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Inflation and Financial Stability Trade-off: Role of Monetary Policy Credibility and Fiscal Cyclicality

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This paper examines the role of monetary credibility and fiscal cyclicality in generating the trade-off between inflation rates and financial stability. We systematically develop simple theoretical models to shape the rationalisation framework, which demonstrates the role of fiscal cyclicality behaviour in arousing a trade-off for the monetary policy to target low inflation rates and a stable financial system at the same time. By utilising the generalised method of moment (GMM), we find that a credible monetary policy generates a trade-off between inflation and financial stability as long as the fiscal policy is procyclical.

Keywords: credibility of monetary policy, procyclical fiscal policy, inflation and financial stability.

1. Introduction

The global financial crisis and the prolonged uncertainty of financial instability, together with a protracted economic recovery in their aftermath, have aroused hesitation regarding the role of monetary policy. This hesitation is not only on price stability goals but also on financial stability goals (Bordo & Siklos, 2015). However, ensuring low inflation and a stable financial sector at once is much more challenging for the monetary authority than merely focusing on a low and stable inflation rate. It becomes one of the monetary authority's significant concerns, as inflation and the financial sector frequently generate a severe trade-off.

Recent literature has pointed out the monetary policy dilemma of inflation and financial stability from several viewpoints. Geraats (2010) argues that whether price and financial stability are complementary or contradictory objectives depends on the type of economic shocks. In their characterisation of economic shocks, Jonsson and Moran (2014) also support these arguments. They argue that a trade-off between price and financial stability may arise if supply shocks drive economic fluctuations. Kim and Mehrotra (2015) suggest that—ex-post—there may have been a short-term policy trade-off for central banks with both financial and price stability objectives.

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There is a growing literature that focuses on risk-taking behaviour channels that generate a trade-off between inflation and financial stability. Using the Taylor-style monetary policy rule in the possibility of reacting to banks' short-term liabilities, Shukayev and Ueberfeldt (2018) find that central banks need to accept higher levels of inflation and output volatility. In other words, there is still a policy trade-off between price and financial stability. Patnaik *et al*. (2019) examine the inflation–financial stability trade-off faced by monetary policy in the case of India. They find robust evidence of the trade-off between price and financial stability. This implies that the conduct of monetary policy may constrain the ability of a central bank to target financial stability with monetary policy instruments. Fouejieu *et al*. (2019) provide a framework to investigate trade-off between macroeconomic and financial stability when the central bank has a financial stability objective. Relying on a New Keynesian model with an endogenous financial bubble, their simulations suggest that a central bank attempting to "lean against the wind" may face trade-off between inflation/output stability, and financial stability.

The proponents of this view also mention the role of credible monetary policy in defining what is characterised as the low-interest and inflation rate period in generating financial instability. According to the risk-taking channels Borio and Zhu (2012), maintaining low-interest rates for a protracted period increases financial risks through higher incentives to search for yields (Rajan, 2005). Jordà *et al*. (2015) use a large data set to document how loose monetary conditions have historically boosted real estate lending and house price bubbles, especially in the post-war period. For financial corporations, low-interest rates can increase interest margins, boost the firm's value and increase leverage, which ultimately translates into higher risk exposure (Adrian & Shin, 2010). Gambacorta (2009) also states that credible monetary policy has resulted in a protracted low-interest-rate episode that leads to an increase in banks' risk-taking behaviour, and accordingly promotes financial instability. Kim and Mehrotra (2015) assess the trade-off between financial stability and price stability by looking at the interaction between financial stability and actual-targeted inflation deviation—which can also be interpreted as monetary credibility (see Warjiyo & Juhro, 2019)—in Australia, Indonesia, Korea, New Zealand, Philippines and Thailand from 2000 to 2014. They find that about 12% of the observed country-years are characterised by the trade-off between monetary credibility and financial stability.

However, the way we see how the trade-off between inflation and financial instability occurs is slightly different. Looking at the US economy, a low inflation rate straightforwardly occurs with a gradual increase in interest rates (see Figure 1). Monetary policy is implemented in response to financial instability within inflation targeting. Thus, when using the interest rate as the policy instrument to achieve targeted inflation, the interest rate would have to be adjusted in response to an increased probability of financial default. The hike of asset price increases the value of collateral, boosts leverage, pushes both consumption and aggregate demand, and thus elevates inflation rates. To maintain a credible monetary policy with the inflation rate in order, the conduct of monetary policy will adjust interest rates upwards. Therefore, a credible monetary policy is not associated with a low-interest rate but with stable inflation.

Instead of charging the monetary authority with blame, we argue that there is also an important role of fiscal cyclicality behaviour. Figure 2 shows that before the bubble was about to burst in 2008, the Fed's monetary policy was more credible under the relatively more procyclical fiscal policy, which means that the US government tried to push the economy excessively, while the monetary authority persistently kept fighting against inflation. Therefore, under this circumstance, the economic policy was characterised by unharmonised coordination.

To shed light on the responsibility of an unharmonised economic policy, we develop a simple model to explain this situation. Our model demonstrates that in the initial condition, a procyclical fiscal policy distorts the credibility of monetary policy. Procyclical fiscal policy causes divergences in the targeted inflation rate, actual inflation rate and expected inflation rate. Afterwards, the monetary authority must decide whether to pursue its credibility or let it deteriorate. However, the monetary authority faces a dilemma related to the available options. On one hand, if the monetary authority decides to pursue its credibility, it causes low inflation and exacerbates financial instability. On the

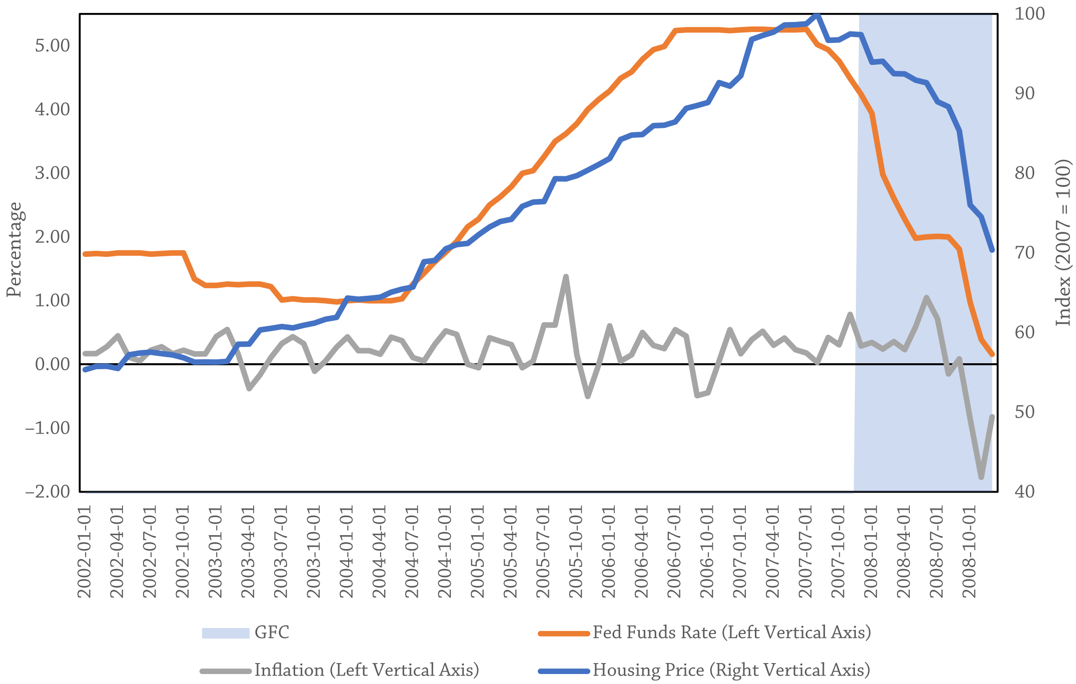

Figure 1. *Inflation rate, fed fund rate and housing price in the United States (2002–2008)*
Source: Federal Reserves of Economic Data (FRED) and Green Street Advisor (GSA)

other hand, if the monetary authority decides to let its credibility deteriorate, it will effectively ensure financial stability but not lower inflation rates.

