Monetary Policy and Asset Prices: More Bad News for ‘Benign Neglect’*

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Abstract

In this paper we explore the optimal policy reaction to boom-bust cycles in asset prices. Bordo and Jeanne (2002a, b) point to the risks of a reactive strategy that only mitigates the consequences of a crisis if and when it occurs. Acting pre-emptively by rigorously counteracting the build-up of the crisis scenario may be superior in welfare terms. We show that even a purely reactive monetary policy involves an ex ante response to a possible asset price crash. The reason, however, is not the attempt to avoid real and financial disruption but to react optimally to changes in private sector’s expectations. Furthermore, we find that the welfare losses of a reactive strategy increase when forward-looking expectations are taken into account while the welfare implications of a pro-active strategy do not change.

Keywords: Monetary policy, asset prices, credit crunch, boom bust cycles, forward-looking behavior.

JEL Codes: E52, E58, E44

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1. Introduction

According to conventional wisdom, inflation-targeting central banks should respond to asset price booms only insofar as the latter signal current or future changes in the target variables, inflation and the output gap. In many cases this strategy seems to be consistent with benign neglect, in the sense that central banks do not react pre-emptively in the boom phase but rather ease monetary policy reactively if and when an asset price crash occurs. Several arguments have been put forward to justify this policy approach. First, doubts have been raised concerning central bankers’ abilities to identify bubbles or high-cost asset price booms, i.e. booms that are followed by severe consequences for the target variables, ex ante (Bernanke and Gertler (2001)). Second, monetary policy is often regarded as a blunt tool. Given the complex nature of the transmission mechanism, the monetary policy necessary to curb an asset price boom is open to debate: a small increase in interest rates may have no significant impact on asset prices, or even lead to a further boost in asset prices, while a strong interest hike may be a trigger for an economic downturn (Greenspan (2002), Bernanke and Gertler (1999)). Third, monetary policy reactions to asset price booms may lead to public confusion regarding the objectives of monetary policy and may undermine the central banker’s credibility (Borio and Lowe (2002)).

This conventional view, however, has not remained undisputed. Cecchetti, Genberg and Wadhwani (2003), and Cecchetti et al. (2000), challenge the view that monetary policy should ignore asset price movements unless they signal changes in the central bank’s target variables. They maintain that monetary policy should follow a pro-active strategy by including asset prices in the Taylor rule. Reacting to asset price misalignments (i.e. to the bubble component of asset price movements) may improve macroeconomic performance. This necessarily requires that monetary policy is able to detect bubbles. While many observers are skeptical about that (see Bernanke and Gertler (1999), Dornbusch (1999) and
Cogley (1999), Cecchetti, Genberg and Wadhwani (2003) and Cecchetti et al. (2000) argue that, despite all difficulties, identifying large misalignments is no more difficult than identifying other components of the Taylor rule, such as potential output.

Further objections to this conventional wisdom are raised by Bordo and Jeanne (2002a, b). Dealing mainly with the first two of the above arguments, Bordo and Jeanne (BJ) offer new arguments in favor of a pro-active monetary policy response to asset price booms. They show that benign neglect of asset price inflation may be dominated by a pro-active monetary policy that responds to an asset price boom by pre-emptively raising interest rates. Benign neglect in the boom phase entails the risk that the boom will be followed by a bust. Falling asset prices reduce creditors’ collateral base and, if sufficiently severe, lead to a credit crunch and thus a sharp reduction in real economic performance. A pre-emptive monetary restriction (according to the pro-active strategy), however, may avert this crisis scenario in the first place by deterring firms from accumulating too much debt. The preconditions for a slowdown in real activity in the aftermath of an asset price collapse are thus eliminated. Hence, a pro-active monetary policy strategy can be understood as an insurance against the risk of an asset price collapse and the subsequent macroeconomic decline. But the required interest rate hike is associated with immediate costs in terms of output losses and a suboptimally low inflation rate. In general, central banks have to trade-off current and future losses of the different policy options when asset prices soar. BJ show that the optimal policy reaction to asset price booms depends on the economic conditions in a complex, non-linear way.

In this paper we extend the BJ-model in several directions. While BJ compare a pro-active strategy with benign neglect by employing a reduced form model that is independent of the private sector’s forward-looking behavior, we adhere more closely to the New Keynesian approach to monetary policy and allow for forward-looking expectations on the supply and
demand side of the economy. Furthermore, our focus is not only on the supply side effects of an asset price bust but also on its potential impact on aggregate demand. We first show that during an asset price boom, a ‘benign neglect’ policy option in the sense of completely disregarding the possibility of an asset price collapse generally is not optimal. Even a purely reactive monetary policy responds to the possible occurrence of an asset price crash ex ante. The reason for this monetary policy adjustment in the boom phase, however, is not the attempt to counter pro-actively the occurrence of an asset price bust. Rather, the policymaker aims at reacting optimally to changes in private sector’s expectations. While the direction of the nominal interest rate adjustment is not unambiguous, the real interest rate will unambiguously decline. Thus, in our model, following the reactive policy approach is not to be equated with a policy of ‘benign neglect’. This stands in sharp contrast to the model by BJ and to the view of monetary policy practitioners as judged by their statements.

