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

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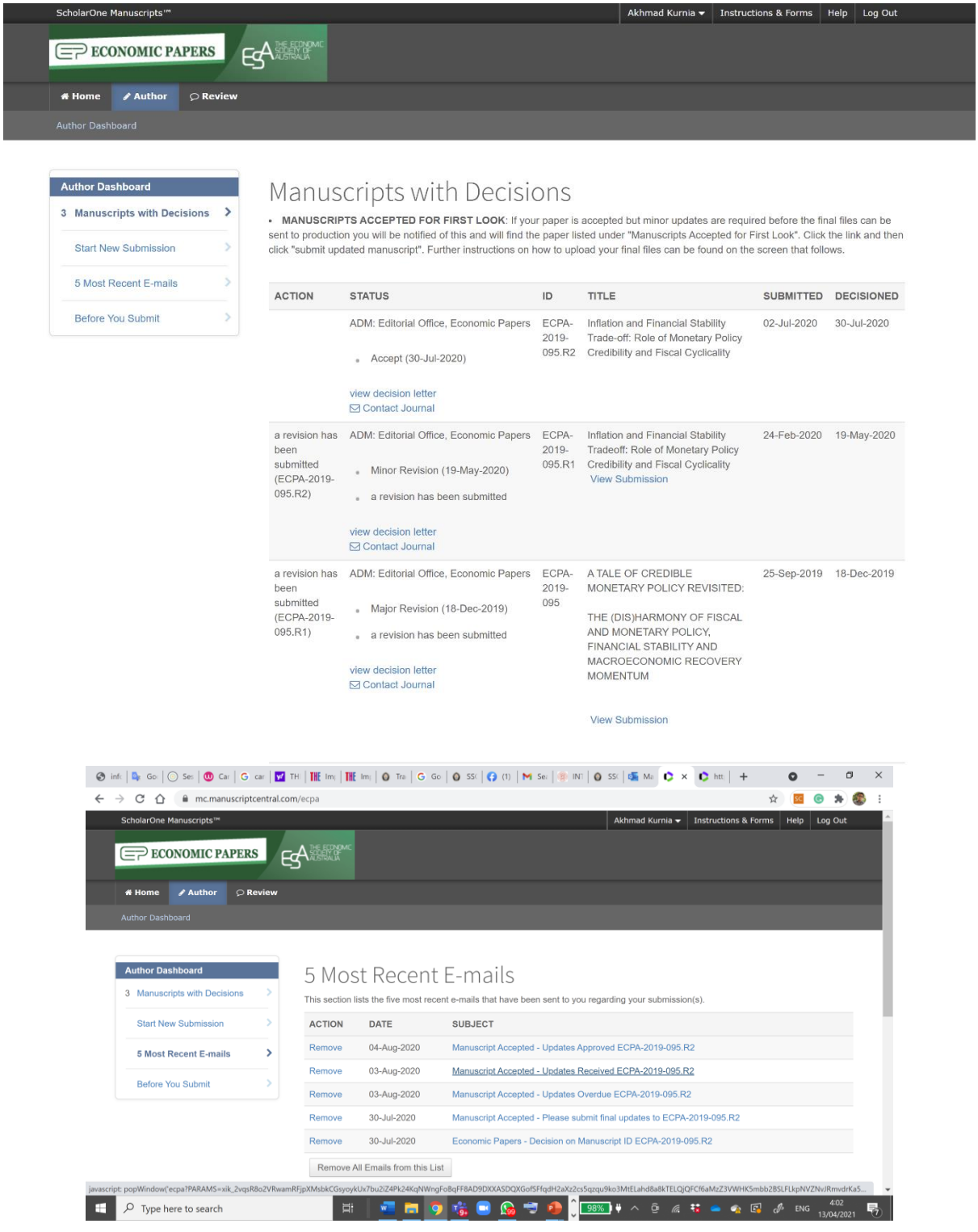

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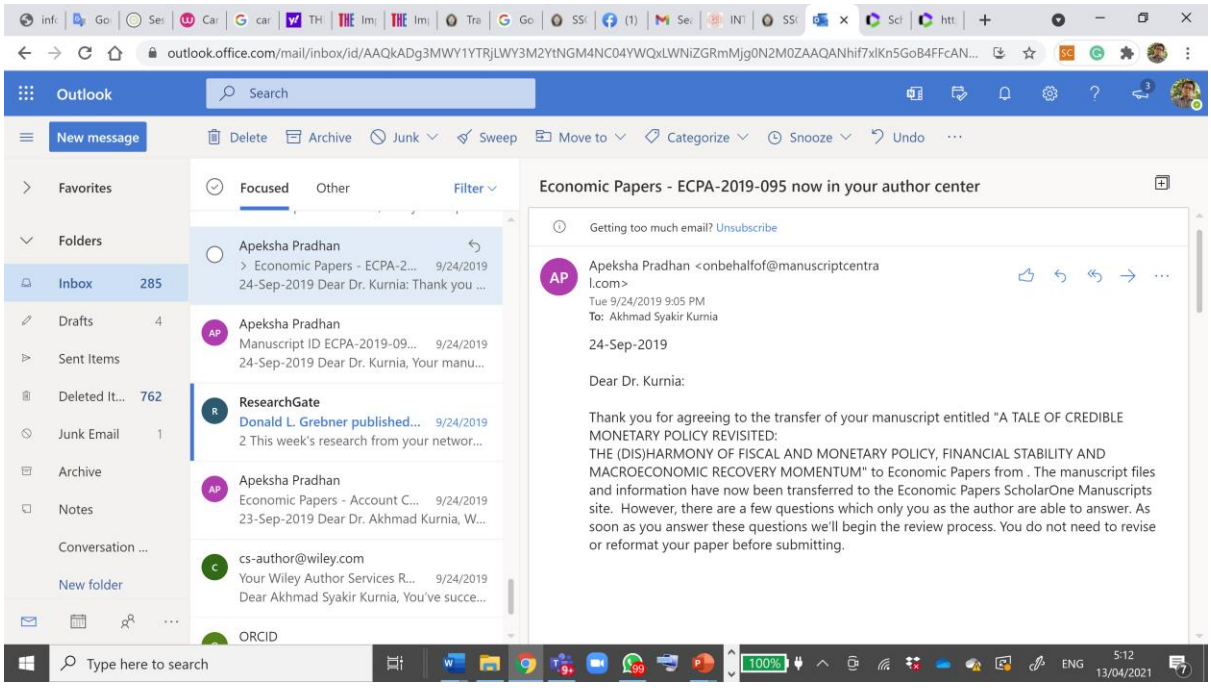

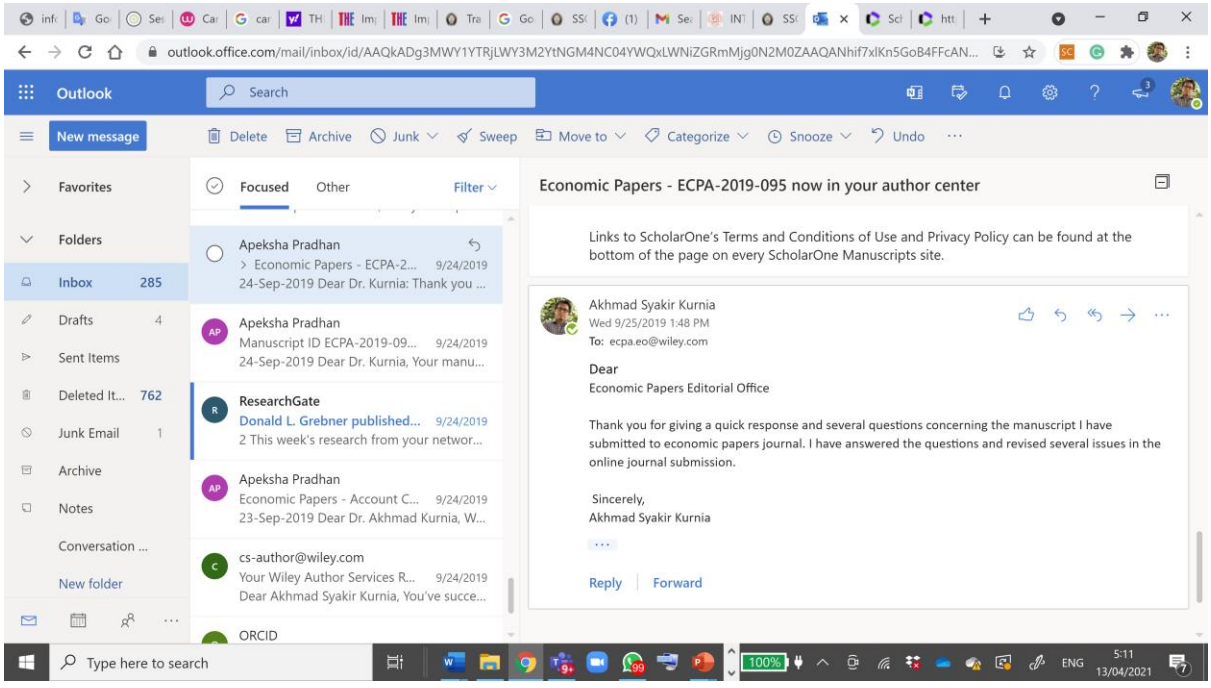

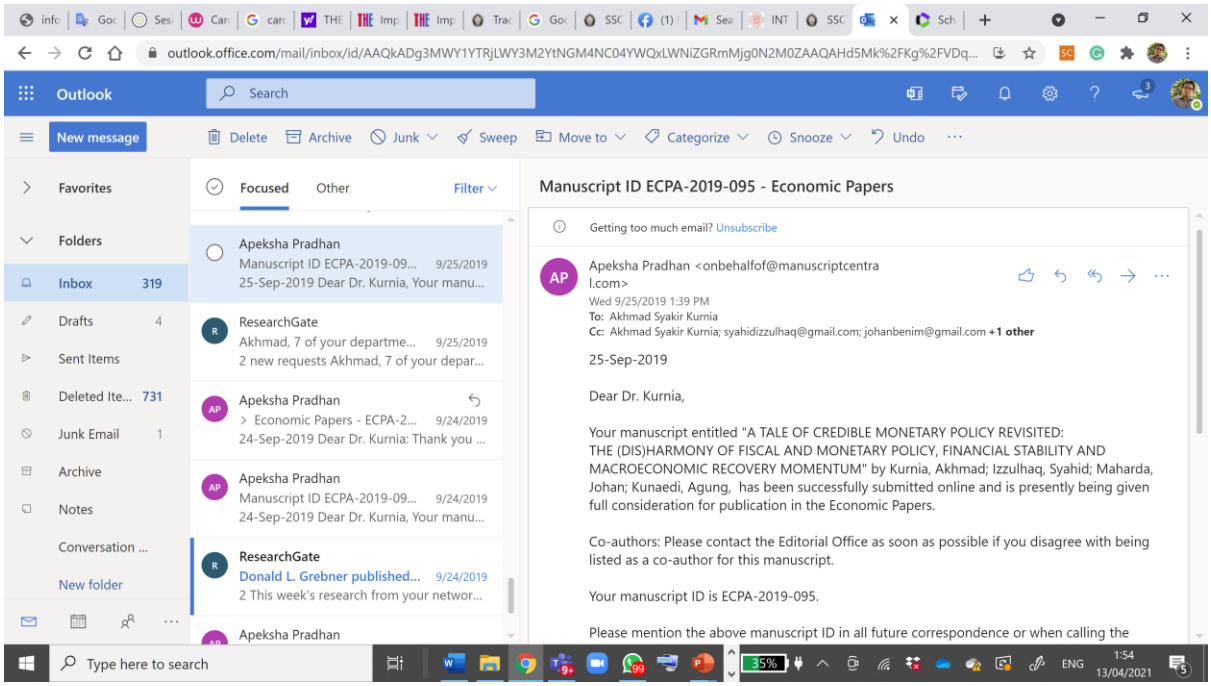

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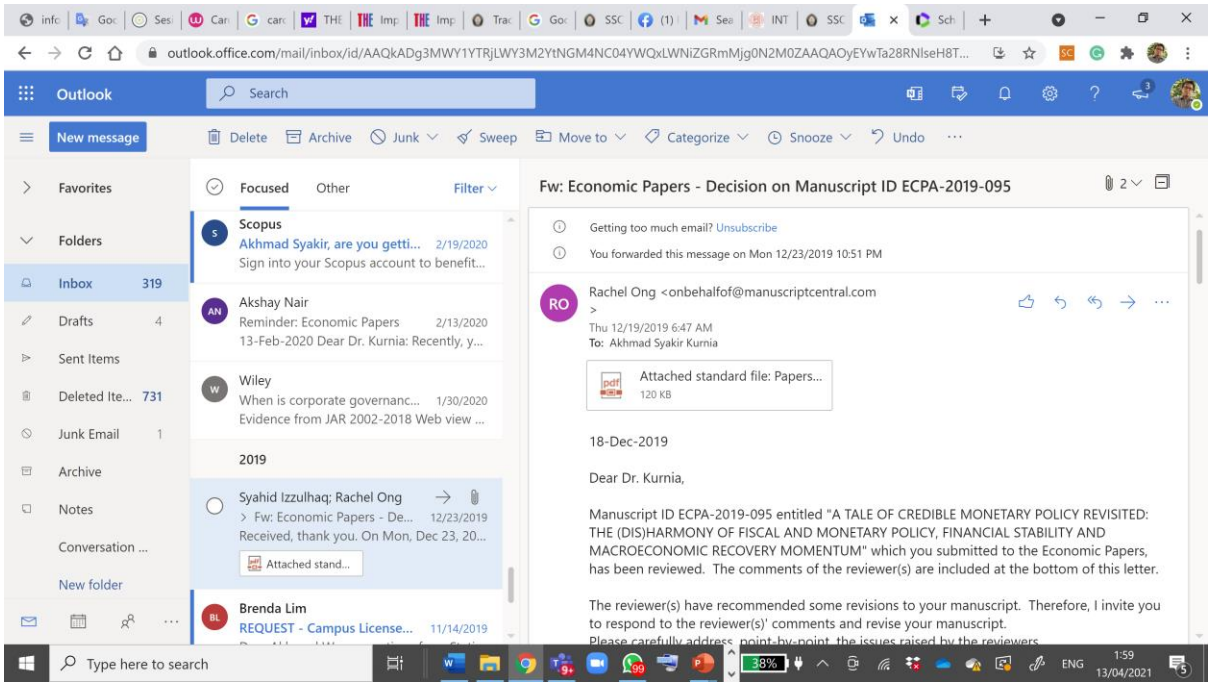

Referee Report For "A Tale of Credible Monetary Policy Revisited: The (Dis)harmony of Fiscal and Monetary Policy, Financial Stability and Macroeconomic Recovery Momentum"

December 3, 2019

This paper argues that "credible monetary policy has been the scapegoat for the crisis caused by the recklessness of fiscal policy in response to the business cycle" (p.1). This is an interesting topic, but the paper needs to be re-written and the analysis developed before being publishable.

1 Major Comments

- *Economic Papers* is an applied, general interest, journal. Writing in a style where there are propositions is not suited to the audience of this journal.
  - I would suggest that the authors review every equation and whether they are necessary.
  - The theoretical model section seems too long at present for the material covered.
  - At least one of the propositions is redundant. Proposition 4 is assumed in the text immediately above it. As the propositions aren't proved, moving away from this format seems desirable. If they are maintained, some of them need to be re-worded so as to be clearer (e.g. Propositions 5 and 6).
- The authors need to use the model to demonstrate how it supports their argument better. For example, is it possible to show the effect of fiscal policy being set in a different way through simulations? In other words, can estimates for selected countries be obtained of how GDP growth would have evolved with counter-cyclical fiscal policy?

  - The estimated contribution of pro-cyclical fiscal policy in causing the financial crisis by the authors is presently not clear. Even if a simulation cannot be done, this needs to be demonstrated better.
  - The claim on page 4 "In contrast, if the fiscal policy is counter-cyclical, there are no reasons for monetary policy to raise interest rates. Besides, counter-cyclical fiscal policy could restrain excessive booms and busts in a beneficial manner,..." is strong and not enough evidence is provided in the paper to justify it. Likewise, the discussion on page 17 says "We validate that a credible monetary policy does not always generate financial instability, and it is essentially a matter of fiscal policy...". I don't think the evidence presented currently does validate this.
  - Motivation as to why using a panel is an appropriate way to conduct the analysis could be given (e.g. on page 11).

- The empirical section needs to be documented better.
  - The frequency of the data is not clear. It should be stated at the beginning of Section 3.
  - The reason for using System GMM is not explained.
  - The instruments used need to be stated, and what they are instrumenting for.
  - Are fixed effects included? Is this, together with the lag, why system GMM is used? For a macro panel 2SLS may be preferred, as one can get a lot of instruments with GMM, some of which are weak. See Judson and Owen (1999). Your tables seem to suggest a large number of instruments are being used.
  - The notation needs to be clearer about whether the level or growth rates of variables are being used.

- In constructing variables the Hodrick-Prescott Filter is used. An example is the trend is used to proxy inflation expectations. As the Hodrick-Prescott filter is a two-sided filter this will introduce leads into your regressions, which is problematic. Using a survey measure of inflation expectations would be preferable, although I realize there may be data limitations for some countries in your panel.

- Databases of financial crises exist (e.g. Laeven and Valencia 2018). These could be compared to the results from your timing.

- Why focus on the volatility of stock prices, rather than their level? Stock price misalignment conceptually is closer to the level of prices being high, especially relative to fundamentals. Could the average Price-to-Earning ratio in each country be used?

2 Minor Comments

- The title is too long.
- Using house prices, rather than just equities, would strengthen the paper. The BIS maintain a database that could be useful.
- The graphs need to be re-drawn so as the grid lines line up with the axes labels - see, for example, the right-hand sides of Figure 1 and Figure 2.
- Is $k = 1$ in Equation 7 a typo?
- The notation of the asset price deviation - σ - is potentially confusing, given it's usually used for the standard deviation.
- The description of the asset price bubble on page 8 is too long.
- The definition of the credibility of monetary policy in the first paragraph of Sub-section 3.1 is unnecessarily wordy.
- The sign of the change in the CMP variable as the credibility increases could be stated explicitly to aid interpretation.
- Equation 18 could be trimmed.
- Why not allow the output gap to influence inflation in Equation 19?
- In Equation 1 a lag of inflation is now being referred to as inflation expectations (page 15), whereas before it was trend inflation.
- Why use money supply growth, rather than interest rates, to capture the stance of monetary policy in Equation 19?
- Why does Minsky motivate a second lag of stock market volatility? (page 14)
- Making which equations the columns correspond to in Table clearer would aid the reader.
- There are a lot of estimates included in the Tables in Appendix B. Are these all necessary?
- There are small drafting issues throughout the paper, e.g. missing articles/propositions (e.g. the third paragraph of page 19).
- I would suggest not ending the paper on "Suggestions for Further Research", and instead emphasizing the contributions of the paper, although that is personal preference.

3 References

Judson, Ruth A. & Owen, Ann L., 1999. "Estimating dynamic panel data models: a guide for macroeconomists," Economics Letters, Elsevier, vol. 65(1), pages 9-15, October.

Luc Laeven & Fabian Valencia, 2018. "Systemic Banking Crises Revisited," IMF Working Papers 18/206, International Monetary Fund.