This paper elucidates the impact of the combination of monetary policy credibility and fiscal cyclicality on financial stability and inflation rates. Furthermore, we attempt to highlight the importance of policy coordination on the cyclical behaviour of fiscal policy, and the monetary policy to respond to it. For the empirical investigation, we employ the generalised method of moment (GMM) method involving 25 selected inflation-targeting framework (ITF) countries from 2003 to 2017.

To the best of our knowledge, there is one crucial point that differentiates this paper from previous research. This paper addresses the trade-off between inflation rates and financial stability considering the role of monetary credibility and fiscal cyclicality behaviour, while the existing literature has not yet addressed the role of fiscal cyclicality. Thus, we make every effort to significantly contribute to the development of literature related to the topics of monetary policy/authority credibility, fiscal cyclicality and inflation–financial stability trade-off. Another motivation of this paper is to examine the role of monetary credibility and fiscal cyclicality in generating the trade-off between inflation rates and financial stability. We find robust evidence that suggests that a credible monetary policy generates a trade-off between inflation and financial stability if the fiscal policy is procyclical.

The rest of this paper is organised as follows. Section II elaborates on a theoretical foundation. Section III presents the empirical strategy regarding the definition of variables, the measurements and the devoted econometric method to estimate the parameters. Section IV presents the empirical findings and its discussion. Section V provides both remarks and policy recommendations.

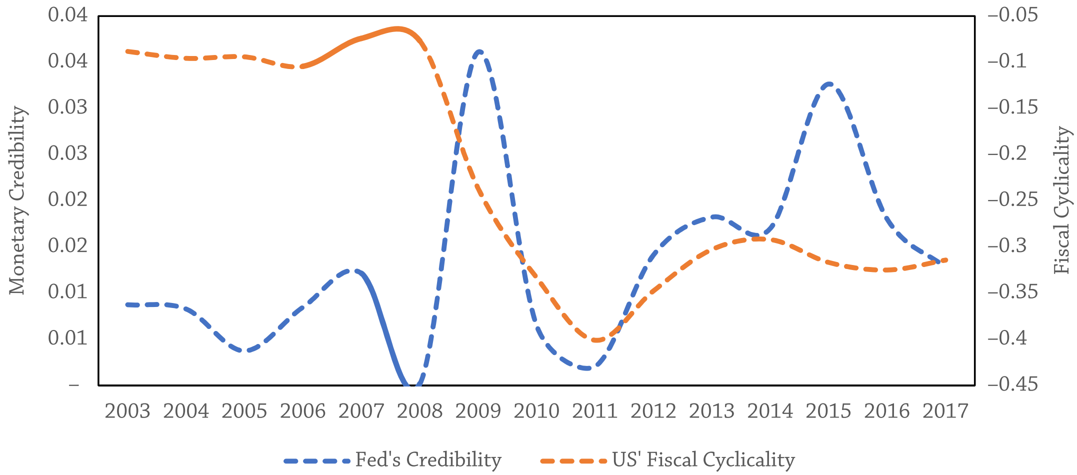

Figure 2. *Credibility of monetary policy and cyclicality behaviour of fiscal policy in the United States (2002–2007)*
Note: The cyclical behaviour of fiscal policy has been estimated using a 20-year rolling regression between cyclical components of government expenditure and real GDP. A positive (negative) correlation indicates procyclical (countercyclical) fiscal policy. The credibility of monetary policy has been estimated using the calculated value of absolute deviation between actual and expected inflation. A higher (lower) CMP indicates a more (less) credible monetary policy. The rate of expected inflation is generated from a backward-looking Phillips Curve, in which actual inflation responds to its lagged quarterly average and the Hodrick–Prescott detrended unemployment rate (Matteo, Marco, & Giuliana, 2013).
Source: Authors' calculations

2. Simple Model

The set-up of the model aims to scrutinise the role of monetary policy credibility and fiscal cyclicality in shaping the nexus between inflation rates and financial instability. This section is organised as follows. The first section begins with the interdependency between the credibility of monetary policy and procyclical fiscal policy. The second section elucidates the financial instability model. Finally, the third section highlights the dilemma of credible monetary policy within procyclical fiscal policy.

2.1. Interdependency between Monetary Policy Credibility and Procyclical Fiscal Policy

We begin with the monetary policy credibility model developed by Barro and Gordon (1983), focusing on the role of the money growth policy. In this model, we augment the cyclicality of fiscal policy with the assumption that monetary policy transmission is imperfect. Thus, the model is expressed as follows:

$$\pi = \mu + \beta.\gamma; \pi'(\gamma) > 0 \tag{1}$$

where π, μ, γ and β are inflation rates, money growth, degree of fiscal policy cyclicality behaviour and parameter of γ, respectively. Equation (1) describes a positive relationship between inflation rates and cyclical behaviour of fiscal policy $\pi'(\gamma) > 0$ indicates that if the fiscal policy is procyclical, then the constant money growth policy is more inflationary. Therefore, it also shows the imperfect transmission of monetary policy ($\pi \neq \mu$). Kaminsky *et al.* (2004) and Mcmanus and Ozkan (2015) have revealed that the procyclical fiscal policy may affect the inflation rates by "turning sunny days into scorching infernos." That is, procyclical expansions in government expenditure excessively boost the aggregate demand, and set the economy into the "over-heated" circumstances, therefore causing the inflation rates to soar.

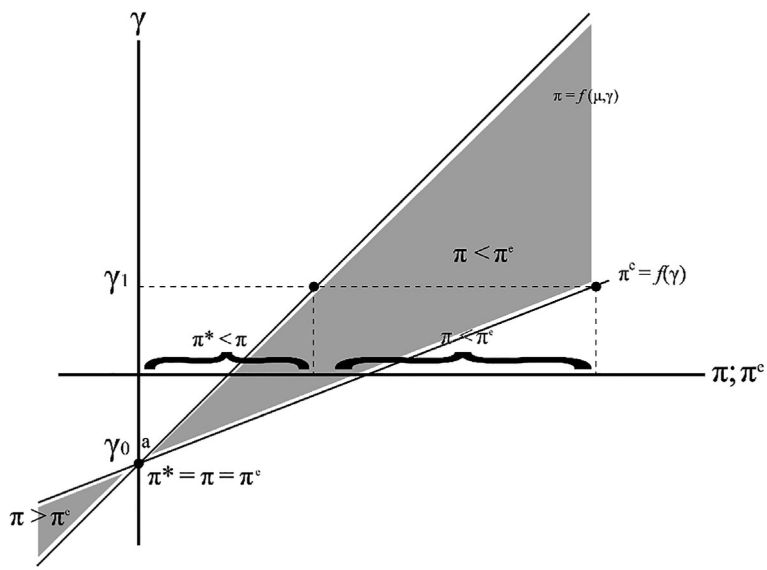

Figure 3. *Cyclical behaviour of fiscal policy and rates of targeted, actual and expected inflation*

Targeting the inflation rate as the goal of monetary policy in ITF implies a sacrifice ratio to be borne in mind. There must be a cost of forgone output due to stable and low inflation rates. Consequently, a credible monetary policy is unavoidably characterised as countercyclical. Provided the trade-off between inflation and output, the central bank has the following single-period loss function to minimise:[1]

$$L = a(\pi - \pi^*)^2 + (y - y^*)^2; y^* = k.y^n \tag{2}$$

where π^*, y, y^*, y^n and k are targeted inflation rates, output level, targeted output level, potential output and temptation parameter, respectively. Given the trade-off between inflation rates and output level, achieving low inflation rates implies that some of the output is sacrificed, *ceteris paribus*. Theoretically, it is represented by a Lucas supply shock:

$$y = y^n + b(\pi - \pi^e) \tag{3}$$

where π^e is the expected inflation rate.