In a recent paper, Gruen, Plump and Stone (2005) remain skeptical about a pro-active monetary policy. Employing a backward-looking model, they stress the role of time lags in monetary policy. The optimal monetary policy in the presence of asset price bubbles is shown to depend on the stochastic properties of the bubble. Private sector expectations are not referred to explicitly in their model. In contrast, we underline the importance of the private sector’s forward-looking expectations for monetary policy during asset price booms. This gives rise to an expectations channel that is absent in backward-looking models. We argue that the welfare losses of the reactive strategy increase when forward-looking expectations are taken into account, while the welfare implications of a pro-active strategy are not affected by the introduction of forward-looking behavior. Hence, the incorporation of forward-looking expectations strengthens the case for a pro-active strategy and involves more bad news for benign neglect.
The remainder of the paper is structured as follows. In the second section the model is presented. The pro-active and reactive policies and the optimal policy rule are derived in section 3. The model’s policy implications are discussed in section 4. Section 5 concludes.

2. The Model

We seek to explore how optimal monetary policy is affected by boom-bust cycles in asset prices when assets serve as the collateral base for debt accumulation in the private sector. Our key question can be formulated as follows: Suppose the economy runs the risk that an asset price boom is not sustainable and the possible bust may cause a precipitous drop in both output and aggregate demand by generating a credit crunch - how and when should monetary policy act if policymakers are aware of this?

We consider an economy that exists for three periods. In period 1, asset prices are driven up. Firms need funds to be able to produce, but they face a credit constraint and can only borrow against collateral to finance capital accumulation. Policymakers must decide whether to eliminate the risk ex–ante that, in the future, a credit crunch is provoked by an asset price bust, or to follow a reactive policy approach, i.e. deal with the consequences of an asset price bust if and when it occurs. In period 2, a credit crunch may or may not occur, depending on the policy chosen in period 1. Agents can only obtain further credit if the required new credit remains below the real value of their collateral minus the ex post debt burden. Hence, the credit constraint that agents face is directly linked to asset prices. Since financial disruptions that may drive the economy away from its steady state can only occur in

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1 As discussed in the Introduction, our model is closely related to BJ (2002a, b). In contrast to BJ (2002a) we are not interested in the microeconomic foundation of the collateral-induced credit crunch. We exclusively focus on macroeconomic effects and on macroeconomic policy. Readers who are interested in the microeconomics of the lending and borrowing decisions of households and firms are therefore referred to their work.

2 In contrast to some recent (related) papers, including Cecchetti et al. (2000), Filardo (2003), and Gruen, Plump and Stone (2005), our focus is not on asset price bubbles but on asset price booms, irrespectively of whether they are fundamentally driven or caused by a bubble. In the BJ model, asset price movements are caused by news about long-run productivity and are not associated with the bursting of a bubble.
period 2 and are precluded thereafter by assumption, the third period merely serves to represent the new steady state. Thus, in period 3, the economy moves into a new steady state.³

2.1 Aggregate Demand and Aggregate Supply

Our model closely resembles the standard New Keynesian sticky price model.⁴ We modify the well-known standard model by adding a random disturbance to the aggregate demand and the aggregate supply equation that we interpret as a shock emanating from the financial sector (see below).⁵ The two building blocks of our model are given in equations (1) and (2).

\[ \pi_t = \beta E_t \pi_{t+1} + \alpha x_t + v_t \]  

\[ x_t = E_t x_{t+1} - \left( i_t - E_t \pi_{t+1} - r^* \right)/\sigma - \psi v_t \quad t = 1, 2, 3 \]

Equation (1) is the so-called New Phillips Curve (NPC), giving aggregate supply, while equation (2) represents aggregate demand. All variables are expressed as percentage deviations around their non-stochastic steady state values. The NPC posits that current inflation, \( \pi_t \), has a forward-looking component depending on expected future inflation (with \( E_t \) denoting the rational expectation operator on the basis of all information available up to period t). This forward-looking component is of course rooted in the assumption that firms set prices in a staggered fashion.⁶ When firms decide about their optimal prices they must be concerned about future inflation, because they might be unable to reset their prices for several periods. In addition, current inflation depends on the output gap, \( x_t \), defined as the deviation

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³ As explained in more detail below, t = 3 can be interpreted as a steady state of an infinite horizon version of the model.
⁴ We confine ourself to the macroeconomic side of the New Keynesian approach. See, e.g., Galí (2002) and Woodford (2003) for detailed expositions and discussions of the microeconomic foundation of the New Keynesian models.
⁵ BJ (2002a, b) introduced this idea.
⁶ Staggered price setting was introduced by Calvo (1983).
of current output from its flex-price level and on the shock $v_i$. $\beta$ is households’ discount factor.

The supply side effects of the financial sector shock $v_i$ are based on the credit crunch it may precipitate. Owing to moral hazard considerations, firms can only borrow against collateral. Assets serve as collateral, so that soaring asset prices facilitate the accumulation of debt in the corporate sector. Falling asset prices, however, reduce firms’ collateral base, thus tightening their credit constraint (a credit crunch occurs). Hence, an asset price reversal may provoke financial distress in the corporate sector, forcing firms to stop producing and giving rise to bankruptcies in the corporate sector. The macroeconomic result is a reduction in the goods supply. With respect to its supply side effects, a credit crunch is therefore treated as a negative productivity shock that leads to a slowdown in economic activity.