Responses to Comments from referee, Revision submitted on February 24 2020
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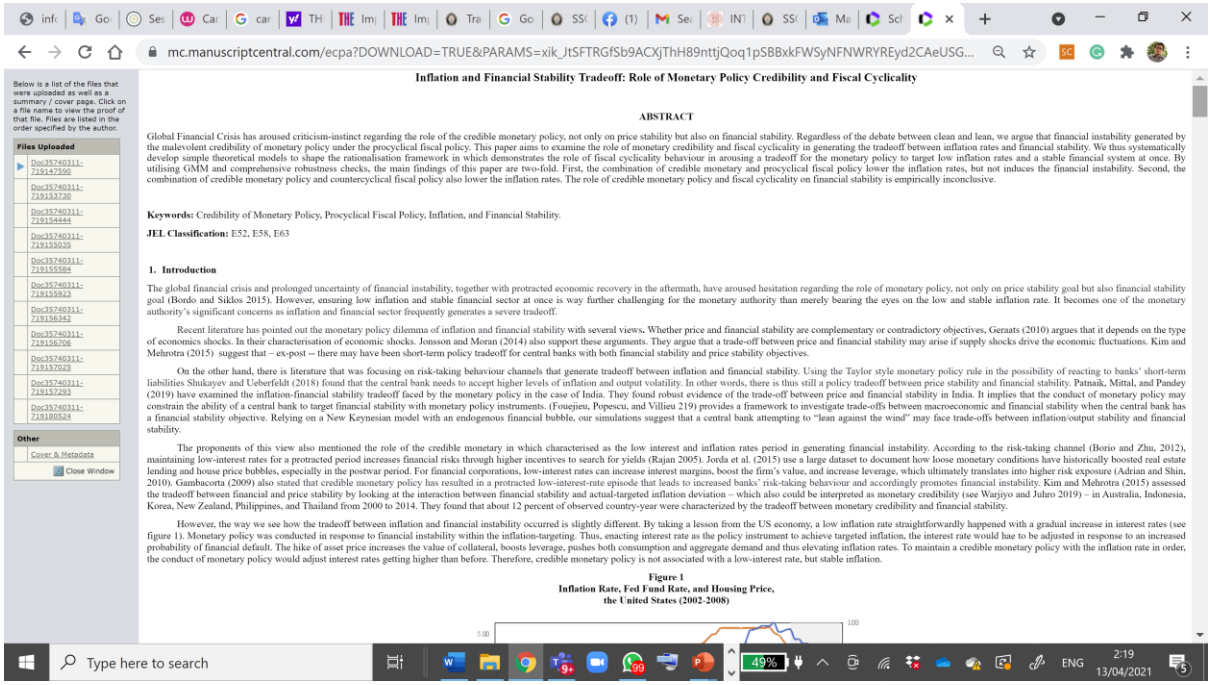

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Inflation and Financial Stability Tradeoff: Role of Monetary Policy Credibility and Fiscal Cyclicality

ABSTRACT

Global Financial Crisis has aroused criticism-instinct regarding the role of the credible monetary policy, not only on price stability but also on financial stability. Regardless of the debate between clean and lean, we argue that financial instability generated by the malevolent credibility of monetary policy under the procyclical fiscal policy. This paper aims to examine the role of monetary credibility and fiscal cyclicality in generating the tradeoff between inflation rates and financial stability. We thus systematically develop simple theoretical models to shape the rationalisation framework in which demonstrates the role of fiscal cyclicality behaviour in arousing a tradeoff for the monetary policy to target low inflation rates and a stable financial system at once. By utilising GMM and comprehensive robustness checks, the main findings of this paper are two-fold. First, the combination of credible monetary and procyclical fiscal policy lower the inflation rates, but not induces the financial instability. Second, the combination of credible monetary policy and countercyclical fiscal policy also lower the inflation rates. The role of credible monetary policy and fiscal cyclicality on financial stability is empirically inconclusive.

Keywords: Credibility of Monetary Policy, Procyclical Fiscal Policy, Inflation, and Financial Stability.

JEL Classification: E52, E58, E63

1. Introduction

The global financial crisis and prolonged uncertainty of financial instability, together with protracted economic recovery in the aftermath, have aroused hesitation regarding the role of monetary policy, not only on price stability goal but also financial stability goal (Bordo and Siklos 2015). However, ensuring low inflation and stable financial sector at once is way further challenging for the monetary authority than merely bearing the eyes on the low and stable inflation rate. It becomes one of the monetary authority's significant concerns as inflation and financial sector frequently generates a severe tradeoff.

Recent literature has pointed out the monetary policy dilemma of inflation and financial stability with several views. Whether price and financial stability are complementary or contradictory objectives, Geraats (2010) argues that it depends on the type of economics 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 the economic fluctuations. Kim and Mehrotra (2015) suggest that – ex-post -- there may have been short-term policy tradeoff for central banks with both financial stability and price stability objectives.

On the other hand, there is literature that was focusing on risk-taking behaviour channels that generate tradeoff 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) found that the central bank needs to accept higher levels of inflation and output volatility. In other words, there is thus still a policy tradeoff between price stability and financial stability. Patnaik, Mittal, and Pandey (2019) have examined the inflation-financial stability tradeoff faced by the monetary policy in the case of India. They found robust evidence of the trade-off between price and financial stability in India. It implies that the conduct of monetary policy may constrain the ability of a central bank to target financial stability with monetary policy instruments. (Fouejieu, Popescu, and Villieu 219) provides a framework to investigate trade-offs 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, our simulations suggest that a central bank attempting to "lean against the wind" may face trade-offs between inflation/output stability and financial stability.

The proponents of this view also mentioned the role of the credible monetary in which characterised as the low interest and inflation rates period in generating financial instability. According to the risk-taking channel (Borio and Zhu, 2012), maintaining low-interest rates for a protracted period increases financial risks through higher incentives to search for yields (Rajan 2005). Jorda et al. (2015) use a large dataset to document how loose monetary conditions have historically boosted real estate lending and house price bubbles, especially in the postwar 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 and Shin, 2010). Gambacorta (2009) also stated that credible monetary policy has resulted in a protracted low-interest-rate episode that leads to increased banks' risk-taking behaviour and accordingly promotes financial instability. Kim and Mehrotra (2015) assessed the tradeoff between financial and price stability by looking at the interaction between financial stability and actual-targeted inflation deviation – which also could be interpreted as monetary credibility (see Warjiyo and Juhro 2019) – in Australia, Indonesia, Korea, New Zealand, Philippines, and Thailand from 2000 to 2014. They found that about 12 percent of observed country-year were characterized by the tradeoff between monetary credibility and financial stability.

However, the way we see how the tradeoff between inflation and financial instability occurred is slightly different. By taking a lesson from the US economy, a low inflation rate straightforwardly happened with a gradual increase in interest rates (see figure 1). Monetary policy was conducted in response to financial instability within the inflation-targeting. Thus, enacting interest rate as the policy instrument to achieve targeted inflation, the interest rate would hae 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 elevating inflation rates. To maintain a credible monetary policy with the inflation rate in order, the conduct of monetary policy would adjust interest rates getting higher than before. Therefore, credible monetary policy is not associated with a low-interest rate, but stable inflation.

Figure 1
Inflation Rate, Fed Fund Rate, and Housing Price, the United States (2002-2008)

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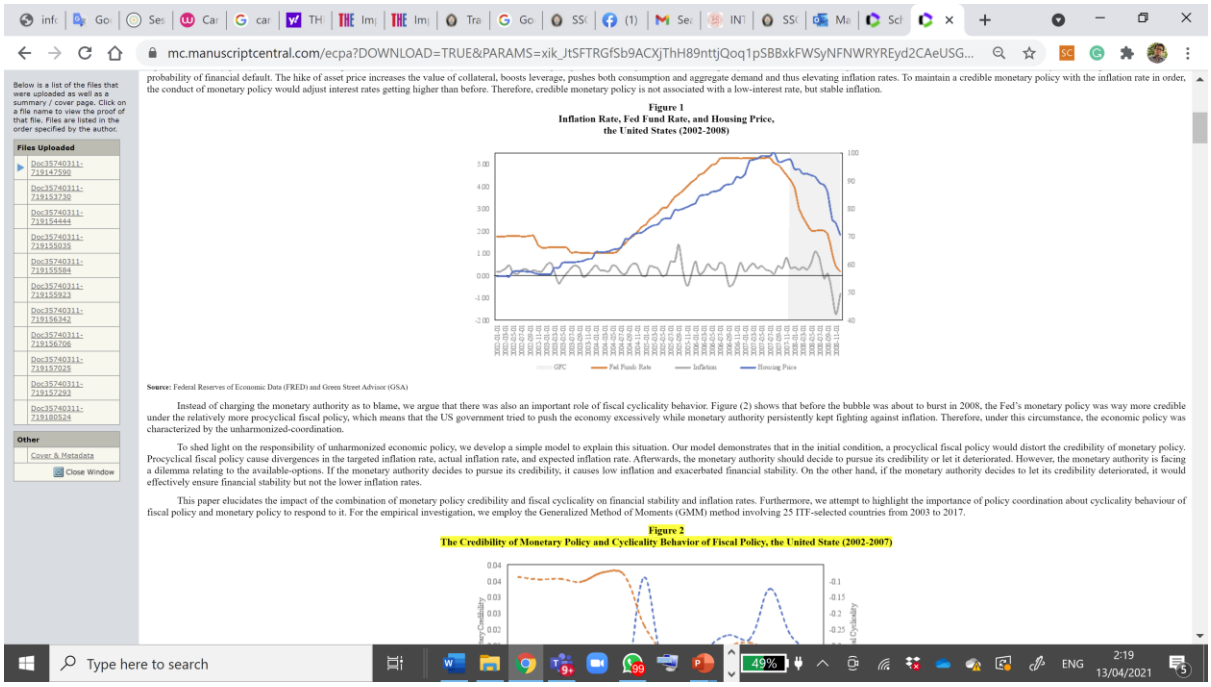

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Figure 1
Inflation Rate, Fed Fund Rate, and Housing Price, the United States (2002-2008)

Source: Federal Reserves of Economic Data (FRED) and Green Street Advisor (GSA)

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

To shed light on the responsibility of unharmonized economic policy, we develop a simple model to explain this situation. Our model demonstrates that in the initial condition, a procyclical fiscal policy would distort the credibility of monetary policy. Procyclical fiscal policy cause divergences in the targeted inflation rate, actual inflation rate, and expected inflation rate. Afterwards, the monetary authority should decide to pursue its credibility or let it deteriorated. However, the monetary authority is facing a dilemma relating to the available-options. If the monetary authority decides to pursue its credibility, it causes low inflation and exacerbated financial stability. On the other hand, if the monetary authority decides to let its credibility deteriorated, it would effectively ensure financial stability but not the 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 about cyclicality behaviour of fiscal policy and monetary policy to respond to it. For the empirical investigation, we employ the Generalized Method of Moments (GMM) method involving 25 ITF-selected countries from 2003 to 2017.

Figure 2
The Credibility of Monetary Policy and Cyclicality Behavior of Fiscal Policy, the United State (2002-2007)

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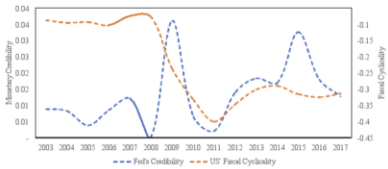

Source: Authors' Calculation.
Notes: the cyclicality behaviour of fiscal policy has been estimated using a 20-year rolling regression between cyclical components of government expenditure and real GDP. A positive (negative) correlation indicates procyclical (countercyclical) fiscal policy; The credibility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

To the best of our knowledge, there is one crucial point that differentiates this paper from other previous researches: this paper addresses the tradeoff between inflation rates and financial stability in consideration of the role of monetary credibility and fiscal cyclicality behaviour, **while the existing literature has not yet addressed the role of fiscal cyclicality.** Depart from it, and we thus make every effort to significantly contribute to literature development relating to topics of monetary policy/authority credibility, fiscal cyclicality, and inflation-financial stability tradeoff. Afterwards, **the motivation of this paper is to examine the role of monetary credibility and fiscal cyclicality in generating the tradeoff between inflation rates and financial stability. Our key result is that the combination of credible monetary and procyclical (countercyclical) fiscal policy lower inflation rates, but not induces the financial instability. It implies that the role of credible monetary policy and fiscal cyclicality on financial stability is empirically inconclusive.**

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

2. The Simple Model

The setup of the model aims to scrutinize the role of monetary policy credibility and fiscal cyclicality in shaping the nexus between inflation rates and financial instability. This section is organized 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; 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 earlier by Barro and Gordon (1983), focusing on the role of money growth policy. In contrast to the original model, we augment cyclicality of fiscal policy with the assumption that monetary policy transmission is imperfect. Thus, the model is expressed as follows:

$$\pi = \mu + \beta.\gamma;\ \pi'(\gamma) > 0 \qquad (1)^{[1]}$$

Where π, μ, γ and β are inflation rates, money growth, degree of fiscal policy cyclicality behavior, and parameter of γ, respectively.

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Targeting the inflation rate as the goal of monetary policy in the inflation targeting framework (ITF) implies a sacrifice ratio to bear in mind. There must be a cost of forgone output due to stable and low inflation rates. As a consequent, credible monetary policy is unavoidably characterized as countercyclical. Provided the tradeoff between inflation and output, the central bank has a following single-period loss function to minimize:

$$L = a(\pi - \pi^*)^2 + (y - y^*)^2 c\, y^* = k.y^n \qquad (2)$$

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 tradeoff between inflation rates and output level, achieving low inflation rates implies to some of the output to sacrifice, *ceteris paribus*. Theoretically, it represented by a synthesis of Okun law and Phillips Curve:

$$y = y^n + b(\pi - \pi^e) \qquad (3)$$

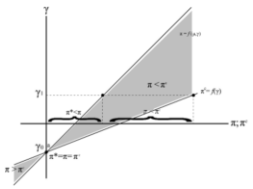
where π^e inflation rates.

Substituting equation (1) and (3) on equation (2) and take the first-order condition, we obtain the optimal combiation of fiscal policy cyclicality behavior and the devoted variables that minimize the loss function as follows[2]:

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

Figure (3) depicts equation (1) and (6) in a way so that we can see the optimal policy. It can be seen that at γ_0 (i.e. countercyclical fiscal policy), the targeted inflation is paralleled to actual and expected inflation rates, *ceteris paribus*. In contrast, if the cyclicality behavior of fiscal policy occurs at γ_1 then it would create a gap between targeted, actual, and expected inflation rates.

Figure 3
Cyclicality Behavior of Fiscal Policy and Rates of Targeted, Actual, and Expected Inflation



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

Proposition 1. *Pro-cyclical fiscal policy generates a gap among 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 characterized by the degree of the cyclicality behavior of fiscal policy. The first circumstance (i.e. procyclical fiscal policy) indicated by a deviation on targeted, actual, and expected inflation rates. By contrast, the second circumstance (i.e. countercyclical fiscal policy) characterized by an equal rate of targeted, actual, and expected inflation.

Proof

Equation $Y = -\frac{1}{\beta}\mu + \frac{b^2}{\beta(a+b^2)}\pi^e$ and $Y = -\frac{1}{\beta}\mu + \frac{1}{\beta}\pi$ 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 $\pi = f(y)$ $\frac{\partial \pi}{\partial Y}$ is steeper than slope of

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L_a denotes the loss function within the first condition. The loss function equation is elaborated 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 the loss function L_a is larger than zero.

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

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

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

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

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

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

When the credibility is under pressure, the monetary authority is assumed to be able to retain its credibility back over a tighter monetary policy (see figure 2). The monetary authority will run a negative money growth policy and, therefore, significantly higher interest rates in order 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 in order to maintain the credibility of monetary policy. As can be seen in figure 4 below, equation (1) and (6) will shift, resulting in a change of optimal point from point a to point b.

Figure 4
Monetary Policy Response to the Procyclical Fiscal Policy

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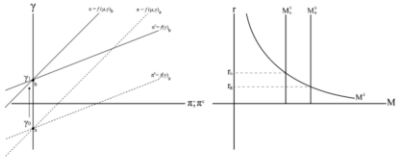


Proposition 3. *Contractionary monetary policy could adjust the deteriorated monetary policy credibility by employing a negative money growth policy and significantly higher interest rates.*

2. 2. The Financial Instability Model

The economy has been witnessed with several episodes of the financial crisis from the 1930's great depression to the recent crises. A feature that is commonly found intrinsically in all episodes of the financial crisis is the presence of asset price misalignment (Taipalus 2012). Indeed, it is worth stressing that the asset price misalignment is not merely a factor in deteriorating financial stability. Nevertheless, a massive swing of the asset price is often associated with strains in the financial sector and the real economy (Borio and Lowe 2002). Therefore, we define financial instability as a build-up of asset price deviation from its fundamental value; and accordingly, we simplify and modify the endogenous asset price bubbles model *a la* Fouejieu, Popescu, and Villieu (2019) - earlier found in Blanchard and Watson (1982) - by adding the output gap as follows:

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

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

We set the probability of bubble to persist follows a sigmoid pattern, and hence the probability of the bubble to persist is a function of z as follows:

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

Moreover, the ratio of the probability of the bubble to persist and to burst is defined as follows:

$$\frac{P_{br}}{1 - P_{br}} = e^z \quad (10)$$

Taking into natural logarithm form, the ratio of the probability of the bubble to persist and to burst equals to z.

$$\ln\left(\frac{P_{br}}{1-P_{br}}\right) = z \tag{11}$$

Based on equation (11) it can be seen that the more significant the increase (decreases) in interest rates the more significant (lower) the probability to default $(1-P_{br})$ 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.

$$z = f(\Delta r);\ \frac{\partial z}{\partial(\Delta r)} < 0 \tag{12}$$

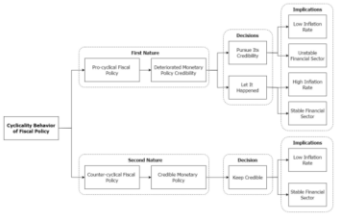
Equation (16) implies that tightening monetary policy (increased interest rate) leads to larger pessimism and risk-averse behaviour reduces demand for credit, high loan loss provisions, and the higher probability of the bubble to burst (Warjiyo and Juhro 2019). Also, higher interest rates imply higher borrowing costs; shrunk leverage increases financial risk and consequently exacerbates financial stability (Dell'Ariccia, Laeven, and Marquez 2014). Since the deviation of actual asset price from its fundamental value becomes more extensive than before, then the probability of the bubble to burst becomes larger.

Proposition 4. *The higher the increase of the interest rates, the larger the asset price deviates from its fundamental value.*

2. 3. The Dilemma of the Credible Monetary Policy Under the Procyclical Fiscal Policy

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

Figure 5
Abstraction Tree of the Channel



Notes: conceptualized by the authors.

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

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

What if the monetary authority does nothing to retain its credibility and let the deterioration takes place. **Under this circumstance, the financial sector and macroeconomy adversely generate a trade-off. Since the monetary authority is not lifted the interest rate, financial stability thus remains relatively stable (proposition 4). However, it sacrifices the inflation rates in which unreliable monetary policy lets the broadened gap between the actual and expected rate of inflation exists (proposition 2). In other words, the financial sector is stabilized at the expense of the inflation rate, which is costly for the economy.**

Hypothesis 2. ***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 nature, the monetary authority would not be facing a dilemmatic option. The countercyclical fiscal policy ensures lower output gaps, therefore, becomes a benevolent complementary to monetary policy (proposition 2). Thus, under this circumstance, monetary authority attains and chooses to keep its credibility. Monetary authority thus has no reason to crawls up interest rates significantly, which in turn lowers the probability of the bubble to burst (proposition 4). As a result, the economy would be characterized by the low inflation rate and low probability of the bubble to burst.

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

3. Empirical Strategy

3. 1. Observation

The observation is selected based on the implementation of an explicit ITF regime (see Hammond 2012). The reason behind this selection is that the credibility of monetary authority plays a vital role in the explicit ITF regime. We thus construct an annually unbalance panel dataset comprise 375 observations covering 25 ITF countries (i.e., Argentina, Australia, Brazil, Canada, Chile, Colombia, Ghana, Iceland, India, Indonesia, Israel, Japan, Mexico, New Zealand, Norway, Peru, Philippines, Poland, Rep. Korea, Romania, South Africa, Sweden, Turkey, United Kingdom, and the United States) from 2003 to 2017.

3. 2. Identifying Technical Definition of the Variables

The Credibility of Monetary Policy

A growing literature suggests numerous technical approaches to define the extent of credible monetary policy. Warjiyo and Juhro (2017) define monetary policy credibility as the deviation of actual and targeted inflation by which the larger the deviation actual inflation from the target, the less credible the monetary policy is. Fritsche, Slacalek, and Dovern (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 credible monetary policy using the inflation persistence approach reflecting public responsiveness to the monetary policy. Higher persistence of the inflation rate indicates less 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). It implies that the credible monetary policy is the outcome of harmonized-interaction between public and monetary authority by which 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 monetary policy using the following formula:

$$CMP = \frac{|\pi - \pi^e|}{(1 + |\pi - \pi^e|)} \times 100 \tag{13}$$

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, Marco, and Giuliana 2013).

The Cyclicality Behavior of Fiscal Policy

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The Cyclicality Behavior of Fiscal Policy

The cyclicality behavior of a fiscal policy is related to how the fiscal policy (e.g., tax, spending, and deficit/surplus budget policy) responds towards the business cycles. Fiscal policy is said as procyclical when fiscal authority responds to the economic expansion by expansionary fiscal policy and responds to the economic recession by contractionary fiscal policy (Kaminsky, Reinhart, and Végh 2004).

