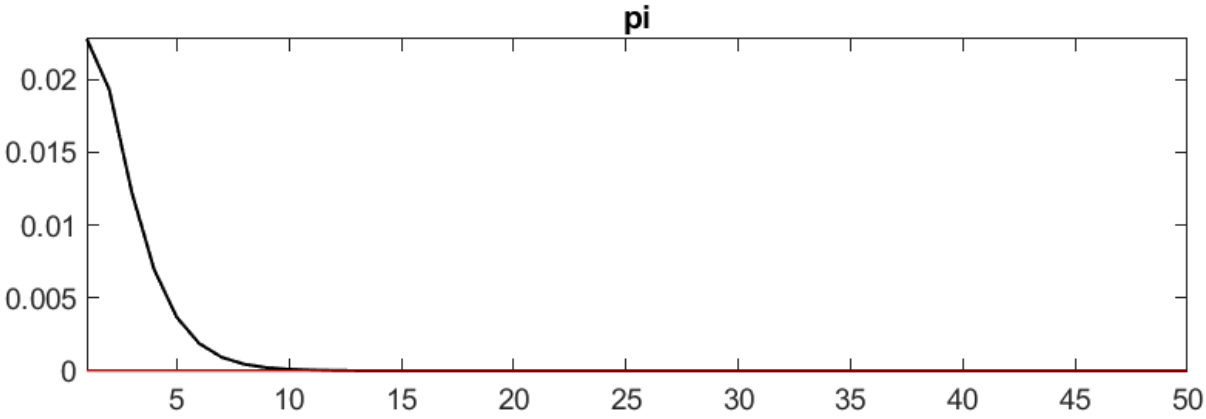

Figure 4.2.2: Impulse response function of inflation to cost-push shock

Source: Author's compilation

In the event that the divine coincidence does not hold, the optimal policy decision becomes more complex. This is because the simple Taylor rule is no longer the optimal choice, but it becomes suboptimal. Depending on the magnitude of the cost-push shock, the inflation rate may exceed the target. In addition, the output gap becomes worse because the cost-push shock reduces output, which means a gap remains between actual output and the potential level of output. The central bank faces a trade-off and therefore has to make a choice on whether to stabilize inflation or stabilize the output gap (Blanchard and Gali, 2007). It is in such instances that the central banks transparency, communication and credibility become paramount.

Figure 4.2.3 shows that the central bank responds to the increase in the inflation rate by increasing the interest rate. In conjunction, this illustrates the Gibson paradox in the South African economy, which was also found in Keho (2015) study. The Gibson paradox argues that the inflation rate and nominal interest rate are correlated (Benati and Benigno, 2023) in the long-run.