Substituting equations (1) and (3) in equation (2) and taking the first-order condition, we obtain the optimal combination of fiscal policy cyclicality behaviour and the devoted variables that minimise the loss function as follows:

$$\gamma = -\frac{1}{\beta}\mu + \frac{b^2}{\beta(a + b^2)}\pi^e \tag{4}$$

Figure 3 depicts equations (1) and (6) in a way so that we can see the optimal policy. At γ_0 (i.e. countercyclical fiscal policy), the targeted inflation is parallel to the actual and expected inflation rates, *ceteris paribus*. In contrast, if the cyclical behaviour of fiscal policy occurs (at γ_1), then it creates a gap between targeted, actual and expected inflation rates.

[1]Assuming that monetary policy is time consistent, $k = 1$, which implies targeted output equal to its potential, and the central bank sets the targeted inflation rates equals to zero (Blinder, 2000).

Proof

Equations $\gamma = -\frac{1}{\beta}\mu + \frac{b^2}{\beta(a+b^2)}\pi^e$ *and* $\gamma = -\frac{1}{\beta}\mu + \frac{1}{\beta}\pi$ *have different slopes, where* $\frac{b^2}{\beta(a+b^2)}\pi^e < \frac{(a+b^2)}{\beta(a+b^2)}\pi; a>0$. *In other words, slope of* $\pi = f(\gamma)$, $\frac{\partial\pi}{\partial\gamma}$, *is steeper than slope of* $\pi^e = f(\gamma)$, $\frac{\partial\pi}{\partial\gamma}$,

Proposition 1 *Procyclical fiscal policy generates a gap between targeted, actual and expected inflation rates. The more procyclical the fiscal policy, the larger the gap.*

Based on the above explanation, there are two conditions characterised by the degree of cyclical behaviour of fiscal policy. The first circumstance (i.e. procyclical fiscal policy) is indicated by a deviation in targeted, actual and expected inflation rates. In contrast, the second circumstance (i.e. countercyclical fiscal policy) is characterised by an equal rate of targeted, actual and expected inflation.

L_a denotes the loss function within the first condition. The loss function equation is as follows:

$$L_a = a(\pi - \pi^*)^2 + [(1-k)y^n + b(\pi - \pi^e)]^2; \pi \neq \pi^e \neq \pi^*; \gamma_1; k = 1 \quad (5)$$

Equation (7) suggests that with procyclical fiscal policy, the credibility of monetary authority is undermined, and thus, value of the loss function L_a is larger than zero.

$$L_b = (\Delta\pi_{\text{tar}})^2 + \left[b\left(\Delta\pi_{\text{exp}}\right)\right]^2; L_b > 0 \quad (6)$$

where $\Delta\pi_{\text{tar}} = (\pi - \pi^*)$ and $\Delta\pi_{\text{exp}} = (\pi - \pi^e)$.

On the contrary, the loss function (L_b) within the second condition, which assumes $\pi = \pi^e = \pi^*; \gamma_0; k = 1$, is as follows:

$$\begin{gathered} L_b = a(\pi - \pi^*)^2 + [(1-k)y^n + b(\pi - \pi^e)]^2 \\ L_b = 0 \end{gathered} \quad (7)$$

The value of the total loss (L_b) within the second condition equals zero $(L_b = 0)$. This implies that with a countercyclical fiscal policy, the monetary policy achieves its optimal credibility, and hence, fiscal policy is complementary to the monetary policy.

Proposition 2 *Procyclical fiscal policy malevolently exacerbates the credibility of monetary policy. On the contrary, the countercyclical fiscal policy helps monetary policy to attain its credibility.*

When credibility is under pressure, the monetary authority is assumed to be able to regain its credibility via a tighter monetary policy (see Figure 2). The monetary authority will run a negative money growth policy and, therefore, significantly increase interest rates to adjust the deviation between targeted, expected and actual inflation rates. In this case, expansionary government spending results in the crowding-out effect by which the monetary authority will adjust the interest rate up to maintain the credibility of monetary policy. As can be seen in Figure 4 below, equations (1) and (6) will shift, resulting in a change in optimal point from point a to point b.

Proposition 3 *Contractionary monetary policy could adjust the deteriorated monetary policy credibility by employing a negative money growth policy and significantly higher interest rates.*

2.2. Financial Instability Model

The economy has witnessed several episodes of financial crises, from the 1930 Great Depression to the recent crises. A feature that is commonly found intrinsically in all episodes of the financial crises is the presence of asset price misalignment (Taipalus, 2012). Indeed, it is worth stressing that asset price misalignment is not merely a factor in deteriorating financial stability. Nevertheless, a massive swing in the asset price is often associated with strains in the financial sector and the real economy (Borio & Lowe, 2002). Therefore, we define financial instability as the build-up of asset price

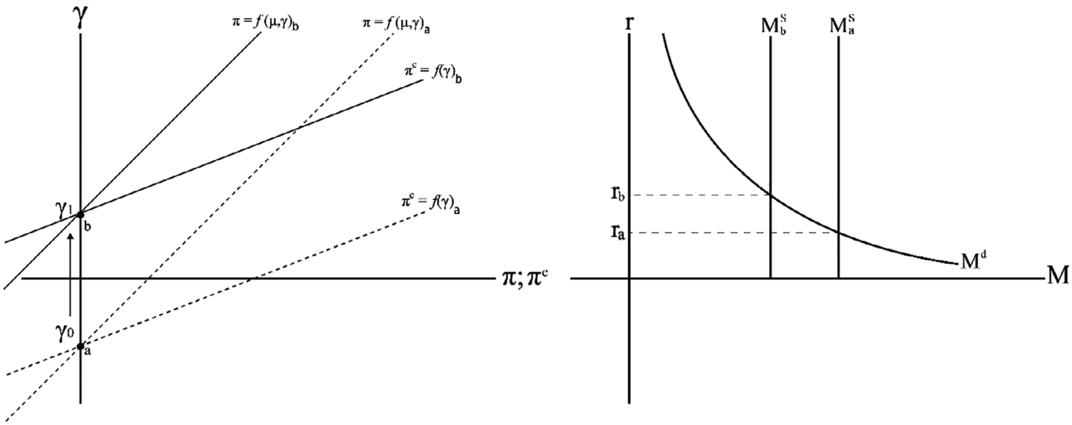

Figure 4. *Monetary policy response to the procyclical fiscal policy*

deviation from its fundamental value. Accordingly, we primarily simplify the endogenous asset price bubbles model *a la* Fouejieu, Popescu, and Villieu (2019), earlier found in Blanchard and Watson (1982):

$$\sigma = f(\sigma_e, P_{\text{br}}) + \varepsilon_\sigma$$
$$\frac{\partial \sigma}{\partial \sigma_e} > 0; \frac{\partial \sigma}{\partial P_{\text{br}}} < 0 \tag{8}$$

where σ, σ_e, P_{br}, $1-P_{\text{br}}$ and ϵ_σ are actual asset price deviation from its fundamental value, expected value of σ, probability of the bubble to persist, probability of the bubble to burst and exogenous shock, respectively.