There are several approaches to identify fiscal policy cyclicality behavior, given devoted variables and measurement technique. Tornell and Lane (1999), Talvi and Végh (2005), Ilzetzki (2011), Park (2012), Frankel, Vegh, and Vuletin (2013) used government spending, whereas Kaminsky, Reinhart, and Végh (2004) and Camous and Gimber (2018) used tax revenue as the fiscal instrument proxy. It shows that government spending frequently applied to identify fiscal policy cyclicality behavior instead of tax revenue. Park (2012) argues that using tax revenue as the variable leads to biased estimation since tax revenue inherently correlated to business cycles determinant, which is tax rates. On the other hand, most of the paper frequently employs a regression approach to identify the fiscal policy cyclicality behavior coefficient. However, those papers are focused on the determinant factors of fiscal cyclicality behavior. In contrast, this paper utilizes fiscal cyclicality behavior as an independent variable.

This paper operates a **20-year window rolling regression for cyclical component of both government spending and Gross Domestic Product (GDP) to obtain cyclicality coefficient for each individual and time observation** (Mcmanus and Ozkan 2015; Frankel, Végh, and Vuletin 2013) Furthermore; a positive correlation indicates that fiscal policy is procyclical, *vice versa.* Specifically, the measurement of fiscal cyclicality behavior categorized as follows:

$$\hat{P}_{12,t}\begin{cases} 1 \geq \hat{P}_{12,t} > 0, for\ procyclical\ fiscal\ policy \\ -1 \leq \hat{P}_{12,t} < 0, for\ countercyclical\ fiscal\ policy \end{cases} \quad (14)$$

Where n is rolling window and $\hat{P}_{12,t}$ is the rolling regression coefficient **between two cyclical components of government spending and GDP.**

The Financial Instability

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

As was discussed earlier, financial instability is characterized by an increased deviation of asset price away from its fundamental value (i.e. asset price misalignments). Nevertheless, the question in mind is which indicator that best approximately reflects the asset price misalignment. The severe worldwide history of crises (e.g., the tulip crisis, the south sea bubbles, 2008 global financial crisis, so on, and so forth) has captured asset price misalignment occurrence, which is identically characterized by the downturn of the stock market (Johannessen 2017). Meanwhile, aligned with Johannessen (2017), Taipalus (2012) developed the asset price misalignment indicators using the stock-market-based data. The result shows that the indicators can locate the periods that were quoted as of severe booms periods or busts in asset prices. Likewise, Vila (2000), Okina, Shirakawa, and Shiratsuka (2001), Malkiel (2010), Fouejieu, Popescu, and Villieu (2019) use the stock-market-based indicators, specifically Morgan Stanley Capital International (MSCI) stock index as a measure to the asset price bubbles. Therefore, it suggests that the stock market could approximately reflect the asset price misalignment. For the asset price misalignment measure, we thus adopt the stock-market-based indicator, namely stock market volatility. It implies that excessive stock volatility indicates asset price misalignment.

3. 3. Model Specification

The objective of this paper is to explain the malevolent-effects of credible monetary policy under the procyclical fiscal policy on the inflation rate and financial stability. The models directly scrutinise the effect of the credible monetary policy on inflation rates and financial stability conditional to the cyclicality 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 us to analyse the consequences for each kind of fiscal cyclicality behaviour towards the impact of the credible monetary authority on inflation rates, economic growth, and financial stability

We depart with the first model estimate aiming to examine the impact of the credible monetary policy on inflation rates under the procyclical fiscal policy. This estimate follows the standard determination model of inflation that includes 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 shown as follows:

$$\pi_{i,t} = \alpha_0 + \delta_1 \pi_{i,t-1} + \alpha_1 CMP_{i,t} + \alpha_2 (CMP_{i,t} \times FCB_{i,t}) + \gamma \mathbf{Z}_{i,t} + u_{i,t} \quad (15)$$

$$\pi_{i,t} = \alpha_0 + \delta_1 \pi_{i,t-1} + (\alpha_1 + \alpha_2 FCB_{i,t}) CMP_{i,t} + \gamma \mathbf{Z}_{i,t} + u_{i,t}$$

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$$\pi_{i,t} = \alpha_0 + \delta_1 \pi_{i,t-1} + (\alpha_1 + \alpha_2 FCB_{i,t}) CMP_{i,t} + \gamma \mathbf{Z}_{i,t} + u_{i,t}$$

Where π, CMP, FCB, $\gamma \mathbf{Z}$ are inflation rate, monetary policy credibility, cyclicality character of fiscal policy, and vector of parameter and controlled variables respectively. α_1 and $\alpha_2 FCB_{i,t}$ denote the primary-effect and augmented-effect of monetary policy credibility.

Lastly, we proceed to the second model estimate aiming to analyze the aftermaths of monetary policy credibility on financial stability conditional to the cyclicality behavior of fiscal policy. Specifically, the specification of the model also involves several control variables such as trade openness, exchange rates, and Debt to GDP Ratio (see Alexakis, Apergis, and Xanthakis 1996; Nikmanesh 2016; Huang 2017) The model is shown as follows:

$$\rho_{i,t} = \alpha_0 + \delta_3 \rho_{i,t-1} + \alpha_9 CMP_{i,t} + \alpha_{10} (CMP_{i,t} \times FCB_{i,t}) + \tau \mathbf{Q}_{i,t} + u_{i,t}$$

$$\rho_{i,t} = \alpha_0 + \delta_3 \rho_{i,t-1} + (\alpha_9 + \alpha_{10} FCB_{i,t}) CMP_{i,t} + \tau \mathbf{Q}_{i,t} + u_{i,t} \quad (16)$$

Where ρ, $\tau \mathbf{Q}$, and $(\alpha_9 + \alpha_{10} FCB_{i,t})$ are stock volatility, the vector of parameters and control variables, and the net effect of monetary policy credibility on stock volatility.

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 since the Lagged Dependent Variables (LDV) would be correlated with the Composite Error Term (CET) by construction (Baltagi 2005). We thus employ the Generalized Method of Moment (GMM). However, in deciding between Differenced- or System GMM that would be employed, we follow standard procedure developed by Stephen Bond (Roodman 2009)**. The rules of thumb are critically deciding the selection between Difference- or System GMM in which utilizes the first order LDV's coefficient of Difference-GMM (δ_{FD-GMM}), Pooled Least Square (δ_{PLS}), and Fixed Effect (δ_{FE}). The estimated δ_{PLS} is considered to be biased upwards, while estimated value the of δ_{FE} is considered to be biased downwards (Bond 2002). When the estimated value of δ_{FD-GMM} lies below or closer to δ_{FE} than to δ_{PLS}, System GMM is suitable for estimation, *vice versa* (Roodman 2009).**

Table 1
Estimated LDVs' Coefficient

	First Model Estimate	Second Model Estimate
Pooled Least Square (δ_{PLS})	.5632988	.6417423
Fixed Effect (δ_{FE})	.3171388	.6030496
Difference GMM (δ_{FD-GMM})	**.2214667**	**.6123579**
	$\delta_{FD-GMM} < \delta_{FE} < \delta_{PLS}$	$\delta_{FE} < \delta_{FD-GMM} \ll \delta_{PLS}$

From the table (1) we obtained the estimated values of δ_{FD-GMM}, δ_{PLS}, and δ_{FE} for the first and second model estimates. For the first model estimate, we could see that δ_{FD-GMM} lies below the δ_{FE} and δ_{PLS} ($\delta_{FD-GMM} < \delta_{FE} < \delta_{PLS}$). In this case, therefore, System GMM is suitable for estimating the first model estimate. For the second one, the estimated value of δ_{FD-GMM} is greater than δ_{FE} and relatively closer to the δ_{PLS}. Therefore, estimation using Differenced GMM is more suitable for the second model estimate.

4. Results

This section elucidates the estimation results and its discussion. 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

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4. Results

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4. 1. Estimation Result

We begin by exploring the empirical relationship between inflation rates and monetary policy credibility under the procyclical (countercyclical) fiscal policy **(model 1)**. The result shows a positive net-effect of monetary policy credibility on inflation rates by which formed by significant positive primary-effect and insignificant augmented-effect. It implies that the cyclicality behavior of fiscal policy does not affect the outcomes of monetary credibility on inflation rate reduction. In other words, it suggests that inflation remains low along with a more credible monetary policy, irrespective of the cyclicality behavior of fiscal policy. However, we also found that actual inflation has not driven by the one-year lagged inflation. It indicates the flexibility of price changing.

Table 2
Estimation Results

	Model Estimates	
	Dependent Variable: Inflation	**Dependent Variable: Stock Volatility**
Inflation (-1)	.1861313	
	(.1166045)	
Stock Volatility (-1)		.6375642***
		(.0474052)
Monetary Credibility	.035003***	49.70852
	(..0100785)	(39.71373)
Monetary Credibility × Fiscal Cyclicality	-.0409745	-46.04614
	(.0364007)	(52.99603)
Trade Openness		-9.095279
		(8.427782)
Money Growth	.0012769***	
	(.0003429)	
Real Effective Exchange Rates	-.0006093***	-.1532608***
	(.0001795)	(.0513636)
Unemployment Rate	-.0018963	
	(.0441323)	
Public Debt	-.0001354**	-.0743615**
	(.000054)	(.0355918)
Constant	.0823579	
	(.0200451)	
Serial Correlation ($\bar{\chi}$-Prob.)	0.256	0.014
Hansen Test (Chi-squared Prob.)	0.108	0.061
Wald-Stat (5)	148.44***	320.11***
Number of Instruments	21	18
Number of Observation	341	301
Number of Group (Countries)	25	24
Estimator	System GMM	FD-GMM

Notes: (1) and (2) represent the results of the first, second, and third model estimates. Stars denote statistical significance *, **, dan *** at 10 percent, 5 percent, and 1 percent, respectively. Numbers in the parentheses, ( ), represent Windmeijer standard error. Those two estimations show no serial correlation (represented by $\bar{\chi}$-*prob.* of serial correlation) with valid instruments (insignificant chi-squared probability of Hansen Test). We instrument all independent variables as we assume that each model is with strictly exogenous independent variables and a single-equation.

A significant effect of money growth on the inflation rate with positive sign thereby indicates that the higher the growth of money, the higher 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 confirms the exchange rates pass-through hypothesis (see Taylor 2000). A significantly negative effect of public debt by which indicates that increases in public debt irregularly reduce inflation rates. A significant effect of public debt on the inflation rate with a negative sign on the parameter indicates that an increase in public debt reduces inflation rates. Higher public debt potentially reduces the incentive to accumulate public debt and prioritizing fiscal sustainability instead (Park 2012).

Finally, we wrap up the estimations by scrutinizing the empirical relationship between monetary policy credibility and financial stability under the procyclical (countercyclical) fiscal policy. The estimation output shows that the credible monetary policy and its interaction term with fiscal cyclicality are empirically insignificant. **It implies that monetary credibility would not exacerbate financial stability.** On the other hand, it contrasts the existing literature that found the trade-off between monetary credibility and financial stability (e.g., Rajan 2005; Gambacorta 2009; Kim and Mehrotra 2015; Shukayev and Ueberfeldt 2018; Fouejieu, Popescu, and Vilieu 2019). However, the second model estimate seems problematic since it contains serial correlation problems and relatively weak instrument variables. In this regard, therefore, we employ several robustness strategies to obtain convincing shreds of evidence.

4. 2. Robustness Checks

In order to ensure robust estimations, we employ estimation consistency checking with different variable measurements. First, expected inflation in which component of monetary credibility (CMP) measurement, would be estimated using the Hodrick-Prescott Filter (HP-Filter). Correia, Neves, and Rebelo (1995) explain that the backward-forward model estimation of HP Filter makes it well-performed to measure an approximate value of expected inflation rates. Besides, we also define monetary credibility as the absolute gap between actual inflation and targeted inflation by the central bank (see Warjiyo and Juhro 2019). The second strategy to afford robust findings and rationalizations is that we are not only employing a rolling regression for cyclicality behavior of fiscal policy measurement but also rolling correlation with a 20-years window ($\hat{\Gamma}_Z$). It measured the correlation between the cyclical component of both real GDP and government expenditure. Specifically, the measurement of fiscal cyclicality behavior interpreted as follows:

$$\hat{\Gamma}_Z \begin{cases} 1 \geq \hat{\Gamma}_t > 0, for\ procyclical\ fiscal\ policy \\ \hat{\Gamma}_t = 0, for\ acyclical\ fiscal\ policy \\ -1 \leq \hat{\Gamma}_t < 0, for\ countercyclical\ fiscal\ policy \end{cases} \quad (17)$$

For the last robustness check, we strive to scrutinize the consistency estimation for the financial system stability variable as it is problematic to find out "one-size fits all" measurement due to the broad dimension of the system; and hence we operate several financial stability related variables. First, we use the Morgan Stanley Capital International (MSCI) index as a measure of the asset price bubbles (see Fouejieu, Popescu, and Villieu 2019). Second, we also utilize 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 captures the banking system risk-taking behavior (Li and Malone 2016). This strategy is important since it implies that our robustness check on financial system stability comprise not only a test for measurement consistency but also a consistency test if the assumption of financial stability is different from what we define earlier.

Table 3
Correlation Coefficients

	CMP (HP-Filter)	CMP (Backward PC)	CMP (Target Inflation Base)	Fiscal Cyclicality (Rolling Regression)	Fiscal Cyclicality (Rolling Correlation)	Stock Price Volatility	MSCI Index	Bank Z-score
CMP (HP-Filter)	1							
CMP (Backward PC)	0.1928	1						
CMP (Target Inflation)	0.7645	0.3324	1					
Fiscal Cyclicality (Rolling Regression)								

For the last robustness check, we strive to scrutinize the consistency estimation for the financial system stability variable as it is problematic to find out "one-size fits all" measurement due to the broad dimension of the system; and hence we operate several financial stability related variables. First, we use the Morgan Stanley Capital International (MSCI) index as a measure of the asset price bubbles (see Fouejieu, Popescu, and Villieu 2019). Second, we also utilize 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 captures the banking system risk-taking behavior (Li and Malone 2016). This strategy is important since it implies that our robustness check on financial system stability comprise not only a test for measurement consistency but also a consistency test if the assumption of financial stability is different from what we define earlier.

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CMP (Backward PC)	0.1928	1						
CMP (Target Inflation)	0.7645	0.3324	1					
Fiscal Cyclicality (Rolling Regression)				1				
Fiscal Cyclicality (Rolling Correlation)				0.8467	1			
Stock Price Volatility						1		
MSCI Index						0.2079	1	
Bank Z-score						-0.2178	-0.1387	1

First, we explore the correlation between the main variables (see table 3). The correlation analyses show that, for the monetary credibility variables, all the variables are correlated positively. The CMP HP-filter is strongly correlated with inflation-target-based CMP but weakly correlated with the backward-Phillips-style CMP. While the backward-Phillips-style CMP moderately correlated with the inflation-target-based CMP. These imply that the variation value amongst the CMP measurement, although it all has the same direction, meaning that the higher CMP implies less credible monetary policy, *vice versa*. For the fiscal cyclicality variables, we found that both regression and correlation approach measurements are strongly correlated. Finally, we examine the correlation between financial stability variables, i.e., stock price volatility, MSCI Index, and bank z-score. Generally speaking, those variables relatively have a weak correlation. The stock volatility has a negative correlation with the bank z-score since the higher bank z-score means a lower banking risk. The weakest correlation exhibited by the relationship between bank -score and MSCI Index. This suggests that it is hard to define financial stability simply with one measurement as the broad meaning of the system. Through this robustness test, therefore, we encompass the examination of a different approach that defines financial stability.

We employ 22 estimations for a robustness test that combines various variable measurement approaches (see table 5 in Appendix B). Based on the rule of thumb for GMM estimator selection, we mostly use the system GMM (see table 4 in Appendix B). First. our robustness test shows that the role of monetary credibility in lowering inflation is empirically robust. From five estimations, we found that four estimations indicate that the lower CMP (i.e., credible monetary policy), the lower inflation rates. While the interaction term between monetary credibility and fiscal cyclicality empirically insignificant. This finding suggests that fiscal cyclicality would not disrupt the advantage of monetary credibility in lowering the inflation rates.

For the examination of financial stability, however, we found that both monetary credibility and the interaction term do not significantly affect financial stability. However, this is an important finding. Although existing literature that emphasises the role of monetary credibility in causing financial instability (e.g., Rajan 2005; Gambacorta 2009; Kim and Mehrotra 2015; Shukayev and Ueberfeldt 2018; Fouejieu, Popescu, and Villieu 2019), our result demonstrates that the impact of monetary credibility on financial stability is robustly inconclusive. While the robustness test estimatios for financial stability indicates a self-driven effect in which lagged dependent variable robustly significant. Therefore, our results show that monetary credibility is not the driver for financial instability, although effectively lower the inflation rates.

5. Concluding Remarks

This paper aims to examine the role of monetary credibility and fiscal cyclicality in generating the tradeoff between inflation rates and financial stability. We thus systematically develop simple models to shape the rationalisation framework in which demonstrates the role of fiscal cyclicality behaviour in arousing a tradeoff for the monetary policy to target low inflation rates and stable financial system at once. 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 deteriorated, it would effectively ensure financial stability but not the lower inflation rates.

However, our hypotheses are not empirically proved. In summary, table (4) summarise our findings. It portrays the outcomes (i.e., inflation rates and financial stability) of the combination of monetary policy credibility and fiscal policy cyclicality behaviour. First, our results demonstrate that the combination of credible monetary and procyclical fiscal policy lower the inflation rates, but not induces the financial instability. **It contrasts to our hypothesis that a combination of credible monetary policy and procyclical fiscal policy would generate the lower inflation rates at the expense of financial stability.** Second, our findings also illustrate that the combination of credible monetary policy and countercyclical fiscal policy also lower the inflation rates. This finding proves our third proposition (see proposition 3). **Although pro-cyclical fiscal policy would initially deteriorate the credibility of monetary policy by generating a gap between targeted, actual, and expected inflation rates, the monetary authority would 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.**

This paper aims to examine the role of monetary credibility and fiscal cyclicality in generating the tradeoff between inflation rates and financial stability. We thus systematically develop simple models to shape the rationalisation framework in which demonstrates the role of fiscal cyclicality behaviour in arousing a tradeoff for the monetary policy to target low inflation rates and stable financial system at once. 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 deteriorated, it would effectively ensure financial stability but not the lower inflation rates.

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Table 4
Fiscal Policy and the Monetary Policy Credibility's Outcomes Towards Inflation and Financial Stability

{Inflation; Financial Stability}

		Fiscal Policy	
		Procyclical	**Countercyclical**
Monetary Policy	**Credible**	Low; Inconclusive	Low; Inconclusive
	Non-Credible	High; Inconclusive	

Finally, as exhibited in the table (4), the combination of credible monetary policy and procyclical fiscal policy would not exacerbate financial stability. This paper found that the indirect role of fiscal cyclicality on financial stability is empirically weak. However, our findings remark that the impact of monetary credibility on financial stability is inconclusive. It can be happened by the various potential impact of monetary credibility on financial stability, either stabilise, neutral, or destabilise. One strand of literature emphasises that credible monetary policy would destabilise the financial system stability (e.g., Rajan 2005; Gambacorta 2009; Kim and Mehrotra 2015; Shukayev and Ueberfeldt 2018; Fouejieu, Popescu, and Villieu 2019). However, monetary policy also could stabilise the financial system. The major rationale of why credible monetary policy would not be inducing the financial instability is policy predictability. The over-heated financial sector activity would be transmitted to the inflation rates via wealth effect (see Fouejieu, Popescu, and Villieu 2019). Thus, in turn, the monetary authority would mitigate the wealth effect impact on inflation rates by increasing the interest rates. As we know, higher interest rates mean a higher risk (Dell'Ariccia, Laeven, and Marquez 2014), thus the financial agent would muffle their activity in potential investment lost due to higher interest rates. Eventually, the more predictable monetary policy becomes one of the foremost signals to the financial market agent; hence a credible monetary policy would effectively lower inflation rates and mitigate financial over-boomed activities while the monetary credibility and fiscal cyclicality may also have no role in financial stability when the financial sector activities are a self-dr iven.

