Monetary Policy and Boom-Bust Cycles in Asset Prices: A Literature Survey

by

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August 2010

-Abstract-

In this paper, a general overview regarding asset prices and monetary policy is given. First, the role for asset prices in the objective function of monetary policy is discussed. In this regard, a short overview regarding the possible inclusion of asset prices in the inflation measure is given and the role of financial stability in the objective function of monetary policy is analyzed. Second, the development of research and literature regarding the topic of whether and how monetary policy should respond to asset price misalignments and boom-bust cycles is presented. After the classic discussion of exogenous bubbles and linear rules is laid out, the development to a middle ground with endogenous bubbles and non-linear rules is put forward. Third, since the worldwide financial crisis 2007-2009 has led to a thorough re-evaluation of related research, respective developments are surveyed.

Keywords: Monetary Policy, Credit Crunch, Boom-Bust Cycles, Globalization, Phillips Curve IS curve.

JEL Codes: E52, E58, E44, F41

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1. Introduction

Should policymakers adjust interest rates when they observe rapidly rising asset prices and to what extent? Is it optimal to adopt a proactive policy of raising short term real interest rates during an asset price boom to prevent the build-up of a financial market crisis scenario, or is it optimal to follow a reactive policy that ignores its impact on the likelihood of a future downward financial cascade? A pre-emptive interest rate hike may involve unnecessary high welfare losses in terms of too low inflation and output losses during the boom-phase, while a reactive strategy may be associated with a bust-induced economic recession in the aftermath of the boom.

Whereas contributions of the classic discussion often expressed general skepticism about both the feasibility and the desirability of the pre-emptive monetary policy strategy (Bernanke and Gertler 1999, 2001), Greenspan 2002), more recent studies, however, emphasize that there is no clear-cut answer to the optimal policy choice. Rather, the optimal policy response to an asset price boom may depend in a complex way on various economic determinants, such as the probability of a bust-induced credit crunch and the degree of ‘market exuberance’ (Bordo and Jeanne 2002a, b), the extent of the private sector’s forward-looking behavior (Berger, Kißmer and Wagner 2007) or the time lags of monetary policy (Gruen, Plumb and Stone 2005).

Academic research has devoted considerable efforts in exploring this monetary policy trade-off.\(^1\) The contributions of the reactive strategy often expressed general skepticism about both the feasibility and the desirability of the pre-emptive monetary policy strategy. For example, Bernanke and Gertler (1999), (2001) argue that central banks should take asset prices only insofar into account as they influence inflation and output. Furthermore, a reactive strategy seems to be synonymous in many cases to a policy of ‘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. The advocates of the reactive strategy point to three issues justifying their approach. First, central banks may not be able to identify asset price misalignments. Second, monetary policy is often regarded as a blunt tool. A small interest rate increase could even further fuel the boom – the increase necessary to slow the boom or prick the bubble may lead to a severe recession. Third, monetary policy behaving in an active manner may raise credibility problems: central banks with the primary objective of

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stabilizing inflation might have problems in communicating markets a monetary tightening, especially in the case of low inflation.

In contrast, the proponents of the proactive strategy (e.g. by Cecchetti et al. 2000, 2003) argue that monetary policy should raise interest rates in a proactive manner in order to prevent bubbles from growing. Using the (modified) model of Bernanke and Gertler (1999), (2001), Cecchetti et al. (2000) show that the inclusion of asset prices in the Taylor rule may enhance macroeconomic performance. Regarding the identification problem, they argue that other variables used in conducting monetary policy, like the output gap, are hard to assess too.

Following this debate, several studies show that there are no simple rules for solving this problem. Rather, the optimal policy response to an asset price boom may depend in a complex way on various economic determinants, such as the probability of a bust-induced credit crunch and the degree of ‘market exuberance’ (Bordo and Jeanne 2002a, b), the extent of the private sector’s forward-looking behavior (Berger, Kißmer and Wagner 2007) or the time lags of monetary policy (Gruen, Plumb and Stone 2005).

Furthermore, following the subprime and financial crisis 2007-2009, the topic whether and how monetary policy should take asset price developments into account, is currently being re-evaluated with several authors arguing for a stronger role of financial factors and for the “leaning against the wind” approach.²

In this survey, an overview regarding boom-bust cycles in asset prices and monetary policy is given. In chapter 2, the role for asset prices in the objective function is discussed. First, a short overview regarding the possible inclusion of asset prices in the inflation measure is given. Second, the role of financial stability in the objective function of monetary policy is analyzed in detail. In this context, the classic discussion of exogenous bubbles and linear rules is presented, including the models of Bernanke and Gertler (1999), (2001) and Cecchetti et al. (2000), (2003). Then, the development to a middle ground with endogenous bubbles and non-linear rules is discussed. In this regard, several important models are referred to: Kent and Lowe (1997), (1998), Gruen et al. (2005), and Bordo and Jeanne (2002a, b). Since the worldwide financial crisis 2007-2009 has led to a thorough re-evaluation of related research, recent developments are surveyed in chapter 3. Chapter 4 concludes.

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² See for example Yellen (2009), Trichet (2009), White (2009), Weber (2009), Cúrdia and Woodford (2009), de Fiore and Tristani (2009), Adrian and Shin (2008) and Lipsky (2008). Even Svensson (2009) can be interpreted in a way that leaning against the wind can be synonymous with flexible inflation targeting.
2. Should Asset Prices Be Included in the Objective Function?³

In the last decade or so there has been an intense debate among policymakers and scientists regarding asset prices and monetary policy. During boom-bust cycles like the New Economy bubble and the 2007-2009 subprime and financial crisis in the U.S. this discussion was regularly amplified. There is consensus that central banks should watch asset price developments since they may have an impact on economic variables like output and inflation and on financial stability. However, what is far from clear is the question whether asset prices should be part of the central bank’s objective function and whether and how central banks should respond to asset prices. Policymakers can take account of asset prices by integrating them in the inflation measure and by considering financial stability in the objective function. In the following sections an overview on the different problems discussed in this context is delivered.

