ARTICLE IN PRESS

Economics Letters ▮ (▮▮▮▮) ▮▮▮–▮▮▮

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Central bank independence and macro-prudential regulation ☆

Kenichi Ueda [*,1], Fabián Valencia [2]

International Monetary Fund, USA

HIGHLIGHTS

- Financial sector regulation is not effective to reduce already-piled-up nominal debt.
- But, monetary policy can create inflation ex-post to reduce the private sector's real debt burden.
- A central bank in charge of both price and financial stability faces a time inconsistency problem.
- Before credit shock realizes, the central bank chooses the socially optimal inflation level.
- However, ex-post, the central bank may choose higher inflation than the social optimum.

ARTICLE INFO

Article history:
Received 8 January 2013
Received in revised form
24 December 2013
Accepted 28 December 2013
Available online xxxx

JEL classification:
E58
G28
H11

Keywords:
Monetary policy
Macro-prudential regulation
Central bank independence
Time-inconsistency

ABSTRACT

When a central bank is in charge of both price and financial stability, a new time-inconsistency problem may arise. Monetary policy may be abused to reduce the private sector's real debt burden after a financial shock materializes.

1. Introduction

This paper examines the interplay between macro-prudential regulation and monetary policy by focusing on the institutional design. In particular, we investigate a potential time-inconsistency problem arising under a dual-mandate central bank in charge of both price and financial stability.

Our departure point is the work pioneered by Kydland and Prescott (1977) and Barro and Gordon (1983) on the time-inconsistency problems of monetary policy, adapted to allow for financial shocks. In our model, there are two stages. In the first stage, the policymaker (possibly a single or several institutions) makes simultaneous decisions on monetary policy and macro-prudential regulation. In the second stage, only monetary policy decisions can be revised or "fine-tuned" after the realization of a financial shock. This setup captures the fact that macro-prudential regulation is intended to be used preemptively to constrain excessive leverage, but it does little ex-post to change the stock of debt, once a financial shock materializes. Monetary policy, on the other hand, can be used ex-ante and ex-post.

The key finding is that it is optimal to separate the price and financial stability objectives. While the dual-mandate central bank chooses the socially optimal level of inflation ex-ante, it has the ex-post incentive to reduce the real burden of private debt through inflation. This result is analogous to the incentives to monetize public sector debt studied in Calvo (1978) and Lucas and Stokey (1983).

The next section presents the model setup. Section 3 discusses the social planner solution. Section 4 shows how a time-inconsistency problem arises in the decentralized solution. Section 5 shows, in turn, that separation yields the social optimum, and Section 6 concludes.

☆ The views expressed in the paper are those of the authors and do not necessarily represent those of the IMF or IMF policy.

* Corresponding author. Tel.: +1 202 623 6368.
E-mail addresses: kueda@imf.org (K. Ueda), fvalencia@imf.org (F. Valencia).

[1] Part of this research was conducted while Ueda was visiting the Department of Economics at MIT.

[2] Tel.: +1 202 623 6355.

0165-1765/$ – see front matter © 2014 Published by Elsevier B.V.
http://dx.doi.org/10.1016/j.econlet.2013.12.038

Please cite this article in press as: Ueda, K., Valencia, F., Central bank independence and macro-prudential regulation. Economics Letters (2014), http://dx.doi.org/10.1016/j.econlet.2013.12.038

2. Model setup

2.1. Loss function

It has been shown in monetary models with financial frictions that output and price stability may not be sufficient statistics for welfare. In those cases, the loss function is composed of three main terms: the usual two terms, deviations of output and inflation from their socially optimal non-stochastic steady state levels, and the third term, reflecting welfare losses associated with financial distortions. The reason why output and inflation cease to be sufficient statistics for welfare, when financial frictions are present, is because shocks affect agents differently depending on whether they are financially constrained or not (Carlstrom et al., 2010), or whether they are borrowers or savers (Cúrdia and Woodford, 2009).

In line with this literature (see also Woodford (2011)), we start by assuming a loss function with three elements: the variance of output, y; inflation, π; and private sector leverage, ϕ, which can be interpreted as either household leverage or bank leverage:[3]

$$L = \frac{a}{2}(y - y^*)^2 + \frac{b}{2}(\pi - \pi^*)^2 + \frac{c}{2}(\phi - \phi^*)^2, \tag{1}$$

where $a > 0$, $b > 0$, and $c > 0$ denote the weights corresponding to each objective, and the starred variables denote the corresponding socially optimal levels.

This representation means that the same levels of output and inflation can be achieved with different tightness of financial constraints (coupled with associated exogenous shocks). Also, a conflict between neutralizing the distortions from nominal rigidities and the distortions from financial frictions may arise. On the one hand, tighter monetary policy reduces the welfare loss associated with nominal rigidities when inflation risk is high. On the other hand, it may worsen the borrowing constraints, resulting possibly in a larger welfare loss.