Therefore, by technically utilizing GMM and comprehensive robustness checks, it thus can be concluded that the more credible monetary policy, the lower inflation rates regardless of the fiscal cyclicality, while the role of credible monetary policy and fiscal cyclicality on financial stability is empirically inconclusive.

5. 1. Suggestions for Further Research

There are several empty spaces in this paper. First, this paper excludes the role of macroprudential policy as one of the actors in which assumes a 'leans-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 behavior. Those empty spaces could be satisfied with the more comprehensive construction, such as a game-theoretical framework, so on, and so forth.

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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

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Cyclicality Behavior of Fiscal Policy	Correlation between cyclical components of government expenditure and real GDP. Regression between cyclical components of real GDP with respect to cyclical components of government expenditure.	$\hat{\sigma}^2_{\widehat{Y}\widehat{G}}(n) = \frac{1}{n-1}\sum_{i=1}^{n}(y_{1i}-\widehat{\mu}_{\widehat{Y}}(n))(y_{2i}-\widehat{\mu}_{\widehat{G}}(n))$; $\hat{\rho}_{\widehat{Y}\widehat{G}}(n) = \frac{\hat{\sigma}^2_{\widehat{Y}\widehat{G}}(n)}{\hat{\sigma}^2_{\widehat{Y}}(n) \times \hat{\sigma}^2_{\widehat{G}}(n)}$; The rolling correlation coefficient (20 years window) $\tau_t^i = \alpha_i + \beta_i \gamma_t^i + \varepsilon_t$, The rolling regression coefficient (20 years window)	World Bank Data, Penn World Table
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 Stenley Capital International Index	Index	Bloomberg
Bank Z-score	The default probability of the Banking sector	Index	Global Financial Development Indicators
Unemployment Rate	Unemployment to Labor Force Ratio.	Percentage	World Economic Outlook

Appendix B. Robustness Test Estimations

Table 5
Estimator Selection for Robustness Checks

	Variable Combinations		δ_{PLS}	δ_{FE}	δ_{FD-GMM}	Estimator Selection	No
CMP (HP-Filter)	Fiscal Cyclicality (Rolling Regression)	Inflation Rates	.5685337	.2965623	.1962958	System GMM	(1)
	Fiscal Cyclicality (Rolling Correlation)		.5715414	.3440067	.2510438	System GMM	(2)
CMP (Target Inflation)	Fiscal Cyclicality (Rolling Regression)	Inflation Rates	.4800608	.2226913	.296512	System GMM	(3)
	Fiscal Cyclicality (Rolling Correlation)		.4904	.2414336	.3353058	System GMM	(4)
CMP (Backward Phillips Curve)	Fiscal Cyclicality (Rolling Correlation)	Inflation Rates	.5660908	.2414336	.2180608	System GMM	(5)

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CMP (Backward Phillips Curve)	Fiscal Cyclicality (Rolling Correlation)	Inflation Rates	.5660908	.2414336	.2180608	System GMM	(5)
CMP (HP-Filter)	Fiscal Cyclicality (Rolling Regression)	Stock Price Volatility	.5743819	.4791726	.585641	Diff-GMM	(6)
		MSCI Index	.8898372	-.2129971	-.221106	System GMM	(7)
		Bank Z-score	.9172721	.2880967	.3519971	System GMM	(8)
	Fiscal Cyclicality (Rolling Correlation)	Stock Price Volatility	.5730945	.4844711	.5929925	Diff-GMM	(9)
		MSCI Index	.8705414	-.2493745	-.2595465	System GMM	(10)
		Bank Z-score	.9131476	.2904428	.3597646	System GMM	(11)
CMP (Target Inflation)	Fiscal Cyclicality (Rolling Regression)	Stock Price Volatility	.6779525	.5752592	.5904581	System GMM	(12)
		MSCI Index	.8709964	-.3661545	-.3663554	System GMM	(13)
		Bank Z-score	.9009344	.272782	.3034565	System GMM	(14)
	Fiscal Cyclicality (Rolling Correlation)	Stock Price Volatility	.6786673	.5712177	.5879271	System GMM	(15)
		MSCI Index	.8538441	-.3659896	-.3661496	System GMM	(16)
		Bank Z-score	.9048147	.2712191	.2964842	System GMM	(17)
CMP (Backward Phillips Curve)	Fiscal Cyclicality (Rolling Regression)	MSCI Index	.6013967	-.1538404	-.4620121	System GMM	(18)
		Bank Z-score	.9237517	.2759005	.313381	System GMM	(19)
	Fiscal Cyclicality (Rolling Correlation)	Stock Price Volatility	.6031414	.4940704	.6345261	Diff-GMM	(20)
		MSCI Index	.1013874	-.1590937	-.1639219	System GMM	(21)
		Bank Z-score	.9237792	.288805	.3290157	System GMM	(22)

Notes: Table (5) shows the results for GMM estimator selection. The rules of thumb are critically deciding the selection between Difference- or System GMM in which utilizes the first order LDV's coefficient of Difference-GMM (δ_{FD-GMM}), Pooled Least Square (δ_{PLS}), and Fixed Effect (δ_{FE}). The estimated δ_{PLS} is considered to be biased upwards, while estimated value the of δ_{FE} is considered to be biased downwards (Bond 2002). When the estimated value of δ_{FD-GMM} lies below or closer to δ_{FE} than to δ_{PLS}, System GMM is suitable for estimation, *vice versa* (Roodman 2009).

Table 6

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Table 6
Robustness Check Estimations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Inflation (-1)	.1151723 (.1080789)	.1661463 (.1136786)	.355563*** (.0832793)	.380169*** (.0928975)	.1930638* (.1164458)			
Stock Volatility (-1)						.585641*** (.0360393)		
MSCI (-1)							.4583961*** (.0696368)	
Bank Z-score (-1)								.3693287 (.2977206)
Monetary Credibility (HP-Filter)	.189431*** (.0717202)	.0481322 (.0597511)				73.68911 (-3.860479)	.55161** (.273004)	-16.48531 (27.56051)
Monetary Credibility (Target Inflation)			1.035659*** (.1636926)	.886655*** (.154974)				
Monetary Credibility (Backward-Phillips)					.0384936*** (.0109615)			
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Correlation)		.3615075** (.1655804)						
Monetary Credibility (Target Inflation) × Fiscal Cyclicality (Rolling Correlation)				.1254651 (.2994679)				
Monetary Credibility (Backward-Phillips) × Fiscal Cyclicality (Rolling Correlation)					-.025391* (.0145016)			
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Regression)	.0727115 (.1309639)					-3.860479 (252.4202)	-.7163799* (.4235533)	-8.802333 (36.41416)
Monetary Credibility (Target Inflation) × Fiscal Cyclicality (Rolling Regression)			-.373918 (.7695605)					
Monetary Credibility (Backward-Phillips) × Fiscal Cyclicality (Rolling Regression)								
Trade Openness						-10.34142 (7.789426)	-.026919 (.0244826)	-5.516071 (4.611552)
Money Growth	.0012045*** (.0003174)	.0011093*** (.0003228)	.0004687** (.0002093)	.00045** (.0002061)	.0012558*** (.0003459)			
Real Effective Exchange Rates	-.0006311*** (.0001699)	-.0005635*** (.000156)	-.0002946** (.0001302)	-.0002413** (.0001297)	-.000612*** (.0001833)	-.1184691*** (.0445191)	-.0001428 (.0001195)	-.0275043 (.0371379)
Unemployment Rate	.0013861 (.0522805)	.0024956 (.0485775)	.0035236 (.0244822)	-.0014456 (.0223983)	-.0054631 (.0430385)			
Public Debt	-.0001462*** (.0000507)	-.0001291*** (.0000418)	-.0000996** (.0000393)	-.0000885*** (.0000265)	-.000136** (.0000573)	-.0525308* (.0269908)	-.0001487 (.0001264)	.026472 (.0439433)
Constant	.084406 (.0196644)	.0761532 (.0178055)	.0381895 (.0141701)	.0328324 (.0140682)	.0828307 (.0204109)		.038146 (.0339263)	12.51702 (6.657739)
Serial Correlation (χ^2-Prob.)	0.233	0.321	0.138	0.244	0.236	0.017	0.319	0.079
Hansen Test (Chi-squared Prob.)	0.182	0.149	0.181	0.209	0.105	0.074	0.095	0.143
Wald-Stat (5)	160.35***	280.26***	276.73***	282.17***	135.89***	313.54***	11835.08***	25.66***
Number of Instruments	21	21	21	21	21	18	20	19
Number of Observation	341	341	255	255	341	301	350	325
Number of Group (Countries)	25	25	22	22	25	24	25	25
Estimator	System GMM	System GMM	System GMM	System GMM	System GMM	Diff-GMM	System GMM	System GMM

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Real Effective Exchange Rates	-.0006311*** (.0001699)	-.0005635*** (.000156)	-.0002946** (.0001302)	-.0002413** (.0001297)	-.000612*** (.0001833)	-.1184691*** (.0445191)	-.0001428 (.0001195)	-.0275043 (.0371379)
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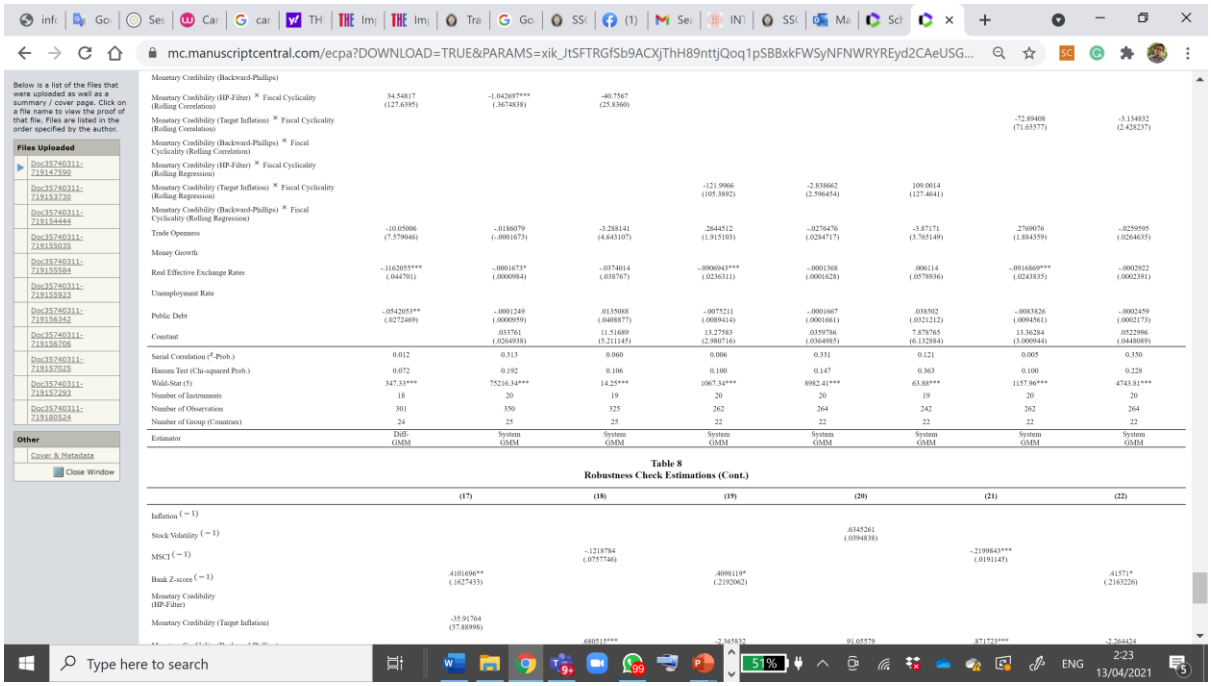
Number of Instruments	21	21	21	21	21	18	20	19
Number of Observation	341	341	255	255	341	301	350	325
Number of Group (Countries)	25	25	22	22	25	24	25	25
Estimator	System GMM	System GMM	System GMM	System GMM	System GMM	Diff-GMM	System GMM	System GMM

Table 7
Robustness Check Estimations (Cont.)

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Inflation (-1)								
Stock Volatility (-1)	.5929925 (.0369287)			.7137078*** (.0306916)			.7128825*** (.02988)	
MSCI (-1)		.5597915*** (.0700003)			.4530592*** (.0460616)			.4068674*** (.0544863)
Bank Z-score (-1)			.4416043** (.2223191)			.4459455*** (.1288408)		
Monetary Credibility (HP-Filter)	56.428 (63.19469)	.7880887*** (.2362766)	2.147491 (13.0813)					
Monetary Credibility (Target Inflation)				71.55204* (40.80733)	1.449086 (1.272966)	-61.67428** (28.6019)	84.36188 (55.81598)	2.555912 (1.937766)
Monetary Credibility (Backward-Phillips)								
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Correlation)	34.54817 (127.6395)	-1.042697*** (.3674838)	-40.7567 (25.8360)					
Monetary Credibility (Target Inflation) × Fiscal Cyclicality (Rolling Correlation)							-72.89408 (71.65577)	-3.134832 (2.428237)
Monetary Credibility (Backward-Phillips) × Fiscal Cyclicality (Rolling Correlation)								
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Regression)								
Monetary Credibility (Target Inflation) × Fiscal Cyclicality (Rolling Regression)				-121.9966 (105.3892)	-2.838662 (2.596454)	109.0014 (127.4641)		
Monetary Credibility (Backward-Phillips) × Fiscal Cyclicality (Rolling Regression)								
Trade Openness	-10.05006 (7.579046)	-.0186079 (-.0001673)	-3.288141 (4.643107)	.2644512 (1.915103)	-.0276476 (.0284717)	-3.87171 (3.765149)	.2769076 (1.884359)	-.0259595 (.0264635)
Money Growth								



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Monetary Credibility (Backward-Phillips)								
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Correlation)	34.54817 (127.6395)	-1.042697*** (.3674838)	-40.7567 (25.8360)					
Monetary Credibility (Target Inflation) × Fiscal Cyclicality (Rolling Correlation)							-72.89408 (71.65577)	-3.134832 (2.428237)
Monetary Credibility (Backward-Phillips) × Fiscal Cyclicality (Rolling Correlation)								
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Regression)								
Monetary Credibility (Target Inflation) × Fiscal Cyclicality (Rolling Regression)				-121.9966 (105.3892)	-2.838662 (2.596454)	109.0014 (127.4641)		
Monetary Credibility (Backward-Phillips) × Fiscal Cyclicality (Rolling Regression)								
Trade Openness	-10.05006 (7.579046)	-.0186079 (.0001673)	-3.288141 (4.643107)	.2644512 (1.915103)	-.0276476 (.0284717)	-3.87171 (3.765149)	.2769076 (1.884359)	-.0259595 (.0264635)
Money Growth								
Real Effective Exchange Rates	-.1162055*** (.044701)	-.0001673* (.0000984)	-.0374014 (.038767)	-.0906943*** (.0236311)	-.0001368 (.0001628)	.006114 (.0578936)	-.0916869*** (.0243835)	-.0002922 (.0002391)
Unemployment Rate								
Public Debt	-.0542053** (.0272469)	-.0001249 (.0000959)	.0135088 (.0408877)	-.0075211 (.0089414)	-.0001667 (.0001661)	.038502 (.0321212)	-.0083826 (.0094561)	-.0002459 (.0002173)
Constant		.033761 (.0264938)	11.51689 (5.211145)	13.27583 (2.980716)	.0359786 (.0364985)	7.878765 (6.132884)	13.36284 (3.000944)	.0522996 (.0448089)
Serial Correlation (χ^2-Prob.)	0.012	0.313	0.060	0.006	0.331	0.121	0.005	0.350
Hansen Test (Chi-squared Prob.)	0.072	0.192	0.106	0.100	0.147	0.363	0.100	0.228
Wald-Stat (5)	347.33***	75216.34***	14.25***	1067.34***	8982.41***	63.88***	1157.96***	4743.81***
Number of Instruments	18	20	19	20	20	19	20	20
Number of Observation	301	350	325	262	264	242	262	264
Number of Group (Countries)	24	25	25	22	22	22	22	22
Estimator	Diff-GMM	System GMM	System GMM	System GMM	System GMM	System GMM	System GMM	System GMM

Table 8
Robustness Check Estimations (Cont.)

	(17)	(18)	(19)	(20)	(21)	(22)
Inflation (-1)						
Stock Volatility (-1)				.6345261 (.0394838)		
MSCI (-1)		-.1218784 (.0757746)			-.2199843*** (.0191145)	
Bank Z-score (-1)	.4101696** (.1627433)		.4098119* (.2192062)			.41571* (.2163226)
Monetary Credibility (HP-Filter)						
Monetary Credibility (Target Inflation)	-35.91764 (37.88998)					
Monetary Credibility (Backward-Phillips)		.680515*** (.22345)	-2.365832 (2.768966)	91.05579 (56.31462)	.871723*** (.0559297)	-2.264424 (1.781357)
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Correlation)	.1233256 (73.24986)					
Monetary Credibility (Target Inflation) × Fiscal Cyclicality (Rolling Correlation)						
Monetary Credibility (Backward-Phillips) × Fiscal Cyclicality (Rolling Correlation)				-106.9841* (60.20992)	-.9378477*** (.0600361)	1.800333 (2.397058)
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Regression)						
Monetary Credibility (Target Inflation) × Fiscal Cyclicality (Rolling Regression)						
Monetary Credibility (Backward-Phillips) × Fiscal Cyclicality (Rolling Regression)		-1.400819** (.559179)	3.311494 (8.242095)			
Trade Openness	-3.825095 (3.175609)	.0328576 (.0213088)	-5.804255 (3.81637)	-.7.357433 (9.330561)	-.0003367 (.0111884)	-5.631753 (3.886811)
Money Growth						
Real Effective Exchange Rates	.0003135 (.0481607)	.0001749 (.000243)	-.0389234 (.0356007)	-.1538543*** (.0519987)	.0000989 (.0002484)	-.0376827 (.03586)
Unemployment Rate						
Public Debt	.0407978 (.0321265)	-.0001548 (.0001394)	.0227526 (.0427816)	-.07660065** (.0364582)	-.0000108 (.0000486)	.0221612 (.0420777)
Constant	8.239772 (5.387295)	-.0387684 (.0321112)	12.75614 (4.820543)		-.0224872 (.0268464)	12.49747 (4.953419)
Serial Correlation (χ^2-Prob.)	0.123	0.355	0.072	0.022	0.355	0.074
Hansen Test (Chi-squared Prob.)	0.594	0.205	0.307	0.057	0.102	0.298
Wald-Stat (5)	40.03***	2658.39***	14.85***	409.43***	4933.60***	169.14***
Number of Instruments	19	20	19	18	20	19
Number of Observation	242	350	325	301	350	325
Number of Group (Countries)	22	25	25	24	25	25
Estimator	System GMM	System GMM	System GMM	Diff-GMM	System GMM	System GMM

Notes: (1) and (5) represent the results of the first, second, and third model estimates. Stars denote statistical significance *, **, and *** at 10 percent, 5 percent, and 1 percent, respectively. Numbers in the parentheses (.) represent Windmeijer standard error. Please two estimations show no serial correlation represented by p-prob. of serial

A Rejoinder to Comments

Economic Papers Journal (the Economic Society of Australia)

