Central Bank Independence, Inflation and Money Growth: Evidence from South Africa

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Abstract

Purpose: This article evaluates the impact of the *de jure* independence of the South African Reserve Bank (SARB) on the credibility and discipline of domestic monetary policy. Credibility captures the extent to which economic agents trust the SARB to pursue its price stability mandate and is measured by the relationship between the SARB's independence and domestic inflation. Discipline relates to the effect of independence on money growth rates, where independence is associated with a more disciplined central bank and moderate money growth rates.

Methodology: A simple autoregressive distributed lag (ARDL) econometric specification and Granger causality tests are employed. Following the extant empirical literature, existing indexes of central bank independence (CBI) are regressed on annual rates of inflation and money growth.

Findings: A statistically significant negative relationship is established between both i) CBI and inflation and ii) CBI and money growth for the South African economy. This suggests that the SARB's legal independence plays an important role in containing inflation (credibility) and limiting excessive money growth (discipline).

Contribution: This article fills a gap in the extant literature by being the first attempt at formalising the empirical link between *de jure* CBI, inflation, and the rate of money growth in the South African economy.

Keywords: central bank independence; inflation; inflation expectations; credibility; monetary policy

UNISA
Southern African Business Review
Volume 28 | 2024 | #14375 | 22 pages

https://doi.org/10.25159/1998-8125/14375
ISSN 1998-8125 (Online)

Introduction

Central bank independence (CBI)—that is, "the freedom of monetary policymakers from direct political or governmental influence in the conduct of policy" (Walsh 2010, 21)—plays an important role in price stability. Theoretically, an independent central bank can more credibly commit to a long-term price stability goal. Higher central bank credibility anchors inflation expectations, making it easier for the central bank to achieve its price stability target, creating a virtuous cycle of higher-credibility-lower-inflation-expectations. Corroborating the theory, numerous studies and robust empirical evidence have shown that countries with higher levels of CBI experience lower inflation. Seminal articles include Alesina and Summers (1993), Bodea and Hicks (2015), Crowe and Meade (2008), Grilli, Masciandaro, and Tabellini (1991), Cukierman (2008), Cukierman, Webb, and Neyapti (1992), and Klomp and De Haan (2010). As a result, CBI has proliferated around the world in a wave of reform since the early 1990s[1] as a key institutional mechanism that governments employ to "increase credibility in monetary policy and maintain stable prices" (Bodea 2014, 185).

However, in recent years, CBI has become increasingly challenged, not only in South Africa but around the world. Romelli (2022) argues that central banks' relatively new responsibilities in areas of financial supervision and macroprudential policy might conflict with their traditional price stability goals, calling their credibility into question, while extensive asset purchase programmes after the 2008 global financial crisis are seen as increasing the risk of financial sector dominance. Similarly, massive central bank interventions during the 2020 Covid-19 pandemic have at least in part contributed to persistent high inflation worldwide since late-2021.

Central bank independence has also come under populist pressure (Agur 2018; *The Economist* 2019). Politically, there exists a view that globalisation and its associated "neoliberal ideology of free markets is against the state" (Polillo and Guillén 2005, 1765). Neoliberalism undermines the role of the state, challenging its "autonomy and capacity for independent decision making" (Polillo and Guillén 2005, 1765). A central bank independent from the state is thus ideologically opposed by those who believe that the state should play a central role in economic planning and decision-making—notably control over the money supply and interest rates—and regulation.

In contrast, neoliberal proponents of CBI emphasise that a central bank "free from political contingencies …[can] pursue the goals of fiscal discipline and monetary stability by preventing the rest of the state from engaging in discretionary deficit spending" (Polillo and Guillén 2005, 1768). Central bankers are, on average, more conservative than politicians in the sense that they "care relatively more than political authorities about price stability" (Cukierman 1994, 349). Politicians accept that

1 See Wessels (1997) for a detailed overview of the evolution of central bank independence since the early 1900s. Polillo and Guillén (2005) also provide an interesting sociological perspective of the rapid spread in CBI since 1990.

delegating monetary authority to an apolitical central bank will imply "certain restrictions on their future freedom of action" (Cukierman 1994, 350), but this is necessary to "reduce the set of circumstances under which price stability is sacrificed" in the pursuit of other objectives (Cukierman 1994, 350). However, because delegation is costly, it is "continuously contested in the political arena" (Bodea and Hicks 2015, 40), with central bank independence and credibility often challenged and negatively affected by "political interference from the government that delegated monetary policy in the first place" (Bodea 2014, 191).

However, irrespective of the political and ideological framing of the debate, an independent central bank has certain economic advantages when it comes to combating inflation. "CBI and accompanying institutional arrangements such as inflation targeting have become widely accepted commitment devices" (Cukierman 2008, 723) in support of central banks' core responsibilities of price and financial stability. Governments have incentives to generate short-term economic outcomes through surprise inflation, and therefore, "their own announcements and commitment with regards to inflation have little credibility" (Bodea 2014, 185). However, statutorily independent central banks, transparently committed to price stability targets, are more credible, thus better anchoring inflation expectations, which translates into lower actual inflation outcomes. In addition, independent central banks are more disciplined in that they can behave "in a conservative fashion that is reflected directly in lower rates of money supply growth" (Bodea and Hicks 2015, 37).

