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Monetary Ease: A Factor behind Financial Crises? Some Evidence from OECD Countries

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Abstract This paper addresses the question of whether and how easy monetary policy may lead to excesses in financial and real asset markets and ultimately result in financial dislocation. It presents evidence suggesting that periods when short-term interest rates were persistently and significantly below what Taylor rules would prescribe are correlated with increases in asset prices, especially as regards housing, though no systematic effects are identified on equity markets. Significant asset price increases, however, can also occur when interest rates are in line with Taylor rules, possibly associated with periods of financial deregulation and/or innovation. Finding also some support for a link of countries' pre-crisis monetary stance with the extent to which their financial sectors were hit during the recent crisis, the paper argues that accommodating monetary policy over the period 2002–2005, probably in combination with rapid financial market innovation, would, in retrospect, seem to have been among the factors behind the run-up in asset prices and financial imbalances—the (partial) unwinding of which helped trigger the recent financial market crisis.

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1 Introduction and Main Findings

This paper addresses the question of whether monetary policy ease may lead to excesses in financial and real asset markets and ultimately result in financial dislocation. A particular focus is on the role that earlier monetary policy may have played in the recent financial market crisis. More fundamentally, the question is whether monetary policy can be too accommodative, even if it does not lead to sustained upward pressure on current prices.

The main findings, based on data from twenty-one OECD countries, are as follows: [1]

- The evidence suggests that periods when short-term interest rates were persistently and significantly below what Taylor rules would have prescribed tended to coincide with increases in asset prices, especially as regards housing. No systematic effects are identified on equity markets, probably reflecting the fact that domestic monetary policy is less important for more globally integrated stock markets. Based on (limited) available information, it appears that rates "below Taylor" in situations of *both* a severe recession and a credit crunch may not be associated with a built-up of financial imbalances.
- Significant asset price increases have also occurred when interest rates were in line with Taylor rules, probably associated with periods of financial deregulation and/or innovation, which may often give a strong boost to economic activity by themselves and thereby may lead simple Taylor rules to be overly conservative.
- Monetary policy was accommodating over the period 2002–2005, and possibly in combination with rapid financial market innovation, would, in retrospect, seem to have been among the factors behind the run-up in asset prices and financial imbalances—the unwinding of which helped trigger the recent financial market crisis.

[1] It should be noted that a number of factors beyond the direct control of national central banks have also been important ingredients in the recent turmoil, acting to amplify the impact of monetary ease (or counter the effects of monetary tightening). External influences on bond yields, liquidity creation and risk premia are examples for such non-monetary drivers of accommodating financial conditions. See Ahrend et al. (2006) and Ahrend et al. (2008) for a more detailed discussion of these issues.

The paper is structured in the following way: Section one assesses monetary conditions of twenty-one OECD countries in recent decades, examining how far interest rates may have diverged from Taylor rule levels. Sections two and three examine the association of episodes of monetary policy ease with the build-up of financial imbalances. Section two focuses on developments in housing markets, and section three synthesises the features of recent and historic episodes of monetary ease.

1.1 Identifying Periods of Monetary Ease

As a first step towards examining whether periods of monetary ease tend systematically to be associated with instability in asset prices, this section compares actual interest rates with normative benchmarks based on Taylor rules. Indeed, in the early years of the 21st century, interest rates were, for many economies, widely below the level a standard Taylor rule would have suggested. This finding of policy rates being "below Taylor" is fairly robust to different assumptions and methodologies that can be used to estimate a Taylor rule.

There can be a variety of reasons for which central banks may want to set interest rates at levels that differ from a Taylor rule.[2] Relying on deviations from a Taylor rule to identify periods of unusual monetary ease should hence not be interpreted as suggesting that deviations of monetary policy from a Taylor rule are necessarily inadequate, or inversely, that a monetary policy set at Taylor rates is infallibly adequate.[3] It has, however, been observed that—even though central banks typically do not intentionally follow a Taylor rule when setting monetary

[2] John B. Taylor, after whom the Taylor rule is named, himself described his work (Taylor, 1993) as an attempt "to study the role of policy rules in a world where simple, algebraic formulations of such rules cannot and should not be mechanically followed by policymakers".