2.1 Asset Prices and the Inflation Measure

Usually, the objectives of monetary policy are the stabilization of output and inflation with the latter regularly perceived as the most important objective. Inflation is the increase of the level of prices of goods and services in a certain period. Since assets are an important part of the transmission mechanism of monetary policy, it has been discussed whether asset prices should be included in the measurement of inflation (see the seminal paper by Alchian and Klein 1973). In the context of monetary policy and asset prices this can be viewed as the most extreme proposal (see ECB 2005). Since price stability is typically defined as holding constant a consumer price index given by the costs of consuming goods and services in a year relative to the costs in a base year, the focus of the inflation measurement lies on current consumption. However, sometimes it has been argued that consumers care about future consumption as well. Therefore, Alchian and Klein (1973) argue that a price index should follow an intertemporal approach, thus including asset prices. The reason is that asset prices can be viewed as claims on future consumption. Hence, the authors argue that conventional consumption baskets are incomplete and that a proper consumption basket should not only include current, but also future consumption. However, there are various practical barriers. For example, prices for future goods are not always available. For that reason Alchian and Klein (1973) suggest the use of asset prices as proxies for future consumption. Following their work, several authors have dealt with that issue. Pollack (1989) shows in a theoretical analysis that asset prices can be used for the measurement of inflation. Employing a dynamic

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³ This structure of this section is based in part on Funke, Kißmer and Wagner (2004).
equilibrium price index, Shibuya (1992) shows how the proposal of Alchian and Klein (1973) can be interpreted as a weighted sum of consumer and asset price inflation. Concerning the weights, Shibuya (1992) is using 3% for the weight of the current price index and 97% for the weight of asset prices. In addition, Shiratsuka (1999) employs the dynamic equilibrium price index by Shibuya (1992) and tests the information contents of assets prices regarding inflation. He concludes that the forecasting reliability of asset prices is relatively low and the weight of asset prices too large.\(^4\)

In this context, Bryan, Cecchetti and O’Sullivan (2002a) argue there will be a so-called “excluded goods bias” in the calculation of the inflation statistic. In their analysis, they find that the exclusion of asset prices from the CPI has caused a downward bias of approximately 0.25% annually. Considering three types of assets (equities, bonds and houses), it turns out that the non-consideration of houses leads to the largest error. Furthermore, Bryan, Cecchetti and O’Sullivan (2002b) argue that in periods with a fluctuating real interest rate the exclusion of asset prices from the measurement of inflation can even deform the inflation of all goods. However, Filardo (2000) argues that inclusion of housing and stock market prices in the inflation index not necessarily leads to an increase of the economic performance (of the U.S.). He finds only weak empirical evidence for a link of house price and stock market developments for consumer price inflation with the latter being smaller. There are several authors arguing for an inclusion of house prices at least in the inflation measure. Goodhart (2000) and Goodhart and Hofmann (2001) show that in particular house prices are closely linked to the development of inflation. Moreover, Goodhart and Hofmann (2000) find that house prices are the most informative asset price for making inflation prognoses, whereas equity prices and the yield-spread provide less information. In this context, it should be stressed that the inclusion of house prices into a price index is being discussed at Eurostat. This should be done by including the actual costs of living in houses. In the first two stages (2002-2004 and 2006-2007) the construction of price indices for new built and old houses has been developed. From the third stage on (since 2008) all EU member states are participating and a price index for reconstruction and renovation is displayed. Finally, there should be a price index for housing and real estate, which may in the future be integrated in the Harmonised Index of Consumer Prices (HICP) of the EMU (see Cournède 2005 and Dechent

\(^4\) Moreover, Stock and Watson (2001) analyze the role of asset prices for output and inflation. They obtain mixed results: there are asset prices which predict output and inflation growth in some periods, but there are ambiguous results as well. Sometimes a good indicator in one period turns into a useless indicator in another period.

However, despite the reasons for including asset prices in the inflation measure there are several arguments against the inclusion of asset prices. Yet, Alchian and Klein (1973) put forward some arguments. First, it might not be possible to obtain all the prices necessary for such an index. Since an appropriate asset price should theoretically include all assets (e.g. human capital), it would be disadvantageous when some asset are not covered. Second, a change in asset prices might be hard to interpret. The reason is that not only a change in private sector’s inflation expectations, but a lot of different possible underlying reasons can be responsible for the volatility and variability of asset prices (Gilchrist and Leahy 2002). Hence, the link between asset price changes and future price changes is quite weak (Shiratsuka 1999). There might be situations of asset prices moving in directions completely unrelated to future inflation. For example, a decline in stock prices can be due to impairment in expected profits, whereas future consumption may not be affected. In addition, although house prices are a good indicator for future consumption, this is not true for stock prices.\(^5\) Moreover, when central banks aim at measuring and reacting to asset price inflation, they need to know the fundamental value of all assets, an assumption which is strongly doubted (Smets 1997, Filardo 2000).\(^6\) Third, since current consumption is just a small fraction of lifetime consumption, taking account of asset prices in the sense of Alchian and Klein (1973) would give asset prices a weight far too high and central banks would possibly target asset prices (see Goodhart 2001). Fourth, when monetary authorities are targeting asset prices, moral hazard might be the result. Investors may increase their risk taking when a stabilization of asset prices by monetary policy is anticipated (ECB 2005). Fifth, the appropriate weight of asset prices needs to specified. As stressed by ECB (2005) the weight of asset prices could reach 90%, which would result in a very volatile monetary policy.\(^7\) Sixth, inflation

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\(^5\) There is, however, even some evidence for a negative relationship of equity prices and future inflation, see Filardo (2000).

\(^6\) King (2002) states that no one really knows the equilibrium level of asset prices, because, amongst other things, they are driven by private sector’s expectations. Therefore he concludes that targeting asset prices directly is not possible. However, he proposes to extend the time horizon of monetary policy beyond the usual two-year-horizon.

\(^7\) Bryan et al. (2003a, b) use somehow approaches: For example, they are weighting asset prices in dependence to their inflation forecast ability and they relate the weight inversely to the volatility of the asset (hence, stocks and bonds get a very small weight). Other approaches are those of Cecchetti et al. (2000) who weigh asset prices according to their empirical relationship with prices of goods and services, and of Goodhart and Hofmann (2000) who relate the income spent on assets to total income.

\(^8\) The volatility of asset prices (in particular equity prices) is a problem per se. As is argued by Cecchetti et al. (2000), the extremely high variance of stock returns may just add noise.
indeterminacy could arise. Since monetary policy is usually forward-looking and asset prices are in part build from expectations regarding the future monetary stance, inflation expectations might become self-fulfilling and highly volatile (ECB 2005, Bernanke and Woodford 1997). Finally, when central banks successfully stabilize current consumer price inflation, this will stabilize inflation expectations as well, so there might be no need to take future inflation rates into account.

To sum up, including asset prices in the inflation measure appears to be an unrealistic task. The only exception is the inclusion of house prices in a price index.