Comments	Responses
Introduction Section	
1. A primary weakness of the paper is its **poor touch with the existing literature.** 2. The paper has an **improper introduction**, in the sense that an introductory section should include the background of the study, the research gap, objective, motivation, result, and outline. I suggest that the majority of the introductory section as it is can be recast into a new section on stylized facts.	Revised.
Theoretical Model Section	
1. I would suggest that the authors **review every equation** and whether they are necessary. 2. The theoretical model section seems **too long** at present for the material covered. 3. At least one of the propositions **is redundant**. Proposition 4 is assumed in the text immediately above it. As the propositions aren't proved, moving away from this format seems desirable. If they are maintained, some of them need to be re-worded so as to be clearer (e.g., Propositions 5 and 6).	1. After we reviewed the necessities of our equations, we recognized that the equations are elaborated too long. We exclude the following equations: 4, 5, 10, and 13. 2. We have revised our propositions to be more efficient and clearer-stated. 3. Proposition 4 is removed as we recently aware that it was inconsistent with the model specification and results' interpretation (proposition 4 as reviewers have mentioned).
4. The authors need to **use the model to demonstrate how it supports their argument better.** *For example, is it possible to show the effect of fiscal policy being set in a different way through simulations? In other words, can estimates for selected countries be obtained of how GDP growth would have evolved with* ***counter-cyclical fiscal policy****?*	1. Our theoretical model is aimed to elaborate our rational transmission to explain how procyclical fiscal policy may play an important role in determining the outcome of the credible monetary policy, especially on inflation, growth and financial stability. Thus, model simulations possibly would not be conducted in this regard. 2. But we extend our rational demonstration to the explanation of countercyclical fiscal policy (section II.3).
Empirical Section: ***needs to be documented better.***	
1. The **frequency of the data is not clear.** It should be stated at the beginning of Section 3.	We make several fundamental changes in the empirical-related aspect. First, we redefine our observations as we realized that the old one was problematic. We use unbalance panel data comprise of 25 ITF countries from 2003 to 2017 – ITF country list is obtained from Hammond (2012).
2. The reason for using System GMM **is not explained.** 3. The instruments used **need to be stated**, and what they are instrumenting for. 4. **Are fixed effects included?** Is this, together with the lag, why system GMM is used? For a macro **panel 2SLS** may be preferred, as one can get a lot of instruments with GMM, some of which are weak. ***See Judson and Owen (1999).*** Your tables seem to suggest a large number of instruments are being used.	1. We employ the *collapse* command developed by Roodman (2009) in which anticipates huge number of instrumental variables. 2. We also follow the estimator selection developed by Bond (2002).
5. The **notation needs to be clearer** about whether the level or growth rates of variables are being used.	*Revised.*
Data and Variables	
1. In constructing variables, **the Hodrick-Prescott filter is used.** An example is the trend is used to proxy inflation expectations. As the Hodrick-Prescott filter is a two-sided filter this will introduce leads into your regressions, **which is problematic**. Using a **survey measure of inflation expectations would be preferable**, although I realize there may be data limitations for some countries in your panel.	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, Marco, and Giuliana 2013) The HP-Filter used only for robustness test.
2. Databases of **financial crises exist** ***(e.g. Laeven and Valencia 2018)***. These could be **compared to the results from your timing.**	We have seen the paper, but it simply captured the banking and systemic crises. Whereas we focus on examining the financial instability in which, to some extent, different with the banking crises.
3. Why focus on the volatility of stock prices, rather than their level? Stock price misalignment conceptually is closer to the level of prices being high,	We use the annual stock price volatility index in which obtained from average 360-day stock volatility. Stock volatility is measured by the average standard deviation of the stock market

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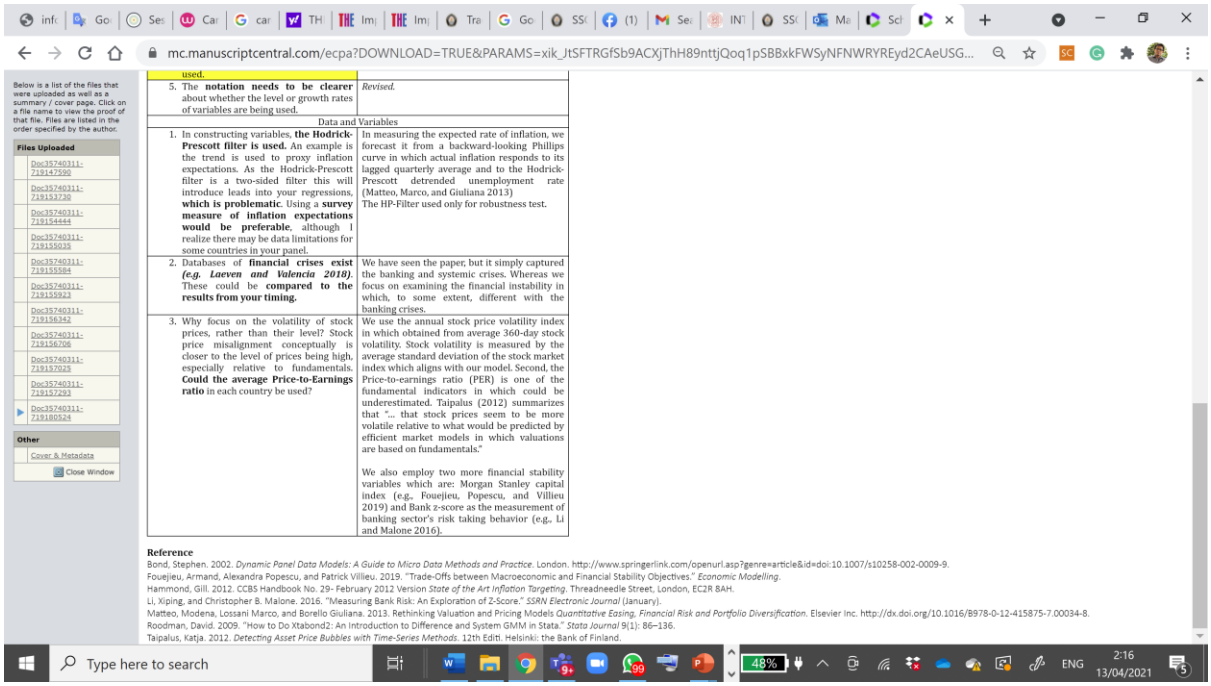

used.

5. The **notation needs to be clearer** about whether the level or growth rates of variables are being used.	*Revised.*
Data and Variables	
1. In constructing variables, **the Hodrick-Prescott filter is used.** An example is the trend is used to proxy inflation expectations. As the Hodrick-Prescott filter is a two-sided filter this will introduce leads into your regressions, **which is problematic**. Using a **survey measure of inflation expectations would be preferable**, although I realize there may be data limitations for some countries in your panel.	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, Marco, and Giuliana 2013) The HP-Filter used only for robustness test.
2. Databases of **financial crises exist *(e.g. Laeven and Valencia 2018)***. These could be **compared to the results from your timing.**	We have seen the paper, but it simply captured the banking and systemic crises. Whereas we focus on examining the financial instability in which, to some extent, different with the banking crises.
3. Why focus on the volatility of stock prices, rather than their level? Stock price misalignment conceptually is closer to the level of prices being high, especially relative to fundamentals. **Could the average Price-to-Earnings ratio** in each country be used?	We use the annual stock price volatility index in which obtained from average 360-day stock volatility. Stock volatility is measured by the average standard deviation of the stock market index which aligns with our model. Second, the Price-to-earnings ratio (PER) is one of the fundamental indicators in which could be underestimated. Taipalus (2012) summarizes that "... that stock prices seem to be more volatile relative to what would be predicted by efficient market models in which valuations are based on fundamentals." We also employ two more financial stability variables which are: Morgan Stanley capital index (e.g., Fouejieu, Popescu, and Villieu 2019) and Bank z-score as the measurement of banking sector's risk taking behavior (e.g., Li and Malone 2016).

Reference

Bond, Stephen. 2002. *Dynamic Panel Data Models: A Guide to Micro Data Methods and Practice*. London. http://www.springerlink.com/openurl.asp?genre=article&id=doi:10.1007/s10258-002-0009-9.
Fouejieu, Armand, Alexandra Popescu, and Patrick Villieu. 2019. "Trade-Offs between Macroeconomic and Financial Stability Objectives." *Economic Modelling*.
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Li, Xiping, and Christopher B. Malone. 2016. "Measuring Bank Risk: An Exploration of Z-Score." *SSRN Electronic Journal* (January).
Matteo, Modena, Lossani Marco, and Borello Giuliana. 2013. Rethinking Valuation and Pricing Models *Quantitative Easing, Financial Risk and Portfolio Diversification*. Elsevier Inc. http://dx.doi.org/10.1016/B978-0-12-415875-7.00034-8.
Roodman, David. 2009. "How to Do Xtabond2: An Introduction to Difference and System GMM in Stata." *Stata Journal* 9(1): 86–136.
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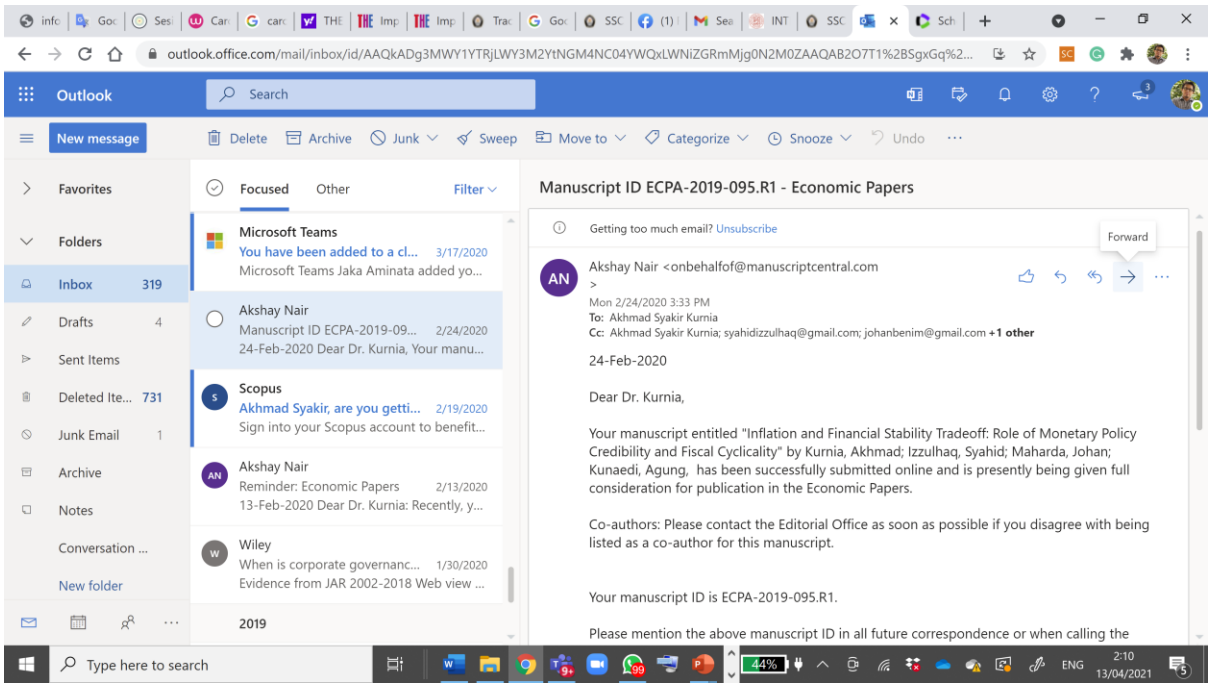
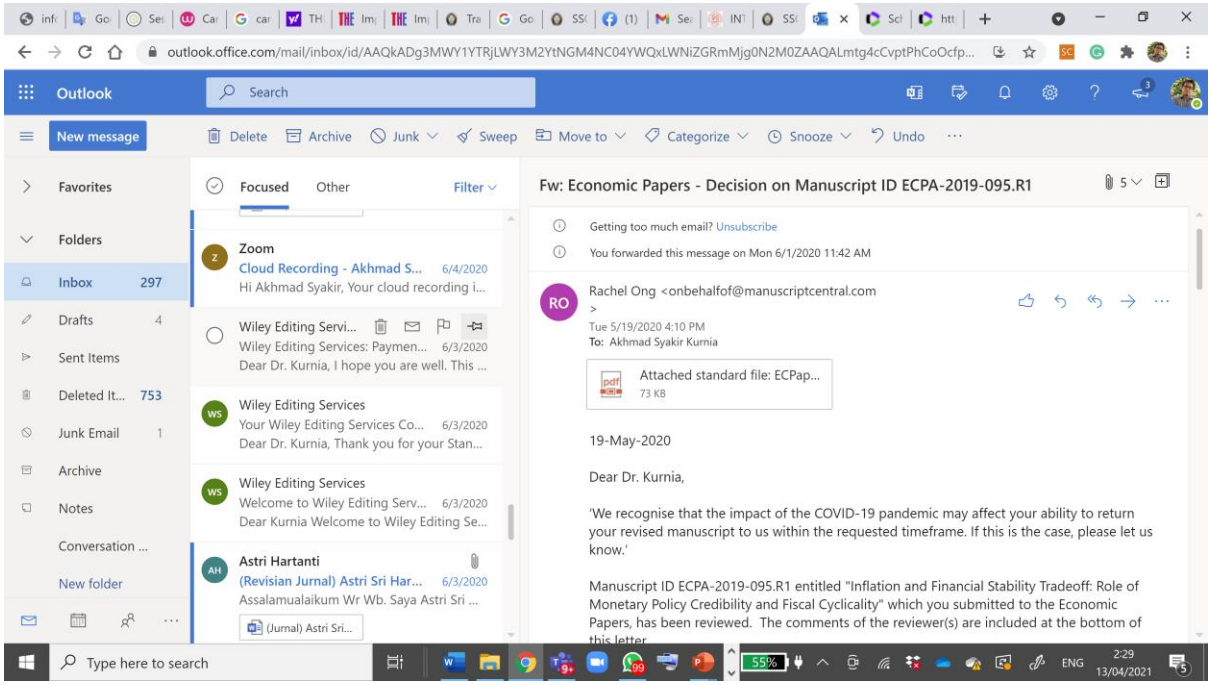
Notification of the second submission after First Revision, February 24 2020



The Decision and The Review of The Second submission, May 19, 2020



Referee Report for "Inflation and Financial Stability Tradeoff: Role of Monetary Policy Credibility and Fiscal Credibility" Revision 1

May 6, 2020

1 Summary

This paper investigates the role of fiscal policy in influencing trade-offs for monetary policy between stabilising inflation and maintaining financial stability.

2 Major Comments

- I thank the authors for their responses to my previous suggestions and the edits they have done. The paper has improved.
- This paper needs to be thoroughly proof-read/edited. Issues such as missing articles and odd phrasing (e.g. "criticism-instinct") detract from the paper. The authors should consider getting it professionally proof read.
- It is not clear how proposition 4, and the sentence immediately above it, follow from the model. The log odds of the asset price bubble bursting are assumed to decrease as the interest rate increases. How does this imply that higher interest rates increase the asset price bubble?
- I still find the use of stock volatility to measure asset price misalignments. While periods of high volatility may follow asset price misalignments, these are different concepts.
  - One option may be to use a test such as Phillips and Shi (2020). This can be implemented using their package in R. Doing this would mean the equation being estimated would have to change (as the dependent variable would be a binary indicator).
  - Alternatively, as mentioned in my previous comments the authors try other measures - e.g. the difference between actual and average Price-to-Earnings (PE) ratio for the major share price index for each country. I realise that the models where prices and earnings co-integrate (e.g. Campbell and Shiller 1989) may not always work, but

extreme PE ratios might still indicate misalignment. The authors do try the MSCI, however, wouldn't it be this de-trended which is the better measure of misalignment?

– If the authors wish to keep with stock volatility the language in their paper should focus on that, or at least financial stability, rather than referring to asset price misalignments. This might involve removing much of the "Financial Instability Model" sub-section.

3 Minor Comments

3.1 The Simple Model

- It could be made explicit that money growth is the instrument of monetary policy here (although later in Figure 4 money demand is introduced).
- In the paragraph above equation 1 it could be made clearer that inflation is now also determined by fiscal policy, and how to interpret γ.
- A sentence could be added to explain how fiscal policy has real effects in this model.
- The authors could note that Equation 3 is a Lucas Surprise Supply curve.
- It is unclear what is meant by "Assuming that time is consistent" in footnote 2 on page 6.

3.2 The Financial Instability Model

- The model includes the expected value of the asset price bubble. How is that determined.
- It could be noted that z is the log odds.
- there is an erroneous reference to Equation (16).
- In Figure 5 it could be made clearer that "Decisions" refer to the decisions of the central bank.

3.3 Empirical results

- Referring to "data", rather than "observation", would be better in the new material in Sub-section 3.1 (page 11).
- The number of decimal places in the tables seem excessive.
- Using a survey-based measure of inflation expectations would strengthen the paper.

- It would be useful to see the results of simple 2SLS (i.e. Anderson and Hsiao 1982) as a reobustness exercise.

- Presumably the robustness tables will be published as an on-line appendix, rather than being included.

4 Reference

Anderson, T.W., and C. Hsiao (1982) "Formulation and Estimation of Dynamic Models Using Panel Data," *Journal of Econometrics*, 18, 47-82.

Phillips, P. C. B. and S. Shi (2020) Real time monitoring of asset markets: Bubbles and crises, *Handbook of Statistics*, H. D. Vinod and C.R. Rao eds., Volume 42, 2, Pages 61-80.

Campbell, J. Y., and R. J. Shiller. (1989) "The Dividend-Price Ratio and Expectations of Future Dividends and Discount Factors." *The Review of Financial Studies*, 1, pp. 195-228.

Third Submission and Responses to The Review: June 27, 2020

A Rejoinder to Comments on

Inflation and Financial Stability Tradeoff: Role of Monetary Policy Credibility and Fiscal Cyclicality"

Economic Papers Journal (the Economic Society of Australia)

We would like to thank the reviewers for the valuable comments that improve this paper. The table below lists our responses to the comments:

Comments	Responses
Major Comments	
This paper needs to be thoroughly proofread/edited. Issues such as missing articles and odd phrasing (e.g., criticism-instinct) detract from the paper. The authors should consider getting it *professionally* proofread.	We sent the paper to the Wiley Editing Service, and got valuable inputs. We have made revisions as advised (the editing certificate is attached).
It is not clear how proposition 4, and the sentence immediately above it, follow from the model. The log odds of the asset price bubble bursting are assumed to decrease as the interest rate increases. How does this imply that higher interest rates increase the asset price bubble?	We restated proposition 4 to be more explicit as it seems inadequate to support our argument: **Proposition 4.** *The higher the increase of 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})*. Since* $\partial\sigma/\partial P_{br} < 0$*, the lower* P_{br} *thus induces the asset price misalignment.*
I still find the use of stock volatility to measure asset price misalignments. While periods of high volatility may follow asset price misalignments, these are different concepts. • One option may be to use a test such as Phillips and Shi (2020). This can be implemented using their package in R. Doing this would mean the equation being estimated would have to change (as the dependent variable would be a binary indicator). • Alternatively, as mentioned in my previous comments the authors try	For the measurement of financial instability (i.e., asset price misalignment), we acknowledged that the concept between stock price volatility and asset price misalignment is different. It is also too costly if we use Phillips and Shi (2020) as we have to meet the deadline. In this regard, therefore, we adopt detrended MSCI estimated using an absolute gap between actual MSCI and its fundamental value.[1] In this regard, therefore, the period of excessive asset price misalignment is identified by widened detrended MSCI.

[1] Fundamental values of MSCI are estimated using Hodrick-Prescott Filter.

other measures - e.g. the difference between actual and average Price-to-Earnings (PE) ratio for the major share price index for each country. I realise that the models where prices and earnings co-integrate (e.g. Campbell and Shiller 1989) may not always work, but extreme PE ratios might still indicate misalignment. The authors do try the MSCI, however, wouldn't it be this detrended which is the better measure of misalignment? • If the authors wish to keep with stock volatility the language in their paper should focus on that, or at least financial stability, rather than referring to asset price misalignments. This might involve removing much of the "Financial Instability Model" sub-section.	Besides, the stock price volatility is no longer being used.
Minor Comments	
"The Simple Model"	
It could be made explicit that money growth is the instrument of monetary policy here (although later in Figure 4 money demand is introduced).	Revised (see page 5, the first paragraph in subsection 2.1).
In the paragraph above equation 1 it could be made clearer that inflation is now also determined by fiscal policy, and how to interpret.	Revised (see page 5, the second paragraph in subsection 2.1).
A sentence could be added to explain how fiscal policy has real effects in this model.	Revised (see page 5, the second paragraph in subsection 2.1).
The authors could note that Equation 3 is a Lucas Surprise Supply curve.	Revised.
It is unclear what is meant by "Assuming that time is consistent" in footnote 2 on page 6.	Revised: "Assuming that monetary policy is time consistent, $k = 1$, which implies targeted output equal to its potential, and the central bank set the targeted inflation rates equals to zero (Blinder 2000)."
"The Financial Stability Model"	
The model includes the expected value of the asset price bubble. How is that determined.	Revised: "… First, the expected value of σ is the expectation adaptive feature that captured the agent's expectation on future σ value based on their specific memory in the past. In other words, it suggests that the bubble is self-driven and could be changing without any connection to fundamental

	factors. For instance, the asset price bubble is thus self-fulfilling when $\partial\sigma_e > 1$ where characterizes the over-optimistic market expectations." (see Page 9)
It could be noted that *z* is the log odds.	Revised.
There is an erroneous reference to Equation (16).	Revised.
In Figure 5 it could be made clearer that "Decisions" refer to the decisions of the central bank.	Revised.
"Empirical Results"	
Referring to "data", rather than "observation", would be better in the new material in Sub-section 3.1 (page 11).	Revised.