In this model, therefore, there are two main drivers of the asset price misalignment: expectations and the probability of the bubble to persist. First, the expected value of σ is the expectation adaptive feature that captures the agent's expectation of future σ value based on their specific memory in the past. In other words, it suggests that the bubble is self-driven and may change without any connection to fundamental factors. For instance, the asset price bubble is self-fulfilling when $\partial \sigma_e > 1$, which characterises the over-optimistic market expectations (Fouejieu *et al.*, 2019). For the value of P_{br}, we define P_{br} in a sigmoid pattern in which the probability of the bubble to persist is a function of z:

$$P_{\text{br}} = f(z) \tag{9}$$

where z is defined as the log odds ratio between P_{br} and 1-P_{br},

$$\ln\left(\frac{P_{\text{br}}}{1-P_{\text{br}}}\right) = z \tag{10}$$

Based on equation (10), it can be seen that larger the increase (decrease) in interest rates, larger (lower) the probability to default, $(1 - P_{\text{br}})$, and hence the lower (higher) the value of z will be. z, as the log ratio of the probability to persist to the probability to default, can be taken as an inquiry for risk-taking behaviour of economic agents, which is sensitive to the change in interest rate.

$$z = f(\Delta r); \frac{\partial z}{\partial(\Delta r)} < 0 \tag{11}$$

Equation (11) implies that tightening monetary policy (increased interest rate) leads to larger pessimism, and risk-averse behaviour reduces demand for credit, high loan loss provisions and a higher probability of the bubble to burst (Warjiyo & Juhro, 2019). In addition, higher interest rates imply higher borrowing costs. Shrunk leverage increases financial risk and consequently exacerbates financial stability (Dell'Ariccia *et al.*, 2014). Since the deviation of the actual asset price from its fundamental value increases, the probability of the bubble to burst becomes larger.

Proposition 4 *The higher increase in the interest rates (Δr) leads to reduced z. In turn, it escalates the probability of the bubble to burst ($1 - P_{br}$) and lowers the probability of the bubble to persist (P_{br}). As $\partial\sigma/\partial P_{\mathrm{br}}<0$, the lower P_{br} thus induces asset price misalignment, σ.*

2.3. Dilemma of the Credible Monetary Policy under the Procyclical Fiscal Policy

This channel can be explained by the combination of propositions formulated earlier. Figure 5 shows the channel through which the nature of the cyclical behaviour of fiscal policy transmits different outcomes in terms of inflation rates and the probability of a bubble to burst (or financial stability). We divide the channel into two types: procyclical fiscal policy (first nature) and countercyclical fiscal policy (second nature).

In the first type, the outcome depends on the decisions undertaken by the monetary authority in response to deteriorating credibility. This creates a monetary policy dilemma. Deteriorating credibility of the monetary policy originating from procyclical fiscal policy is indicated by the larger gap between targeted, actual and expected inflation rates (Propositions 1 and 2). Attempting to regain the credibility will imply negative money growth and higher interest rates (Proposition 3). As an outcome, the interest rate crawls up and boosts the probability of default via an asset price pass-through mechanism (Proposition 4). Therefore, maintaining a credible monetary policy costs financial instability.

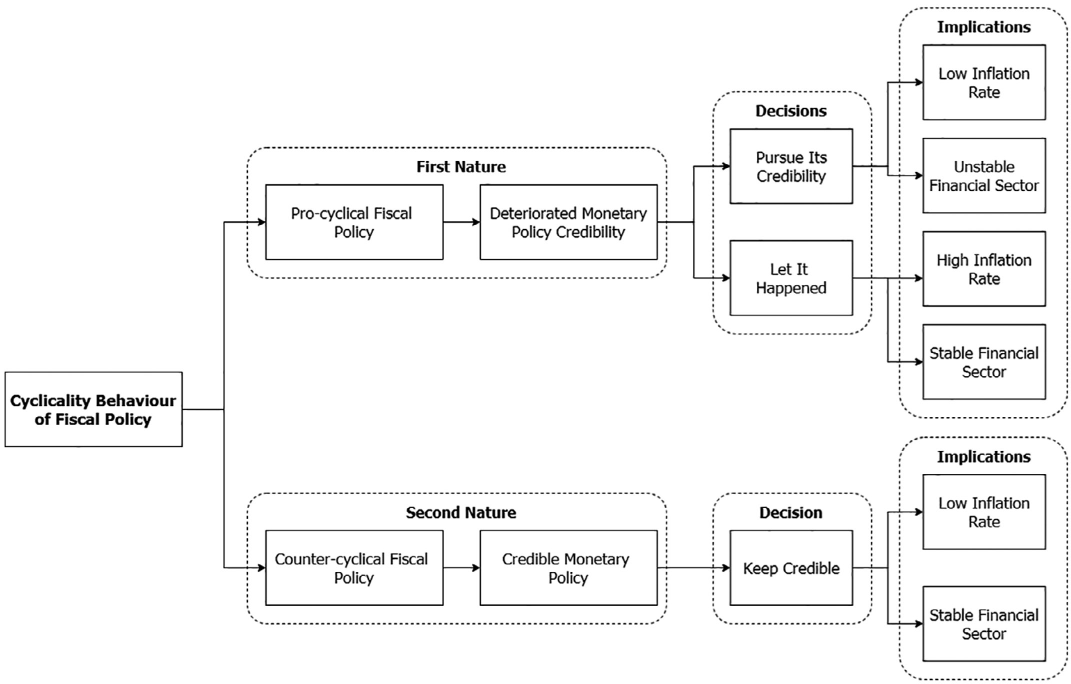

Figure 5. *Abstraction tree of the channel*
Note: conceptualised by the authors.

Hypothesis 1 *Under the procyclical fiscal policy, a more credible monetary policy would generate a lower inflation rate, but with a more unstable financial sector.*

What if the monetary authority does nothing to retain its credibility and lets the deterioration take place? Under these circumstances, the financial sector and the macroeconomy adversely generate a trade-off. Since the monetary authority does not lift the interest rate, the financial sector remains relatively stable (Proposition 4). However, it sacrifices the inflation rates, where an unreliable monetary policy lets the broadened gap between the actual and expected rates of inflation to persist (Proposition 2). In other words, the financial sector is stabilised at the expense of the inflation rate, which is costly for the economy.

Hypothesis 2 *A less credible monetary policy under the procyclical fiscal policy would ensure financial stability, but at the expense of the inflation rate.*

On the contrary, under the second type, the monetary authority would not face a dilemma. The countercyclical fiscal policy ensures lower output gaps. Therefore, it becomes a benevolent complement to monetary policy (Proposition 2). Thus, under this circumstance, monetary authority attains and chooses to maintain its credibility. Thus, monetary authority has no reason to increase interest rates significantly, which in turn lowers the probability of the bubble to burst (Proposition 4). As a result, the economy is characterised by a low inflation rate and a low probability of the bubble burst.

Hypothesis 3 *Credible monetary policy and countercyclical fiscal policy promote both stable financial sectors and low inflation rates.*

3. Empirical Strategy

3.1. Data

We construct a data set covering 25 selected ITF countries[2] (i.e. Argentina[3], Australia, Brazil, Canada, Chile, Colombia, Ghana, Iceland, India[4], Indonesia, Israel, Japan (See Hong *et al*. (2019)), Mexico, New Zealand, Norway, Peru, Philippines, Poland, Republic of Korea, Romania, South Africa, Sweden, Turkey, the United Kingdom and the United States[5]) from 2003 until 2017 from various data sources (see Appendix A).

3.2. Identifying the Technical Definition of Variables

3.2.1. Credibility of Monetary Policy

A growing body of literature suggests numerous technical approaches to define the extent of credible monetary policy. Warjiyo and Juhro (2019) define monetary policy credibility as the deviation of actual and targeted inflation. The larger the deviation of actual inflation from the target, the less

[2]See Hammond (2012) for Australia, Brazil, Canada, Chile, Colombia, Ghana, Iceland, Indonesia, Israel, Mexico, New Zealand, Norway, Peru, Philippines, Poland, Republic of Korea, Romania, South Africa, Sweden, Turkey and United Kingdom.

[3]See Argentina's inflation targeting regime Press Conference on 26 September 2016 (https://www.bcra.gob.ar/Noticias/Regimen_de_Metas_de_Inflacion_en_Argentina_i.asp).