2.2 Financial Stability and the Objective Function

The second issue of the topic asset prices and the objective function of monetary policy is the question whether asset prices should enter the objective function in an independent way, for example by considering financial stability as a second objective beside price stability. The term financial stability has not been exactly defined yet (see Goodhart 2004). Rather, authors often define financial instability. However, following Issing (2003) there are two approaches of a positive definition. The systemic approach stresses that financial stability is associated with a functioning financial system being able to ensure an efficient allocation of capital on markets (Mishkin 1991, Schinasi 2004). The second approach links financial stability to a situation without a banking crisis and stable asset prices (Foot 2003, Ferguson 2002). There is a broad consensus that financial stability is considered an important target for central banks. However, it is usually not given the same weight as price stability which is part of the objective function. Furthermore, there is broad conviction that a high volatility of the inflation rate may induce financial instability. In turn, some authors see price stability as a sufficient condition for financial stability (Schwartz 1995) or as help ensuring financial stability, see Bordo and Wheelock (1998). However, financial stability is often viewed as a constraint rather than a target (Svensson 2004). Financial stability will affect monetary policy only in the case of financial crises, hence in rare cases. In addition, Issing (2003) argues that although there might be a short run trade-off between price stability and financial stability⁹, this trade-off cannot be exploited.

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⁹ The trade-off can be imagined as a situation where low and stable inflation can foster non-fundamental developments on asset markets. Hence, in turn, less price stability might generate more financial stability (see Issing 2003). But, as Issing (2003) stresses, the only situation where lower inflation can generate financial instability is a situation of significant disinflation. But, to come into a situation of disinflation, there has been usually a period of high inflation in advance.
Policymakers should rather focus on the long run where monetary and financial stability assumingly reinforce each other. This finding is supported by empirical evidence.\footnote{\textit{Bordo, Dueker and Wheelock} (2000), (2008) show that financial crises were often accompanied by large changes in inflation and unanticipated changes in inflation have played a major role in large movements in the U.S. stock market. The authors conclude that one policy lesson is that central banks should aim for minimizing unanticipated fluctuations in inflation in order to support stock market stability.}

Furthermore, the chosen monetary policy strategy is important for financial stability (Issing 2003). If central banks employ a simple inflation targeting strategy with a limited policy horizon (one to two years), the costs of financial instability (e.g. deflation following a bust) might not get the appropriate weight. In this regard, one can imagine a situation where the deviation of inflation from target in the short run might be optimal in order to ensure price stability in the medium and long run (Kent and Lowe 1997, 1998). In addition, if financial instability is associated with asymmetric risks (very large losses of a crisis, relatively small losses of a deviation of monetary policy objectives from target), it might be optimal to have lower inflation and output in the short run due to an interest rate hike (Bordo and Jeanne (2002a, b) and Berger, Kißmer, Wagner (2007)). Moreover, there is rather a short-term conflict than an exploitable short-run trade-off between price stability and financial stability. The reason is that an interest rate hike could indeed stop bubbles from growing, but, as already mentioned, this induces a movement below target of the near-term inflation. Since the time horizon for price stability includes future periods which might be ex post to a possible crisis, the conflict is due to the fact that financial stability must be so important that a long-run deviation from price stability is justified by policymakers. As Issing (2003) stresses, this does not imply that price stability should not be the most important objective for monetary policy.

Monetary stability - defined as low and stable inflation (Borio and Lowe 2002) - may contribute to financial stability. This at least is the conventional view in literature (see Bordo et al. 2000). However, this wisdom was challenged even before the financial crisis 2007-2009. Borio et al. (2003) call it the “new environment view”. It is characterized by liberalized financial markets and low inflation even during booms, with monetary policy fuelling booms in an unintended way. The low inflation of the recent decades is the result of better anchored inflation expectations and a higher credibility of monetary policy. This, in turn, together with a more successful stabilization of output, decreases the perceived risks and may encourage financial market participants to take higher risks, maybe resulting in boom-bust cycles on asset markets. In an environment of low inflation and better anchored inflation expectations, it can be expected that there is – in contrast to the conventional view mentioned above –
financial turmoil in a low-inflation-environment. An empirical validation is the increased number of boom-bust-cycles, often preceded by rapid credit growth.\textsuperscript{11} Since central banks are now characterized by a higher anti-inflation credibility, it may take longer for booms showing up in increased inflation which is labeled by Borio et al. (2003) “the paradox of credibility”. Should central banks integrate financial stability in their objective function? This question is not answered definitely, not even by the proponents of the “new environment” view. Most of the time this question is negated, in particular in the conventional part of the literature. As already mentioned, some authors argue that financial stability can be obtained by focusing on the monetary policy objectives inflation and output gap. Furthermore, when using a new objective, there might be pressure by the public when there is a deviation of the other targets. Since it cannot be excluded that asset price misalignments lead to permanent deviations of inflation and output from their targets, some authors and policymakers call for a longer policy horizon (see White 2006, Bean 2003 and Borio et al. 2003). Carney (2009) argues that flexible inflation targeting can be the right approach to ensure price and financial stability through different time horizons. However, the time horizon should not be stretched too far since the credibility of the central bank can be impaired. This may in particular be a problem with the occurrence of longer term shocks.\textsuperscript{12}

There are several empirical analyzes dealing with the role of financial stability for monetary policy. Mishkin and White (2003) analyze 15 stock market crashes in the U.S. and conclude that monetary policy should focus on financial stability rather than on stock markets alone, because there are situations possible where a stock market crash does not induce financial instability. Adrian and Shin (2009a) show that the fluctuations in leverage are linked to periods of financial booms and busts. Furthermore, Adrian and Shin (2008) demonstrate that there is a tight link between the central banks instrument, the overnight rate, and credit growth (broker dealer asset growth) by short-term interest rates, yield spread and risk measures. Funds are passed by broker dealers to other leveraged institutions investing in short and longer terms. Hence, the cost of borrowing is closely associated with monetary policy. As Adrian and Shin (2009a) point out, the result of giving financial intermediaries a role in the transmission process through credit supply and giving short-term interest rates a larger meaning than the assumption that they are only important for determining long-term interest rates. This conclusion is rooted in the assumption of financial amplifications due to frictions in the lending sector (in contrast to Bernanke and Gertler 1989 and Kiyotaki and Moore

\textsuperscript{11} A stronger role for credit in the conduct of monetary policy is claimed by Borio and Lowe (2004).
\textsuperscript{12} For a formal analysis of the extension of the policy horizon see Roi and Mendes (2007).
1997). The authors point to the papers of Bordo and Jeanne (2002a, b) who focus on balance sheets (like Adrian and Shin) and argue that these balance sheets should enter a monetary policy rule in order to reduce the probability of financial crises. Hence, they argue that there is a “case for rehabilitating a role for balance sheet quantities for the conduct of monetary policy”. The reason is that balance sheet dynamics let monetary policy get important in ensuring financial stability. Furthermore and regarding the meaning of credit booms, during the financial crisis 2007-2009, Yellen (2009) admitted that credit booms fuelling house and bond prices are potentially more dangerous than other bubbles since they are able to generate “powerful adverse feedback loops between financial markets and real economic activity”. Although she argues that basically policymakers are better off when avoiding a pre-emptive tightening, Yellen (2009) acknowledges that she “can now imagine circumstances that would justify leaning against a bubble with tighter monetary policy. See also Walsh (2009), who admits that allowing the bubble in house prices to continue to rise was a “serious policy mistake”.