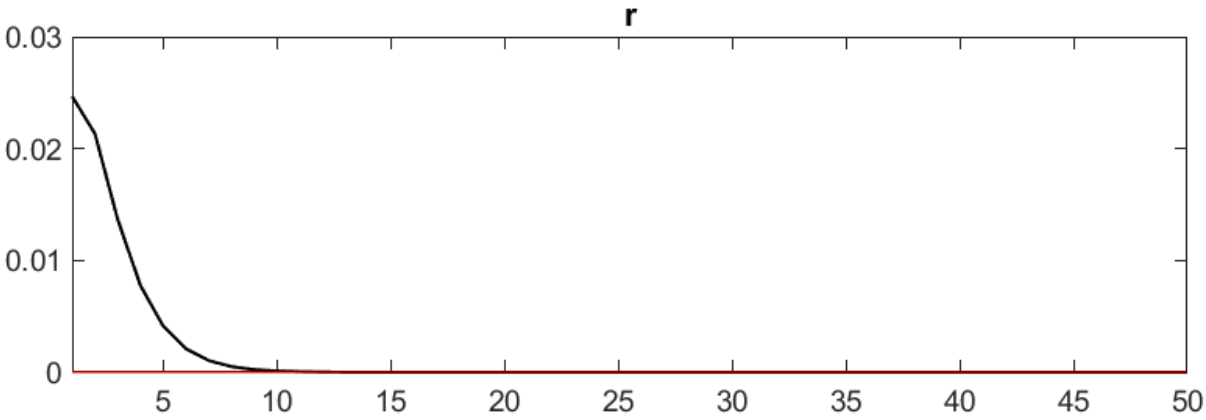

Figure 4.2.3: Impulse response function of the interest rate to cost-push shock

Source: Author's compilation

Technology shock

Figure 4.2.4 below shows that when there is a technological shock in the economy, output increases. A positive technology shock decreases marginal costs. Through the Calvo pressing mechanism, intermediate firms (with monopolistic power) decrease their prices. This decreases the aggregate price level. Following the Taylor rule, the central bank decreases the nominal interest rate. A lower nominal interest rate encourages spending, which increases aggregate demand and boosts economic growth (Romer, 2012).

The gentle slope suggests that the shock persists before returning to the steady state. This is consistent with the Real Business Cycle theory, which posits that a technology shock increases productivity and, consequently, raises output (Romer, 2012). In addition, these findings are similar to Vajrapatkul and Thepmongkol (2022) study in which they found that technological progress increases output and encourages national income in a closed economy.

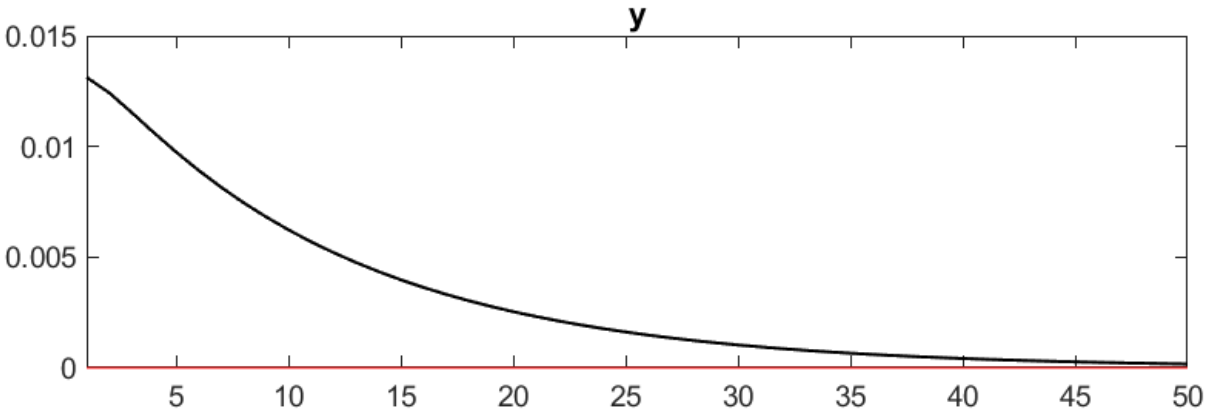

Figure 4.2.4: Impulse response function of output to a technology shock

Source: Author's compilation

Figure 4.2.5 shows that the inflation rate initially decreases, and then it continues to decrease sharply and ends with gradual increase overtime. The decrease in inflation is consistent with theoretical predictions (Romer, 2012). While a positive technology shock increases output, it reduces inflation. This is because firms can produce more goods with the same amount of input and only an improvement in method or

efficiency. In addition, firms can produce and supply more goods and services relative to the aggregate demand. As a result, this puts downward pressure on prices. However, one can observe that the disinflationary pressure is sharp and short-lived. This possibly reflects the cost-push pressure on inflation. This pressure is a result of the challenges businesses face, such as load-shedding and natural disasters. Both of these challenges are mentioned in the 2020- 2023 monetary reports (SARB, 2020d; SARB, 2021; SARB, 2023b).

For instance, a firm may adopt new technology that improves output production (Snowdon and Vane, 2005). In addition, the shock decreases a firm's production costs since the cost of producing each additional unit decreases. However, load-shedding (electricity shortage) increases energy prices, which compels firms to charge this increase in the prices paid by consumers. In the case of natural disasters, supply chains are disrupted and transportation costs increase, which, as expected, increases the price paid by consumers. Overall, these results are a reflection of empirical evidence. South Africa experiences loss aversion since the positive effects expected from the World Cup were lower than expected. One can argue that these results reflect loss aversion, since a positive technology shock seems to be overpowered by structural challenges.