Reference

Blinder, Alan S. 2000. "Central-Bank Credibility: Why Do We Care? How Do We Build It?" *American Economic Review* 90(5): 1421–31.

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 and 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.

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, Mittal, and Pandey (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, Popescu, and Villieu (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 rates 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, Schularick, & Taylor (2015) use a large dataset 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 and 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 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 and 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.

Figure 1 is here

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 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 Moments (GMM) method involving 25 selected inflation targeting framework (ITF) countries from 2003 to 2017.

Figure 2 is here

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.

2. Simple Model

The setup 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:

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

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, Reinhart, and Végh (2004), Mcmanus and Ozkan (2015), and Izzulhaq and Kurnia (n.d.) have revealed that the pro-cyclical fiscal policy may affect the inflation rates by 'turning sunny days into scorching infernos'. That is, pro-cyclical expansions in government expenditure excessively boost the aggregate demand, set the economy into the 'over-heated' circumstances, therefore causing the inflation rates to soar.

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:

$$L = a(\pi - \pi^*)^2 + (y - y^*)^2; y^* = k.y^n \quad (2)^1$$

[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).

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.

Figure 3 is here

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

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:

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

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

$$\boldsymbol{L_b = (\Delta\pi_{tar})^2 + [b(\Delta\pi_{exp})]^2; L_b > 0} \tag{6}$$

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

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:

$$L_b = a(\pi - \pi^*)^2 + \left[(1-k)y^n + b(\pi - \pi^e)\right]^2$$
$$L_b = 0 \quad (7)$$

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 of optimal point from point a to point b.

Figure 4 is here

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's 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 and Lowe, 2002). Therefore, we define financial instability as the build-up of asset price 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):

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

where σ, σ_e, P_{br}, $1 - P_{br}$, 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, Popescu, and Villieu, 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:

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

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

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

Based on equation (10), it can be seen that larger the increase (decrease) in interest rates, larger (lower) the probability to default, $(1 - P_{br})$, 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 and Juhro, 2019). In addition, higher interest rates imply higher borrowing costs. Shrunk leverage increases financial risk and consequently exacerbates financial stability (Dell'Ariccia, Laeven, and Marquez, 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 of 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* $\partial\sigma/\partial P_{br} < 0$*, 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 type: procyclical fiscal policy (first nature) and countercyclical fiscal policy (second nature).

Figure 5 is here

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.

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 rate 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.*

Empirical Strategy

2. 4. Data

We construct a dataset covering 25 selected ITF countries[2] (i.e., Argentina[3], Australia, Brazil, Canada, Chile, Colombia, Ghana, Iceland, India[4], Indonesia, Israel, Japan (See Hong, Anand, and Hul (2019)), Mexico, New Zealand, Norway, Peru, Philippines, Poland, Republic of Korea,

[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 September 26, 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.

Romania, South Africa, Sweden, Turkey, the United Kingdom, and the United States[5]) from 2003 until 2017 from various data sources (see Appendix A).

2. 5. Identifying the Technical Definition of Variables

Credibility of Monetary Policy

A growing body of literature suggests numerous technical approaches to define the extent of credible monetary policy. Warjiyo and Juhro (2017) define monetary policy credibility as the deviation of actual and targeted inflation. The larger the deviation of actual inflation from the target, the less credible the monetary policy. Fritsche, Slacalek, and Dovern (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:

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

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, Marco, and Giuliana, 2013).

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, Reinhart, and Végh, 2004).

[5] See FOMC meeting minutes on January 25, 2012: The Federal Reserves (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 percent.

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, Vegh, and Vuletin (2013) have used government spending, whereas Kaminsky, Reinhart, and Végh (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 (Mcmanus and Ozkan 2015; Frankel, Vegh, and Vuletin, 2013). Furthermore, a positive correlation indicates that fiscal policy is procyclical, and *vice versa.* Specifically, the measurement of fiscal cyclicality behaviour is categorised as follows:

$$\hat{\rho}_{12,t}\begin{cases} 1 \geq \hat{\rho}_{12,t} > 0, for\ procyclical\ fiscal\ policy \\ -1 \leq \hat{\rho}_{12,t} < 0, for\ countercyclical\ fiscal\ policy \end{cases} \quad (13)$$

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

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, and so on) 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, Shirakawa, and Shiratsuka (2001), Malkiel (2010), and Fouejieu, Popescu, and Villieu (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.

2. 6. Model Specification

The objective of this paper is 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:

$$\begin{aligned} \pi_{i,t} &= \alpha_0 + \delta_1 \pi_{i,t-1} + \alpha_1 CMP_{i,t} + \alpha_2 (CMP_{i,t} \times FCB_{i,t}) + \gamma \boldsymbol{Z}_{i,t} + u_{i,t} \\ \pi_{i,t} &= \alpha_0 + \delta_1 \pi_{i,t-1} + (\alpha_1 + \alpha_2 FCB_{i,t}) CMP_{i,t} + \gamma \boldsymbol{Z}_{i,t} + u_{i,t} \end{aligned} \tag{14}$$

where π, CMP, FCB, $\gamma \boldsymbol{Z}$ are inflation rate, monetary policy credibility, cyclicality character of fiscal policy, and vector of parameter and controlled variables, respectively. α_1 and $\alpha_2 FCB_{i,t}$ 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:

$$\begin{aligned} \rho_{i,t} &= \alpha_8 + \delta_3 \rho_{i,t-1} + \alpha_9 CMP_{i,t} + \alpha_{10} (CMP_{i,t} \times FCB_{i,t}) + \tau \boldsymbol{Q}_{i,t} + u_{i,t} \\ \rho_{i,t} &= \alpha_8 + \delta_3 \rho_{i,t-1} + (\alpha_9 + \alpha_{10} FCB_{i,t}) CMP_{i,t} + \tau \boldsymbol{Q}_{i,t} + u_{i,t} \end{aligned} \tag{15}$$

where ρ, $\tau \boldsymbol{Q}$, and $(\alpha_9 + \alpha_{10} FCB_{i,t})$ 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 (LDV) would be correlated with the Composite Error Term (CET)

[6] Fundamental values of MSCI are estimated using the Hodrick-Prescott Filter.

by construction (Baltagi, 2005). Thus, we employ the Generalised Method of Moment (GMM). However, in deciding between the Differenced- or 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- or System-GMM, which utilises the first-order LDV coefficient of Difference-GMM (δ_{FD-GMM}), Pooled Least Square (δ_{PLS}), and Fixed Effect (δ_{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 δ_{FD-GMM} lies below or closer to δ_{FE} than to δ_{PLS}, System-GMM is suitable for estimation, and *vice versa* (Roodman, 2009).

Table 1 is here

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

3. 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.

3. 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.

Table 2 is here

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 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).

3. 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-years window ($\hat{\tau}_{,t}$). 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:

$$\hat{\tau}_{,t}\begin{cases} 1 \geq \hat{\tau}_t > 0, for\ procyclical\ fiscal\ policy \\ \hat{\tau}_t = 0, for\ acyclical\ fiscal\ policy \\ -1 \leq \hat{\tau}_t < 0, for\ countercyclical\ fiscal\ policy \end{cases} \tag{16}$$

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 and 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 if the assumption of financial stability is different from what we define earlier.

First, we explore the correlation between the main variables (see Table 4 in appendix B). The correlation analysis shows that the monetary credibility variables are positively correlated with the backward-Phillips-style CMP by 24 percent. 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 Table 5 and 6 in appendix B). Based on the rule of thumb for GMM estimator selection, we mostly use the System-GMM (see Table 7 and 8 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.

4. 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.

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.

Table 3 is here

The pro-cyclical 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, Laeven, and Marquez, 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.

4. 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, and so on.

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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.	$\hat{\sigma}^2_{12,t}(n) = \frac{1}{n-1}\sum_{i=0}^{n}\left(y_{1t} - \widehat{\mu_{1t}}(n)\right)\left(y_{2t} - \widehat{\mu_{2t}}(n)\right)$; $\hat{\rho}_{12,t}(n) = \frac{\hat{\sigma}^2_{12,t}(n)}{\hat{\sigma}^2_{1,t}(n) \times \hat{\sigma}^2_{2,t}(n)}$; The rolling correlation coefficient (20 years window)	World Bank Data, Penn World Table
	Regression between cyclical components of real GDP with respect to cyclical components of government expenditure.	$\tau^c_t = \alpha_t + \beta y^c_t + \varepsilon_t$; The rolling regression coefficient (20 years 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 4
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 5
Robustness Checks (First Model Estimate)

	(1)	(2)	(3)
Inflation (-1)	.1151723 (.1080789)	.1661463 (.1136786)	.1930638* (.1164458)
Monetary Credibility (HP-Filter)	.1894311*** (.0717202)	.0481322 (.0597511)	
Monetary Credibility (Backward-Phillips)			.0384936*** (.0109615)
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Correlation)		.3615075** (.1655804)	
Monetary Credibility (Backward-Phillips) × Fiscal Cyclicality (Rolling Correlation)			-.025391* (.0145016)
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Regression)	.0727115 (.1309639)		
Money Growth	0012045*** (.0003174)	.0011093*** (.0003228)	.0012558*** (.0003439)
Real Effective Exchange Rates	-.0006311*** (.0001699)	-.0005635*** (.000156)	-.000612*** (.0001833)
Unemployment Rate	.0013861 (.0522805)	.0024956 (.0485775)	-.0054631 (.0430383)
Public Debt	-.0001462*** (.0000507)	-.0001291*** (.0000418)	-.000136** (.0000573)
Constant	.084406 (0196644)	.0761532 (.0178055)	.0828307 (.0204109)
Serial Correlation (z-Prob.)	0.233	0.321	0.236

	(1)	(2)	(3)
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

Notes: (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 6
Robustness Checks (Second Model Estimate)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
MSCI (-1)	.156586*** (.0037014)	.2018108*** (.006666)	-.05802*** (.0026377)				
Bank Z-score (-1)				.3693287 (.2977206)	.4416043** (.2223191)	.4098119* (.2192062)	.41571* (.2163226)
Monetary Credibility (HP-Filter)	.0701031** (.0353772)	.1165757*** (.0364783)		-16.48531 (27.56051)	2.147489 (13.08129)		
Monetary Credibility (Backward-Phillips)			.159635*** (.0081241)			-2.365831 (2.768966)	-2.264424 (1.781357)
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Correlation)		-.1987403** (.1009005)			-40.7567 (25.83604)		
Monetary Credibility (Backward-Phillips) × Fiscal Cyclicality (Rolling Correlation)			-.17017*** (.0079215)				1.800333 (2.397058)
Monetary Credibility (HP-Filter) × Fiscal Cyclicality (Rolling Regression)	-.1312682 (.0967996)			-8.80234 (36.41416)			
Monetary Credibility (Backward-Phillips) × Fiscal						3.311493 (8.242095)	

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cyclicality (Rolling Regression)							
Trade Openness	-.0095402 (.0096171)	-.0084825 (.0086766)	-.0002196 (.002315)	-5.516071 (4.611552)	-3.288141 (4.643107)	-5.804255 (3.816372)	-5.631753 (3.886811)
Real Effective Exchange Rates	-.0000298 (.0000351)	-.0000434 (.0000374)	. 0000779 (.0001005)	-.0275043 (.0371379)	-.0374014 (.038767)	-.0389234 (.0356007)	-.0376827 (.0358599)
Public Debt	-.0000556 (.0000549)	-.0000504 (.0000464)	-4.71E-07 (9.90E-06)	.026472 (.0439433)	.0135088 (.0408876)	.0227526 (.0427816)	.0221612 (.0420777)
Constant	.0130698 (.013255)	.0142077 (.0136327)	-.0102504 (.010027)	12.51702 (6.657739)	11.5169 (5.211145)	12.73614 (12.73614)	12.49747 (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

Notes: (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).

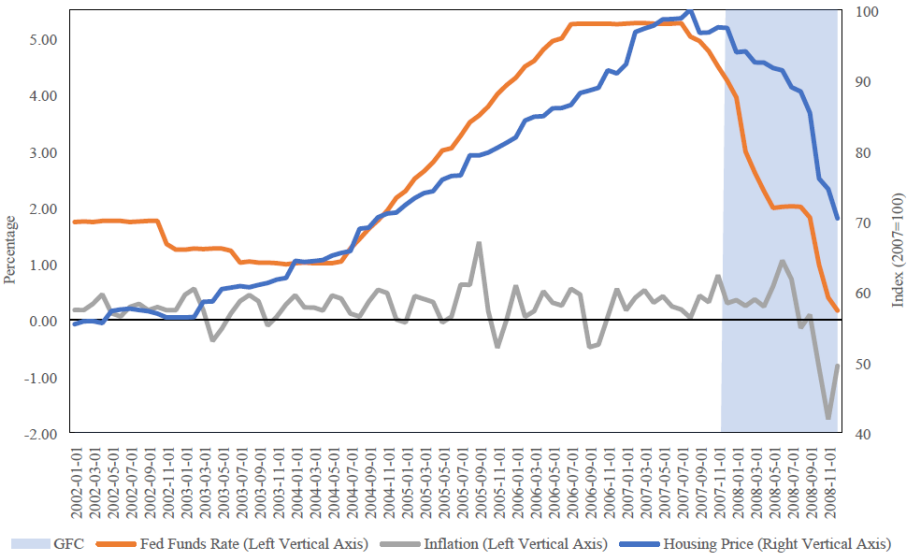
Table 7
GMM Rule of Thumb for Robustness Checks (First Model Estimate)

Variable Combinations			δ_{PLS}	δ_{FE}	δ_{FD-GMM}	Estimator Selection
CMP (HP-Filter)	Fiscal Cyclicality (Rolling Regression)	Inflation Rates	.5685337	.2965623	.1962958	System GMM
	Fiscal Cyclicality (Rolling Correlation)		.5715414	.3440067	.2510438	System GMM
CMP (Backward Phillips Curve)	Fiscal Cyclicality (Rolling Correlation)	Inflation Rates	.5660908	.2414336	.2180608	System GMM

Table 8
GMM Rule of Thumb for Robustness Checks (Second Model Estimate)

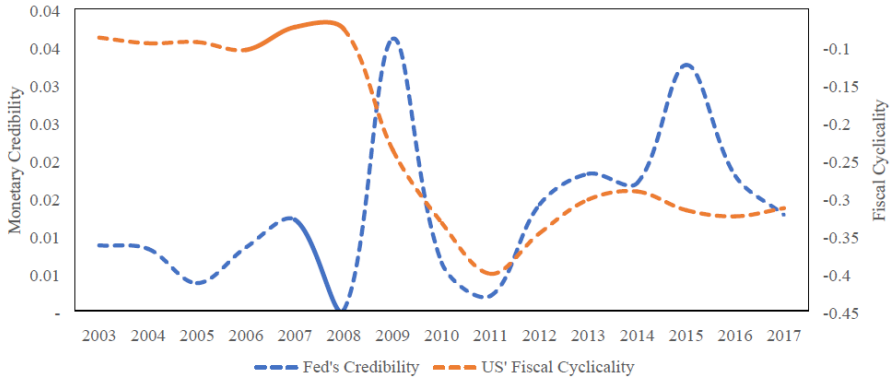
Variable Combinations			δ_{PLS}	δ_{FE}	δ_{FD-GMM}	Estimator Selection
CMP (HP-Filter)	Fiscal Cyclicality (Rolling Regression)	De-trended MSCI	.2108999	-.0506429	-.0496313	System GMM
		Bank Z-score	.9172721	.2880967	.3519971	System GMM
	Fiscal Cyclicality (Rolling Correlation)	De-trended MSCI	.5790135	-.0660833	-.065003	System GMM
		Bank Z-score	.9131476	.2904428	.3597646	System GMM
CMP (Backward Phillips Curve)	Fiscal Cyclicality (Rolling Regression)	Bank Z-score	.9237517	.2759005	.2759005	System GMM
	Fiscal Cyclicality (Rolling Correlation)	De-trended MSCI	.0045335	-.0508041	-.0498093	System GMM
		Bank Z-score	.9237792	.288805	.3200156	System GMM

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).

Figure 2
Credibility of Monetary Policy and Cyclicality Behaviour of Fiscal Policy in the United States (2002–2007)



Source: Authors' calculations.
Notes: 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, and Giuliana, 2013).

Figure 3
Cyclical Behaviour of Fiscal Policy and Rates of Targeted, Actual, and Expected Inflation

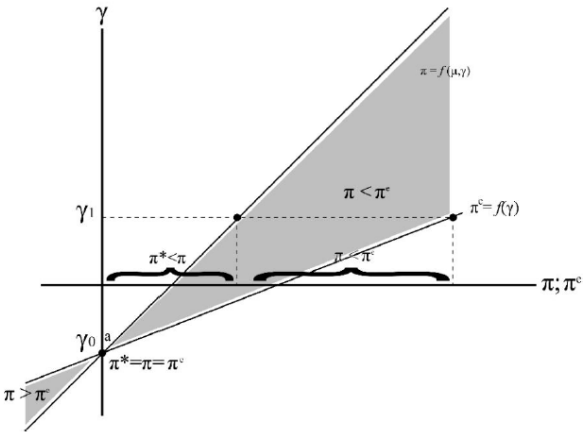


Figure 4
Monetary Policy Response to the Procyclical Fiscal Policy

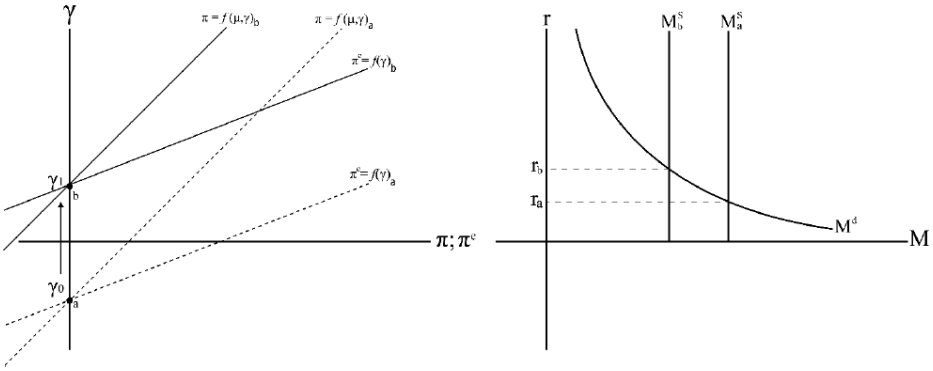
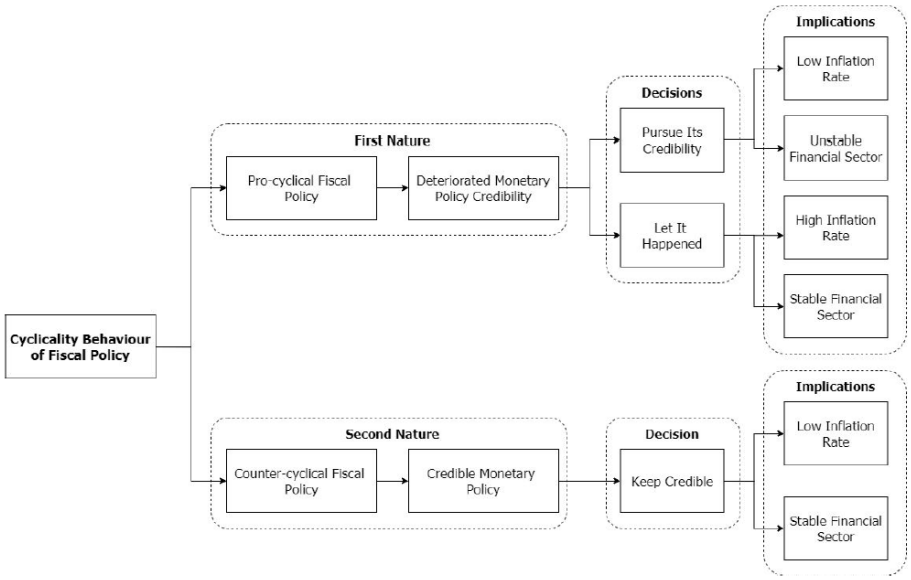


Figure 5
Abstraction Tree of the Channel



Notes: *conceptualised by the authors.*

Table 1
Estimated LDVs' Coefficient

	First Model Estimate	Second Model Estimate
Pooled Least Square (δ_{PLS})	.5632988	.2108999
Fixed Effect (δ_{FE})	.3171388	-.0506429
Difference-GMM (δ_{FD-GMM})	**.2214667**	**-.0496313**
	$\delta_{FD-GMM} < \delta_{FE} < \delta_{PLS}$	$\delta_{FE} \ll \delta_{FD-GMM} < \delta_{PLS}$

Table 2
Estimation Results

	Model Estimates	
	Inflation	**Asset Price Misalignment**
Inflation (− 1)	.1861313 (.1166045)	
Asset Price Misalignment (− 1)		-.0425327*** (.0049759)
Monetary Credibility	.035003*** (.0100785)	.1335766*** (03608)
Monetary credibility × Fiscal Cyclicality	-.0409745 (.0364007)	-.2727361*** (.094729)
Trade Openness		.0060955 (.0040192)
Money Growth	.0012769*** (.0003429)	
Real Effective Exchange Rates	-.0006093*** (.0001795)	.000091 (.0001035)
Unemployment Rate	-.0018963 (.0441323)	
Public Debt	-.0001354** (.000054)	-.0000281 (.0000279)
Constant	.0823579 (.0200451)	-.013234 (.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

Notes: (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.

