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Optimal monetary policy with capital and a financial accelerator

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ABSTRACT

Whether there is a trade-off between price and financial stability is an open question. This paper characterises optimal monetary policy analytically in a New Keynesian economy with capital and a financial accelerator. In addition to stabilising inflation, there is an incentive to smooth volatility in the net worth of borrowers and this presents a trade-off for monetary policy. This trade-off can be eliminated if policymakers can additionally choose an optimal transfer to borrowers. Enriching the model with fire sales and countercyclical bankruptcy costs, there is also an incentive to smooth volatility in default and the capital stock. An optimal transfer to borrowers is not sufficient to eliminate the trade-off in that case. With fewer instruments than targets, optimal transfers are state contingent and countercyclical, while monetary policy stabilises inflation.

1. Introduction

How should monetary policy be shaped in the presence of capital and financial frictions? Prior to the 2007–08 Crisis, the consensus was that monetary policy should provide a nominal anchor and stabilise domestic prices. By mitigating volatility in domestic inflation, price dispersion is reduced and inefficient production is minimised (Clarida et al., 1999; Galí and Monacelli, 2005; Woodford, 2003). The gains in departing from an inflation target, for example responding to volatility in asset prices, were considered small or negative (Bernanke and Gertler, 2001; Faia and Monacelli, 2007; Gilchrist and Leahy, 2002; Nutahara, 2014, 2015).

Notwithstanding, the effects of the Crisis have been severe. In the eighteen months from December 2007, the labour market deteriorated sharply: total non-farm employment fell by almost 8 million and the unemployment rate almost doubled from 5% to 9.5%. The subsequent recovery in jobs growth has been slow. There is debate as to whether an alternative monetary policy would have improved outcomes. Had central banks chosen tighter monetary policy earlier, would this have reduced leverage prior to the Crisis and its severity?

More generally, whether an inflation target is sufficient for managing financial shocks in the presence of a financial accelerator remains contested (Cecchetti et al., 2000; Dupor, 2005; Gambacorta and Signoretti, 2014; Nisticó, 2016). It has been argued that inflation targeting itself could contribute to a higher likelihood of financial instability (Borio and Lowe, 2002; Borio and White, 2004) and that it may be sub-optimal for a central bank to ignore the distribution of financial tail risks (Woodford, 2012). In short, it may be optimal for a central bank to accept greater inflation volatility if it means reduced

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financial volatility.[1] By contrast, the 'modified' Jackson-hole consensus argues that monetary should mitigate volatility in inflation only (Smets, 2014; Svensson, 2010).[2]

An important factor in this debate is to establish precisely what the objectives of monetary policy are when both capital and financial frictions matter. Under what assumptions does it hold that a central bank can focus solely on stabilising inflation, and under what alternatives will it be optimal to take financial volatility into consideration as well?

The central bank's objective has been derived in a New Keynesian (NK) economy with capital, but without a financial accelerator (Edge, 2003; Takamura et al., 2006); and with a financial accelerator applied to the payment of labour, but where capital is assumed fixed (Carlstrom et al., 2010; De Fiore and Tristani, 2012). The implications of a financial accelerator together with investment volatility, as is common in quantitative business cycle models, have not been considered.[3] This is the contribution of this paper.

There are reasons to think that capital with a financial accelerator could be important. The collapse in investment during the Crisis is a key channel through which financial volatility propagated to the real economy. Financial frictions and investment volatility are also relevant for the business cycle more generally (Gertler and Kiyotaki, 2010; Gilchrist and Zakrajšek, 2012; Jermann and Quadrini, 2012). By characterising optimal monetary policy in this environment, one can consider the optimal response to financial shocks, whether is there a trade-off between price stability and financial stability, and whether additional instruments can help resolve any trade-off faced.