Equation (2) is similar to the standard New Keynesian aggregate demand equation derived from household’s optimal intertemporal consumption allocation. An increase in the expected future output stimulates current output, since households seek to smooth consumption across their lifetime. The output gap decreases for an increasing deviation of the real interest rate (defined as the nominal interest rate, $i_r$, minus expected future inflation) from its flex-price level denoted by $r^*$. Moreover, the demand side of the economy can also be supposed to be affected by the financial sector shock. Households’ wealth varies with asset prices, so that asset price movements have an immediate impact on households’ budget constraint, and therefore on consumption. Furthermore, households also use assets as collateral (in practice, real estate in particular) to finance consumption and housing investment. Falling asset prices reduce both households’ financial wealth and households’ collateral values. As a result, consumption is depressed and housing investment is curtailed.\(^7\)

\(^7\) For a more detailed modelling of the link between house prices and consumption see e.g. Aoki, Proudman and Vlieghe (2002).
Thus, besides their effect on aggregate supply, an asset price bust and the ensuing financial market disruptions also gives rise to a demand disturbance.$^8$

Hence, in contrast to BJ (2002a, b), the impact of a precipitous fall in asset prices on the economy is understood as the simultaneous occurrence of a supply and a demand side shock.$^9$ To examine the implication of asset price booms and busts for monetary policy we employ the simplest possible distribution for $v_t$. The financial shock can only occur in the middle period $2$, so that the distribution of $v_t$ can be defined as

\[
\begin{align*}
    v_t &= \begin{cases} 
    0 & \text{in } t \neq 2 \\
    0 & \text{in } t = 2 \text{ if no credit crunch} \\
    \varepsilon > 0 & \text{in } t = 2 \text{ if credit crunch}
\end{cases}
\end{align*}
\]

2.2 Crisis Probability, Policy Instrument and Policy Objectives

In contrast to conventional models, $v_t$ is not an entirely exogenous shock, but is instead assumed to be a financial sector shock that partly depends on the first period’s monetary policy. Policymakers can influence the likelihood of a future credit crunch with their policy instrument, the current nominal interest rate.$^{10}$ By varying the interest rate $i_1$ policymakers are able to influence real interest rates and thus private debt accumulation. A timely (i.e. period-1) real interest rate increase ($i_1 - E_1\pi_2$) discourages debt accumulation in the private sector in the

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$^8$ Incorporating the demand side effects of an asset price bust gives rise to plausible interest rate movements in response to a credit crunch. This enables us to eliminate a counterintuitive feature of the BJ model (2002a, b); in their model, the monetary authority reacts to a credit crunch by raising interest rates, because falling supply meets an unchanged demand so that inflation increases.

$^9$ This feature also distinguishes our model from other recent work. For example, in their influential paper, Gruen, Plump and Stone (2005) introduce financial shocks exclusively in a backward-looking IS equation (inflation effects due to financial shocks may only occur with a lag because current inflation is assumed to depend on lagged inflation and lagged output gap only).

$^{10}$ In other studies, however, the central bank can influence the probability that a bubble continues to grow. See e.g. Kent and Lowe (1997), Gruen, Plump and Stone (2005) and Filardo (2003).
boom period thus curbing the risk of a future credit crunch.\footnote{For a monetary contraction in period 1 to have the desired effect on firms’ debt accumulation, the semi-elasticity of borrowing in period 1 with respect to the real interest rate must be strictly lower than -1. Only then, the debt burden in period 2 resulting from the period 1 credit decreases in the real interest rate and a pre-emptive monetary policy may make sense, since a sufficiently steep interest rate increase eliminates the prerequisite for a credit crunch in period 2.} This is the basis for the proactive monetary policy strategy.

As explained above, we assume that firms and households can only borrow against collateral. If the asset price boom turns out to be sustainable in period 2, the credit constraint will not bind, because the debt burden accumulated so far will still be sufficiently low relative to the real value of the collateral. If, however, asset prices crash, the real value of the collateral that agents are able to offer collapses. Agents now do not receive further credits if their collateral is too low relative to the debt burden resulting from the period-1 credit. In this case, a credit crunch occurs.

The probability of a collateral-induced credit crunch ($\mu$) is thus associated with the level of private debt and hence with monetary policy in the first period.\footnote{We abstract from the possibility that monetary policy may influence the real value of collateral in period 2 and thus may change the credit constraint via this ex-post channel.} Contingent on the policy choice in period 1, the credit crunch probability can now be formulated as

$$ (4) \quad \mu = \text{prob}(v_2 = \varepsilon | i_1 - E_1^\pi_2) = \begin{cases} 0 & \text{if } i_1 - E_1^\pi_2 \geq r > r^* \\ 0 < \mu < 1 & \text{if } i_1 - E_1^\pi_2 < r \end{cases} $$

In (4), $r$ denotes the minimum real interest rate required to completely eliminate the probability of a future credit crunch.\footnote{In our macroeconomic model the value $r$ is taken as given. See BJ (2002a) on how $r$ (and $\mu$) may be related to firms’ initial wealth, first period debt or the degree of market optimism.}
Finally, monetary policy aims at minimizing the following time additive objective function:

\[
V_t = E \left( \sum_{i=1}^{3} \beta^{i-1} L_t \right),
\]

where the period loss function \( L_t \) is quadratic in the inflation rate and in the output gap\(^{14}\)

\[
L_t = \pi_t^2 + \lambda x_t^2.
\]

3. Monetary Policy and Asset Prices: Acting Pre-emptively or Reactively?

As discussed above, policymakers may decide to act pre-emptively or reactively. In the first case the policymaker takes into account how the policy instrument can influence the probability of a future crisis. In our model, we assume that a pro-active monetary policy aims at avoiding a credit crunch in any case. This is achieved by raising the interest rate in period 1 high enough to prevent the accumulation of a debt burden that may jeopardize financial stability in period 2. By contrast, a reactive monetary policy takes the probability of a future crisis as given. In this case, monetary policy always pursues the optimal stabilization policy, i.e. the policymaker optimally responds to deviations of output and inflation from their target levels.