[4]See Reserve Bank of India Act, 1934 (As amended by the Finance, No. 2, Act, 2019), Chapter IIIF Monetary Policy, Point 45ZA.

[5]See FOMC meeting minutes on 25 January 2012: The Federal Reserve (the Fed) officially reached a broad agreement on the following principles regarding its longer-run goals and monetary policy strategy: promoting maximum employment, stable prices and moderate long-term interest rates. The Fed also formally set the medium-term inflation rates at 2 per cent.

credible the monetary policy. Fritsche *et al*. (2009) and Kabundi and Mlachila (2018) define the credibility of monetary policy using disagreement among inflation forecasters. Less disagreement implies higher monetary policy credibility. In other words, the credibility of monetary policy increases when inflation becomes more predictable. Meanwhile, Zeng (2018) identifies the extent of a credible monetary policy using the inflation persistence approach reflecting public responsiveness to the monetary policy. Higher persistence of the inflation rate indicates lesser responsiveness of the public to the monetary policy.

Although the definitions vary, there is a core value of the credibility hypothesis (CH) in those definitions. In verbatim, CH is articulated as the foregone output costs of a disinflationary episode that will be smaller if the public correctly believes that the attempt will not be abandoned (see Fellner (1979)). This implies that a credible monetary policy is the outcome of harmonised interaction between public and monetary authority, as indicated by the successful measures of the monetary authority to set the actual and expected inflation precisely at the same level.

We measure the credibility of the monetary policy using the following formula:

$$\mathrm{CMP} = \frac{|\pi - \pi^e|}{(1 + |\pi - \pi^e|)} \times 100 \tag{12}$$

where CMP, π and π^e are the credibility of monetary policy, actual inflation rates and expected inflation rate, respectively. In measuring the expected rate of inflation, we forecast it from a backward-looking Phillips curve in which actual inflation responds to its lagged quarterly average and to the Hodrick–Prescott detrended unemployment rate (Matteo *et al*., 2013).

3.2.2. Cyclical Behaviour of Fiscal Policy

The cyclical behaviour of fiscal policy is related to how fiscal policy (e.g. tax, spending and deficit/surplus budget policy) responds to business cycles. Fiscal policy is said to be procyclical when fiscal authority responds to economic expansion through an expansionary fiscal policy and responds to economic recession by a contractionary fiscal policy (Kaminsky *et al*., 2004).

There are several approaches to identifying fiscal policy cyclicality behaviour, given devoted variables and measurement techniques. Tornell and Lane (1999), Talvi and Végh (2005), Ilzetzki (2011), Park (2012), and Frankel *et al*. (2013) have used government spending, whereas Kaminsky *et al*. (2004) and Camous and Gimber (2018) have used tax revenue as the fiscal instrument proxy. This shows that government spending is frequently applied to identify fiscal policy cyclicality behaviour instead of tax revenue. Park (2012) argues that using tax revenue as the variable leads to biased estimation because tax revenue inherently correlates with business cycle determinants, which are tax rates. In contrast, many papers frequently employ a regression approach to identify the fiscal policy cyclicality behaviour coefficient. However, these papers focus on the determinant factors of fiscal cyclicality behaviour. In contrast, this paper utilises fiscal cyclicality behaviour as an independent variable.

This paper uses a 20-year window rolling regression for the cyclical component of both government spending and gross domestic product (GDP) to obtain cyclicality coefficients for each individual and time observation (Frankel *et al*., 2013; Mcmanus & Ozkan, 2015). Furthermore, a positive correlation indicates that fiscal policy is procyclical and *vice versa*. Specifically, the measurement of fiscal cyclicality behaviour is categorised as follows:

$$\underset{12,t}{\rho}\begin{pmatrix} 1 \geq \underset{12,t}{\rho} > 0, \text{for procyclical fiscal policy} \\ -1 \leq \underset{12,t}{\rho} < 0, \text{for countercyclical fiscal policy} \end{pmatrix} \tag{13}$$

where n is the rolling window and $\underset{12,t}{\rho}$ is the rolling regression coefficient between the two cyclical components of government spending and GDP.

3.2.3. Financial Instability

Each episode of crisis generates a growing body of literature exponentially, leading to the wide-ranging definitions of financial instability. Nevertheless, the broad literature converges to the identical core meaning, that is the system-wide episode in which the financial system fails to function (World Bank, 2015). Unfortunately, it is difficult to find out the "one-size fits all" meaning due to the broad dimension of the system. Hence, the measure of financial stability is usually proxied by its symptoms.

As discussed earlier, financial instability is characterised by an increased deviation of asset price away from its fundamental value (i.e. asset price misalignments). Nevertheless, the question is which indicator best approximately reflects the asset price misalignment. The severe worldwide history of crises (e.g. the tulip crisis, the south sea bubbles, the 2008 global financial crisis) has captured asset price misalignment occurrence, which is identical to the downturn of the stock market (Johannessen, 2017). Meanwhile, similar to Johannessen (2017), Taipalus (2012) developed the asset price misalignment indicators using stock-market-based data. Their results show that the indicators can locate the periods that are quoted as severe boom or bust periods in asset prices. Likewise, Vila (2000), Okina *et al*. (2001), Malkiel (2010), and Fouejieu *et al*. (2019) use stock-market-based indicators, specifically the Morgan Stanley Capital International (MSCI) stock index as a measure of asset price bubbles. This suggests that the stock market may approximately reflect asset price misalignment. For the asset price misalignment measure, we adopt the detrended MSCI index, estimated using an absolute gap between the actual MSCI index and its fundamental value.[6] Therefore, in this regard, a period of excessive asset price misalignment is identified by a widened detrended MSCI index.

3.3. Model Specification

The objective of this paper was to explain the malevolent effects of credible monetary policy under the procyclical fiscal policy on the inflation rate and financial stability. The models scrutinise the effect of a credible monetary policy on inflation rates and financial stability conditional on the cyclical behaviour of fiscal policy.

Furthermore, the model estimates contain the interaction term variable of monetary credibility (CMP) and fiscal cyclicality (FCB). We technically use the term of primary effect for the coefficient of CMP and the augmented effect for the interaction term coefficient. The interaction term variable facilitates the analysis of the consequences of each kind of fiscal cyclicality behaviour towards the impact of the credible monetary authority on inflation rates, economic growth and financial stability.

We start with the first model estimate, aiming to examine the impact of a credible monetary policy on inflation rates under a procyclical fiscal policy. This estimate follows the standard determination model of inflation, which includes the money growth rate, exchange rates, unemployment rates and public debt as controlled variables (see, e.g., Woodford, 1994; Totonchi, 2011; Alisa, 2015). The model is as follows:

$$\begin{aligned}\pi_{i,t} &= \alpha_0 + \delta_1 \pi_{i,t-1} + \alpha_1 \mathrm{CMP}_{i,t} + \alpha_2(\mathrm{CMP}_{i,t} \times \mathrm{FCB}_{i,t}) + \gamma Z_{i,t} + u_{i,t} \\ \pi_{i,t} &= \alpha_0 + \delta_1 \pi_{i,t-1} + (\alpha_1 + \alpha_2 \mathrm{FCB}_{i,t})\mathrm{CMP}_{i,t} + \gamma Z_{i,t} + u_{i,t}\end{aligned} \tag{14}$$

where π, CMP, FCB and γZ are inflation rate, monetary policy credibility, cyclicality character of fiscal policy and vector of parameter and controlled variables, respectively. α_1 and $\alpha_2 \mathrm{FCB}_{i,t}$ denote the primary effect and augmented effect of monetary policy credibility, respectively.

Lastly, we proceed to the second model estimate, aiming to analyse the aftermath of monetary policy credibility on financial stability conditional on the cyclical behaviour of fiscal policy. Specifically, the model also involves several control variables such as trade openness, exchange rates and debt-to-GDP ratio (e.g. see Fouejieu *et al*., 2019). The model is as follows:

[6]Fundamental values of MSCI are estimated using the Hodrick–Prescott filter.