Thereafter, inflation increases again. This could be a result of expectations for higher inflation in the future, since output and prices increased. Furthermore, two studies found that inflation expectations are a significant determinant of inflation in South Africa (Leshoro 2016; Madito and Odhiambo 2018). The evidence from as early as the 2001 report shows that the SARB began to pay more attention to inflation expectations. Since then, the SARB seems to remain committed to not de-anchor expectations as they significantly impact inflation.

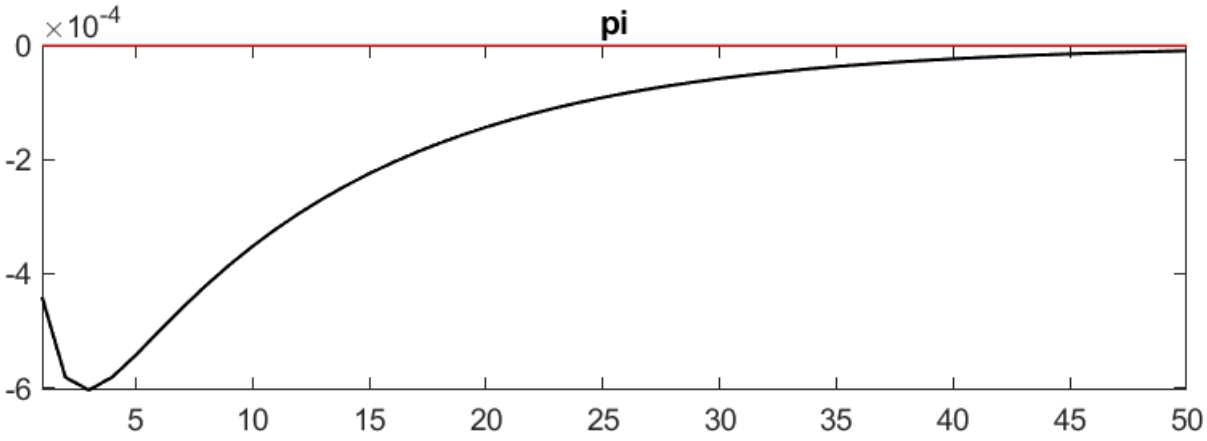

Figure 4.2.5: Impulse response function of inflation to a technology shock

Source: Author's compilation

Figure 4.2.6 illustrates the response of the interest rate to a technology shock. To reiterate, the correlated movement of the interest rate and inflation demonstrates the Gibson paradox. Moreover, the figure shows that in the event of a technology shock, the central bank reduces the interest rate. This reinforces the effect of the technology shock on economic growth, since a lower interest rate encourages spending (which increases aggregate demand). This is also found in Sims (2012) study.