3.1 Pro-active and Reactive Monetary Policies and Welfare

We now proceed by looking at each period in turn, starting with the last one. The values for the policy instrument, inflation rate and output, as well as the losses the

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\(^{14}\) Woodford (2003) and Rotemberg and Woodford (1997) show that a period loss function that is quadratic in inflation and the output gap can be derived as an approximation of households’ period utility losses that result from deviations from the non-stochastic steady state allocation.
A policymaker has to bear under both monetary policy strategies, are summarized in tables for each period.

**Table 1: The New Steady State (Period 3)**

<table>
<thead>
<tr>
<th>Policy instrument</th>
<th>t=3 Pro-active</th>
<th>Reactive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inflation and output</strong></td>
<td>$\pi_3^{PRO} = 0$ and $x_3^{PRO} = 0$</td>
<td>$\pi_3^{REA} = 0$ and $x_3^{REA} = 0$</td>
</tr>
<tr>
<td><strong>Losses</strong></td>
<td>$L_3^{PRO} = 0$</td>
<td>$L_3^{REA} = 0$</td>
</tr>
</tbody>
</table>

The differentiation between a pre-emptive and a reactive approach to monetary policy only makes sense in periods 1 and 2 because, in period 3, all variables are at their target values and no shock is assumed to occur. As the steady state lasts forever, it seems natural to assume that private agents expect all variables to remain at their steady state values. Hence, we impose the terminal condition $E_3 \pi_4 = \pi_3$ to solve the model for the third period. Monetary policy is able to reach the efficient flex-price result by setting the period 3 interest rate equal to the flex-price real interest rate.

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15 We assume discretionary stabilization policies, i.e., policymakers who cannot credibly commit to a future reaction on current shocks even if they would like to do so. In period 3, policymakers do not pay attention to their past behavior and will not react to past shocks. Thus, in period 2 discretionary policy may suffer from the usual stabilization bias related to time-inconsistency problems in models with forward-looking expectations. Note, however, that in our model a stabilization bias can only occur in period 2 because we assume $v_t = 0$ for all periods $t \neq 2$. See, e.g., Bean (2003), on how the possibility of a credit crunch may influence the optimal policy under commitment (from the “timeless perspective”) in a New Keynesian model.
Table 2: The Credit Crunch Period (Period 2)

<table>
<thead>
<tr>
<th>t=2</th>
<th>Pro-active</th>
<th>Reactive</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Policy instrument</strong></td>
<td>$i_{2}^{\text{PRO}} = r^*$</td>
<td>$\text{crisis: } i_{2}^{\text{REA}} = r^* - (\psi \Delta - \alpha) \sigma \varepsilon / \Delta \ ^{16}$</td>
</tr>
<tr>
<td><strong>Inflation and output</strong></td>
<td>$\pi_{2}^{\text{PRO}} = 0$ and $x_{2}^{\text{PRO}} = 0$</td>
<td>$\text{crisis: } \pi_{2}^{\text{REA}} = \lambda \varepsilon / \Delta$ and $x_{2}^{\text{REA}} = -\alpha \varepsilon / \Delta$</td>
</tr>
<tr>
<td><strong>Losses</strong></td>
<td>$L_{2}^{\text{PRO}} = 0$</td>
<td>$\text{crisis: } L_{2}^{\text{REA}} = \lambda \varepsilon^2 / \Delta$</td>
</tr>
<tr>
<td><strong>Expected Losses</strong></td>
<td>$E\left(L_{2}^{\text{PRO}}\right) = 0$</td>
<td>$E\left(L_{2}^{\text{REA}}\right) = \mu \lambda \varepsilon^2 / \Delta$</td>
</tr>
</tbody>
</table>

where $\Delta = \lambda + \alpha^2$.

From the results for period 3, it follows that $E_{2} \pi_{3} = E_{2} x_{3} = 0$ under rational expectations independently of the policymaker’s monetary policy strategy. Expected losses for the second period, however, depend on the monetary policy strategy chosen in the first period. If the policymaker pursues the pro-active strategy, the possibility of a credit crunch is eliminated.\textsuperscript{17} Hence, agents expect output and inflation to be at their flex-price equilibrium values. If, however, policymakers have decided not to contain the accumulation of debt in period 1, the probability of a future credit crunch is strictly positive and expected second period losses are positive as well. For the second period the reactive approach is therefore expected to be welfare inferior to the pro-active strategy. The policymaker pursues the optimal stabilization policy which, in case of a credit crunch, results in an increase in inflation and a decrease in output. Should no credit crunch occur, the policymaker is able to realize the flex-price allocation.

\textsuperscript{16} We suppose that $\psi > 1/\alpha$ so that the optimal monetary policy response to a credit crunch in period 2 unambiguously consists in an interest rate reduction. Thus the policy response to a crisis is more plausible than in the model of BJ (2002a, b). In their model, the central bank reacts by raising interest rates after an asset price collapse because the resulting credit crunch reduces supply without affecting demand. In this respect, our results is more in line with empirical evidence that asset price busts tend to be deflationary (BJ (2002a) themselves point to this counterintuitive result of their model; see the Appendix for a brief exposition of the model by BJ).