2.3 From the Classic Discussion to the Middle Ground

2.3.1 The Classic Discussion: Exogenous Bubbles and Linear Rules
The question of whether and how central banks should respond to boom-bust cycles in asset prices has been very controversially debated during the last decade or so. Whereas there seems to be consensus that central banks should react to a bursting bubble or a bust, it is less clear how monetary authorities should behave during asset price booms. The discussion mainly focused on two positions: the reactive and the proactive strategy.

The proponents of the reactive strategy stress that central banks should take asset prices only insofar into account as they influence inflation and output. Furthermore, in many cases a reactive strategy can be equated to a policy of ‘benign neglect’ (easing of monetary policy in the bust phase but never tightening in the boom phase). Main proponents of this strand of literature are Bernanke and Gertler (1999), (2001). Bernanke and Gertler (1999) use a dynamic New Keynesian model with sticky prices. It differs from the standard models in assuming frictions on the credit market which lead to a so-called “financial accelerator” influencing output. In their model, using flexible inflation-targeting ensures both economic and financial stability. Therefore, responding to asset prices is only necessary when they have an impact on inflation. Furthermore, Bernanke and Gertler (2001) find no significant
additional benefit of a response to asset prices. Rather, trying to influence asset prices can be detrimental. The authors conclude that an aggressive inflation-targeting rule stabilizing inflation and output is sufficient for achieving both macroeconomic and financial stability.

There are several other authors arguing for a reactive policy stance. Gilchrist and Saito (2006) stress the role of information and identification. Using a New Keynesian model with a financial accelerator they show that responding to the asset price gap delivers the largest gains when policymakers can correctly identify the growth of technology.

Svensson (2004) argues for consideration of asset prices only insofar as they have an impact on the objectives of monetary policy. The central bank should not have asset prices as additional target. He proposes a financial stability report. Financial stability works as a constraint on monetary policy, but is binding only in a crisis situation.

In central banking practice, policymakers have usually advocated the reactive approach. Greenspan (2004) stressed that central banks should not target asset prices or lean against the wind but should “…mitigate the fallout when it occurs and, hopefully, ease the transition to the next expansion”. In this regard, the “risk-management approach” is referred to. Since many risks are not quantifiable and central bank actions might affect these risks, “…risk

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13 The authors find that the small gains due to the reduced variability of output gap are likely to be outweighed by the respective increased variability of inflation.

14 For somehow related analyses see Gilchrist and Leahy (2002) and Faia and Monacelli (2007). The latter find that a strong anti-inflationary stance is associated with the highest welfare when considering asset prices. Furthermore, they conclude that monetary policy should respond to rising asset prices by lowering interest rates. The reason is that in their model an increase in asset prices is related to an increase in the price of capital relative to consumption goods, which in turn, works as an implicit tax on investment.
management often involves significant judgment as we evaluate the risks of different events…”.

Yellen (2005) stresses that the central point is not whether central banks should react at all while referring to the taking-account-of wealth effects of assets (e.g. house prices) on consumption, but rather if monetary policy should prick the bubble. Yellen (2005) refers to three issues to be fulfilled before responding in a proactive manner: first, the effect of the deflating bubble on the economy would be very large if the central bank does not act at all, second, it could not be expected that the central bank is able to “mitigate the fallout…” and third, monetary policy is viewed as the best instrument in order to deflate a bubble. Many authors would argue that it is very unlikely that all three issues are fulfilled, so that monetary policy should respond to asset prices only insofar as they influence target variables like inflation and output. In a similar vein, Posen (2006) argues against taking asset prices into account since there is only a weak link between monetary policy and the development of bubbles. Bubbles are caused by irrational exuberance, technological jumps and financial deregulation. The damage generated by bubbles depends on the financial structure of the economy: if there is a functioning banking system, the transmission of a shock will only be weak. However, in the case of financial instability, the possible costs of recession rise significantly. So Posen (2006) concludes there is no substitute for financial stability and the central bank should not directly respond to asset price bubbles, unless they are the cause for fluctuations in inflation and output. Blinder and Reis (2005) examine the question if central banks should burst bubbles and look therefore at the Fed’s policy under Greenspan. They defend the policy conducted by Greenspan, a strategy what they call “mop up after” strategy.

In general, the position favoring the reactive approach brings forward the following arguments against the proactive strategy:\^15:

- The problem of identification of asset price misalignments,
- The problem of the adequate instrument: monetary policy is regarded as a blunt tool in order to deflate bubbles (a small interest rate increase could even further fuel the boom; the increase necessary to slow the boom or prick the bubble may lead to a severe recession),

- The problem of credibility: central banks with the primary objective of stabilizing inflation might have problems in communicating a monetary tightening, especially in the case of low inflation, therefore risking their credibility.

The main proponents of the other policy choice are Cecchetti et al. (2000) and (2003). These authors argue that monetary policy should raise interest rates in a proactive manner in order to prevent bubbles from growing. Using the (modified) model of Bernanke and Gertler, Cecchetti et al. (2000) show that integrating asset prices in a Taylor rule may improve macroeconomic performance. In addition, Cecchetti et al. (2003) argue for reacting (not targeting) to asset price changes as well. Considering an inflation-targeting central bank, they stress that the monetary response should differ depending on whether asset prices changes are driven by fundamentals or not. However, Cecchetti et al. (2003) are aware of their proposal raising communication problems. Furthermore, although they argue that the proactive strategy can lead to smaller probability of asset price bubbles occurring, they in fact employ only an exogenous bubble process.

General arguments in favor of the proactive strategy are\textsuperscript{16}:

- regarding the identification problem, the proponents of the proactive strategy argue that other variables used in conducting monetary policy, like the output gap, are hard to assess too,

- a tighter policy in the run-up phase of a bubble is expected to lead to macroeconomic costs lower than those arising if the bubble bursts, even if the central bank fails in achieving the goals in the short run,

- moral hazard: if market participants know that monetary policy will offset the consequences of a bursting bubble, they might even be stimulated to invest during the boom period,

- monetary policy known for acting preemptively might help to prevent bubbles from occurring and growing, respectively,

- central banks are responsible for maintaining financial stability which is threatened by asset price bubbles.