[3] Under specific circumstances—e.g. in the context of globalisation with strong downward price pressure from Chinese production—overly accommodating monetary policy may not necessarily lead to increasing consumer price inflation within a time horizon generally considered in inflation targeting regimes. Demand pressures could instead show up in the development of asset price bubbles (see e.g. Borio and Lowe, 2002; or Borio and White, 2004). Under such circumstances following a Taylor rule which does not take account of asset prices may imply too low an interest rate.

policy—many central banks have historically often set interest rates in a way that could have been relatively well described by a Taylor rule.[4] The use of a Taylor rule as a benchmark is hence a simple way of identifying situations where monetary policy has been unusual, in the sense of being different from what historical patterns of "standard behavior" by central banks would have suggested.

The Taylor rule stipulates the level of policy rates to be a function of the output gap, divergences of actual (or projected) *rates of inflation* from a target, and the neutral level of interest rates.[5] In the following, a standard specification is used:

$$r_T = \pi + r^* + \lambda_1 (\pi - \pi^*) + \lambda_2 (\text{GAP})$$

where r_T is the Taylor interest rate, π the rate of inflation as measured by core CPI,[6] π^* the desired rate of inflation, r^* the assumed real "neutral" rate, and GAP the output gap. λ_1 and λ_2 are the weights given to, respectively, inflation and output stabilisation. For simplicity, and as widely adopted in the literature, equal weights on output and inflation stabilisation are assumed here, i.e. $\lambda_1 = \lambda_2 = 0.5$. As monetary conditions are also influenced by exchange rate movements, the inclusion of some form of exchange rate variable into a Taylor-style equation could be envisaged. Studies on the subject indicate, however, that the inclusion of an exchange rate variable in Taylor-type rules is generally not helpful for inflation and output stabilisation[7] and this paper therefore abstracts from exchange rates. Intuitively, as exchange rate misalignments can be very protracted, it would not seem desirable to rely on a general rule that would bias monetary policy significantly up or downwards for years just because of exchange rate levels.[8]

There are some potential difficulties in calculating Taylor rates which might affect their operational significance. For example, the output gap and the neutral rate are not observable, and estimates of these variables can be challenged. Problems are generally exacerbated when going back in time, especially where

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[4] See e.g. Taylor (1993), Gerlach and Schnabel (1999), or Nelson (2000).

[5] This rule was first proposed for the United States in Taylor (1993). For a critical discussion of the Taylor rule see, for example, Kohn (2007).

[6] For the United States, core PCE is used.

[7] See, for example, Taylor (2002).

[8] A stronger case for systematically considering exchange rates can be made when not looking at monetary policy stance in levels (as is done here), but in changes.

inflation was high and volatile, so that this study largely abstracts from the pre-1985 period. For simplicity, it is assumed that central banks historically pursued the same inflation objectives during the late 1980s and early 1990s as they currently do, even though at that time inflation rates in many countries were still significantly above levels witnessed during the past decade and some central banks were still mainly focused on monetary aggregates. It also seems likely, and is supported by evidence for some countries, that real neutral rates have been time-variant, and may have come down somewhat over recent decades. However, with the exception of the United States, for which such a time path is readily available, estimates of current neutral rates are used as proxies for historical values.[9] This could bias Taylor-rate estimates downward in earlier periods. On the other hand, for the earlier years the inflation targets assumed in the current Taylor-rule calculations may be overly ambitious, possibly biasing Taylor-rate estimates upward. All in all, the approach chosen to calculate Taylor rates may conceal some potential "below Taylor" episodes in earlier years, which may explain why pre-2000 only relatively few of such episodes are found.[10] This, however, is of lesser concern here, as the main objective is not to find all possible historical episodes, but simply to find *uncontroversial* historical precedents to the more recent episodes.[11]

Using quarterly data, a "below Taylor" episode is defined as a time period with a cumulated deviation from a Taylor rule of at least 12 percentage points. This would, for example, correspond to a deviation by one percentage point during

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[9] Neutral rates are derived from the OECD medium-term reference scenario. Time-variant neutral rates for the United States are taken from Wu (2005).