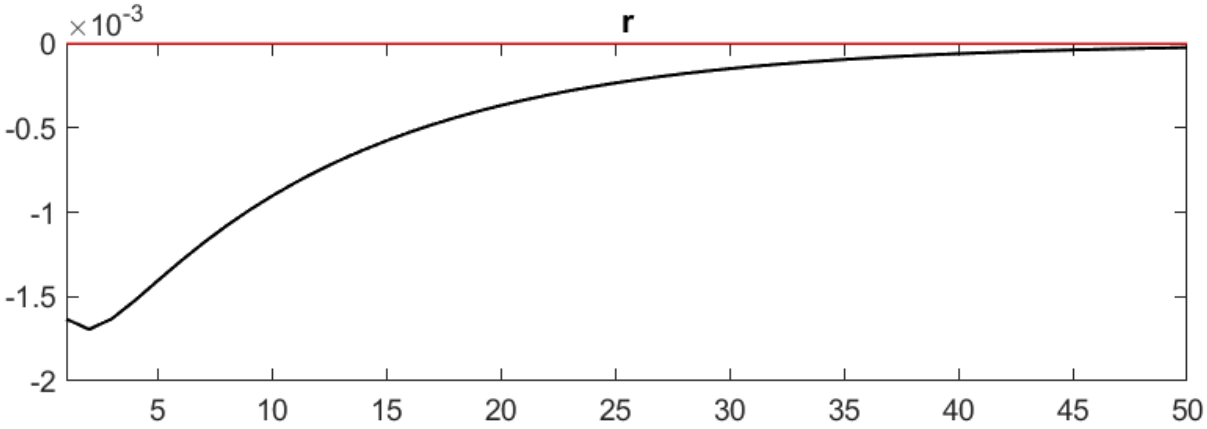

Figure 4.2.6: Impulse response function of the interest rate to a technology shock

Source: Author's compilation

While the results show that a technology shock increases output, the question of why South Africa is challenged by low economic growth still remains. To answer this question, in conjunction with the rise of the inflation rate after the third period in Figure 4.2.5, one can argue that it appears there is something exerting pressure against economic growth. As such, (van Rensburg and Morema, 2023) argue that

load-shedding is a deterrent to economic growth in South Africa. Load-shedding heavily affects producers in the commercial, industrial and agricultural sectors (Olajuyin and Mago, 2022), which rely heavily on the supply of electricity. Moreover, although it does not remain as the only reason for low economic growth, it slows down potential growth even further (van Rensburg and Morema, 2023). The economy experiences an innovative (technology) shock which increases productivity and therefore, output increases. As a result, the cost of production decreases. However, in South Africa, the challenge of load-shedding leads to the loss of production and firms incur higher costs due to spoilage of goods and equipment failure (Walsh et al., 2021). As a result, one can argue that the cost of production does not decrease substantially to significantly reduce inflation.

Furthermore, an increase in the cost of production makes it challenging for producers to hire more workers, which could further exacerbate the unemployment in South Africa. To reduce time consumed conducting interviews and hiring costs, firms may decide to train their workers on the necessary skills instead of hiring new workers (Blatter et al., 2016). Another debate in the literature that affects employment is between technological advancements and their effect on unemployment. Several studies (Škare and Tomic, 2014);(Broughel and Thierer, 2019); (Mohamed et al., 2022) including theories such as the Real Business Cycle theory, argue that technology increases output and therefore economic growth. In contrast, several studies (Duernecker, 2014); (Fiorelli, 2018);(Bessen, 2019) argue that innovation results in firms investing more in the improved technology as production will require less workers.

Skills mismatch is another factor that challenges economic growth in South Africa (Shava and Clementine, 2016). Therefore, if workers do not have the skills to use the new technology, the economy cannot reap the full benefits from the technological advancement. This slows down economic growth even further. Burger (2021) argues that South Africa is challenged by low economic growth due to a lack of structural transformation. When an economy transforms from being labour intensive to being skill intensive, it is known as structural transformation (Habitat, 2016). Although many South Africans have occupations in the primary sector, transformation has occurred hence, the tertiary sector significantly contributes to economic growth (StatisticsSA, 2024) . In addition, South Africa is rich in natural resources and

therefore, it is plausible for the primary sector to have the highest level of employment. In point of fact, this is one of the sectors in which more government support in development is needed for the sector to contribute significantly to economic growth.

Inflation and output standard deviation

The result in Figure 4.2.3 shows that the central bank increases the interest rate in response to an increase in inflation after a cost-push shock. This indicates the prioritization of inflation stability as the central bank seeks to decrease inflation after the cost-push shock. However, the result in Figure 4.2.6 shows that the central bank initially reduces the interest rate in the event of a positive technology shock. The central bank does this even though the inflation rate decreased which suggests a reinforcement of the technology shock to boost economic growth. This suggests that the central bank prioritizes output stability. Therefore, it becomes relevant to understand what weight the central bank places on inflation stability.