\textsuperscript{17} We solve the pro-active strategy case under the assumption that the occurrence of a credit crunch is impossible. Some readers, however, may prefer the alternative interpretation that, by pursuing a pro-active strategy, a credit crunch is unlikely ($\mu = 0$) but not impossible. In this alternative case, only the expected values would coincide with the flex-price values in the credit crunch period. Note, however, that all other results in our paper still remain valid and are completely independent of how the pro-active strategy is interpreted.
Table 3: The Build-Up of Debt (Period 1)

<table>
<thead>
<tr>
<th></th>
<th>Pro-active</th>
<th>Reactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy instrument</td>
<td>$i_1^{PRO} = r$</td>
<td>$i_1^{REA} = r^* + \left[ (\lambda - \alpha \sigma) \Delta + \beta \lambda \alpha \sigma \right] \mu \epsilon / \Delta^2$</td>
</tr>
<tr>
<td>Inflation and output</td>
<td>$\pi_1^{PRO} = -\alpha z / \sigma$</td>
<td>$\pi_1^{REA} = \beta \mu \epsilon (\lambda / \Delta)^2$</td>
</tr>
<tr>
<td></td>
<td>$x_1^{PRO} = -z / \sigma$</td>
<td>$x_1^{REA} = -\beta \alpha \lambda \mu \epsilon / \Delta^2$</td>
</tr>
<tr>
<td>Losses</td>
<td>$L_1^{PRO} = \Delta (z / \sigma)^2$</td>
<td>$L_1^{REA} = (\beta \mu \epsilon)^2 (\lambda / \Delta)^3$</td>
</tr>
</tbody>
</table>

where $z$ is defined as $z = r - r^* > 0$.

In period 1, the policymaker has the option to forestall a future credit crunch by raising the interest rate appropriately. In this case, rational agents expect output and inflation in period 2 to hit their targets exactly, i.e. $E_t \pi_2^{PRO} = E_t x_2^{PRO} = 0$. Insuring the economy against a credit crunch in period 2 is only possible at the cost of immediate deflation and output losses. The policymaker, however, may also decide to follow a reactive strategy and stabilize shocks if and when they occur. But now, forward looking agents will incorporate the possibility of a credit crunch, and the expected future monetary policy in response to such a credit crunch, in their expectations. Hence, owing to the forward looking character of the model, the impact of a (possible) credit crunch on inflation and output will be partly brought forward in time and already materialize in period 1. The reactive policymaker is forced to adjust the current interest rate to contain both the expectation-induced increase in inflation and the expectation-induced decrease of output.

Taking into account how current output and current inflation are influenced by this expectations channel is the key difference between our representation of the reactive strategy and BJ’s.\(^{18}\) Given forward looking agents, a reactive monetary policy, too, has to adjust the

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\(^{18}\) The Appendix provides a short overview of BJ’s (2002a, b) model and its main results. Note that the expectations channel considered here is quite different from the “moral hazard channel” that is discussed in the literature. The latter is based on the assumption that private agents take more risks when they expect future stabilization of an asset price bust (see e.g. Miller, Weller and Zhang (2002)). Our expectations channel, however, points out that the risk of a future credit crunch induces changes in current output and inflation through current behavioral changes.
period 1 interest rate and bear immediate losses, even though the economy is not hit by a shock in the boom period. Now, the reactive monetary policy is not able to implement the flex-price allocation in all but the crisis period. Thus, following the reactive policy approach in our model is not to be equated with a policy of ‘benign neglect’ in the sense of refraining from policy interventions at all in the boom phase. The latter is the view implied by BJ and is often found among monetary practitioners (see below).\textsuperscript{19}

3.2 The Policy Trade Off and the Policy Rule

Should policymakers act pre-emptively and prevent the emergence of a credit crunch, or is the reactive policy approach superior? This policy choice involves a trade-off between period 1 and period 2 objectives. If policymakers want to realize the flex-price allocation in period 2, they must tolerate the losses associated with a high real interest rate in period 1. On the other hand, if policymakers prefer to minimize the loss in period 1, they run the danger of ending up with a severe loss in period 2. The optimal policy can be derived by comparing the expected losses associated with both strategies given in equations (7) and (8).

\begin{equation}
V^{\text{PRO}} = \Delta(z/\sigma)^2
\end{equation}

\begin{equation}
V^{\text{REA}} = \left(\beta \mu \epsilon\right)^2 \left(\lambda / \Delta\right)^3 + \beta \mu \lambda \epsilon^2 / \Delta
\end{equation}

Formally, $V^{\text{PRO}} < V^{\text{REA}}$, i.e. a policy of acting pre-emptively is optimal if

\begin{equation}
r < r^* + \frac{\sigma \epsilon}{\lambda} \sqrt{\beta \lambda \mu \left[1 + \beta \mu (\lambda / \Delta)^2\right]}
\end{equation}

\textsuperscript{19} Thus, our interpretation of a reactive strategy is more in line with Bernanke and Gertler (1999) and Bean (2003), who stress that inflation targeting involves a timely adjustment of monetary policy if an asset price boom signals current or future changes in the target variables. Note, however, that in our model a reactive monetary policy responds to expected financial imbalances, but not to current asset price movements directly.
It is optimal to adopt the pro-active strategy if the real interest rate needed to reduce the probability of a credit crunch to zero, $r$, is below the threshold given by $\bar{r}$. If $r$ is too high, policymakers will choose the reactive strategy, since the costs of avoiding a credit crunch in terms of immediate deflation and output losses are unacceptably high. Intuitively, policymakers’ willingness to act pre-emptively increases in the probability of a credit crunch ($\mu$), in the extent of the asset price bust ($\varepsilon$), and decreases in the degree of time preference (i.e. a fall in $\beta$), as well as in the sensitivity with which output reacts to interest rate changes ($1/\sigma$) and inflation to output changes ($\alpha$).