[10] This may also be connected with the fairly general need for disinflation during the 1980s, as well as the relatively benign global environment after 2000, which allowed for low interest rates resulting in relatively little inflationary pressure.

[11] In order not to rely on historical episodes that are probably artificial, and in any case would likely be controversial, Japan 1995–1998 and New Zealand 1986–1988 are not classified as episodes, as in both cases Taylor rates were artificially high due to one-off jumps in inflation driven by significant increases in consumption tax. Switzerland 1990–1992 is also not classified as an episode, as the Taylor rate was also artificially high, with the increase in inflation being mainly driven by a type of one-off increase in rents, which de facto being indexed to mortgage rates, increased sharply when mortgage rates went up significantly in the aftermath of the late 1980s housing bubble. See for example OECD (1991a) and OECD (1992).

three years, or a deviation by 1.5 percentage points during two years. The focus on cumulative episodes is motivated by the expectation that *sustained* deviations from a Taylor rule lead to different macro-economic consequences than deviations that are quickly reversed. For most episodes, deviations are well above the 12 percentage point threshold. For the largest cases, this threshold is surpassed by a factor of above ten (Ireland 1999–2007), or above six (Portugal 1998–2005, Spain 1998–2007 and Greece 2000–2007). For the United States 2001–2006 episode, this threshold is still surpassed by a factor of almost four. Figure 1, based on data for more than twenty OECD economies from 1985 to 2007, shows Taylor rates, actual policy rates, and potential candidates for episodes.

With a standard Taylor rule as stipulated above, a fairly large number of episodes can be identified where policy rates have been persistently and significantly below prescribed levels. These include the United States (2001–2006), Canada (2001–2007), Norway (2004–2007), Denmark (2001–2004), and Australia (2000–2003). Euro area interest rates were only slightly below what a Taylor rule would have called for, but were well below for some members, as Portugal (1998–2005), Spain (1998–2007), Greece (2000–2007), the Netherlands (1998–2004), Italy (1999–1906), France (2001–2006), Ireland (1999–2007), and Finland (2000–2002). In addition to these recent episodes of "being below Taylor", there are also some historical precedents, namely Switzerland (1985–1988), Finland (1987–1989), the United Kingdom (1987–1990), and the United States (1990–1993).

In the first half of the 2000s, a number of factors were seen as providing justification for keeping policy rates below those which a Taylor rule would have implied. Apart from the fallout from a number of high-profile corporate scandals in the early 2000s, which created financial headwinds not captured by simple Taylor rules, the most important was the fear that other large economies might follow Japan into deflation.[12] Given that costs involved were perceived as

[12] See, for example, Kohn (2004).