I study the objectives of monetary policy in three NK economies. The first is a simple NK economy with capital and exogenous investment efficiency shocks.[4] The second additionally includes a financial accelerator with costly state verification (CSV). Developed by Carlstrom and Fuerst (1997), and similar to the model proposed by Bernanke et al. (1999), I focus on this model because it is sufficiently rich to have both capital and a non-trivial financial accelerator, while still remaining analytically tractable when studying optimal policy. The implied debt contract in this economy is also optimal (Gale and Hellwig, 1985).[5] The third model I consider is a second-generation financial accelerator model that also includes asset fire sales and countercyclical bankruptcy costs (Choi and Cook, 2012).[6]

In the standard NK model with fixed capital, no financing frictions and absent household heterogeneity, it is well known that disturbances to demand (for example, shocks to utility from consumption) or productivity (labour augmenting technical change) do not create a trade-off for monetary policy. There is no distinction between stabilising volatility in real quantities and inflation, and so the "divine coincidence" holds with zero inflation optimally chosen in all periods (Clarida et al., 1999).[7]

I examine whether the same result holds with capital and a financial accelerator. In addition to demand and productivity shocks, I also consider shocks to the marginal efficiency of investment (in the model with capital), to net worth and bankruptcy costs (in the model with CSV) and to volatility in investment returns (in the model with fire sales). These shocks have been emphasised in previous quantitative analysis.[8]

To understand the central bank's objectives, I use the Linear–Quadratic (LQ) approach and study the full commitment solution, otherwise known as optimal policy from a 'timeless perspective' (Benigno and Woodford, 2012). Deriving an explicit welfare-theoretic loss provides maximum transparency on policy objectives and solving the LQ problem provides analytical insight into any trade-offs faced. In particular, the frictions in the economy that a central bank should be concerned with, and how these might affect any policy trade-off.

Focusing on a central bank with access to a single instrument, the nominal interest rate, I find:

(i) Introducing capital in an otherwise standard NK economy does not affect the divine coincidence. In response to all shocks – demand, productivity and the marginal efficiency of investment – the flexible-price equilibrium remains optimal and there is no trade-off between stabilising real variables and inflation.
(ii) Introducing a second friction, CSV, breaks the divine coincidence. Volatility in the net worth of borrowers becomes an additional objective for monetary policy and there is a non-trivial trade-off between stabilising volatility in it and inflation.

[1] For example, by "leaning against the wind" to prevent the build-up of leverage or risk within the economy.

[2] More specifically, monetary policy should only respond to financial shocks once they arrive, even if unconventional policy tools are required.

[3] Gertler and Karadi (2011) is one exception, although the focus there is on unconventional policy rather than the optimal choice of the nominal interest rate. The other is Collard et al. (2017), who study optimal Ramsey policy without deriving an analytic objective and with a different financial wedge (socially inefficient lending).

[4] Examples of analysis of this economy without investment efficiency shocks include Edge (2003) and Takamura et al. (2006). Like these papers, I assume that capital is perfectly substitutable across firms. The only friction is that a random subset of firms are able to choose their prices optimally each period (Calvo pricing). This economy provides a benchmark for establishing the objectives of policy in the presence of capital and investment efficiency shocks, but not financial frictions.

[5] Optimal policy is less tractable in the BGG model and the implied debt contract is not necessarily optimal (Dmitriev and Hoddenbagh, 2017). While the BGG model provides a better quantitative match to the data, one would expect the optimal policy insights to be similar given the similarities between the two models.

[6] The advantage of these two models is that they capture some key dimensions of the interaction between real and financial volatility. However, they do abstract from frictions in the raising of funds by financial intermediaries, such as agency problems between banks and their depositors (Gertler and Karadi, 2011) or bank runs (Angeloni and Faia, 2013), which can also be important.

[7] Only in response to inefficient shocks (such as cost-push or markup shocks), is it optimal to deviate from a zero-inflation equilibrium.

[8] See, for example, Carlstrom and Fuerst (2001), Faia and Monacelli (2007), Justiniano et al. (2010, 2011) and Choi and Cook (2012).