This article focuses on the economic dimension of central bank independence in the South African context. It does not attempt to address the question of the overall direction and implementation of South African economic policy, nor does it attempt to contest or justify the government's choice of inflation targeting as monetary policy framework. Instead, the aim of this article is purely to gauge the relationship between domestic inflation and money growth and the South African Reserve Bank's (SARB) independence and should, therefore, be viewed as but a small segment of a dynamic and complex picture. It takes the political dimension as given: In the early 1990s, the new democratic government decided that monetary policy was to be entrusted fully to an independent central bank, whose primary objective should be the pursuit of price stability by way of "protect[ing] the value of the currency in the interest of balanced and sustainable growth" and which must be performed "independently and without fear, favour or prejudice" (RSA 1996, 224). Price stability was later formalised as an inflation rate within a target band of 3–6% per year; the target range was decided upon in consultation between the National Treasury and the SARB (South African National Treasury 2000). The central question that this article poses is: Given an inflation-targeting monetary policy framework, does independence improve or hinder the SARB's ability to deliver on its price stability mandate?

This article contributes to the discourse by quantifying the relationship between South African inflation and the independence of the SARB. While much of the empirical

literature to date has focused on cross-country studies, limited research evaluates this relationship on a country-specific level. Similarly, no comparable studies dedicated to the South African economy exist. This study, therefore, considers the South African economy only. It has two research objectives, namely, to evaluate the relationship between CBI and inflation and to evaluate the relationship between CBI and money supply growth. Following Bodea and Hicks (2015), this article hypothesises that CBI (i) increases central bank credibility, manifesting in lower rates of inflation through better anchored inflation expectations, and (ii) has a disciplining effect on policy, manifesting in lower money growth rates.

The remainder of this article is structured as follows: Theoretical literature and empirical literature on the relationship between CBI, inflation and money growth are considered. Various existing indexes of CBI from the empirical literature are then employed in a simple time-series model to evaluate the impact of CBI on domestic inflation (credibility) and money growth rates (discipline). This is followed by a discussion of the results and implications.

Literature Review

Central bank independence (CBI) can be broadly defined as "the freedom of monetary policymakers from direct political or governmental influence in the conduct of policy" (Walsh 2010, 21). An independent central bank can, therefore, "control monetary instruments without political interference" (Garriga and Rodriguez 2020, 87).

Independence can be categorised into *goal* independence and *instrument* independence (Grilli et al. 1991; Crowe and Meade 2008). Goal independence implies that the central bank has the ability to choose the monetary policy goals, be it, for example, an inflation target, employment target, or nominal GDP target. However, virtually no central bank is perfectly goal independent, since in most countries the central bank receives its goal(s) or mandate from its government. In South Africa, the SARB's price stability mandate is explicitly described in the Constitution: "The primary object of the South African Reserve Bank is to *protect the value of the currency* in the interest of balanced and sustainable economic growth in the Republic" [own emphasis] (RSA 1996, 224(1)). The SARB cannot simply choose to neglect or discard the price stability mandate in favour of other goals. Only the government, through a Constitutional Amendment Bill, can change the SARB's mandate (Vermeulen 2020).

Instrument independence, on the other hand, refers to the central bank's capacity to choose the instruments with which the policy goals are to be pursued, e.g., lending and discount rates, open-market operations, or reserve requirements. In South Africa, as is the case in many countries around the world, the central bank enjoys instrument independence to pursue its government-directed goals within the ambit of the country's broader economic policy.

Theoretical Benefits of CBI

At the heart of the theoretical case for CBI is the conviction that "a central bank that is politically dependent on the government imparts an inflationary bias on the economy" (Polillo and Guillén 2005, 1769). Governments and politicians have a strong incentive to pursue inflationary policies for short-term electoral gain. However, rational agents will anticipate the government's tendency to renege on any low-inflation commitments. Economic agents will, therefore, incorporate higher inflation rates in their decisions, which would produce a rate of inflation higher than under a regime of credibility.

As a precursor to the explosion of CBI literature, Barro and Gordon (1983) first argued that "reputational forces" (i.e., a monetary authority credibly committed to price stability) can result in better inflation outcomes. Rogoff (1985) subsequently theorised that appointing a "conservative" central banker—in the sense that he has a higher preference for low inflation than the general public—would result in lower actual inflation rates. And, since the theory was supported by empirical evidence, which showed that, in general, a more independent central bank is associated with lower inflation, it was generally accepted that central banks independent from governments would be more effective at curbing inflation. In the decades that followed, the International Monetary Fund (IMF) stressed the importance of an independent central bank and actively promoted central bank reforms towards greater independence (Cukierman 2008, 726).