It should be stressed that the recommendations differ somewhat from the usual Taylor-type reaction functions. Cecchetti et al. (2003) and Smets (1997) argue that central banks should not respond to all asset price misalignments in the same way, but rather depending on the underlying source - in the case of Cecchetti et al. (2003) only when financial shocks are the source of bubbles.

Furthermore, the argumentation of Cecchetti et al. (2003) implies that a response is only justified in the case of a misalignment, which means the central bank is able to distinguish between asset price movements based on fundamentals and irrational movements. This is one of the main fields of controversy between reactive and proactive strategy.

Again, there are several other authors proposing this policy stance. Goodhart (2005) argues with the monetary pillar of the ECB strategy and advises the ECB to act proactively in the situation of rapid monetary growth and a bubble. He refers in particular to the second pillar of the ECB strategy. Crockett (2003) stresses that without an early monetary response further imbalances and larger future costs might be the result. The unwinding of such imbalances may hinder the effectiveness of monetary policy. Although the author refers to the problems (identification, political-economic constraints) associated with such a strategy, he proposes two changes in the conduct of monetary policy: a longer policy horizon and a greater weight on the balance of risks to the outlook.

Regarding the identification problem, Dillén and Sellin (2003) stress that not this is the main problem but rather the high degree of uncertainty regarding the link between monetary policy and asset prices. There are several approaches dealing with (or abstracting from) the identification problem. Employing a model with asset prices driven by irrational shocks regarding expectations of capital returns, Dupor (2005) shows that there is a trade-off between price stabilization and non-fundamental asset-price movements. When the central bank has full information regarding asset-price movements (fundamental or non-fundamental), it responds more aggressively than in the case of limited information. The same applies if the central bank acts under discretion (compared to the case of commitment). Filardo (2004) assumes no information problem. In his backward-looking linear stochastic control model the central bank should systematically respond to asset prices. Moreover, the central bank should only take the non-fundamental part of into account. In addition, implementing uncertainty (regarding about the existence of bubbles), Filardo (2004) shows that the central bank still
responds to asset prices, albeit in a different way (different form of Taylor rule). However, if paradigm uncertainty is introduced, it turns out that a monetary response can be detrimental.

One important feature of the classic discussion about the optimal stance of monetary policy during boom-bust-cycles is the fact that linear rules are used for setting monetary policy, for example the Taylor rule which is based on Taylor (1993). This framework is often associated with a (flexible) inflation targeting framework and is used, amongst others, by Bernanke and Gertler (1999), (2001) and Cecchetti et al. (2000), (2003). The use of linear (instrument) rules like the Taylor rule in the early debate about the optimal stance of monetary policy during asset price booms is characterized by using only a limited set of variables. This has been criticized by several authors, for example by Bordo and Jeanne (2002), Gruen et al. (2005) and by Svensson (2002), (2004). Svensson (2002) argues that flexible inflation targeting should not be interpreted as an instrument rule, but rather as a specific targeting rule in the sense that the objectives have to fulfill a specific condition. However, the results of Svensson (2002), (2004) are pretty similar to those of the proponents of the reactive strategy. Using the targeting rule, asset prices would only be taken into account as they affect the target variables inflation and output. This can be described as a procedure of two steps. In the first step, policymakers would try to identify the underlying source and nature of the respective shock. In the second step, they would estimate the possible consequences of the shock for the expected future path of inflation and output (not only a fixed horizon), conditional on an interest rate path. If they conclude that the (asset price) shock has consequences for inflation and output conditional on the chosen interest rate path, they would adjust the interest rate and revise their interest-rate plan. In addition, Disyatat (2005) argues that preemptive policy cannot be motivated in the standard inflation targeting framework; for such a policy stance either the targeting rule or the model have to be altered. Similar to Bernanke and Gertler (1999), (2001) and Cecchetti et al. (2000), (2003), he assumes a linear Taylor rule and explicitly considers asset prices. Disyatat (2005) constructs a monetary reaction function that reacts to asset prices insofar as they bear information for inflation and output now and in the future. However, he argues that a tighter stance can not be justified to prevent a bust since this policy would be motivated by “something that is not within the model”. Consequently, financial stability should become part of the loss function.

However, this view has not remained undisputed. One objection is that central banks usually set monetary policy for fixed horizons (two to three years), whereas the argumentation of Svensson assumes that there is an infinite time horizon. Hence, developments on asset
markets might not be considered adequately and there may be reasons for an extra response to asset prices. The argumentation of Cecchetti et al. (2000), (2003) for a proactive behavior of monetary policy is based on a fixed time horizon forecasts. As will be argued below, there is a discussion to extend the typical two year horizons in order to be able to better assess developments on asset markets. Monetary policy should have the long run consequences of asset price shocks for output and inflation in mind. In addition, the second pillar of the ECB strategy is justified with the link between credit and money growth and developments on asset markets: strong growth of money and credit aggregates are reliable indicators for boom-bust-cycles and financial instability in the medium to long run, see the findings of Bordo and Jeanne (2002) and Borio and Lowe (2002).
2.3.2 Development to a Middle Ground: Endogenous Bubbles and Non-Linear Rules  
(The Proactive vs. the Reactive Strategy)

As already mentioned, there has been a development towards a “middle ground” position (Richards 2003): Neither should monetary policy respond aggressively to asset prices nor should it act according to the benign neglect approach. Rather it should take asset price fluctuations into account when they contain information about shocks or have implications for monetary policy within a longer than the usual policy horizon. If the analysis of asset prices delivers information that there are risks of financial instability, this will have implications for economic activity and inflation. Consequently, inflation-targeting central banks should watch asset prices and their implications for the risks that an economy is facing in the medium term (see Bean 2003 and Disyatat 2005). In this regard, it should be stressed that in practice the reactive and the proactive strategy might be not so far away from each other: the reactive strategy may have to respond to asset price fluctuations (Dillén and Sellin 2003). The new view is characterized by two features: there are no longer linear rules employed (like the Taylor rule) and the bubble or asset price development is, at least partly, modeled endogenously. The non-linearities can be interpreted in the sense that the possible negative effects of an asset price bust are significantly larger than the positive effects during an asset price boom.  