Table 1. *Estimated LDVs' Coefficient*

	First model estimate	Second model estimate
Pooled least square (δ_{PLS})	0.5632988	0.2108999
Fixed effect (δ_{FE})	0.3171388	−0.0506429
Difference GMM ($\delta_{\text{FD-GMM}}$)	**0.2214667**	**−0.0496313**
	$\delta_{\text{FD}-\text{GMM}}<\delta_{\text{FE}}<\delta_{\text{PLS}}$	$\delta_{\text{FE}}\ll\delta_{\text{FD}-\text{GMM}}<\delta_{\text{PLS}}$

Note: Numbers exhibited in the table represent the first lag dependent variable. Bold numbers denote the coefficient of LDV obtained from Difference-GMM, which utilized as the point of reference for the model selection.

$$\begin{aligned}\rho_{i,t} &= \alpha_8+\delta_3\rho_{i,t-1}+\alpha_9\text{CMP}_{i,t}+\alpha_{10}(\text{CMP}_{i,t}\times\text{FCB}_{i,t})+\tau Q_{i,t}+u_{i,t}\\ \rho_{i,t} &= \alpha_8+\delta_3\rho_{i,t-1}+(\alpha_9+\alpha_{10}\text{FCB}_{i,t})\text{CMP}_{i,t}+\tau Q_{i,t}+u_{i,t}\end{aligned} \tag{15}$$

where ρ, τQ and $(\alpha_9+\alpha_{10}\text{FCB}_{i,t})$ are stock volatility, the vector of parameters and control variables, and the net effect of monetary policy credibility on stock volatility, respectively.

As we are dealing with the inclusion of lagged dependent variables in the model, the standard panel data regression would lead to biased and inconsistent estimation because the lagged dependent variables (LDVs) would be correlated with the composite error term (CET) by construction (Baltagi, 2005). Thus, we employ the generalised method of moment (GMM). However, in deciding between the differenced GMM and system GMM to be employed, we follow the standard procedure developed by Stephen bond (Roodman, 2009). The rules of thumb critically decide the selection between difference GMM and system GMM, which utilises the first-order LDV coefficient of difference GMM ($\delta_{\text{FD}-\text{GMM}}$), pooled least square ($\delta_{\text{PLS}}$) and fixed effect ($\delta_{\text{FE}}$). The estimated δ_{PLS} is considered to be biased upwards, while the estimated value of δ_{FE} is considered to be biased downward (Bond, 2002). When the estimated value of $\delta_{\text{FD-GMM}}$ lies below or closer to δ_{FE} than to δ_{PLS}, System GMM is suitable for estimation and *vice versa* (Roodman, 2009).

From Table 1, we obtained the estimated values of $\delta_{\text{FD-GMM}}$, δ_{PLS} and δ_{FE} for the first and second model estimates. For the first model estimate, we see that $\delta_{\text{FD-GMM}}$ lies below δ_{FE} and δ_{PLS} ($\delta_{\text{FD-GMM}} < \delta_{\text{FE}} < \delta_{\text{PLS}}$). Therefore, System GMM is suitable for estimating the first model. For the second model, the estimated value of $\delta_{\text{FD-GMM}}$ is greater than δ_{FE} and relatively far below δ_{PLS}. Therefore, estimation using System GMM is more suitable for the second model.

4. Results

This section elucidates the estimation results and discusses them. It begins with statistical inferences followed by the construe of the meaning of empirical findings within the theoretical framework discussed earlier.

4.1. Estimation Result

Table 2 shows the estimation results. We begin by exploring the empirical relationship between inflation rates and monetary policy credibility under the procyclical fiscal policy (model 1). The results show a positive net effect of monetary policy credibility on inflation rates, formed by significant positive primary effect and insignificant augmented effect. This implies that the cyclical behaviour of fiscal policy does not affect the outcomes of monetary credibility on the inflation rate reduction. In other words, it suggests that inflation remains low along with a more credible monetary policy, irrespective of the cyclical behaviour of fiscal policy. However, we also found that actual inflation is not driven by one-year lagged inflation. This indicates the flexibility of price changes.

A significant effect of money growth on the inflation rate with a positive sign indicates that higher the growth of money, higher the inflation rates. The result is parallel to the classical theory of money or the monetarist view (see Friedman (1968)). A significant effect of exchange rates with a negative sign on the parameter suggests that currency depreciation leads to higher inflation. The result

Table 2. *Estimation Results*

	Model estimates	
	Inflation	Asset price misalignment
Inflation (−1)	0.1861313 (0.1166045)	
Asset price misalignment (−1)		−0.0425327*** (0.0049759)
Monetary credibility	0.035003*** (0.0100785)	0.1335766*** (03608)
Monetary credibility × Fiscal cyclicality	−0.0409745 (0.0364007)	−0.2727361*** (0.094729)
Trade openness		0.0060955 (0.0040192)
Money growth	0.0012769*** (0.0003429)	
Real effective exchange rates	−0.0006093*** (0.0001795)	0.000091 (0.0001035)
Unemployment rate	−0.0018963 (0.0441323)	
Public debt	−0.0001354** (0.000054)	−0.0000281 (0.0000279)
Constant	0.0823579 (0.0200451)	−0.013234 (0.0114176)
Serial correlation (*z*-Prob.)	0.256	0.314
Hansen test (Chi-squared Prob.)	0.108	0.229
Wald-Stat (5)	148.44***	1283.44***
Number of instruments	21	20
Number of observation	341	350
Number of group (Countries)	25	25
Estimator	System GMM	System GMM

Note: (1) and (2) represent the results of the first, second and third model estimates, respectively. Stars denote statistical significance *, ** and *** at 10%, 5% and 1%, respectively. Numbers in parentheses, (), represent the Windmeijer standard error. These two estimations show no serial correlation (represented by *z-prob*. of serial correlation) with valid instruments (insignificant chi-squared probability of the Hansen test). We instrument all independent variables, as we assume that each model is with strictly exogenous independent variables.

provides evidence to the exchange rates pass-through hypothesis (see Taylor (2000)). A significant effect of public debt on the inflation rate with a negative sign on the parameter indicates that an increase in public debt irregularly reduces inflation rates. Higher public debt potentially reduces the incentive to accumulate more public debt, and prioritises fiscal sustainability instead (Park, 2012).

Finally, we wrap up the estimations by scrutinising the empirical relationship between monetary policy credibility and financial stability under the procyclical fiscal policy. The estimation output shows that a credible monetary policy generates higher asset price misalignment under a procyclical fiscal policy. Technically, it is indicated by a negatively significant net effect under the procyclical fiscal policy. In contrast, under the countercyclical fiscal policy, the credible monetary policy maintains a stable financial system, which is indicated by a positive net effect. The remaining variables of the model estimate show a significantly negative effect of the first lagged asset price misalignment on its actual value. This finding contradicts our theoretical foundation. However, it is consistent with the Minsky Instability Hypothesis, which states that a stable condition may actually induce instability in the future (Angerma, 2013).