Time Consistency and Credibility

In the context of monetary policy, time inconsistency refers to the incentive a monetary authority beholden to government may have to deviate from its pre-announced price stability policy path in order to exploit potential short-term economic benefits arising from unanticipated money growth or inflation. Such benefits may include economic activity expansion and reductions in the real value of government debt (Barro and Gordon 1983, see also Alesina and Tabellini 1987). However, it is widely accepted that "current decisions of economic agents depend upon expected future policy" (Kydland and Prescott 1977, 486). Thus, agents know that such a monetary authority is likely to "prioritise other goals over price stability" (Garriga and Rodriguez 2020, 88) and will, therefore, not fully trust the monetary authority's stated commitment to low inflation. Governments might try to "generate economic growth through surprise inflation" (Bodea and Hicks 2015, 38). However, such benefits "cannot arise systematically in equilibrium when people understand the policymaker's incentives and form their expectations accordingly" (Barro and Gordon 1983, 101). Because rational actors "anticipate high prices from policy-makers with little reputation for price stability … the result is just higher inflation than optimally desired" (Bodea 2014, 188).

It follows that the erosion of a monetary authority's inflation-fighting credibility has significant consequences: when the monetary authority loses credibility, economic agents will expect higher future inflation, therefore demanding increases in nominal

wages and prices, which will ultimately result in self-fulfilling higher inflation (Bernanke 2010, 3).

The credibility problem is theoretically overcome by "delegating monetary policy to an independent central bank, committed to the goal of low inflation" (Grilli et al. 1991, 365) and that is free from political interference. An independent central bank has "no incentives to create surprise inflation" (Bodea and Hicks 2015, 38), thereby creating a "regime of credibility in the pursuit of monetary stability" (Polillo and Guillén 2005, 1782). It follows that inflation expectations will be lower "if the public believes that the central bank is free from interference" (Bodea and Hicks 2015, 54), which, in the absence of external shocks, should manifest in lower actual inflation outcomes.

Fiscal Dominance and the Political Business Cycle

Related to the time-inconsistency problem is the fact that "politicians may be tempted to use monetary policy to produce short-term boosts in employment and output for electoral purposes" (Garriga and Rodriguez 2020, 88), spending money to "create favourable economic and political environments just before elections" (Wessels 2004, 133). Politicians are inclined to have their own agendas and "may value short-run economic expansions highly while discounting the longer-run inflationary consequences of expansionary policies" (Klomp and De Haan 2010, 593), implying a natural inflationary bias. Monetary policy is, therefore, entrusted to an "independent and conservative central banker" (Klomp and De Haan 2010, 612), shielded from partisan political goals, and who is more committed to the long-term price stability objective (Polillo and Guillén 2005).

In addition, in emerging-market economies there will always be the added pressure for greater social expenditure funded by government spending (Kahn 2008). This challenge is exacerbated in South Africa with its high levels of inequality and consequent narrow tax base, which puts a strain on the government's spending goals relative to its tax income. Wessels (2004, 153) cautions against the "ample historical evidence of countries experiencing runaway inflation stemming from the malpractice of central banks being pressurised by governments into financing their fiscal deficits." Money printing erodes the purchasing power of the currency and, in excess, could quickly spiral out of control into a vicious inflationary cycle. A credible commitment from the central bank not to monetise deficits may strengthen the government's incentive to balance its budget, contributing to more disciplined fiscal policy (Grilli et al. 1991) and balanced money growth (Bodea 2014). Conversely, a government not wanting or not able to balance its budget is likely to pressure the central bank into inflating away public debt. Therefore, "the power to spend money …[is] … separated from the power to create money" (Mboweni 2000, 1), giving rise to a fundamental tension, but also mutual accountability, between the fiscus or government (money spenders) and the central bank (money creators).

In conclusion, when "central bankers are insulated from political pressures, commitments to price stability can be credible" (Garriga and Rodriguez 2020, 88), contributing to better anchored inflation expectations and helping to maintain low inflation.

Criticisms and Areas of Contention

Although an independent central bank plays an important role in anchoring inflation expectations, in some instances it can be associated with some disadvantages and is, therefore, not beyond criticism. For instance, Forder (2005) criticises the notion of central banks' legal independence derived from its statutes, arguing that economic behaviour is determined by "incentives and constraints, not the contract or rule book" (Forder 2005, 852). This line of argument also appears in the pro-independence literature, where it is acknowledged that *de jure* (legal) independence might not always be consistent with *de facto* (in practice or reality) independence (Bodea and Hicks 2015; Romelli 2022; Walsh 2010), "particularly in developing countries where institutions and the rule of law might be weaker" (Crowe and Meade 2008, 769). *De jure* CBI can, however, be considered "a measure of policy intent" (Agur 2018, 688); it is, therefore, a widely used metric for monetary policy credibility in the empirical literature.

Undemocraticness and Accountability

Turning over control of monetary policy, which affects every person in the country, to a body of unelected officials that are seemingly responsible to no one, can be seen as undemocratic (Mboweni 2000; Padayachee 2015). Forder (2005) suggests that central bankers, once independent, would attempt to further promote independence as a way to entrench and enhance their own positions, while lamenting "the presumption of economists' moral superiority and the superiority of policy making by economists over politicians and democratic policy" (Forder 2005, 856).