In contrast to Cecchetti et al. (2000), (2003) there are several studies adopting the “middle ground” position and, in part, model the bubble or asset price process endogenously, for example Kent and Lowe (1997), (1998). Employing a model in which the central bank is able to affect the probability of bubble bursting, the asset price bubble is assumed to grow exponentially. The consequence of a bursting bubble is a reduction in inflation which is larger the longer the bubble has survived. The authors show that an increase in interest rates at an early stage can be the optimal strategy. Yet, the proactive stance is associated with immediate costs due to deviations from target inflation and these costs are larger the longer the bubble has survived.

Kent and Lowe (1997) propose a tighter monetary policy in some cases, naming three reasons for that:

Note that in the wake of the financial crisis (and even before) there has been a development in the New Keynesian literature towards the inclusion of limited asset market participation. Galí et al. (2004) and Bilbiie (2008) allow for non-asset holders. They show that, if the share of non-asset holders becomes large, the Taylor principle is weakened and even changed completely, see also Stehn (2009). However, one of the implications is that higher real interest rates raise aggregate demand (violation of the Taylor principle in the ’non-Keynesian’ region).

An interesting approach is delivered by von Peter (2004): his work is linking banking with asset prices in a macroeconomic model. He shows in a overlapping generation and non-linearized model that falling asset prices have via borrower default indirect, non-linear feedback effects from the banking system by constraining credit.
- A tighter policy increases the probability of a bubble bursting,
- Once the bubble bursts it does not grow again for a certain time,
- Although inflation will be in the short term below target, the central bank tightens its policy in order to avoid extreme deviations of inflation from its target.

Furthermore, they draw an important conclusion. They show that boom-bust cycles in property cycles are often accompanied by cycles in credit growth. This result is similar to the results in the analysis of Kent and Lowe (1998), Bordo and Jeanne (2002) and several other papers.\(^{19}\)

In a similar vein, Gruen, Plumb and Stone (2005) allow for endogenous bubbles and non-linearities. Assuming two different policymakers, a skeptic (using the current price to forecast asset prices) and an activist (using stochastic implications of the bubble), the authors show in their model that the optimal monetary response depends on the stochastic properties of the bubble. If information is not available sufficiently, a robust approach used by the skeptic might be the best alternative. Sometimes the activist recommends tighter, sometimes looser policy. Therefore, the activist might need to use a judgment of the process behind the bubble. Due to the lag structure of monetary policy the proactive policy might already associated with a loosening of monetary conditions during the boom. Hence, it is not longer clear that the proactive policy always implies looser policy than the reactive strategy during an asset price boom. Similar to Gruen et al. (2005), Kontonikas and Montagnoli (2006) are using an extension of the Ball (1999) and Svensson (1997) model and show that in the case of non-fundamental developments of asset prices as well as wealth effects and inefficient markets, policymakers should respond to asset price misalignments.

A seminal paper in this context is the analysis of Bordo and Jeanne (2002a, b). They show that the desirability of a proactive policy depends in a rather complex way on economic conditions. It is therefore not easy to obtain a simple policy rule for acting proactively. Rather, the central bank has to solve the trade-off of immediate losses today (proactive strategy in order to prevent a credit crunch by raising interest rates) and possible losses in the future due to a credit crunch with decreasing output. Following the classic discussion of Bernanke and Gertler (1999), (2001) vs. Cecchetti et al. (2000), (2003) the authors show that there is no clear-cut answer for central banks to behave reactively or proactively, since there is no linear solution in the form of a simple Taylor rule. Rather, there is a non-linear solution, depending on various parameters. Hence, there is no clear answer to the question whether a

\(^{19}\) See for example Igan (2009), IMF (2009c) and Schularick and Taylor (2009).
proactive strategy of curbing asset price inflation in the boom phase or a reactive strategy of dealing only with the consequences of an asset price bubble crash is always the optimal choice. The latter option is usually known as ‘benign neglect’: never tighten monetary policy in the run-up phase, only reacting in the aftermath of a bust.

Bordo and Jeanne (2002) try to solve the identification problem by looking for indicators of boom-bust cycles in house prices. For example, the find that in the run-up phase of boom-bust cycles that credit growth has been particularly strong and that boom-bust cycles on property markets are more likely to be associated with detrimental consequences for the economy than boom-bust cycles on equity markets. Furthermore, the authors do not focus on bubbles per se, but rather on developments on asset markets which might end in serious consequences, irrespective of the question whether asset prices are justified by fundamentals or not. In this regard, their analysis differs from the work of Bernanke and Gertler (1999), (2001), Cecchetti et al. (2000), (2003) and many others. For these reasons Bordo and Jeanne (2002) focus on firms’ property used as collateral for new credit which is necessary for production and not on bubbles per se. Rather, they use the empirical evidence that during booms on property markets there is a strong credit growth to model the boom-bust-cycle as the occurrence of a boom on property market and a possible credit crunch. In addition, the empirical evidence shows that busts on housing markets have larger wealth effects on consumption than busts on equity markets.

Extending the analysis of Bordo and Jeanne (2002a, b) in the New Keynesian direction, Berger, Kißmer and Wagner (2007) find that due to forward-looking behavior of the private sector even the reactive strategy has to adjust monetary policy during the boom phase. The reason is that private agents know a credit crunch may appear in the future if the central bank pursues a reactive strategy. The possible response is therefore contained in the private expectations, leading to lower output and higher inflation today. Therefore, ‘benign neglect’ is not a sensible option for central banks in the case of forward-looking private agents, see also Berger and Kißmer (2008). The proactive strategy is not affected by the forward-looking expectations in welfare terms, whereas the losses of the reactive strategy increase. In addition, Berger and Kißmer (2007) stress that empirical studies show that policymakers often “lean with the wind” during asset price booms. See Berger, Kißmer and Knütter (2007) and Knütter and Wagner (2008) for the impact of globalization on the policy trade-off for central banks during boom-bust cycles in asset prices.
To sum up, all studies arguing for a proactive strategy assume (at least under certain circumstances) that the interest rate is a proper instrument to influence asset prices. However, as mentioned above, doubts regarding this issue are raised regularly. First, the models assume often only one asset price, whereas in reality central banks face a multitude of asset prices. In the case of a misalignment on one asset market (say the stock market), developments on other asset markets (say housing market) can be justified by fundamentals. A bursting bubble on one market induce or fuel another bubble on a different market (see Filardo 2006 for theoretical and Detken and Smets 2004, Funke et al. 2004, Kent and Lowe 1998 for Australia for empirical evidence). Second, it is doubtful whether an increase in interest rates has the desired effects. It might even possible that a small interest rate increase amplifies the boom because the private subjects assume the central bank is able to control the situation and is ahead of the curve. To obtain the desired result, it may be necessary to increase interest rates significantly. In turn, the central bank risks raising the interest rates in a way that causes a recession. However, as recently stressed by Trichet (2009), the instrument problem might not be so large: Recent research shows that even a small change of the policy rate might be sufficient. Adrian and Shin (2008) show that in case of financial institutions borrowing short and lending long (like in the run-up of the recent subprime crisis) even a small change in the policy rate can significantly affect the profits of these institutions. Moreover, when small interest rate changes split up the private herding behavior and reveal the central banks intentions, then they might have great impact on asset prices, see Hoerova et al. (2009).