4. Policy Implications and Discussion

In this chapter we discuss the policy implications of our model by explicitly distinguishing two questions. First, we clarify what a reactive policy strategy should look like. In the debate on the optimal monetary policy reaction to asset price busts, pursuing a reactive policy approach is, at least implicitly, usually identified with acting if and when a bust occurs (see, e.g., BJ (2002a, b)). This narrow interpretation of the reactive strategy as a policy of benign neglect towards asset price movements ignores the question whether a policy of benign neglect is a sensible policy option at all: even if the reactive strategy turns out to be the optimal policy, this does not necessarily imply a benign neglect.

Furthermore, as shown above, a reactive strategy may be dominated by a pro-active monetary policy. Second, we therefore address the question how the introduction of forward looking behavior affects the welfare balance between the pro-active and the reactive policy approach.
4.1 Interest Rate Policy: Does a “Benign Neglect” Policy Option Exist?

Among monetary policy practitioners, a prominent view concerning the appropriate reaction to asset price boom-bust cycles seems to be that central banks should deal with the consequences of asset price busts but refrain from policy adjustments in the run-up to a crisis. As Greenspan puts it (with reference to the late 1990s): “(I)t was far from obvious that bubbles, even if identified early, could be pre-empted short of the central bank inducing a substantial contraction in economic activity – the very outcome we would be seeking to avoid. […] Instead, we … need to focus on policies to mitigate the fallout when it occurs and, hopefully, ease the transition to the next expansion.” (Greenspan 2002).

Our model, however, points out that adopting a reactive policy might be quite different from benign neglect in the sense of a “sit and wait” policy. We expand on this by looking at the key factors determining the optimal interest rate setting in period 1 by a reactive policymaker.

While forming their expectations, private agents consider the possibility of a future crisis if policymakers do not raise the interest rate to the minimum level $r$ necessary to eliminate the likelihood of a future credit crunch. Given a current real interest rate lower than $r$, agents expect the discretionary policy response - should a credit crunch occur - to result in an increase in the next period’s inflation and a decrease in the next period’s output gap. Owing to the forward-looking nature of output and inflation, the current values of both variables change immediately (see Table 3). An increase in expected inflation induces firms to set higher prices at once since they are unsure when they will be able to adjust their prices again. Current inflation therefore increases. The net effect on aggregate demand in the first period is less clear. On the one hand, current demand tends to increase, since an increase in

\footnote{20 Greenspan explicitly refers to asset price bubbles while our model is concerned with asset price reversals no matter whether they are caused by a bursting bubble or by fundamental factors.}
inflation expectations reduces the real interest rate. But, on the other hand, a reduction in
expected future output depresses demand today, so that the net effect on the economy’s
demand side remains ambiguous. The optimal policy response, i.e. the nominal interest rate
optimally chosen in period 1, \( i_1^{\text{REA}} \), thus cannot be determined unambiguously (see equation
(10) which is taken from Table 3).

\[
(10) \quad i_1^{\text{REA}} = r^* + \left[ (\lambda - \alpha \sigma) \Delta + \beta \lambda \alpha \sigma \right] \mu \varepsilon / \Delta^2.
\]

If the real interest rate channel predominates on the demand side, an increase in both
demand and inflation unambiguously calls for an increase in \( i_1^{\text{REA}} \). If, however, aggregate
demand decreases, the overall policy reaction depends on parameter values. Despite the
possibility of a credit crunch in the next period, it may be optimal for the policymaker to leave
the policy instrument unchanged or even to decrease the nominal interest rate \( i_1^{\text{REA}} \). While the
adjustment of the period 1 nominal interest rate is not unambiguously defined under the
reactive policy strategy, the real interest rate is unambiguously smaller than \( r^* \). Defining
\( r_1^{\text{REA}} = i_1^{\text{REA}} - E_t \pi_2^{\text{REA}} \) as the first period’s real interest rate associated with the reactive strategy,
we have

\[
(11) \quad r_1^{\text{REA}} = r^* - \left[ \lambda (1 - \beta) + \alpha^2 \right] \alpha \lambda \mu \varepsilon / \Delta^2.
\]

The reactive monetary policy should allow the current real interest rate to fall below
the flex-price equilibrium value \( r^* \). Since \( r_1^{\text{PRO}} = r > r^* \), the real interest rates under a reactive
and under a pro-active policy strategy move in exactly opposite directions in period 1.21 This
result can best be understood by considering what a pro-active and a reactive policymaker aim
at. While the pro-active response intends to eliminate the risk of a future bust-related credit

\[21\] Note, that \( E_t \pi^{\text{PRO}} = 0 \) for the pro-active strategy.
crunch by containing debt accumulation, the reactive policy responds to a deterioration of current expectations about the future values of inflation and output, given the risk of future financial instability.\textsuperscript{22}

Introducing forward looking expectations gives rise to another channel through which an asset price collapse impinges upon the economy. A looming asset price bust is incorporated in the private sector’s expectations, thus affecting the optimal monetary policy before the collapse occurs. Hence, both the pro-active and the reactive approach involve a monetary policy adjustment in the run-up of a crisis; the line between the reactive and the pro-active approach is somewhat blurred. A ‘benign neglect’ policy option implying that monetary policy is only adjusted when asset prices actually collapse, no longer exists if agents exhibit a forward-looking behavior.\textsuperscript{23}