In the South African context, there has been confusion over the role of the SARB's private shareholders, shareholders' role in appointing directors to the Board, and the role and influence of the Board over monetary policy (Vermeulen 2021). The SARB is wholly privately owned, with its 2 million shares held by around 800 shareholders. Shareholders elect seven directors to the SARB's Board of Directors, with eight directors appointed by the government (RSA 2010). Out of the 15 directors on the Board, there are only four executive directors, namely the governor and the three deputy governors. These executives are all appointed by the President of South Africa, in consultation with the Minister of Finance, for a term of five years, while the remaining 11 non-executive directors are appointed on three-year terms (RSA 2010). The SARB's Board of Directors is not the same as the Monetary Policy Committee (MPC), which is the body that takes interest (repo) rate decisions. The MPC consists of senior SARB officials only, which, at the time of writing, included the governor and three deputy-governors—who happen to also be the four executive directors from the Board—and the SARB's Head of Economic Research (SARB n.d.). The SARB's four executives

are, therefore, also the dominant actors who determine the monetary policy stance, and all are appointed by a democratically-elected president; thus, they act as proxies of the democratic government and are, therefore, at worst, *indirectly* democratically appointed.

Importantly, "delegation of authority to a non-elected institution should be accompanied by accountability and transparency" (Cukierman 2008, 723). Indeed, as central banks have become more independent since the early 1990s, "demand for transparency has increased" (Crowe and Meade 2008, 764). Central banks have themselves attempted to utilise "forward guidance" involving better communication and transparency to shape expectations of future policy paths.

Nergiz-Dincer and Eichengreen (2014) find that the SARB, although not particularly independent of government, scores very high in their transparency index. The Minister of Finance holds significant influence over the SARB, including consulting with the President on the appointment of governor, deputy governors and other directors, the power to make regulations relating to the election of directors by shareholders (RSA 1989), and the statutory requirement of "regular consultation" between the central bank and National Treasury (RSA 1996). Finally, the Minister of Finance and Parliament ultimately hold the governor accountable for monetary policy implementation.

Distributional Consequences and the Public Interest

Central bank independence can be problematic in the context of financial regulation and stability. Central banks have been tasked with ensuring financial stability due to them having control over the strongest instruments and unique powers in times of financial crisis (e.g., institutional capital, access to international networks, emergency liquidity, and lender of last resort capabilities). However, while an independent central bank supposedly serves no constituencies but its government, in some circles central banks are criticised as being "too close" to the financial sector: governors, executives and board members[2] are often former investment bankers or "pro-finance" academics, which may suggest the "capture" of the central bank by the financial sector (Carre and Gauvin 2018). Rogoff (1985, 1180) goes as far as suggesting that a central banker has a financial incentive to "improve his standing in the financial community" in order to "earn greater remuneration upon returning to the private sector." In this light, Forder (2005, 849) argues that "an independent central bank should not be expected to pursue the public interest" but rather the "protection of their own position" (Forder 2005, 854).

Carre and Gauvin (2018, 156–157) suggest that during the global financial crisis, societal preferences "were not necessarily favourable to giving more power to financiers at the central bank while a crisis caused by financiers themselves was raging." And because bailing out banks and financial markets comes with enormous distributional

2 Three directors (out of 11) on the SARB's first Board of 1921 were banking representatives. Since 2010, however, only two out of the 15 directors represent commerce or finance (RSA 2010).

consequences, which are often argued not to be in the "public interest," the independence of a central bank can be "gravely compromised [even] without monetary policy coming into the dispute" (Kganyago 2019, 5). Central bank capture can also "increase for reasons related to financial regulation" (Carre and Gauvin 2018, 155). In the aftermath of financial crises, financiers might wish to limit financial reforms and lobby for "softer" supervision requirements so as to "ensure the profitability of finance" (Carre and Gauvin 2018, 157). It follows that the concept of independence needs to be broadened beyond insulation from political pressure to also include insulation from the financial sector (Caruana 2013).[3]

Policy Coordination

Finally, separation between monetary and fiscal policy could result in the policies working against each other (Mboweni 2000). In addition, an independent central bank might pay "too little attention to the budgetary consequences of its actions" (Grilli et al. 1991, 365); the mutual accountability alluded to earlier could, therefore, handicap policy coordination. For this reason, it is important that the design of the monetary policy framework should serve a country's economic policy as a whole.

Empirical Evidence

Ultimately, there is abundant empirical evidence that countries with more independent central banks experience lower inflation. Studies include Alesina and Summers (1993), Alpanda and Honig (2010), Bodea and Hicks (2015), Crowe and Meade (2008), Cukierman et al. (1992), Cukierman et al. (2002), Cukierman (2008), Garriga and Rodriguez (2020), Gyeke-Dako et al. (2022), Grilli et al. (1991), Jácome and Vázquez (2008), and Klomp and De Haan (2010).

Other studies are less equivocal, finding weak or mixed evidence on the relationship between CBI and inflation. These include Agoba et al. (2017) and De Haan and Kooi (2000). Forder (2005) and Pollard (1993) also summarise some methodological critiques against the accuracy and consistency of the empirical evidence. However, Klomp and De Haan's meta-regression analysis of 59 studies examining the relationship between CBI and inflation finds robust evidence of a "significant genuine effect of CBI on inflation" (Klomp and De Haan 2010, 593). While many researchers found a significant negative relationship between *de jure* CBI and inflation in developed economies, evidence for developing economies was less clear. However, the turnover of central bank governors, as an inverse measure of *de facto* independence, was in several instances found to be positively correlated to inflation, suggesting that there exists a negative relationship between greater CBI (tantamount to a lower governor turnover ratio) and inflation (Klomp and De Haan 2010).