4.2. Robustness Checks

To ensure robust estimations, we employ estimation consistency checks with different variable measurements. First, the expected inflation, which is a component of monetary credibility (CMP) measurement, is estimated using the Hodrick–Prescott filter (HP filter). Correia, Neves, and Rebelo (1995) explain that the backward–forward model estimation of HP filter performs well in measuring the approximate value of expected inflation rates. The second strategy to afford robust findings and rationalisations is that we not only employ a rolling regression for the cyclical behaviour of fiscal policy measurement, but also a rolling correlation with a 20-year window $\left(\tau_t\right)$. It measures the correlation between the cyclical component of real GDP and government expenditure. Therefore, the measurement of fiscal cyclicality behaviour is interpreted as follows:

$$\tau_{,t}\begin{pmatrix} 1\geq\tau_t>0,\text{for procyclical fiscal policy} \\ \tau_t=0,\text{for acyclical fiscal policy} \\ -1\leq\tau_t<0,\text{for countercyclical fiscal policy} \end{pmatrix} \tag{16}$$

For the last robustness check, we strive to scrutinise the consistency estimation for the financial system stability variable, as it is problematic to find out a "one-size fits all" measurement due to the broad dimension of the system. Hence, we also operate the Bank Z-score as the financial system stability variable. Bank Z-score is frequently used and becomes a popular indicator of financial system stability because of its ability to capture the banking system's risk-taking behaviour (Li & Malone, 2016). This strategy is essential because it implies that our robustness check on financial system stability comprises not only a test for measurement consistency but also a consistency test to check whether the assumption of financial stability is different from what we define earlier.

First, we explore the correlation between the main variables (see Table B1 in Appendix B). The correlation analysis shows that the monetary credibility variables are positively correlated with the backward-Phillips-style CMP by 24 per cent. This implies variation in the values among the CMP measurement, although all have the same direction, which means that a higher CMP implies less credible monetary policy and *vice versa*. For the fiscal cyclicality variables, we find that both regression and correlation approach measurements are strongly correlated. Finally, we examine the correlation between the financial stability variables, that is detrended MSCI index and Bank Z-score. The correlation coefficient indicates that the Bank Z-score and MSCI index are weakly correlated. This suggests that it is difficult to define financial stability directly with one measurement as there is a broad meaning of the system. Therefore, through this robustness test, we encompass the examination of a different approach that defines financial stability.

We employ ten estimations for a robustness test that combines various variable measurement approaches (see Tables B2 and B3 in Appendix B). Based on the rule of thumb for GMM estimator selection, we mostly use the System GMM (see Tables B4 and B5 in Appendix B). Most robustness tests show that the role of monetary credibility in lowering inflation is empirically robust. We find that in estimations (1) and (3), the lower the CMP (i.e. credible monetary policy), the lower the inflation rates. The interaction term between monetary credibility and fiscal cyclicality is empirically insignificant, although we find it to be significant in estimation (2). Based on our robustness test results, we can conclude that most estimations indicate that fiscal cyclicality may not disrupt the advantage of monetary credibility in lowering inflation rates.

For the examination of financial stability, however, we find that both monetary credibility and the interaction term significantly affect financial stability measured only by the detrended MSCI index but not the Bank Z-score. Therefore, our robustness test estimation suggests that our findings are consistent as long as financial instability is measured by asset price alignment. On the contrary, the fact that our estimations are not consistent with other measurements implies the difficulty to find out a "one-size fits all" measurement for the financial system stability, due to the broad dimension of the system.

5. Concluding Remarks

This study examines the role of monetary credibility and fiscal cyclicality in generating the trade-off between inflation rates and financial stability. We systematically develop simple models to shape the rationalisation framework, which demonstrates the role of fiscal cyclicality behaviour in arousing a trade-off for the monetary policy to target low inflation rates and a stable financial system at once. On one hand, when the fiscal policy is procyclical, and the monetary authority decides to pursue its credibility, it causes low inflation but at the expense of financial stability. On the other hand, if the monetary authority decides to let its credibility deteriorate, it will effectively ensure financial stability but not lower inflation rates.

Table 3. *Fiscal Policy and Monetary Policy Credibility Outcomes Towards Inflation and Financial Stability*

	Fiscal policy	
	Procyclical	Countercyclical
Monetary policy		
Credible	Low; Unstable	Low; Stable
Non-credible	High; Stable	

In this paper, we find that a credible monetary policy does not always generate financial instability, and it necessarily depends on fiscal policy. First, we find that a credible monetary policy may promote not only financial stability but also lower inflation rates as long as the fiscal policy is countercyclical. In contrast, the procyclical fiscal policy leaves the monetary policy facing a trade-off between inflation and financial stability. Table 3 shows the outcomes.

The procyclical fiscal policy will initially deteriorate the credibility of monetary policy by generating a gap between targeted, actual and expected inflation rates. Therefore, the monetary authority will try to attain its credibility by employing a negative money growth policy, which also significantly increases interest rates, to adjust the deviation between targeted, expected and actual inflation rates. However, a significant increase in interest rate implies higher borrowing costs, reduced leverage and increased financial risk, consequently exacerbating financial stability (Dell'Ariccia *et al*., 2014). In contrast, if the fiscal policy is countercyclical, there are no reasons for the monetary authority to raise interest rates quickly or, at least, step by step. Furthermore, the countercyclical fiscal policy could restrain excessive booms and busts of business cycles, thereby reducing the procyclicality of the financial sector, thus generating not only a stable inflation rate but also financial stability.

5.1. Suggestions for Further Research

There are several gaps in this paper. First, this paper excludes the role of macroprudential policy as one of the actors in a "lean-against-the-wind" policy. Second, it implies that there could be a dynamic interaction between fiscal, monetary and macroprudential policy in determining both inflation rates and financial stability regarding their cyclicality behaviour. These gaps could be satisfied with a more general construction, such as a game-theoretical framework.

Conflict of Interest

The Statement of No Conflict of Interest.

The Statement of Authorship

Akhmad Syakir Kurnia conceived and designed the study, collected data, analysed and interpreted the data, drafted the manuscript and/or critically revised the manuscript, and approved the final version of the manuscript. Syahid Izzulhaq conceived and designed the study, collected data, analysed and interpreted the data, drafted the manuscript and/or critically revised the manuscript. Johan Beni Maharda conceived and designed the study, collected data, and analysed and interpreted the data. Agung Kunaedi collected data, and analysed and interpreted the data.

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Appendix A.
Variables, Measurement and Data Sources

Variables	Operational description	Measurement/unit of account	Sources
The credibility of monetary policy	Smoothed value of absolute deviation between actual and expected inflation.	$CMP = \frac{\lvert\pi-\pi^e\rvert}{(1+\lvert\pi-\pi^e\rvert)} \times 100$	Author's calculation, Bank for International Settlement
Cyclicality behaviour of fiscal policy	Correlation between cyclical components of government expenditure and real GDP.	$\sigma_{12,t}2(n) = \frac{1}{n-1}\sum_{i=0}^{n}(y_{1t}-\mu_{1t}(n))(y_{2t}-\mu_{2t}(n))$; $\rho_{12,t}(n) = \frac{\sigma_{12,t}2(n)}{\sigma_{1,t}2(n)\times\sigma_{2,t}2(n)}$; The rolling correlation coefficient (20-year window)	World Bank Data, Penn World Table
	Regression between cyclical components of real GDP with respect to cyclical components of government expenditure.	$\tau_t^c = \alpha_t + \beta y_t^c + \varepsilon_t$; The rolling regression coefficient (20-year window)	
Inflation rates	The annual growth rate of CPI.	Percentage change (2010 = 100)	Bank for International Settlement
Public debt	General government gross debt.	Percentage of GDP	World Economic Outlook
Money growth	Growth of broad money (M2)	Percentage change	World Bank Data
Exchange rates	Real effective exchange rates (REER).	Index (2010 = 100)	IFS and FRED
Stock volatility	Stock price volatility is the average of the 360-day volatility of the national stock market index.	Index	Global Financial Development Dataset (GFDD)
MSCI	Morgan Stanley Capital International Index	Index	Bloomberg
Bank Z-score	Default probability of banking sector	Index	Global Financial Development Indicators
Unemployment rate	Unemployment-to-labour force ratio.	Percentage	World Economic Outlook