Table 3
Fiscal Policy and Monetary Policy Credibility Outcomes Toward Inflation and Financial Stability

		Fiscal Policy	
		Procyclical	**Countercyclical**
Monetary Policy	**Credible**	Low; Unstable	Low; Stable
	Non-Credible	High; Stable	

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Inflation and Financial Stability Tradeoff: Role of Monetary Policy Credibility and Fiscal Cyclicality

Authors

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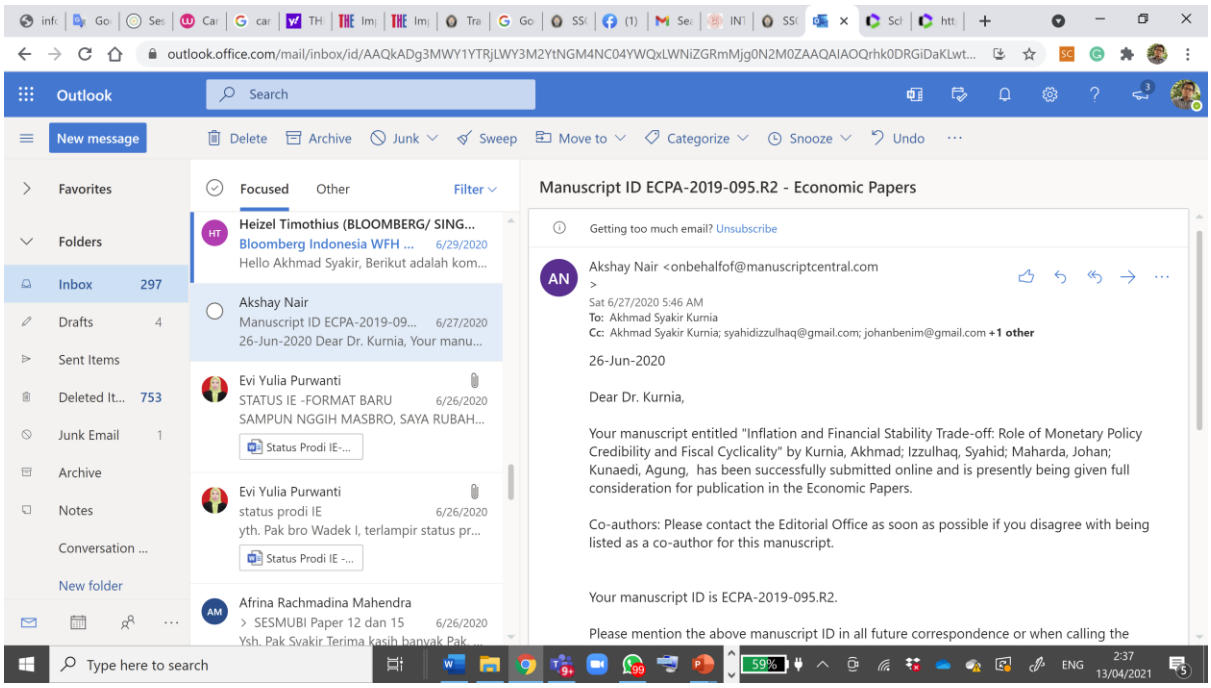

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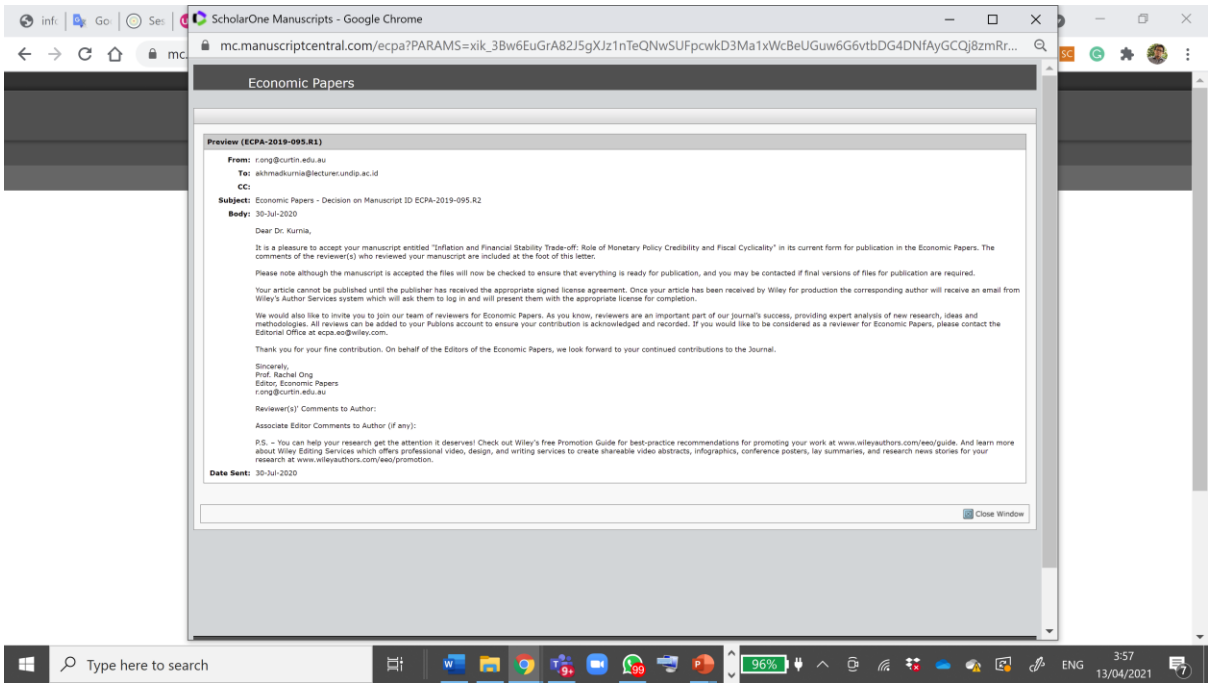

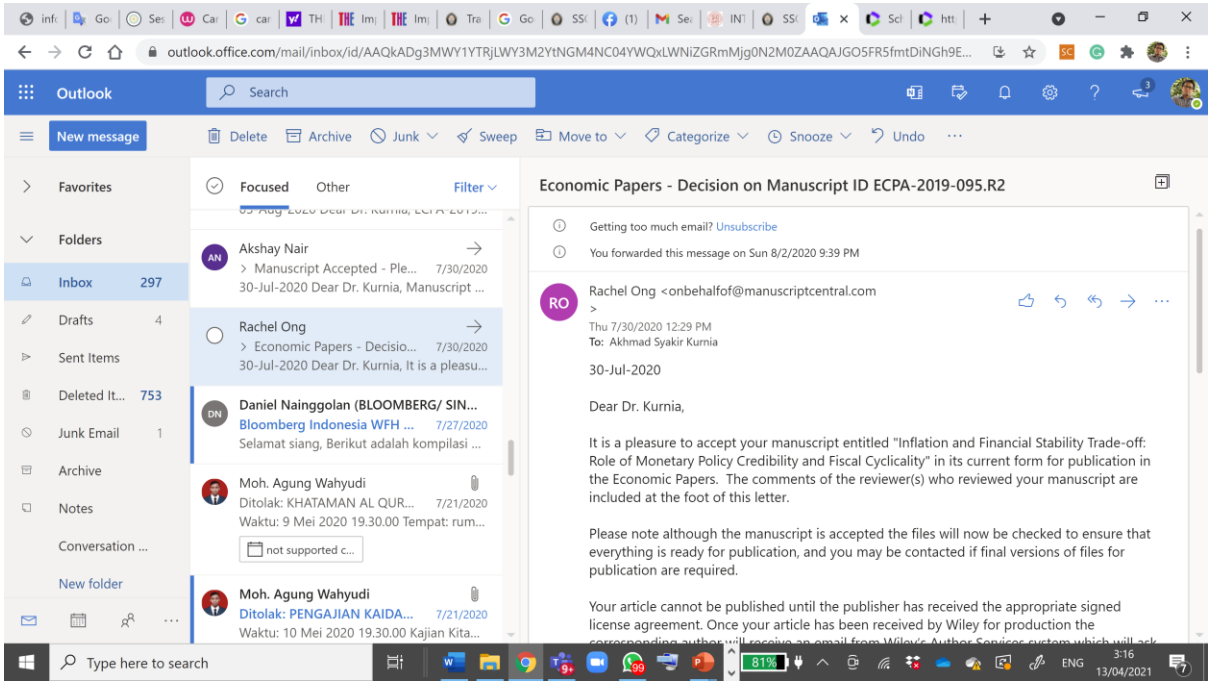

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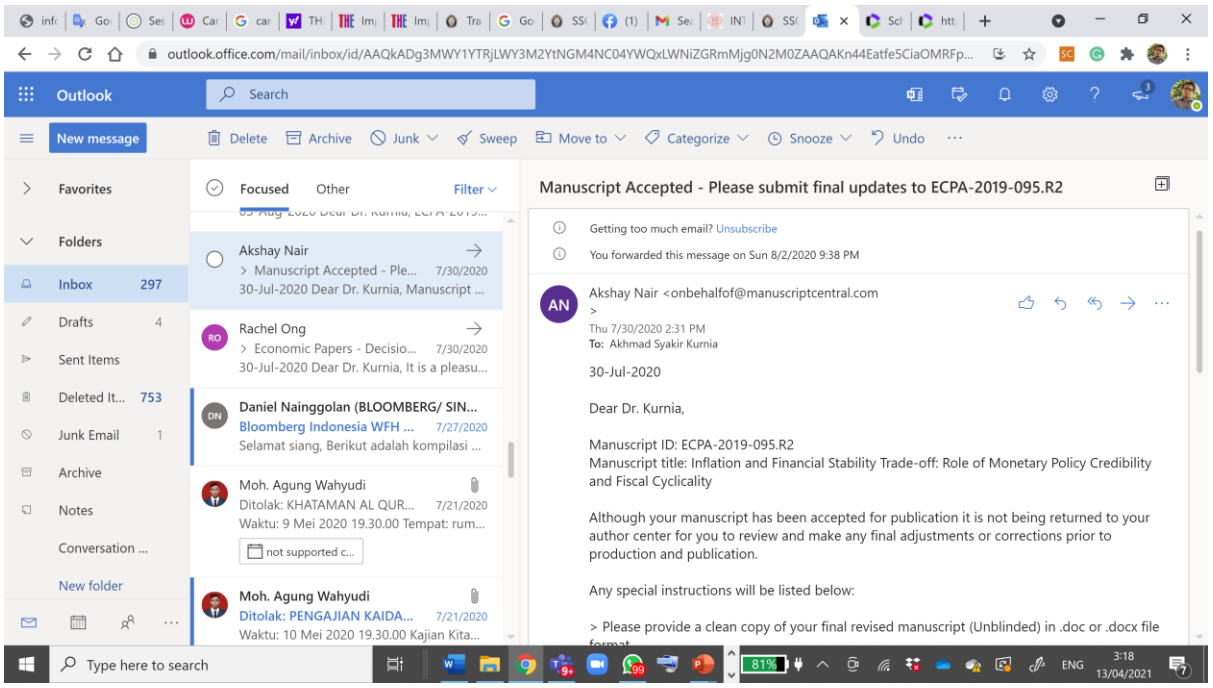

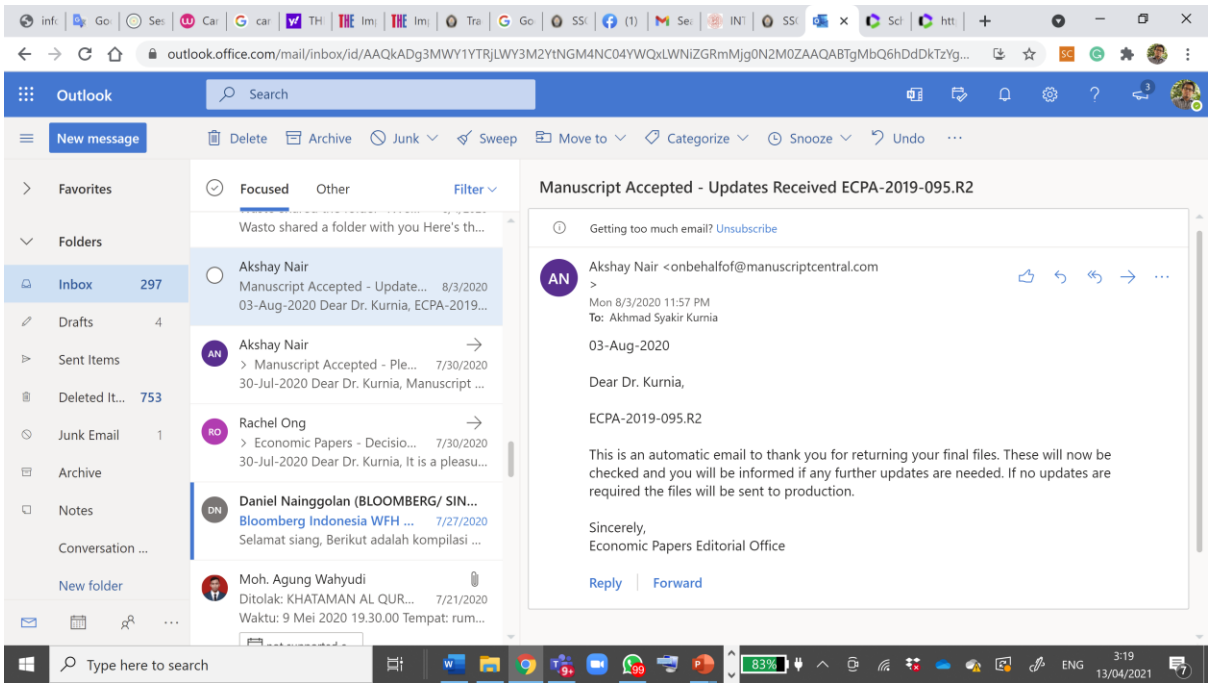

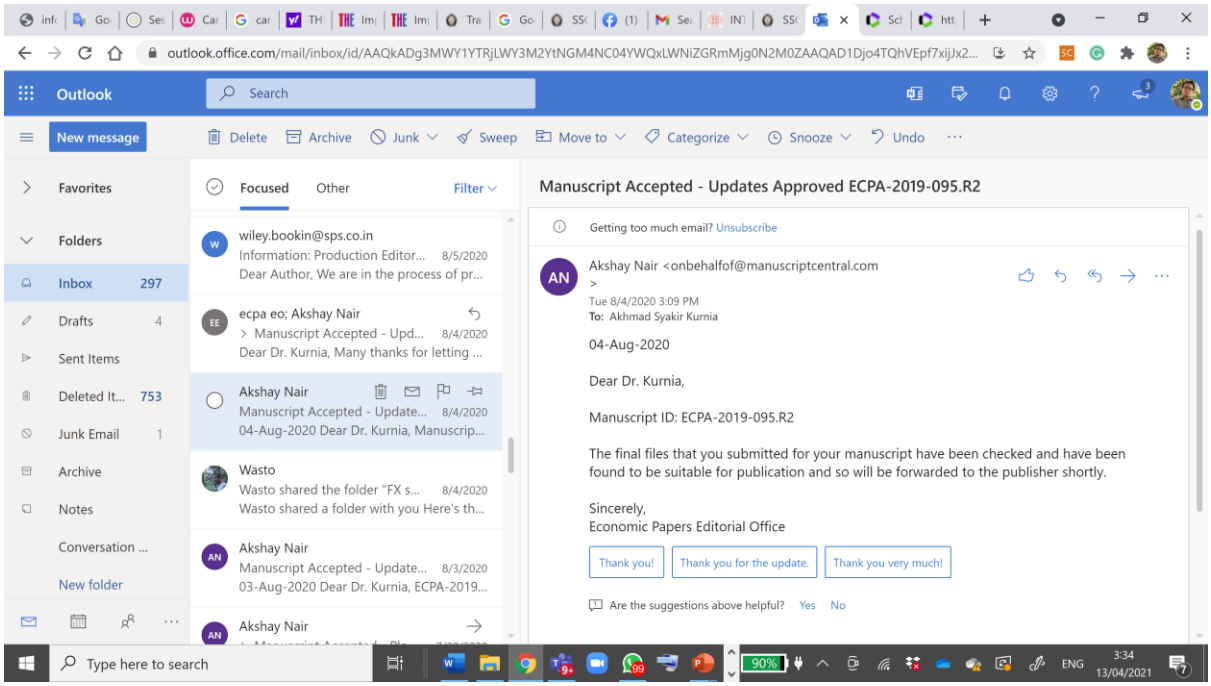

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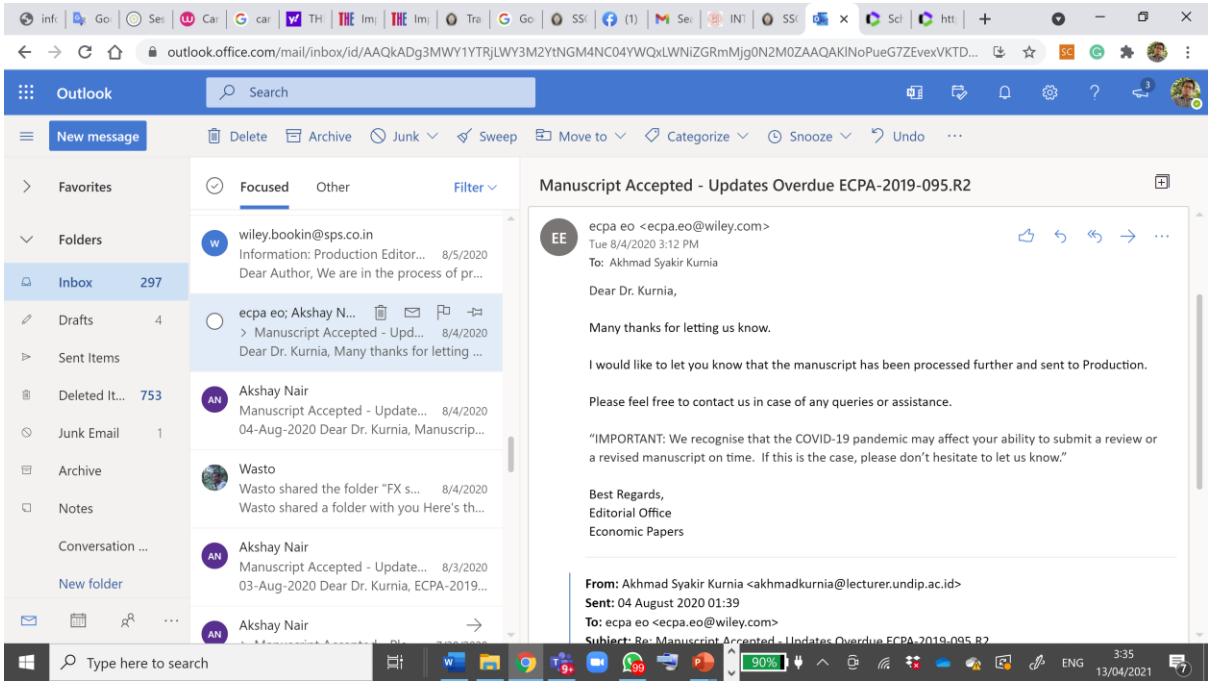