To analyse whether the central bank puts more weight on price stability or output stability, the standard deviation of the two variables can be assessed. The standard deviation results are based on the calibrated parameters in this study. Table 5 shows that the standard deviation of inflation, 0.032208, is less than that of output, 0.084802. This suggests that the inflation rate is less volatile, and the central bank prioritizes price stability over output stability. This is consistent with the SARB's mandate to target the inflation rate (SARB, 2023a). In addition, if we calculate the output gap (output – natural rate of output), the standard deviation is 0.045634, which is still higher than that of the inflation rate. Furthermore, in table 6 one can also observe that even in the event of a shock, the central bank puts more weight on stabilizing inflation. This further emphasizes inflation targeting.

Variable	**Std. dev**
Output	0.084802
Inflation	0.032208
Natural rate of output	0.039168

Table 5: Moments of simulated variables
Source: Authors compilation

	Output	Inflation	Interest rate
Constant	0.468116	2.169829	2.175865
Technology shock	1.312170	-0.044079	-0.163292
Cost-push shock	-5.959696	2.276072	2.466338

Table 6: Policy and Transition functions
Source: Author's compilation

Table 6 also illustrates what is known as the sacrifice ratio. The sacrifice ratio refers to the amount of output and employment an economy loses when trying to reduce inflation by 1%. It is common for the sacrifice ratio to be large in New Keynesian models (Snowdon and Vane, 2005). However, empirical literature has shown that the sacrifice ratio in South Africa remains relatively low (Gereziher and Nuru, 2024; Loewald et al., 2022). Therefore, the central bank tolerates the losses to output in order to stabilize inflation. These results also reinforce the results illustrated in Table 5, which shows that the SARB prioritizes price stability. Given the recent discussions on South Africa changing its inflation rate, the target that the SARB chooses will be a reflection of how much they tolerate the trade-off between inflation and output.

Chapter 5 - Conclusion

This study sought to explore the divine coincidence in a closed South African economy, with the inclusion of a technology shock and cost-push shock. The divine coincidence argues that policymakers can implement policies that can stabilize the inflation rate and stabilize the output gap simultaneously under certain assumptions. However price rigidities, uncertainty and shocks in the economy make it challenging for central banks to stabilize both inflation and the output gap. The SARB has successfully stabilized inflation in South Africa, which attracts investment. Investment sets the stage for innovation and, therefore, economic growth. However, South Africa is still challenged by economic growth and low unemployment. Furthermore, literature has shown that inflation in South Africa is largely driven by cost-push shocks. Therefore, an analysis that includes a technology shock and cost-push shock can provide possible reasons for South Africa's success in price stability, yet it faces low economic growth.

Empirical studies on the divine coincidence have shown that some economies can stabilize the inflation rate and reduce the output gap, while others face a trade-off. Some studies argued that conventional and unconventional policy methods, less government intervention in financial systems and low interest rates are required for the divine coincidence to hold. In contrast, the divine coincidence breaks down due to real wage rigidities, dollar invoicing – especially in SOEs, cost-push shocks, credit shocks and externalities. The results of these studies show that rigidities, uncertainty and shocks challenge policymakers such that they cannot simultaneously stabilize inflation and the output gap.

Technology shocks allow firms to increase production and both actual output and potential output. This increases economic growth. Following a technology shock, policymakers may decrease the interest rate to promote spending which enhances the effect of the technology shock. However, literature has presented contrasting results on whether positive technology shocks create employment or increase unemployment. Conversely, cost-push shocks increase production costs, which further increases the price paid by consumers for goods and services. Furthermore, cost-push shocks are a significant determinant of inflation in South Africa. Cost-push

shocks may arise from structural issues and central banks alone cannot be responsible for boosting economic growth.

The main and first objective of this study is to explore the divine coincidence and whether it holds in a closed South African economy. Based on the results of the variance decomposition and the impulse response functions, it is evident that the divine coincidence does not hold. This is because of the cost-push shock that significantly decreases output while the inflation rate rises. As a result, policymakers cannot stabilize the inflation rate and the output gap and the divine coincidence breaks down. The central bank cannot rely on the idea that stabilizing inflation will simultaneously stabilize output performance.