Figure 1. Taylor Rule and Actual Interest Rates

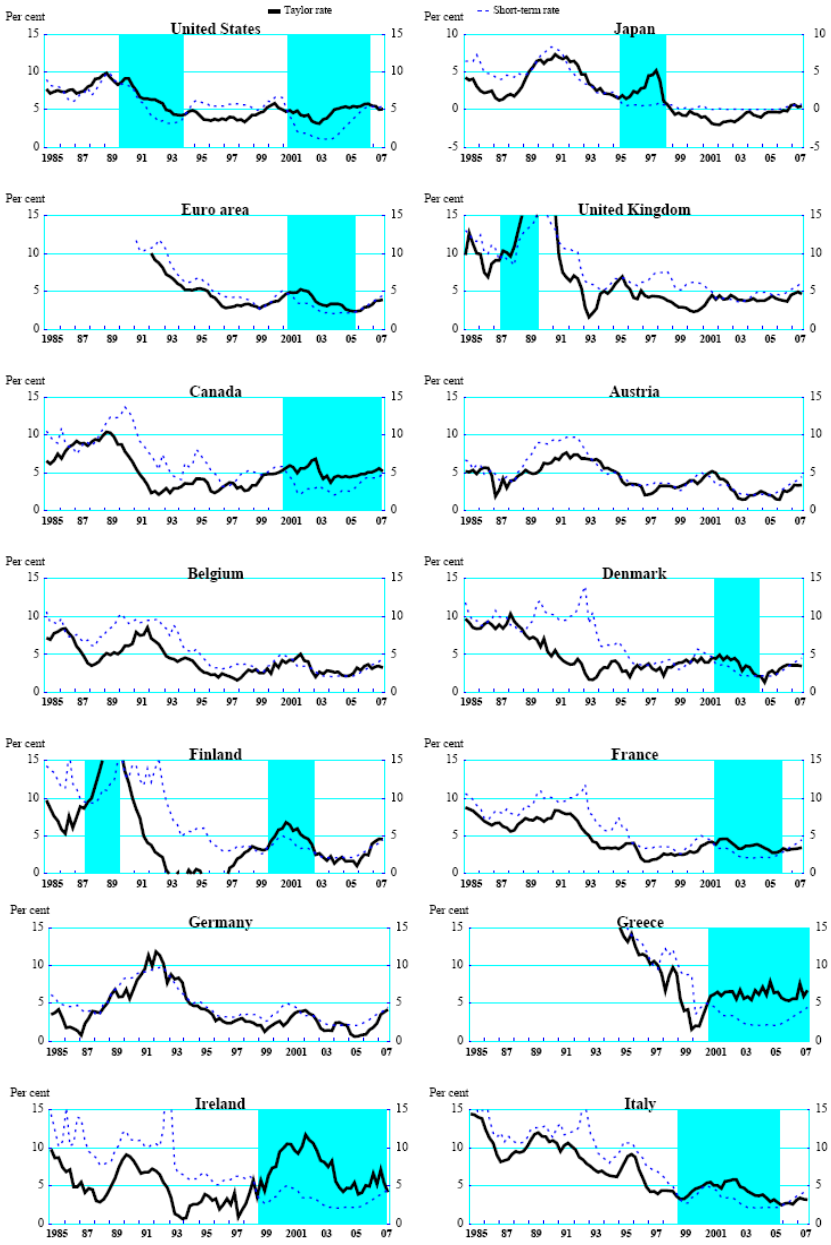
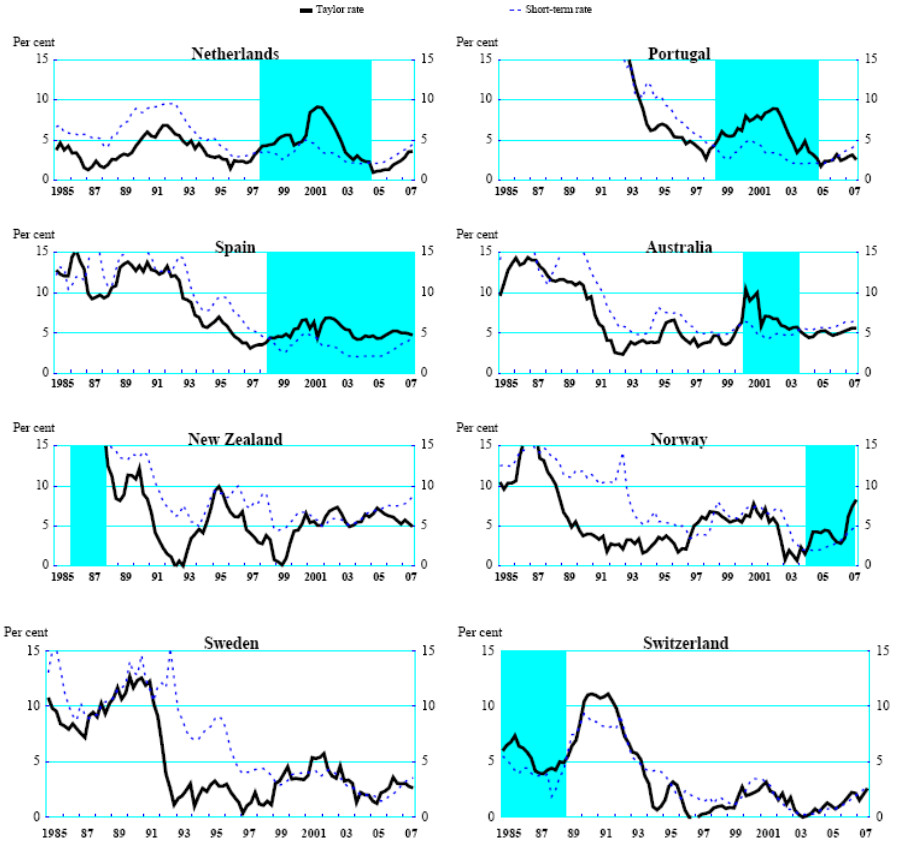