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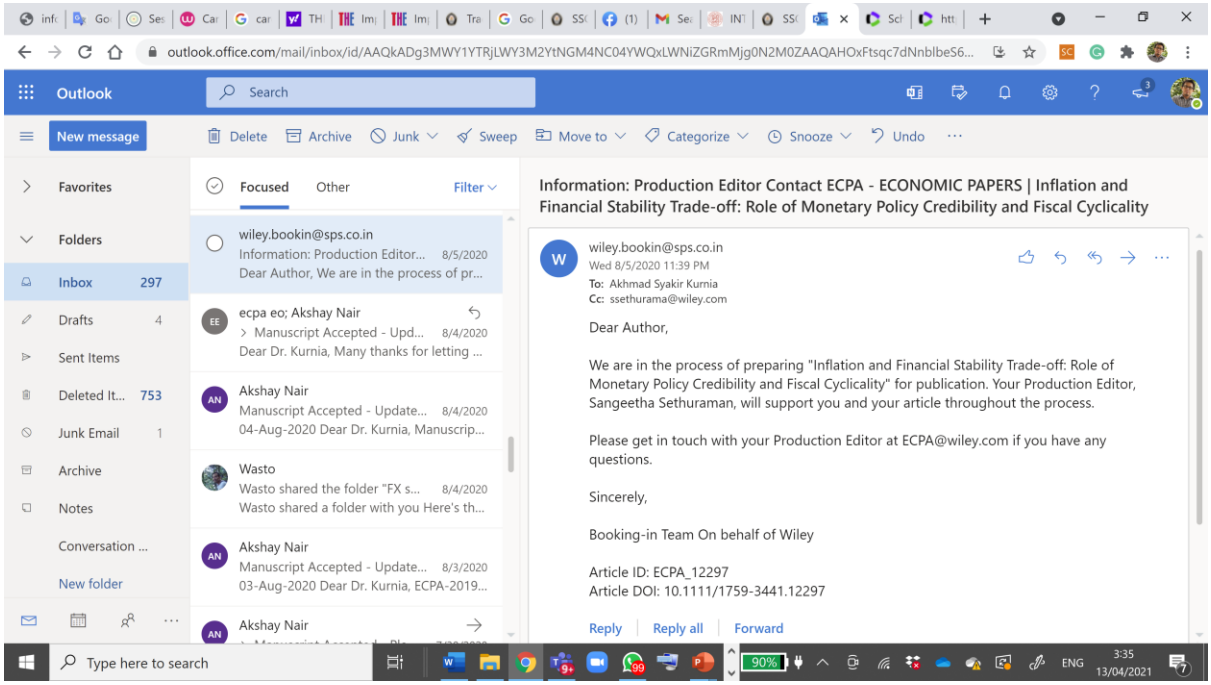

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Inflation and Financial Stability Trade-off: Role of Monetary Policy Credibility and Fiscal Cyclicality

Akhmad Syakir Kurnia Syahid Izzulhaq Johan Beni Maharda and Agung Kunaedi

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

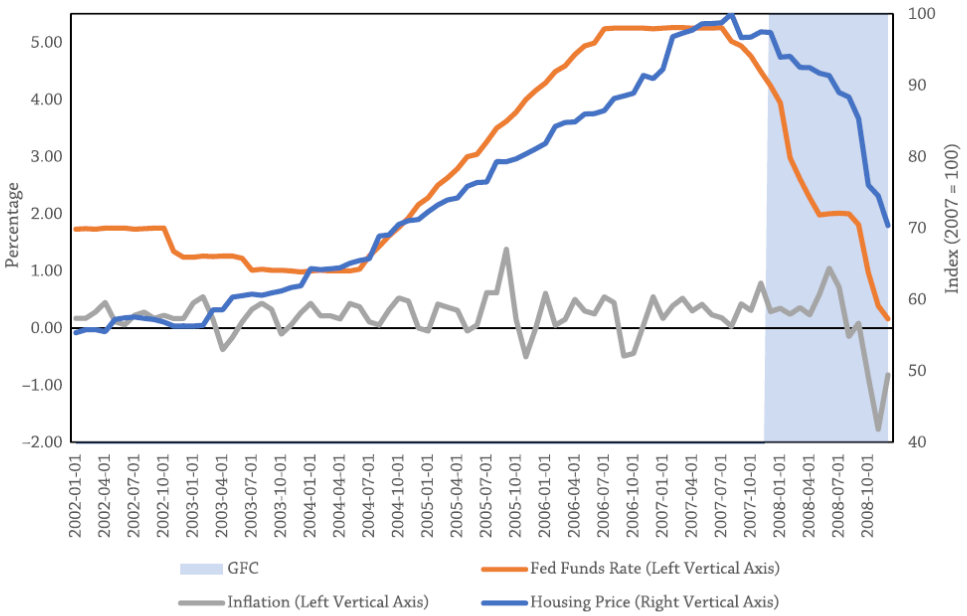

Figure 1. *Inflation rate, fed fund rate and housing price in the United States (2002–2008).*
Source: Federal Reserves of Economic Data (FRED) and Green Street Advisor (GSA).

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.

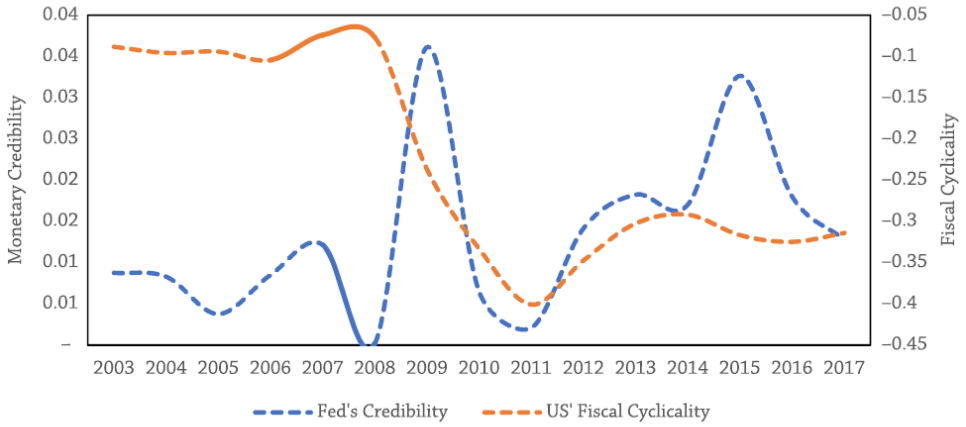

Figure 2. *Credibility of monetary policy and cyclicality behaviour of fiscal policy in the United States (2002–2007).*
Source: Authors' calculations.
Notes: The cyclical behaviour of fiscal policy has been estimated using a 20-year rolling regression between cyclical components of government expenditure 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).

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), Mcmanus and Ozkan (2015), and Izzulhaq and Kurnia (n.d.) 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.

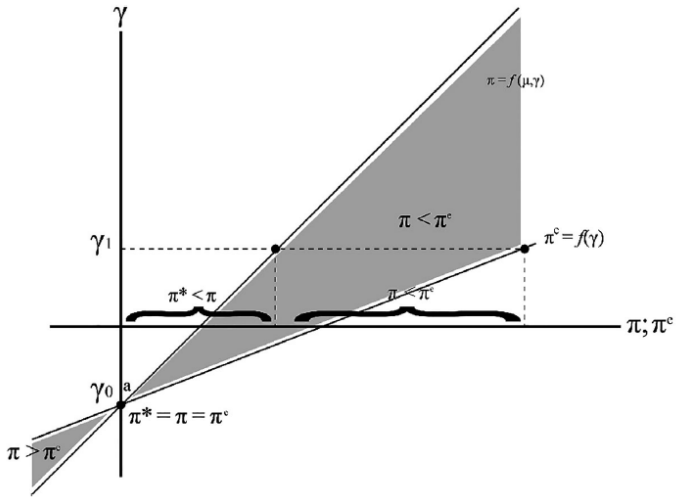

Figure 3. *Cyclical behaviour of fiscal policy and rates of targeted, actual and expected inflation.*

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:

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

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.

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

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:

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

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

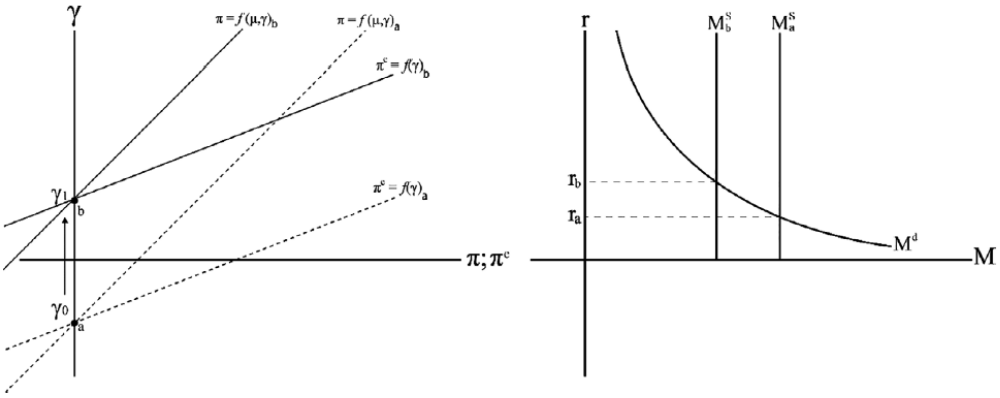

Figure 4. *Monetary policy response to the procyclical fiscal policy.*

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 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 $1\text{-}P_{\text{br}}$,

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

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.

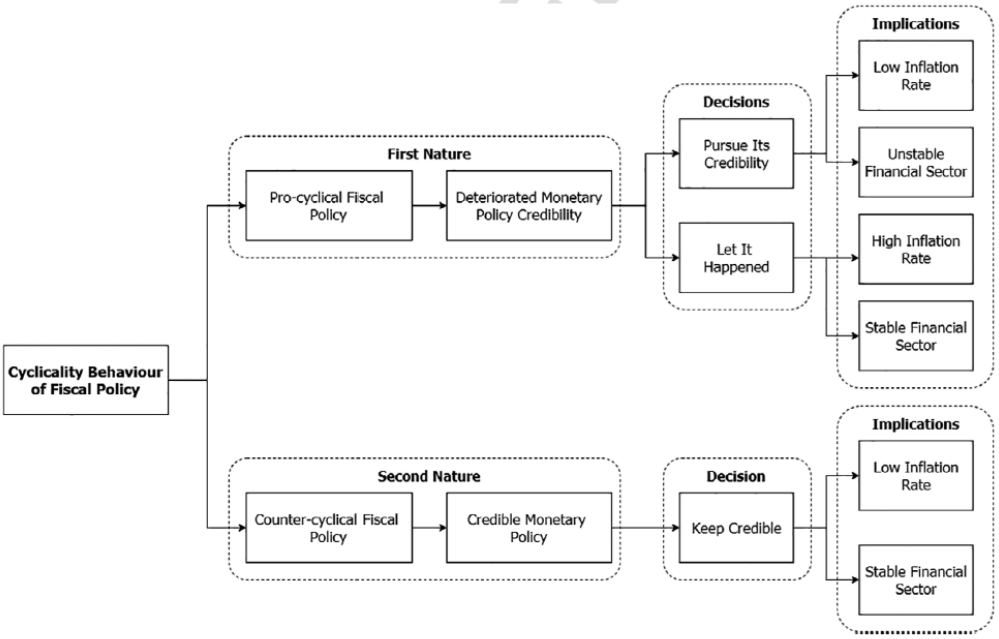

Figure 5. *Abstraction tree of the channel.*
Note: conceptualised by the authors.

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:

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

where n is the rolling window and $\hat{\rho}_{12,t}$ 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 ($\delta_{FD\text{-}GMM}$)	**0.2214667**	**−0.0496313**
	$\delta_{FD-GMM} < \delta_{FE} < \delta_{PLS}$	$\delta_{FE} \ll \delta_{FD-GMM} < \delta_{PLS}$

$$\rho_{i,t} = \alpha_8 + \delta_3\rho_{i,t-1} + \alpha_9 \mathrm{CMP}_{i,t} + \alpha_{10}(\mathrm{CMP}_{i,t} \times \mathrm{FCB}_{i,t}) + \tau Q_{i,t} + u_{i,t}$$
$$\rho_{i,t} = \alpha_8 + \delta_3\rho_{i,t-1} + (\alpha_9 + \alpha_{10}\mathrm{FCB}_{i,t})\mathrm{CMP}_{i,t} + \tau Q_{i,t} + u_{i,t} \quad (15)$$

where ρ, τQ and $(\alpha_9 + \alpha_{10}\mathrm{FCB}_{i,t})$ 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 (δ_{FD-GMM}), pooled least square (δ_{PLS}) and fixed effect (δ_{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 $\delta_{FD\text{-}GMM}$ 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 $\delta_{FD\text{-}GMM}$, δ_{PLS} and δ_{FE} for the first and second model estimates. For the first model estimate, we see that $\delta_{FD\text{-}GMM}$ lies below δ_{FE} and δ_{PLS} ($\delta_{FD\text{-}GMM} < {}_{\delta_{FE}} < \delta_{PLS}$). Therefore, System GMM is suitable for estimating the first model. For the second model, the estimated value of $\delta_{FD\text{-}GMM}$ 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 provides evidence to the exchange rates pass-through hypothesis (see Taylor

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.

(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 ($\hat{\tau}_{,t}$). 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:

$$\hat{\tau}_{,t}\begin{cases} 1 \geq \hat{\tau}_t > 0, \text{for procyclical fiscal policy} \\ \hat{\tau}_t = 0, \text{for acyclical fiscal policy} \\ -1 \leq \hat{\tau}_t < 0, \text{for countercyclical fiscal policy} \end{cases} \quad (16)$$

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.

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

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	

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.	$\text{CMP} = \frac{\lvert\pi - \pi^e\rvert}{(1+\lvert\pi - \pi^e\rvert)} \times 100$	Author's calculation, Bank for International Settlement
Cyclicality behaviour of fiscal policy	Correlation between cyclical components of government expenditure and real GDP.	$\hat{\sigma}^2_{12,t}(n) = \frac{1}{n-1}\sum_{i=0}^{n}(y_{1t} - \widehat{\mu}_{1t}(n))(y_{2t} - \widehat{\mu}_{2t}(n))$; $\hat{\rho}_{12,t}(n) = \frac{\hat{\sigma}^2_{12,t}(n)}{\hat{\sigma}^2_{1,t}(n) \times \hat{\sigma}^2_{2,t}(n)}$; 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.	$\tau^c_t = \alpha_t + \beta y^c_t + \varepsilon_t$; The rolling regression coefficient (20-year window)	

Appendix A. (*Continued*)

Variables	Operational description	Measurement/unit of account	Sources
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)	Inflation rates	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

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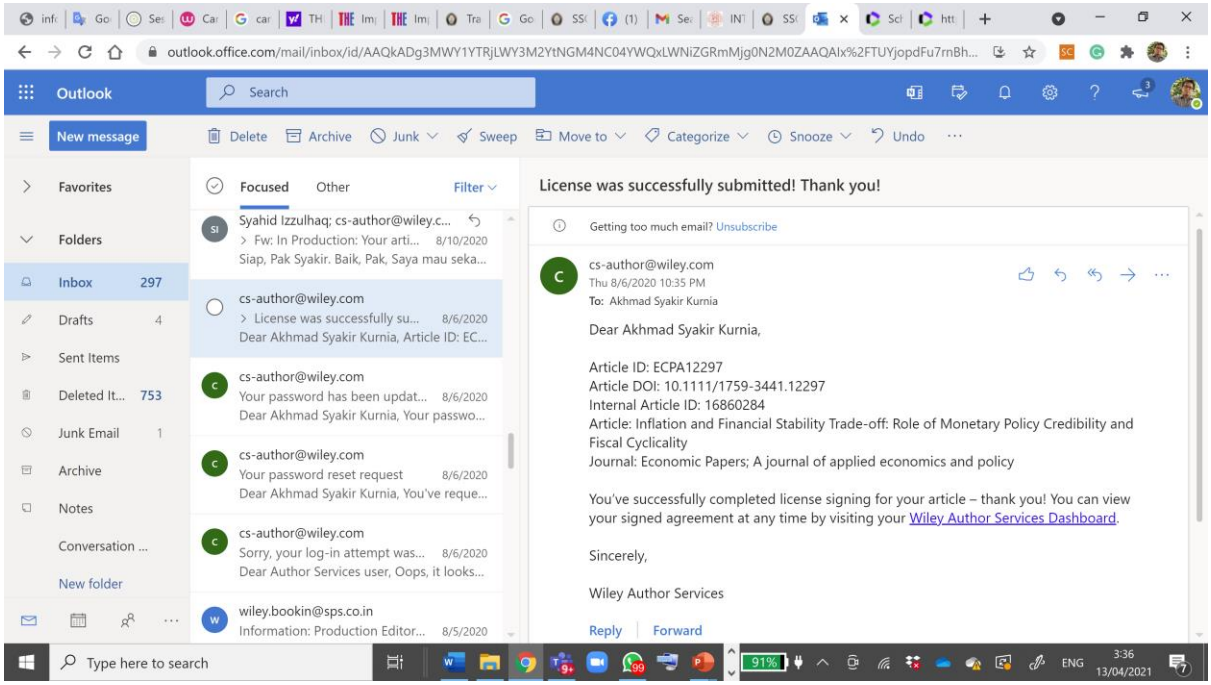

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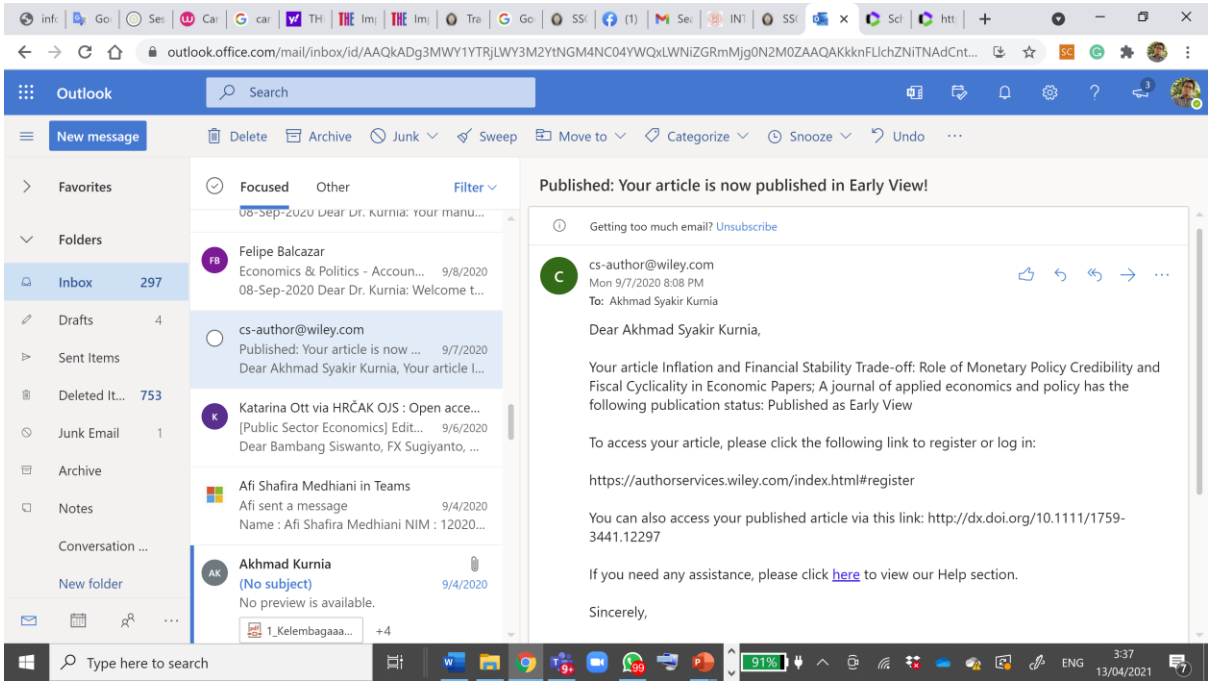

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