The second objective was to determine the effect of a technology shock on inflation and output. The study finds that a technology shock increases output, which reinforces theoretical expectations. Furthermore, it implies a decrease of the output gap as the economy is producing closer to potential output. In conjunction, the impulse response also illustrates that the technology shock decreases inflation. The SARB responds by decreasing the interest rate which suggests a commitment to economic growth by encouraging spending. Thereafter, the inflation rate increases again. From a theoretical perspective, this suggests a change in expectations about the future inflation rate, and empirical studies argue that inflation expectations are a significant determinant of inflation in South Africa.

The third and final objective was to determine whether the central bank puts more weight on price stability or output stability. The inflation rate appeared to be less volatile when compared to output. Therefore, the SARB prioritises price stability, which is true to the SARB's inflation rate targeting policy. In addition, the SARB has been successful in keeping the inflation rate within the target range.

The divine coincidence implies that central banks can have one policy that will stabilize the inflation rate and the output gap simultaneously. However, the results of this study show that the SARB faces a trade-off between the inflation rate and output and therefore, the divine coincidence does not hold. Yet, the SARB successfully stabilizes the financial environment, South Africa's economy struggles with low economic growth. The divine coincidence uses one policy instrument (the interest rate) to stabilize inflation and output simultaneously. Meanwhile, a dual mandate

allows policymakers to address output growth and inflation separately, while viewing them as of equal importance. The central bank can also prioritize anchoring expectations as this will make it easier for the central bank to manage the effects of cost-push shocks.

Despite the results revealing that a technology shock increases output, which in turn boosts economic growth, South Africa is still confronted by low economic growth. The study argues for two possible reasons. Firstly, South Africa faces structural issues such as load-shedding, which is a major threat to output production. It increases energy prices, and some businesses (especially SMEs) are forced to shut down. This reduces the number of agents that contribute to economic growth. Secondly, there is a skills mismatch challenge in South Africa. This means the economy cannot obtain all the benefits from innovation, which slows down economic growth. The SARB argues that monetary policy has temporary effects on economic growth while targeting inflation has more permanent effects on prices. Furthermore, output is more sensitive to structural challenges and real shocks, which monetary policy cannot offset without risking inflation instability. Although the SARB may face criticism, the central bank must continue to target inflation, since the policy tools were designed to manage inflation and not structural challenges that affect inflation.

Therefore, government interventions through research and development that are sector specific and supportive government policies can lead to sustainable economic growth and job creation. Similarly, although the SARB cannot boost economic growth on its own, collaboration through research and development with fiscal policy is encouraged. This could potentially produce strategies to increase employment – especially in sectors that contribute significantly to economic growth. In addition, this allows monetary policy to focus on the aggregate demand aspects of the economy while fiscal policy addresses the structural efficiency of the economy. Either there is more investment into the electricity generation from public and private institutions or an approach in which technological developments depend less on electricity and more on renewable energy sources is suitable. South Africa’s inflation rate is often in the lower region of the inflation target. More flexibility within the band would allow for more economic growth. The non-existence of the divine coincidence is not a crisis for the SARB, however it prompts policymakers to take an approach or adopt

strategies that manage the trade-off while supporting economic growth. This responsibility however, cannot rest solely on the SARB.

This study explores the divine coincidence specifically in South Africa. A limitation is that the findings are conditioned to South Africa's economic structure, and may not hold for other emerging economies. This is because of differences in monetary policy frameworks. In addition, a different method could yield different results. Future research should pursue a comparative analysis of emerging markets, and adopt an alternate Phillips curve.

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22-08-2025
Miss Lungelo Ayotha Aphiwe Manqele (221002352)
Westville

Dear Miss Lungelo Ayotha Aphiwe Manqele,

Original application number: 00031878
Project title: The exploration of the divine coincidence in South Africa

Exemption from Ethics Review

In response to your application received on 22 August 2025 , your school has indicated that the protocol has been granted **EXEMPTION FROM ETHICS REVIEW.**

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:
Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,

[redacted]

Prof Claire Lauren Vermaak
Academic Leader Research

Lungelo Manqele (221002352) 1 REVISED FINAL.docx

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