Figure 1. Taylor Rule and Actual Interest Rates (cont.)



Note*:* The Taylor rule rate is a function of an equilibrium real interest rate (short term), the (implicit) inflation target, the average output gap and the gap between actual inflation and the implicit inflation target. Equal weight is given to the inflation gap and the output gap. For the United States, the assumed price stability target is for inflation of 1.9% and the assumed equilibrium real interest rate is 2.85%. For Japan the respective figures are 1.0% and 1.2%, for the euro area countries 1.9% and 2.1%, for the United Kingdom 2.0% and 3.0%, for Canada 2.0% and 2.75%, for Australia 2.5% and 2.85%, for New Zealand 2% and 3%, for Norway 2% and 2.4%, for Sweden 2% and 2.1%, and for Switzerland 1.0% and 1.6%.

Source: OECD (2007, 2008).

asymmetric[13]—falling into deflation was considered more difficult and costly to correct than some overshooting of inflation targets—a risk management approach was thought to call for erring on the side of ease. This approach was easier to adopt in an environment of globalisation-induced disinflation, which was seen as, initially, helping central banks to keep domestic inflation at levels consistent with their respective understanding of price stability while running the economy at higher levels of activity.[14] Finally, in a monetary union as the euro area, the central bank had to focus on the currency area in its entirety when setting interest rates, even if this had asymmetric effects on asset prices which, potentially, could lead to financial imbalances in some member countries.

Several factors, however, suggested that the potential problems of undershooting Taylor rates were increasing.[15] A corollary of the bond market "conundrum" was that long–term rates failed to rise when policy rates finally increased, meaning that financial conditions remained extremely accommodative, while risk premia and volatility were artificially low.[16] Also, low interest rates were occurring in an environment of strong financial innovation and off-balance sheet expansion, which meant that monetary policy influence on overall liquidity creation was diminishing. Finally, the wealth effects of monetary policy were

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[13] The assumption of asymmetric costs, while widely shared, is not universally agreed upon (see e.g. White, 2006; or Borio and White, 2004). While the size of deflation costs remains speculative, evidence provided by Bordo and Filardo (2005) points to mild deflation being relatively benign, as long as it is not accompanied by banking crises or other asset busts. Also, asset price booms that turn sour may create potentially large costs. IMF (2003) argues that, post WWII, house-price collapses in industrial countries led, on average, to GDP losses of around 8%. Following Cecchetti (2006), housing booms worsen growth prospects particularly by creating large risks of very bad outcomes. Detken and Smets (2004), who distinguish between high- and low–cost booms, argue that real-estate price developments would play a larger role in high-cost booms.

[14] See Pain et al. (2006). The effects of globalisation temporarily allowed achieving inflation targets at lower rates of interest and higher rates of activity as low imported inflation compensated for higher domestic inflation.