The loss function (1) is consistent with those typically derived in New Keynesian macroeconomic models, in which the social welfare function is approximated by a second-order Taylor expansion around the non-stochastic steady state, and consumption, borrowing, and other key variables are approximated by log-linearization. Evaluation at the optimal levels implies that the terms with first derivatives are equal to zero, and only the terms with second derivatives remain as in (1). Cross-derivatives can be considered to be small or zero near the steady state. Mathematically, this is a result from log-linear approximations to the equilibrium relations among the key variables. Therefore, only squared terms remain. In models with financial frictions, this type of approximation yields a squared term related to the level of credit or leverage in the economy, in addition to the squared term related to output and inflation. In Appendix A to this paper, we illustrate a fairly general derivation of the loss function (1) based on a simple model with financial frictions and nominal rigidities. We also explain, in detail, that typical examples of loss functions derived formally in the literature (i.e., Carlstrom et al., 2010; Cúrdia and Woodford, 2009) have the same functional form as our loss function (1).

2.2. Key variables

Credit growth, δ, is defined as the rate of change in the stock of nominal debt: $D = \overline{D}(1 + \delta)$, and private sector leverage is defined as

$$\Phi = \frac{D}{PY} = \frac{\overline{\Phi} P^e Y^e (1+\delta)}{PY} \quad \text{and} \\ \ln(\Phi) = \phi \approx \overline{\phi} - (\pi - \pi^e) - (y - y^e) + \delta, \tag{2}$$

where D denotes the stock of nominal debt; P, the price level; and Y, real GDP. Moreover, we assume, above, that there is a predetermined level of private debt in the economy given by $\overline{\Phi} = \overline{D}/(P^e Y^e)$, where superscript e denotes expected values. This $\overline{\Phi}$ is the total nominal amount of debt before any additional credit expansion, evaluated at the expected price and output level. It can be understood as an initial condition due to structural factors or recent macroeconomic developments. Note that Eq. (2) is quite intuitive. The real value of debt can be reduced ex-post by positive surprises in inflation $(\pi - \pi^e)$ and output $(y - y^e)$. If debt is too high, inflation can be beneficial from the point of view of financial stability.[4]

Output is given by a standard Lucas supply curve, augmented with the effects of changes in the supply of credit

$$y = \overline{y} + \alpha(\pi - \pi^e) + \beta\delta, \tag{3}$$

where $\overline{y}$ denotes the level of output that would prevail in the absence of distortions. We assume that positive credit supply shocks increase output, in line with Peek and Rosengren (2000), and others.

We assume that credit growth, δ, has two components:

$$\delta = \delta_0 + \epsilon, \tag{4}$$

where δ_0 corresponds to the expansion in credit that is controlled by regulatory actions, such as countercyclical regulatory tools, and ϵ is a financial or credit shock with $E[\epsilon] = 0$ and variance σ_ϵ^2. Possible interpretations for ϵ include changes in asset prices or shifts in the supply of credit (domestic or external) that ultimately affect leverage. The credit shock ϵ can also reflect uncertainty about the effect of the specific policy tool on credit. This uncertainty arises because prudential regulations are not equivalent to credit allocation in a central planning economy.

The monetary authority controls π_0, but total inflation is also affected by credit growth,

$$\pi = \pi_0 + \gamma\delta. \tag{5}$$

It is assumed that credit growth affects inflation because higher credit expansion is associated with higher expenditure.[5] The two policy tools, π_0 and δ_0, affect inflation. As for expected inflation, it can be expressed as

$$\pi^e = \pi_0^e + \gamma\delta^e = \pi_0^e + \gamma\delta_0^e. \tag{6}$$

Policy decision-making involves two stages. In the first stage, before the realization of the credit shock, monetary and macro-prudential regulation are decided simultaneously. In the second stage, after the realization of the credit shock, monetary policy decisions can be revised, but macro-prudential regulation cannot. In essence, monetary policy can be used ex-ante and ex-post whereas macro-prudential regulation is only effective ex-ante. This is because regulation can only affect flows of credit, not the outstanding stock of debt, while monetary policy can reduce real debt by creating inflation.

As a result, a time-inconsistency problem arises analogous to the one examined in the literature on fiscal and monetary interactions (e.g., Calvo, 1978; Lucas and Stokey, 1983), in which the policymaker has incentives to use monetary policy to reduce the real value of public debt by generating higher inflation.

3 A closely related literature studies macroeconomic models with financial frictions that create externalities. Welfare losses arise with socially inefficient levels of leverage, which can be excessive (or insufficient) because individuals do not internalize the impact of their borrowing decisions on asset prices and on others' balance sheets (e.g., Bianchi and Mendoza, 2010; Jeanne and Korinek, 2010).

4 At the same time, the loss function also allows for too little credit to be welfare-reducing.

5 For the sake of simplicity, we do not allow a feedback from output to inflation.

Please cite this article in press as: Ueda, K., Valencia, F., Central bank independence and macro-prudential regulation. Economics Letters (2014), http://dx.doi.org/10.1016/j.econlet.2013.12.038