3 Exploring this further falls beyond the scope of this article, but it remains an important area for future research.

Econometric Analysis

Data Analysis

Three indexes of central bank independence from the extant empirical literature are utilised in the econometric analysis, namely Romelli's (2022) CBIE index, Grilli et al.'s (1991) GMT index, and Cukierman et al.'s (1992) CWN index. These three indexes were constructed across a range of countries, including South Africa.

Romelli (2022) developed a new index of CBI by categorising independence across six dimensions, namely: 1) governor and central bank board; 2) monetary policy and conflict resolution; 3) monetary policy objectives; 4) limitations on lending to the government; 5) financial independence; and 6) reporting and disclosure. This new CBIE index augments and expands on the widely used Grilli et al. (1991) (GMT) and Cukierman et al. (1992) (CWN) indexes by including additional information on, among others, the dismissal of governors and board members, financial conditions on lending to governments, and central banks' financial reporting and disclosure. A point between 0 (no independence) and 1 (full independence) is assigned to each characteristic within the six dimensions. Each characteristic is weighted equally to assign a score to each dimension, with the overall index calculated as the average score across the six dimensions. Similar procedures were followed in the construction of the original Grilli et al. (1991) (GMT) and Cukierman et al. (1992) (CWN) indexes. However, the GMT and CWN indexes assigned little to no weight to financial independence and reporting and a correspondingly larger weight to the first four dimensions of independence. Romelli (2022) updated these indexes to 2017 using their original methodologies.

The econometric specifications and variables employed follow Bodea and Hicks (2015). To test the first hypothesis that CBI can contain inflation through improved central bank credibility, inflation is modelled as a function of CBI and a number of control variables, including real GDP growth, trade openness and the real exchange rate. That is, $INFL = f(CBI, GDPGR, REER, OPEN)$. To test the second hypothesis, that CBI has a disciplining effect on money growth, the growth rate in the M2 monetary aggregate is regressed on CBI and real GDP growth. Annual data from 1972–2017 are used in the estimations. This corresponds with the sample over which Romelli (2022) published updated CBI indexes across countries. The new CBIE index was obtained from Romelli (2022), along with the updated GMT and CWN indexes used for robustness checks. Inflation data, the year-on-year change in the consumer price index (CPI), were obtained from Statistics South Africa, while real GDP, M2 money growth rates, the real exchange rate, and the exports and imports data used in constructing the trade openness series, were obtained from the SARB Quarterly Bulletin.

As is evident from the unit root tests (table 1), the variables are of mixed order of integration: all three the CBI indexes and inflation contain a unit root and are, therefore, non-stationary, while the growth rates of real GDP and the M2 money supply are stationary. The real exchange rate and trade openness variables are also non-stationary.

Table 1: Unit root tests

	level		first diff.		Order of integration
	t-stat	Prob.	t-stat	Prob.	
Augmented Dickey-Fuller (ADF)					
CBIE	-1.150	0.687	-6.596	0.000	I(1)
GMT	-1.293	0.625	-6.633	0.000	I(1)
CWNE	-1.100	0.708	-6.765	0.000	I(1)
INFL	-1.247	0.647	-6.778	0.000	I(1)
M2GR	-4.010	0.003	-	-	I(0)
GDPGR	-5.545	0.000	-	-	I(0)
REER	-2.104	0.244	-5.097	0.000	I(1)
OPEN	-0.708	0.835	-5.600	0.000	I(1)
Phillips-Perron (PP)					
CBIE	-1.150	0.687	-6.597	0.000	I(1)
GMT	-1.293	0.625	-6.633	0.000	I(1)
CWNE	-1.100	0.708	-6.766	0.000	I(1)
INFL	-1.937	0.313	-9.759	0.000	I(1)
M2GR	-4.097	0.002	-	-	I(0)
GDPGR	-5.545	0.000	-	-	I(0)
REER	-2.285	0.181	-6.250	0.000	I(1)
OPEN	-0.708	0.835	-5.504	0.000	I(1)

Note: Trade openness is calculated as the ratio of the sum of exports and imports to real GDP, while the real effective exchange rate represents an average annual exchange rate, weighted across South Africa's 20 largest trading partners.

Methodology

Because this model contains variables integrated of different order, the autoregressive distributed-lag (ARDL) bounds approach of Pesaran, Shin, and Smith (2001) is employed to test the impact of CBI on South African inflation and money growth rates. The ARDL bounds test consists of two steps. First, the presence or absence of a cointegrating relationship between the variables needs to be established.