[15] For a discussion of the changes in the transmission of monetary policy as a result of financial market trends, see Cournede et al. (2008).

[16] See Rajan (2006). See also Jimenez et al. (2007) for micro-based evidence that low interest rates increase bank risk taking.

being amplified by financial deepening, so that the potential problems of undershooting Taylor rates were increasing from the asset price side.

Having established episodes of unusual monetary ease with hindsight, the question remains whether central banks would have been able to avoid these below-Taylor episodes had they wished to do so. There are two issues here: first, central banks have to base monetary policy decisions on real-time data (or estimates thereof) which are regularly—and sometimes quite significantly—revised as more underlying information becomes available. Second, the single interest rate set for a monetary union may not be equally adequate for each member country taken in isolation.

While the issue of data revisions is important, it would seem unlikely that below-Taylor episodes in our sample purely result from errors in real-time data, given that the episodes here capture relatively large and persistent deviations from a Taylor rule. For example, even when using real-time data and projections as were available in late 2003 (as published in the OECD Economic Outlook, 2003/2), the Federal Funds rate would have been clearly below Taylor unless a neutral rate below one is assumed.[17] This said, it cannot be excluded that in certain circumstances policies that were thought to be in line with a Taylor rule later turn out to have been significantly below, a possibility that may be especially pertinent for more volatile economies. For policy-making, this may point to a need for alternative strategies that could provide additional signals less vulnerable to "real-time" issues.[18]

In a monetary union, "below Taylor" episodes in some member countries can hardly be avoided.[19] Setting policy rates to prevent the emergence of country specific "below Taylor" episodes would imply rates at levels that are potentially above what would be optimal for the currency area as a whole, which would be

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[17] Wu (2005) shows that, at the time, structural-model-based estimates pointed to the real neutral rate being above two percent, even though simple real time estimates of the neutral rate based on the trend real rate suggested a neutral rate below one percent. The latter, however, does not imply that it was impossible to spot that policy rates were below Taylor, but rather highlights the dangers of relying on relatively volatile simple statistical real time estimates of the neutral rate, especially when those diverge strongly from historical values.

[18] See e.g. Borio and Lowe (2002), Borio and White (2004) or White (2006).

[19] At least not unless business cycles and maybe also potential growth rates of these economies are largely synchronised.

undesirable due to significant output costs. This feature of monetary policy may point to a specific need of countercyclical macro-prudential regulation in monetary unions.[20]

2 Monetary Policy and Housing Market Developments

While many observers see the monetary ease of 2002–2005, when interest rates were significantly lower than the level indicated by a standard Taylor rule, as a factor behind the rapid run-up in house prices in the United States, this remains a matter of controversy. [21] During the same period, incomplete business cycle convergence within the euro area resulted in a situation where, for some member countries including Ireland and Spain in particular, monetary policy rates (set to be consistent with conditions in the euro area as a whole) were persistently and significantly below what a "country–focused" Taylor rule would have suggested. Most of these countries experienced particularly strong house price increases (Figure 5, Annex).[22]

Over the 2001–2006 period, the correlation between various indicators of housing market buoyancy and the distance of respective euro area countries from a Taylor-rule benchmark rate is indeed striking (Figure 2). Mortgage lending, housing investment, construction investment, and house prices all show a fairly strong correlation with deviations from a Taylor rule. The correlation with house prices is actually the weakest, which is not surprising as e.g. differences in zoning restrictions (which should be uncorrelated with monetary policy stance) would also be expected to have a significant influence on price developments.[23] While somewhat weaker, the correlation between various indicators of housing market