Bernanke and Kuttner (2003) argue that a small interest rate increase may boost asset prices further since private agents believe that the central bank takes the inflation target serious and is able to steer the economy, hence is ahead of the curve. For example, during the New Economy Boom, the Fed increased interest rates up to 6 %, but stock prices increased further. Hence, a small interest rate increase may not be sufficient to curb asset price inflation.
3. Recent Developments

The subprime and financial crisis 2007-2009 has led to a thorough reevaluation of the topic of whether and how monetary policy should take boom-bust cycles in asset prices (and credit growth) into account.

During the last decade or so, there has been a development towards inflation targeting frameworks aiming at relatively strict price stability objectives. While central banks all over the world were successful in achieving these objectives, they might have neglected developments in credit growth and, somewhat consequently, asset prices. In some countries, like the U.S., the result was an unsustainable degree of leverage and debt in the financial system. However, there were some warnings which stressed the link between credit growth and increasing asset prices, often used as collateral, and fuelling consumption and investment, see Borio (2006), Borio and White (2004), Borio and Shim (2007), Borio et al. (2003), White (2006), (2008). Moreover, there is empirical evidence that financial crises were preceded by rapid credit growth (see above, e.g. Bordo and Jeanne 2002a, b). Moreover, in the past, it has been argued that only a “leaning against the wind”-strategy is associated with costs. However, as has been shown, the reactive (benign neglect) strategy is not necessarily costless. Costs could be rooted in a loss of credibility of the banking system, as in Japan’s lost decade and the current financial crisis. Moreover, if the zero lower bound is reached, monetary policy might fall into the liquidity trap. In both situations, the only solution might be a fiscal bailout. Further costs could be the deviation from monetary policy objectives which regularly occur in the case of financial imbalances.

Since the financial crisis 2007-2009 it has become obvious that the standard macroeconomic modeling had not considered the financial sector in an appropriate way. As stressed by Walsh (2009), the largest part of the literature concluded that central banks should ignore asset price developments, but at the same time they just focused on the stabilization of inflation and the output gap. Researchers should have been put the focus on the question whether and how financial frictions can generate distortions in itself In this case one should consider to put these frictions into the target rule (interest rate rule).

In the following, some important theoretical contributions of the recent past focusing on the topic monetary policy, asset prices and integration of financial markets are presented. 
Employing the model of Kiyotaki and Moore (1997), Miller and Stiglitz (2009) and show that the integration of an asset price bubble can lead to a serious downward spiral. Since they take additional channels into account (e.g. high leverage, overvalued collateral, balance sheet effects), it turns out that interest rate cuts by monetary policy alone are not sufficient. Rather,
the authors argue that the purchase of assets and the restructuring of capital are important features of a crisis solution. Fukunaga and Saito (2009) base their analysis on the Bernanke, Gertler and Gilchrist (1999) model (BGG) and Gilchrist and Saito (2008) framework. In their analysis, the financial accelerator plays an important role. Shocks to the economy affect the balance sheet of borrowers and induce countercyclical movements of the external finance premium. They consider financial market imperfections by allowing the external finance premium to rise when the net worth of the borrower is decreasing. Following BGG, the authors include asset prices in the monetary policy rule and show that, when movements in asset prices are associated with inefficiencies in the economy, it can be beneficial (in terms of the variance of output and inflation and a welfare function weighting the variances of output and inflation) to include asset prices in the Taylor rule. However, the benefits decrease when policymakers possess only limited information about the relation between financial distortions and asset price movements. Fujiwara and Teranishi (2009) show in a New Open Economy Macroeconomic model that central banks aim at achieving financial stability, meaning in integrated financial markets to minimize fluctuations of loan rates.

IMF (2009) is focusing on the potential lessons for monetary policy from asset price fluctuations. Using a New Keynesian model, the authors argue that it can be beneficial when monetary policy reacts stronger to imbalances on credit and asset markets. In addition, it is shown that a macroprudential instrument which dampens credit spreads can be useful in dealing with credit and asset price imbalances. As in Bordo and Jeanne (2002a, b), the authors focus rather on house prices than stock prices since housing wealth is more important than stock market wealth and housing almost always requires issuing debt for a bank credit. They focus on two shocks: a positive productivity shock and a financial shock that is associated with a relaxation in lending standards. Similar to Bordo and Jeanne (2002a, b) they do not focus on bubbles or irrational exuberance. The macroprudential instrument can mitigate fluctuations in credit spreads which arise through changes in collateral and financial shocks. This instrument should have the same impact on the financial sector like a regulation that requires banks to hold more capital reserves (and therefore increasing the rate which banks charge over funding costs).

IMF (2009), based on Kannan et al. (2009), employs a credit accelerator mechanism, which is similar to the financial accelerator mechanism of the BGG model, but is working through housing finance rather than firms’ capital. The credit accelerator is characterized by lower lending rates when collateral is rising. Subsequently, lower rates lead to an increase in housing demand, which feeds into higher house prices. Therefore, collateral value is rising.
which leads again to lower lending rates and induce households to take out even more loans. The authors analyze several policy rules in reaction to the shocks. Regarding the financial shock, they show that a positive financial shock (modeled as reduction in lending standards of 100 basis points) induces increasing investment and house prices. IMF (2009) shows that enhancing the standard Taylor rule by an additional term reacting directly to credit can produce greater stability in terms of smaller output and inflation variability. Furthermore, additionally integrating the macroprudential instrument into the Taylor rule improves the results even more. The results of the IMF (2009) indicate that policymakers should take risks of macrofinancial developments into account and possibly, react to it. As in Bordo and Jeanne (2002a, b) central banks should not focus too much on asset prices themselves, but rather on developments that are associated with them: lax lending standards, excessive credit growth, overinvestment and deteriorating balances. One way is that the objective function of central banks can be extended; another way could be macroprudential supporting monetary policy. The problem with the modeling of the macroprudential instrument is that it is ad hoc and should be only interpreted as the intention to act as a regulatory instrument (see IMF 2009).