This involves testing the null hypothesis of no cointegration:

$$H_0 : \theta_1 = \theta_2 = \cdots = \theta_j = 0$$

against the alternative hypothesis:

$$H_1 : \theta_1 \neq \theta_2 \neq \cdots \neq \theta_j \neq 0$$

based on the following regression framework, which is then used to examine the theoretical specification:

$$\Delta Y_t = \beta + \sum_{i=1}^{n} \beta_{0i} \Delta Y_{t-i} \sum_{i=1}^{n} \beta_{1i} \Delta X_{1,t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta X_{2,t-i} + \cdots + \sum_{i=1}^{n} \beta_{ji} \Delta X_{j,t-i} + \theta_1 X_{1,t-i} + \theta_2 X_{2,t-1} + \cdots + \theta_j X_{j,t-1} + \epsilon_t \quad (1)$$

Y_t is the dependent variable, with $\mathbf{X} = (X_1, X_2, \ldots, X_j)$ representing a vector of explanatory variables. β_{ji} and θ_{ji} represent, respectively, the short- and long-term coefficients of the explanatory variables. Δ is the first difference operator, and ϵ_t is the residual error term. The long-term coefficients have to be jointly statistically significant (i.e., cointegration has to be present) to ensure that the model can be reliably estimated.

Each variable's optimal lag length *i* is determined by simulating various lag length specifications and then choosing the combination that yields the minimum Akaike information criterion (AIC). The cointegration hypothesis is then evaluated by comparing the estimation's calculated *F*-statistic against the PSS critical values. For a given confidence interval and sample size these critical values contain clear upper and lower bounds. If the *F*-statistic exceeds the upper bound, the null hypothesis can be rejected and cointegration can be established. If the *F*-statistic is smaller than the lower bound, the null hypothesis cannot be rejected, while if the *F*-statistic falls within the bounds, the test is inconclusive.

If cointegration is established, the second step is to estimate a short-term error-correction model (ECM). The ECM determines the model's dynamics around both its short-term and long-term trends, and can be represented as follows, where ECM_{t-1} denotes the lagged error-correction term from (1):

$$\Delta Y_t = \beta + \sum_{i=1}^{n} \beta_{0i} \Delta Y_{t-i} + \sum_{i=1}^{n} \beta_{1i} \Delta X_{1,t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta X_{2,t-i} + \cdots + \sum_{i=1}^{n} \beta_{ji} \Delta X_{j,t-i} + \delta ECM_{t-1} + \mu_t \quad (2)$$

Results and Discussion

ARDL Analyses

The results for the first set of ARDL analyses are presented in table 2. Six different model specifications are considered, with inflation and the M2 money growth rate regressed on each of the three CBI indexes—CBIE, GMT and CWN—with real GDP growth included as the only control variable. Cointegration is established in all six specifications as their associated *F*-statistics fall outside the PSS upper bound. Similarly, the estimated cointegration coefficients fall between 0 and -1, confirming that all specifications evaluated here are dynamically stable.

Table 2: Central bank independence, inflation and money growth

	INFL			M2GR		
	CBIE	**GMT**	**CWN**	**CBIE**	**GMT**	**CWN**
Long run coefficients						
C	0.358***	0.214***	0.220***	3.627***	2.788***	2.848***
	(0.033)	(0.019)	(0.017)	(0.743)	(0.354)	(0.373)
CBI	-0.611***	-0.314***	-0.470***	-3.469*	-1.701*	-2.666*
	(0.080)	(0.043)	(0.060)	(1.768)	(0.877)	(1.352)
GDPGR	-0.640	-0.613	-0.629	14.093*	14.095*	14.123**
	(0.423)	(0.477)	(0.419)	(6.989)	(6.996)	(6.995)
Short run coefficients						
D(INFL(-1))	0.197	-	0.197	-	-	-
	(0.151)	-	(0.150)	-	-	-
D(GDPGR)	-0.156	-0.194	-0.152	-1.368	-1.433	-1.318
	(0.126)	(0.122)	(0.124)	(2.907)	(2.895)	(2.918)
D(GDPGR(-1))	0.526***	0.483***	0.519***	-	-	-
	(0.127)	(0.127)	(0.125)	-	-	-
D(GDPGR(-2))	0.401***	0.436***	0.406***	-	-	-
	(0.134)	(0.130)	(0.132)	-	-	-
D(GDPGR(-3))	0.237*	0.254**	0.243*	-	-	-
	(0.122)	(0.121)	(0.121)	-	-	-
D(CBI)	0.001	-0.032	-0.002	3.571	1.905	2.482
	(0.147)	(0.070)	(0.111)	(3.893)	(1.934)	(2.941)
D(CBI(-1))	0.315*	0.142*	0.242**	-	-	-
	(0.155)	(0.078)	(0.117)	-	-	-
D(CBI(-2))	0.528***	0.245***	0.405***	-	-	-
	(0.154)	(0.077)	(0.117)	-	-	-
D(CBI(-3))	0.375**	0.177**	0.297**	-	-	-
	(0.161)	(0.082)	(0.120)	-	-	-
ECM	-0.644***	-0.583***	-0.649***	-0.725***	-0.723***	-0.727***
	(0.127)	(0.123)	(0.126)	(0.108)	(0.108)	(0.109)
F-statistic	5.808	5.086	6.024	10.401	10.408	10.367

Note: Standard errors in parentheses. ***, ** and * represent significance at 1%, 5% or 10%. Bounds test significant at the 1% level for both specifications. M2GR is logged.