4.2 Pro-active Versus Reactive: What is the Superior Policy Strategy?

Hence, in our model the key question is not when to react to asset price fluctuations but how monetary policy should optimally respond to an asset price boom. Does the optimal policy consist in a timely substantial monetary tightening that, on the one hand, prevents the economy from falling prey to a bust-induced output depression in the future but that, on the other hand, is associated with an immediate and potentially severe loss of output? Or should policymakers bring about a decrease in the real interest rate to deal with the current

\textsuperscript{22} Empirical evidence shows that monetary policy during asset price booms that were followed by recessions is typically quite expansionary (see Detken and Smets (2004)). Our model supports the view that this observation is related to a reactive monetary policy strategy. The work of Gruen, Plumb and Stone (2005), however, suggests a different view. Allowing for time lags in monetary policy, they show that an optimal pro-active monetary policy will tighten monetary conditions when an asset price bubble is small, but it will already start to reduce interest rates significantly when the bubble is still growing.

\textsuperscript{23} Strictly speaking, not adjusting the nominal interest rate in period 1 when following the reactive strategy (benign neglect) may be optimal under very special circumstances. \( r_i^{REA} \) is only independent of the expected value of \( v \), if \((\lambda - \alpha \sigma)\Delta + \beta \lambda \alpha \sigma = 0 \). See equation (10) and the discussion above. Furthermore, \( r_i^{REA} \) will always depend on \( \mu \epsilon \), i.e. there is no benign neglect when we use the real interest rate to characterize the monetary policy stance.
expectation-induced deviation of policy objectives from their targets and run the risk of a future asset price collapse, with the resulting serious contraction in future real activity?

Monetary policymakers, however, seem to dislike the idea of acting pre-emptively in an asset price boom. They usually point out that a pro-active policy might be infeasible to implement because the interest rate has to be regarded as a blunt tool in this respect. Basically two arguments are put forward to back this assessment:

As illustrated by Greenspan’s remarks quoted above, central bankers often stress the adverse real economic effects that may be immediately related to a pre-emptive interest hike.\textsuperscript{24} Our model, however, suggests that the pro-active strategy is unambiguously dominated by the reactive approach only when policymakers do not care about real economic activity at all (see equations (7) and (8)). This is the case if they pursue a policy of strict inflation targeting (i.e. $\lambda = 0$).\textsuperscript{25} For flexible inflation-targeting central banks ($\lambda > 0$) a pro-active strategy may be superior exactly because they have the impact of monetary policy adjustments on real economic activity in mind.

Furthermore, central bankers usually point to their uncertainty about the transmission mechanism: In practice, there might be no simple mechanical relation between monetary policy instruments and the likelihood of a future bust-induced credit crunch.\textsuperscript{26} Our model, however, presumes policymakers who know the real interest rate necessary to prevent a credit crunch from occurring. In the light of the arguments above this is, of course, a heroic assumption. But it cannot be concluded that the information requirements inhibit the

\textsuperscript{24} See, e.g., Greenspan (2002) and Bernanke and Gertler (1999) for this reasoning against a pre-emptive monetary restriction during an asset price boom.

\textsuperscript{25} One caveat has to be observed. If the consequences of an asset price bust exclusively affect the economy’s demand side, the Greenspan line of argumentation is backed by our model. New Keynesian models posit that monetary policy can fully prevent demand shocks from affecting inflation and output by setting the interest rate appropriately.

\textsuperscript{26} See e.g. Mussa (2003) for a similar assessment of the link between monetary policy and asset prices.
realization of the pro-active strategy while the practical implementation of the reactive policy does not pose similar problems. The optimal setting of the nominal interest rate $i_{t}^{REA}$ similarly requires information about various parameters as can easily be verified by looking at equation (10).

Hence, in general, our model supports the policy view formulated by BJ (2002a, b), but offers further arguments that cast doubt on the optimality of the Greenspan line:

First, the consideration of a forward-looking component in private agents’ behavior makes a timely monetary restriction to curb the risk of an asset price collapse even more favorable. The threshold value for the real interest rate ($\bar{r}$) policymakers are ready to endure increases when compared with the BJ case (see the Appendix), because the reactive policy also suffers from welfare losses in the boom period. Hence, acting pre-emptively is now optimal for an even wider range of parameter values.

Second, a corollary of this change in the nature of the reactive policy strategy is that its welfare results deteriorate compared to the BJ (2002a, b) model without forward-looking behavior. Now, a reactive monetary policy is not able to realize the flex-price allocation in all but the crisis period. Deviations from this first-best allocation already materialize when a crisis starts to loom. Welfare under the pro-active strategy, however, is not touched by introducing forward-looking expectations (see the Appendix).

5. Conclusions

In this paper, we are concerned with the optimal monetary policy reaction to boom-bust cycles in asset prices. Basically, monetary policy may deal with the economic consequences of an asset price bust if and when it occurs (reactive strategy), or policymakers may prevent the crisis scenario in the first place by a pre-emptive monetary restriction (pro-
active strategy). We show that the distinction between the reactive and the pro-active approach is blurred by integrating forward-looking behavior of agents. Even the reactive approach now involves a monetary policy adjustment during an asset price boom. If policymakers pursue the reactive policy strategy and refrain from eliminating the possibility of a credit crunch in the aftermath of an asset price bust pre-emptively, agents know that a credit crunch might occur in the future. The policy response to a (possible) future credit crunch is therefore incorporated in private expectations thus depressing output and increasing inflation today. A policy of ‘benign neglect’ towards asset price booms, i.e. disregarding the possibility of an asset price bust when deciding about the monetary policy stance, is therefore (generally) not optimal.