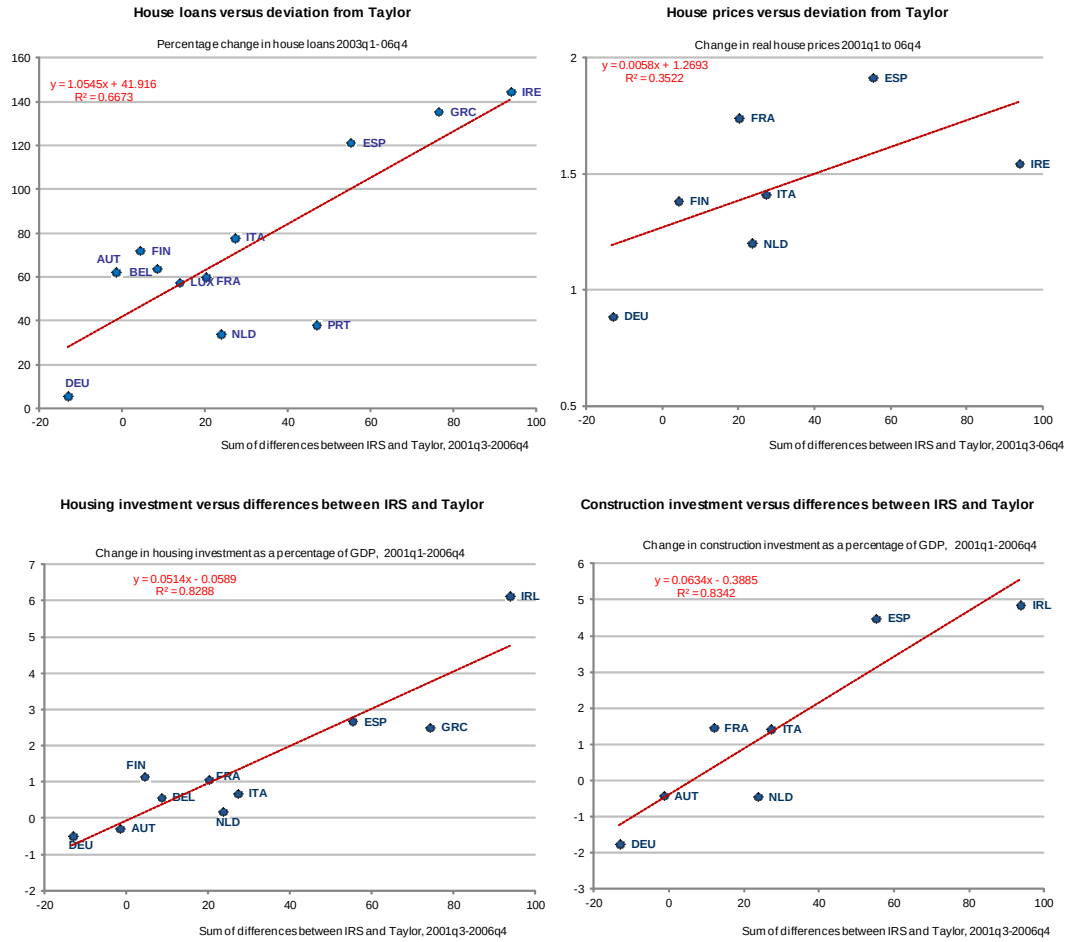
[20] See e.g. Ahrend et al. (2008).

[21] See e.g. Ahrend et al. (2008).

[22] On the nexus between house prices and financial imbalances see, for example, Girouard et al. (2006) or van den Noord (2006). On the rareness of soft landings following residential investment booms, see Rae and van den Noord (2006).

[23] See, for example, Hoeller and Rae (2007).