Evidence is found of a statistically significant negative long-term relationship between CBI and inflation across all CBI indexes. This supports the hypothesis that higher CBI improves central bank credibility, which contributes to lower inflation outcomes, and is consistent with the findings of much of the empirical literature described above.

The positive and statistically significant short-run coefficients on the lagged CBI variables could suggest that a change in CBI may be associated with temporarily higher inflation. This could be ascribed to the possibility that a structural shift towards granting the central bank more independence might give rise to a temporarily stricter monetary policy stance, with the ultimate goal of longer-term price stability. The monetary authority more aggressively combating inflation with higher interest rates could consequently temporarily increase certain costs in the economy, potentially creating second-round upward pressure on the price level in the short run. This dynamic is earmarked for further research.

In the short run, higher inflation can also be attributed to a byproduct of faster GDP growth in the preceding 2–3 years. Similarly, the results support the hypothesis that higher CBI has a disciplining effect on money growth rates, by way of a statistically significant (albeit only at the 10% level of significance) negative long-term relationship between CBI and the M2 money growth rate.

Causality

The preceding ARDL analyses provide preliminary evidence of a negative and significant relationship between CBI and both inflation and money growth. Granger causality tests—which evaluate the extent to which past values of a series X could provide useful information in predicting future values of Y, beyond that which could be predicted using the past values of Y alone—are next employed to further evaluate the strength and significance of the relationships between these variables. Table 3 summarises the results of the Granger causality tests. The calculated *F*-statistics are evaluated against the null hypothesis that X *does not* Granger-cause Y.

Table 3: Granger causality tests: Central bank independence, credibility and discipline

Relationship	**Direction**	***F* -statistic**	**Prob.**	**Result**
Inflation (credibility)	CBIE → INFL	4.272	0.070	Reject H_0. CBIE Granger-causes INFL.
	INFL → CBIE	1.071	0.387	Cannot reject H_0.
Money growth (discipline)	CBIE → M2GR	3.052	0.059	Reject H_0. CBIE Granger-causes M2GR.
	M2GR → CBIE	3.124	0.056	Reject H_0. M2GR Granger-causes CBIE.

Table 3 finds unidirectional causality from CBI—as measured by Romelli's (2022) CBIE index—to inflation, and bidirectional causality between CBI and money growth

rates at the 10% level of significance. This suggests that higher independence "Granger-causes" lower inflation, further supporting the notion that higher CBI increases the central bank's credibility, which manifests in lower inflation expectations and, ultimately, lower inflation. There is also evidence of a mutually reinforcing relationship between CBI and monetary discipline, as approximated by the M2 money growth rate. Higher CBI fosters better discipline, which in turn contributes again to higher CBI, and so on in a virtuous cycle.

Robustness

This is admittedly a quite simple model, which is intended to be a first glance at the potential relationships between CBI and inflation and CBI and money growth. Its parsimony might come at the cost of omitted variable bias, with the CBI index potentially capturing the impact on inflation of variables not included in this specification. However, it does present a useful starting point for more comprehensive future analyses.

Alternative CBI Indexes

Romelli's (2022) CBIE index is substantially more comprehensive than the GMT and CWN indexes. While the CBIE index provides information on 42 criteria of central bank institutional design, GMT and CWN, respectively, consider only 15 and 16 such criteria. Table 2 shows that the results hold across all three these indexes. Moreover, the results also hold qualitatively over Cukierman's (1994) alternative LVAU and LVAW indexes.[4] Therefore, irrespective of the index employed, there is robust evidence of a negative and statistically significant relationship between legal CBI and inflation, and CBI and money growth, in South Africa.

Governor Turnover

As a second robustness check, the rate of turnover of the governor—a more informal indicator of *de facto* CBI (Cukierman et al. 1992), which was often found to have a positive relationship with inflation in developing countries in the sense that a higher turnover ratio is associated with higher inflation—is also evaluated as explanatory variable. However, the *F*-statistic associated with this specification does not fall beyond the ARDL upper bound (not shown). Cointegration cannot be established, and there is, therefore, no evidence of a significant relationship between the turnover ratio and inflation or money growth over this sample period in the South African economy.

Other Drivers of Inflation

Bodea and Hicks (2015) control for additional potential drivers of inflation, including trade openness and the exchange rate. Table 4 below extends the previous analyses by controlling for trade openness and the real effective exchange rate in considering the impact of CBI on inflation. It is generally expected that countries with a higher degree

4 These results are not shown here, but can be made available on request.

of trade openness are more vulnerable to global inflationary patterns, while a weakening exchange rate exacerbates "imported" inflation. However, while neither of the additional control variables is statistically significant, the negative relationship between CBI and inflation detected previously persists, albeit at a slightly lower level of statistical significance.