In our model, the reactive policy approach turns out to be inferior for an even wider range of parameter values compared to the seminal work by Bordo and Jeanne (2002a, b). While the welfare losses of the reactive strategy increase when forward-looking expectations are taken into account, the welfare implications of a pro-active strategy are not affected by the introduction of forward-looking behavior. Hence, we raise further doubts concerning the appropriateness of the seemingly dominant view among monetary policy makers of dealing with the consequences of an asset price bust when it occurs.

Appendix

In order to compare the BJ results with our own, we provide the essence of the stylized macroeconomic model by BJ (2002a, b) for monetary stabilization policy. We repeat our model here with one minor modification. We introduce a dummy variable $\delta$ that will prove useful to outline BJ’s (2002a, b) model using our set-up.
(A1) \[ V_t = E\left( \sum_{i=1}^{3} \beta^{i-1} L_t \right) \]

(A2) \[ L_t = \pi_t^2 + \lambda x_t^2 \]

(A3) \[ \pi_t = \delta E_t \pi_{t+1} + \alpha x_t + v_t \]

(A4) \[ x_t = \delta E_t x_{t+1} - \left( i_t - \delta E_t \pi_{t+1} - r^* \right) / \sigma - \delta \psi v_t \]

The assumptions concerning the financial market structure and the distribution of the shock remain the same as in the main text. Setting \( \delta = 1 \) gives rise to the model employed in this paper, while setting \( \delta = 0 \) effectively switches off any forward-looking behavior and the demand-side effects of the financial sector shock. The latter case is the one investigated by BJ (2002a, b).\(^{27}\) The results for \( \delta = 0 \) are summarized in Table 4.

Table 4: Monetary policies in a stylized BJ model

<table>
<thead>
<tr>
<th>t=1</th>
<th>t=2</th>
<th>t=3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pro-active</td>
<td>Reactive</td>
<td>Expected losses:</td>
</tr>
<tr>
<td>( i_1 = r ), ( \pi_1 = -\alpha z / \sigma ), ( x_1 = -z / \sigma ), ( L_1 = \Delta(z / \sigma)^2 )</td>
<td>( i_2 = r^* ), ( \pi_2 = 0 )</td>
<td>( i_3 = r^* ), ( \pi_3 = 0 ), ( x_3 = 0 ), ( L_3 = 0 )</td>
</tr>
<tr>
<td>( x_2 = 0 ), ( L_2 = 0 )</td>
<td>( E(L_2) = 0 )</td>
<td>( E(L_2) = 0 )</td>
</tr>
</tbody>
</table>

with both \( z \) and \( \Delta \) defined as above, i.e. \( z = r - r^* > 0 \) and \( \Delta = \lambda + \alpha^2 \).

Our first result is related to the optimal policy response in the first period, when policymakers are pursuing the reactive strategy (subscripts refer to the authors’ names).

\(^{27}\) BJ assume \( \beta = 1 \). We allow for a more general assumption.
When suppressing forward-looking expectations in the aggregate supply and demand functions, as in the BJ model, the optimal policy in the first period is to set the interest rate \( i_{rea}^{RE} \) equal to \( r^* \), the flex-price equilibrium value of the real interest rate. This may no longer be optimal when forward-looking behavior is considered (see (A2), \( i_{rea}^{BKW} \) denotes the first period nominal interest rate related to the reactive strategy in our model). In general, the first period’s nominal interest rate setting now depends on the expected value of the financial sector shock (\( \mu \varepsilon \)).

Our second result is related to the optimality condition for the pro-active strategy. Pursuing a pro-active policy strategy is optimal if

\[
\begin{align*}
(A3) \quad & r < r_{BJ} = r^* + \frac{\sigma \varepsilon}{\Delta} \sqrt{\beta \lambda \mu}, \\
(A4) \quad & r < r_{BKW} = r^* + \frac{\sigma \varepsilon}{\Delta} \sqrt{\beta \lambda \mu} \left[ 1 + \beta \mu \left( \frac{\lambda}{\Delta} \right)^2 \right]
\end{align*}
\]

where \( r_{BJ} \) (\( r_{BKW} \)) denotes the threshold value for the real interest rate implied by the BJ (by our BKW) model. Equation (A4) simply repeats equation (9). Since all parameters are positive, we have \( r_{BKW} > r_{BJ} \). Hence our second result can be derived from (A3) and (A4): when allowing for forward-looking behavior the pro-active strategy turns out to be superior for an even wider range of parameter values.

Our third result is related to the welfare implications of the alternative policy strategies. By evaluating expected losses in the BJ model we find:

\[
\begin{align*}
(A5) \quad & V_{BJ}^{PRO} = \Delta \left( \frac{z}{\sigma} \right)^2 \\
(A6) \quad & V_{BJ}^{REA} = \beta \lambda \mu \varepsilon^2 / \Delta
\end{align*}
\]
The following equations (A7) and (A8) simply repeat the equations (7) and (8), respectively.

\[(A7)\quad V_{BKW}^{PRO} = \Delta(z/\sigma)^2\]  \[(A8)\quad V_{BKW}^{REA} = \left(\beta\lambda\mu\varepsilon^2/\Delta\right) + (\beta\mu\varepsilon)^2(\lambda/\Delta)^3\]

Hence, we find that the welfare losses of the reactive strategy increase when forward-looking expectations are taken into account, while the welfare implications of a pro-active strategy are not affected by the introduction of forward-looking behavior.

References