Adrian and Shin (2009b) analyze a model containing a friction in the credit supply. Assuming that monetary policy and, in turn, the supply of credit, can affect the risk-taking of central banks, the short term interest rate becomes an important price variable in its own (in contrast to the usual assumption that central banks are primarily interested in steering long-term interest rates by managing expectations).

Adrian and Shin (2008) argue that policymakers should ask the following questions:
- Do you know for sure there is a bubble in real estate prices?
- Could the current benign funding conditions reverse abruptly with adverse consequences for the economy?

They argue that even if the first question has been answered with no, it is still possible to answer the second question with yes. This, in turn, means that it is not necessary to identify bubbles, but rather recognize critical situations in terms of leverage and credit growth. Furthermore, they show that the short term interest rate and expectations of the future policy path are important determinants of asset growth (broker dealer asset growth). In particular, they stress that variations in the policy rate change short term rates, which in turn have a

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21 When focusing only on productivity shocks, the simple Taylor rule turns out to be the best.
direct impact on the profitability of the banking sector and the credit supply. Hence, central banks are able to curb excessive credit growth and short term interest rates matter directly for monetary policy. Adrian, Moench and Shin (2010) analyze the meaning of financial intermediaries for macroeconomic fluctuations. In particular, they focus on the link between the macro risk premium and the growth of balance sheets of financial intermediaries. They assume that the capacity of their balance sheets is linked to their risk taking and credit supply. They show that a macro risk premium (consisting of a combination of financial market spreads) is related to credit spreads. Finally, they extend the basic New Keynesian model by incorporating measures of balance sheet and the macro risk premium. One of the findings is that interest rate and credit spreads are more important than the level of interest rates for macroeconomic fluctuations. Adrian et al. (2010) extend the model by two variables and two equations: first, they extend both the IS and the Phillips curve by the macro risk premium which is defined in an extra equation. The second variable is the risk appetite, which determines, amongst others, the macro risk premium. Hence, it is assumed that monetary policy is able to affect the credit supply of banks via the risk-taking channel. The risk appetite itself is determined by macroeconomic conditions (inflation, output, interest rate). The Taylor rule is extended by the macro risk premium and the risk appetite as well. As stressed by the authors, their approach differs from the financial accelerator literature focusing on credit demand by analyzing the effects of financial frictions on credit supply.


Using the proposal of McCulley and Toloui (2008) and Taylor (2008), Cúrdia and Woodford (2009a, b) present a formal analysis of the problem. Assuming an intermediation technology, which implies that for real lending an intermediary is necessary, the total amount of lending consists of the funds that the intermediary lends to its borrowers and a cost of loan origination

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22 For empirical evidence of financial shocks, see Jermann and Quadrini (2009). The authors define a financial shock as a shock which affects the firms’ capacity to borrow. They show that the inclusion of financial shocks (shocks to firms’ ability to borrow in combination with rigidities in the adjustment of their financial structure) makes the model better fit the data.

Muehlbauer (2010) shows that the assumption that in DSGE models without financial frictions asset prices play no separate role is in contrast to data form U.K. consumption evidence. However, by using an Ando-Modigliani consumption function which is able to capture features like liquidity, wealth and housing collateral effects the author can explain the data.
and monitoring. Due to this technology, there will be a credit spread in the banking sector. A negative financial shock leads to higher costs of intermediation between borrowers and savers, inducing an increase in the credit spread. The mere existence of a credit spread does not have a significant influence on the path of different policies. However, variations in the credit spread are more important in that it influences the equilibrium relation between the policy rate and expenditure and the output-inflation-tradeoff. Cúrdia and Woodford (2009a, b) show that a response to variations in a credit spread (a rising spread would imply a reduction of the policy rate) can improve results stemming from disturbances in the financial sector. When variations in credit spreads occur, the total cost-push term is a combination of the usual cost-push shock and a cost-push term due to financial frictions. In case of a change in credit spreads the policy rate is shifted (the rate should be lowered when credit spreads rise). Consequently, Cúrdia and Woodford (2009a, b) find evidence that the credit spread moves the simple Taylor rule in the right direction and that the simple Taylor rule is too tight when the credit spread is increasing and too loose when the credit spread is decreasing. See for the cost push effects of financial frictions also Demirel (2009).

A similar analysis is the one by Fiore and Tristani (2009). It differs from Cúrdia and Woodford (2009a, b) in the source of the underlying financial friction. The microfounded friction arises due to optimal debt contracts and reflects in the Phillips curve in form of a credit spread. Since a higher credit spread implies a higher external finance costs, resulting in pressure on inflation, the financial frictions act as a cost-push term like in the paper by Cúrdia and Woodford (2009a, b). In addition, the financial shock has a negative impact on output. Real wages are falling since firms try to offset the negative effects of the increase in financing costs. As Fiore and Tristani (2009) show, an aggressive easing is the optimal response to a financial shock increasing the credit spread.

Furthermore, and in contrast to Cúrdia and Woodford (2009a, b), Teranishi (2009) analyzes a New Keynesian model with financial frictions working through the cost channel. Teranishi (2009) includes terms for loan interest rates in the New Keynesian Phillips curve in order to impact like a cost-push shock. He shows that the (optimal) Taylor rule also includes a credit-spread term. However, the optimal reaction of monetary policy to a rise of the credit spread can be positive or negative.
4. Conclusion

In this paper, a general overview regarding asset prices and monetary policy was given. It turned out that this topic is very important issue for both policymakers and researchers, not only since the recent subprime and financial crisis. This is true when looking at the monetary policy transmission channels and several historic boom-bust cycles. Concerning typical patterns associated with boom-bust cycles, the empirical evidence regarding economic conditions during and before boom-bust cycles is striking. In particular, money, credit growth and private debt played a crucial role. This is one reason why the framework used in the innovative part of this dissertation aims at taking some of these variables and developments into account. In the chapters 2.1 and 2.2, important policy questions were analyzed and discussed: whether asset prices should be included in the inflation measure and whether they should enter the objective function of monetary policy. It turned out that these topics are intensively discussed. The development of academic research and discussion was presented in chapter 2.3. The classic discussion of exogenous bubbles and linear rules was laid out, followed by the development to a middle ground with endogenous bubbles and non-linear rules. Here, empirical findings flow into the models of the middle ground, in particular in the model of Bordo and Jeanne (2002a, b). Since the financial crisis 2007-2009 has led to a thorough re-evaluation of related research, recent developments were surveyed in detail in chapter 2.4. In particular, an overview about recent developments in theoretical and empirical literature was delivered.
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