Table 4: Central bank independence, inflation and additional control variables

	INFL		
	CBIE	**GMT**	**CWN**
Long-run coefficients			
C	0.246*	0.066	0.220***
	(0.132)	(0.170)	(0.017)
CBI	-0.813**	-0.367**	-0.470***
	(0.381)	(0.178)	(0.060)
GDPGR	1.456*	1.423*	-0.629
	(0.774)	(0.764)	(0.419)
REER	0.001	0.001	
	(0.001)	(0.001)	
OPEN	0.130	0.081	
	(0.310)	(0.296)	
Short-run coefficients			
D(GDPGR)	0.242	0.234**	0.245**
	(0.104)	(0.106)	(0.102)
D(CBI)	0.064	-0.032	-0.048
	(0.106)	(0.054)	(0.080)
D(CBI(-1))	0.424***	0.200***	0.334***
	(0.123)	(0.062)	(0.093)
D(CBI(-2))	0.606***	0.291***	0.471***
	(0.125)	(0.063)	(0.094)
D(CBI(-3))	0.466**	0.215***	0.367***
	(0.128)	(0.066)	(0.095)
D(REER)	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)
D(REER(-1))	-0.001	-0.001	-0.001
	(0.000)	(0.000)	(0.000)
ECM	-0.367**	-0.376***	-0.358***
	(0.050)	(0.054)	(0.048)
F-statistic	7.571	6.974	7.999

Note: Standard errors in parentheses. ***, ** and * represent significance at 1%, 5% or 10%. Bounds test significant at the 1% level for both specifications.

Alternative Monetary Aggregates

Finally, the robustness of the results against alternative monetary aggregates is evaluated. Table 5 presents the relationship between CBI and the growth rate in the M2 money stock against the relationships between CBI and the growth rates in both the

narrowest (the monetary base, M1A) and broadest (M3) monetary aggregates. Because there are negative growth rates in the monetary base, monetary aggregates are not logarithmised here.

Table 5: Central bank independence and growth in different monetary aggregates

	CBIE		
	M2GR	**M1AGR**	**M3GR**
Long-run coefficients			
C	0.303***	0.427***	0.251***
	(0.085)	(0.148)	(0.074)
CBI	-0.551**	-0.593*	-0.4002**
	(0.211)	(0.331)	(0.177)
GDPGR	2.5838**	-0.877	2.161***
	(1.017)	(1.760)	(0.573)
Short-run coefficients			
D(GDPGR)	0.400	1.585***	-
	(0.314)	(0.572)	-
D(GDPGR(-1))	-	0.608	-
	-	(0.643)	-
D(GDPGR(-2))	-	1.070*	-
	-	(0.573)	-
D(GDPGR(-3))	-	1.921**	-
	-	(0.551)	-
D(CBI)	1.088***	-	-
	(0.385)	-	-
D(CBI(-1))	0.706	-	-
	(0.443)	-	-
D(CBI(-2))	0.121	-	-
	(0.427)	-	-
D(CBI(-3))	0.822**	-	-
	(0.391)	-	-
ECM	-0.677***	-0.716***	-0.570***
	(0.108)	(0.134)	(0.086)
F-statistic	9.989	6.528	10.323

Note: Standard errors in parentheses. ***, ** and * represent significance at 1%, 5% or 10%. Bounds test significant at the 1% level for all specifications. M1AGR and M3GR are I(0) at, respectively, the 1% and 5% level of significance.

CBI is observed to have a negative relationship with the growth rates in all the monetary aggregates evaluated. Of particular interest is the fact that there is still a negative relationship between CBI and the narrowest monetary aggregate, M1A, despite a relatively weak level of significance. The narrower the monetary aggregate, the more directly the central bank has control over it; it follows that the negative relationship between CBI and M1A growth supports the disciplining effect of CBI on the SARB in terms of money creation.

Conclusion

Central bank independence matters in South Africa. CBI was illustrated to have a negative relationship with both inflation and the rates of money growth. For the purposes of price stability, central bank independence is important. Independence serves as a commitment device, which increases a central bank's credibility and anchors inflation expectations, which contributes to lower actual inflation outcomes. The SARB's statutory independence, therefore, supports the SARB's ability to deliver on its price stability mandate, and is thus an important pillar of a successful inflation-targeting strategy. Independence also plays a disciplining role in monetary policy in the sense that it tempers money growth rates across all monetary aggregates evaluated.

Politically, the SARB is not particularly independent. The SARB's executive directors—governors and deputy-governors—are appointed by the President. These four government-appointed executives also dominate the MPC, the committee responsible for the monetary policy stance. The SARB's price stability mandate is a directive received from the government, and the SARB has no autonomy in setting monetary policy objectives. The closest to political input on monetary policy is arguably the fact that the 3–6% inflation target was jointly determined between the SARB and the Treasury. The reality is that the SARB is but an agent of the government, performing its constitutionally-mandated duties within its statutory frameworks.

While the parsimonious econometric approach followed here might appear elementary, it presents a starting point for deeper empirical analyses. One potential area for further research could be to evaluate the impact of other control variables and possible drivers of inflation on the relationship between CBI and inflation. It may well be that CBI represents but a proxy for strong institutions or the rule of law; if these are controlled for, the estimated impact of independence might be smaller. Another potentially promising line of enquiry might consider the impact of CBI on inflation expectations directly—provided comprehensive and comparable data on inflation expectations are available or can be developed—as this is the key theoretical channel through which CBI is argued to lower actual inflation outcomes.

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