Appendix B. Robustness Check

Table B1. *Correlation Coefficients*

	CMP (HP Filter)	CMP (Backward PC)	Fiscal cyclicality (Rolling Regression)	Fiscal cyclicality (Rolling Correlation)	MSCI index (HP Filter Detrended)	Bank Z-score
CMP (HP Filter)	1.000					
CMP (Backward PC)	0.241	1.000				
Fiscal cyclicality (Rolling Regression)	0.257	0.217	1.000			
Fiscal cyclicality (Rolling Correlation)	0.218	0.259	0.778	1.000		
MSCI index (HP Filter Detrended)	0.163	0.462	−0.049	−0.084	1.000	
Bank Z-score	−0.238	−0.008	−0.123	−0.267	−0.087	1.000

Table B2. *Robustness Checks (First Model Estimate)*

	(1)	(2)	(3)
Inflation (-1)	0.1151723	0.1661463	0.1930638*
	(0.1080789)	(0.1136786)	(0.1164458)
Monetary credibility (HP Filter)	0.1894311***	0.0481322	
	(0.0717202)	(0.0597511)	
Monetary credibility (Backward Phillips)			0.0384936***
			(0.0109615)
Monetary credibility (HP Filter) × Fiscal Cyclicality (Rolling Correlation)		0.3615075**	
		(0.1655804)	
Monetary credibility (Backward Phillips) × Fiscal Cyclicality (Rolling Correlation)			−0.025391*
			(0.0145016)
Monetary credibility (HP Filter) × Fiscal Cyclicality (Rolling Regression)	0.0727115		
	(0.1309639)		
Money growth	0012045***	0.0011093***	0.0012558***
	(0.0003174)	(0.0003228)	(0.0003439)
Real effective exchange rates	−0.0006311***	−0.0005635***	−0.000612***
	(0.0001699)	(0.000156)	(0.0001833)
Unemployment rate	0.0013861	0.0024956	−0.0054631
	(0.0522805)	(0.0485775)	(0.0430383)
Public debt	−0.0001462***	−0.0001291***	−0.000136**
	(0.0000507)	(0.0000418)	(0.0000573)
Constant	0.084406	0.0761532	0.0828307
	(0196644)	(0.0178055)	(0.0204109)
Serial correlation (*z*-Prob.)	0.233	0.321	0.236
Hansen Test (Chi-squared Prob.)	0.182	0.149	0.105
Wald-Stat (5)	160.35***	280.26***	135.89***
Number of instruments	21	21	21
Number of observation	341	341	341
Number of group (Countries)	25	25	25
Estimator	System GMM	System GMM	System GMM

Note: (1) and (2) represent the results of the first, second and third model estimates, respectively. Stars denote statistical significance *, ** and *** at 10%, 5% and 1%, respectively. Numbers in parentheses, (), represent the Windmeijer standard error. These two estimations show no serial correlation (represented by *z*-prob. of serial correlation) with valid instruments (insignificant chi-squared probability of the Hansen test).

Table B3. *Robustness Checks (Second Model Estimate)*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MSCI (−1)	0.156586***	0.2018108***	−0.05802***				
	(0.0037014)	(0.006666)	(0.0026377)				
Bank Z-score (−1)				0.3693287	0.4416043**	0.4098119*	0.41571*
				(0.2977206)	(0.2223191)	(0.2192062)	(0.2163226)
Monetary Credibility (HP Filter)	0.0701031**	0.1165757***		−16.48531	2.147489		
	(0.0353772)	(0.0364783)		(27.56051)	(13.08129)		
Monetary credibility (Backward Phillips)			0.159635***			−2.365831	−2.264424
			(0.0081241)			(2.768966)	(1.781357)
Monetary credibility (HP Filter) × Fiscal Cyclicality (Rolling Correlation)		−0.1987403**			−40.7567		
		(0.1009005)			(25.83604)		
Monetary credibility (Backward Phillips) × Fiscal Cyclicality (Rolling Correlation)			−0.17017***				1.800333
			(0.0079215)				(2.397058)
Monetary credibility (HP Filter) × Fiscal Cyclicality (Rolling Regression)	−0.1312682			−8.80234			
	(0.0967996)			(36.41416)			
Monetary credibility (Backward Phillips) × Fiscal Cyclicality (Rolling Regression)						3.311493	
						(8.242095)	
Trade openness	−0.0095402	−0.0084825	−0.0002196	−5.516071	−3.288141	−5.804255	−5.631753
	(0.0096171)	(0.0086766)	(0.002315)	(4.611552)	(4.643107)	(3.816372)	(3.886811)
Real effective exchange rates	−0.0000298	−0.0000434	0.0000779	−0.0275043	−0.0374014	−0.0389234	−0.0376827
	(0.0000351)	(0.0000374)	(0.0001005)	(0.0371379)	(0.038767)	(0.0356007)	(0.0358599)

Table B3. (*Continued*)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Public debt	−0.0000556	−0.0000504	−4.71E-07	0.026472	0.0135088	0.0227526	0.0221612
	(0.0000549)	(0.0000464)	(9.90E-06)	(0.0439433)	(0.0408876)	(0.0427816)	(0.0420777)
Constant	0.0130698	0.0142077	−0.0102504	12.51702	11.5169	12.73614	12.49747
	(0.013255)	(0.0136327)	(0.010027)	(6.657739)	(5.211145)	(12.73614)	(4.933419)
Serial correlation (*z*-Prob.)	0.318	0.318	0.313	0.079	0.060	0.072	0.074
Hansen test (Chi-squared Prob.)	0.199	0.212	0.045	0.143	0.106	0.307	0.298
Wald-Stat (5)	28401.6***	23564.5***	89674.9***	25.66***	14.25**	14.85**	169.14***
Number of instruments	20	20	20	19	19	19	19
Number of observation	350	350	350	325	325	325	325
Number of group (Countries)	25	25	25	25	25	25	25
Estimator	System GMM	System GMM	System GMM	System GMM	System GMM	System GMM	System GMM

Note: (1) and (2) represent the results of the first, second and third model estimates, respectively. Stars denote statistical significance *, ** and *** at 10%, 5% and 1%, respectively. Numbers in parentheses, (), represent the Windmeijer standard error. These two estimations show no serial correlation (represented by z-prob. of serial correlation) with valid instruments (insignificant chi-squared probability of the Hansen test).

Table B4. *GMM Rule of Thumb for Robustness Checks (First Model Estimate)*

Variable combinations		δ_{PLS}	δ_{FE}	$\delta_{FD\text{-}GMM}$	Estimator selection
CMP (HP Filter)					
Fiscal cyclicality (Rolling Regression)	Inflation rates	0.5685337	0.2965623	0.1962958	System GMM
Fiscal cyclicality (Rolling Correlation)		0.5715414	0.3440067	0.2510438	System GMM
CMP (Backward Phillips Curve)					
Fiscal cyclicality (Rolling Correlation)	Inflation rates	0.5660908	0.2414336	0.2180608	System GMM

Table B5. *GMM Rule of Thumb for Robustness Checks (Second Model Estimate)*

Variable combinations		δ_{PLS}	δ_{FE}	$\delta_{FD\text{-}GMM}$	Estimator selection
CMP (HP Filter)					
Fiscal cyclicality (Rolling Regression)	Detrended MSCI	0.2108999	−0.0506429	−0.0496313	System GMM
	Bank Z-score	0.9172721	0.2880967	0.3519971	System GMM
Fiscal cyclicality (Rolling Correlation)	Detrended MSCI	0.5790135	−0.0660833	−0.065003	System GMM
	Bank Z-score	0.9131476	0.2904428	0.3597646	System GMM
CMP (Backward Phillips Curve)					
Fiscal cyclicality (Rolling Regression)	Bank Z-score	0.9237517	0.2759005	0.2759005	System GMM
Fiscal cyclicality (Rolling Correlation)	Detrended MSCI	0.0045335	−0.0508041	−0.0498093	System GMM
	Bank Z-score	0.9237792	0.288805	0.3200156	System GMM