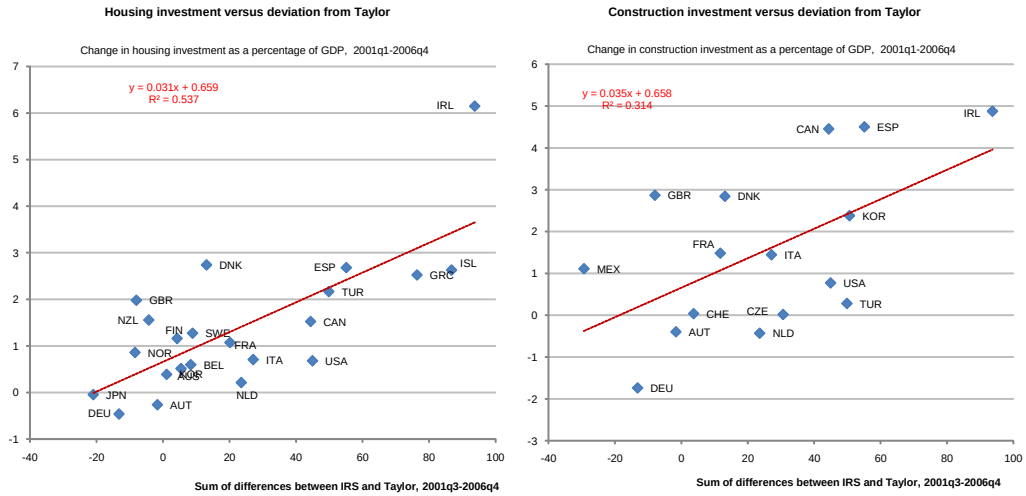
Figure 2. Deviation from Taylor Rule versus Various Measures of Housing Activity in the Euro Area



Source: OECD (2007, 2008).

buoyancy and the distance of respective countries from a Taylor-rule benchmark rate also seems to persist when looking at a broader country sample (Figure 3).

Figure 3. Deviation from Taylor Rule versus Housing and Construction Investment in the OECD



Source: OECD (2007, 2008).

Obviously, even an unusually strong correlation could be spurious and, in any case, does not tell in which direction causation would run. It is however hard to think of convincing candidates for a variable that would simultaneously be strongly connected to both housing market activity and deviations from Taylor-rates, and that itself would not be strongly influenced by monetary policy. As regards causation, it could be argued that strong housing activity may temporarily increase economic growth above trend, thus leading to output above potential (i.e. a positive output gap), which would then be reflected in increased Taylor rates. However, while this would imply that monetary policy may not have had a role in setting off housing market buoyancy, it would nonetheless be largely responsible for its continuation by not reacting (strongly enough) to it. All in all, even though the presented evidence does not constitute final econometric proof for a causal link from prolonged monetary ease to housing buoyancy, it is strongly suggestive of it. A further intuitive explanation for causality running from monetary policy to housing buoyancy is the direct influence of policy rates on borrowing costs, and in many countries on the amount potential house-buyers are able to borrow.

3 Evidence on Linkages between Monetary Policy, Asset Prices, and Financial Crises

This section examines to what degree episodes where monetary policy was significantly and consistently below what a simple Taylor rule would have prescribed, coincided with booms in asset prices, and whether those booms resulted in subsequent financial problems, notably in the banking sector. Table 1 synthesises information concerning the sampled episodes and shows that periods below Taylor seem to coincide visibly with housing sector buoyancy. Close to 95% of the episodes saw strong house price increases (and 75% very strong increases). A similar picture emerges for mortgage credit, total credit to the private sector and, to a slightly lesser degree, housing investment. For monetary aggregates, the evidence is limited and less convincing, whereas equity markets were not systematically affected in a noticeable way.

It should be noted that the majority of episodes have occurred in the post-2000 period, in a specific global environment that could have had a common effect on the countries involved. The extent to which earlier historical episodes conform to the general characteristics of more recent episodes is thus important. The following examines first historical episodes that resemble relatively clearly the recent experience, before turning to an episode that stands out:

- *Conforming episodes* The Swiss 1985–1988, Finnish 1987–1989 and the earlier part of the UK 1987–1990 episodes resemble relatively closely the post-2000 experience. All countries witnessed housing booms, reflected in increases in housing credit, housing investment, and house prices (see Figure 6, Annex). There was also some growth in monetary aggregates, though not to a degree that would particularly stand out. Comparable to recent episodes, there is no evidence for a systematic impact on equity markets. Finally, all countries had witnessed relatively extensive financial sector deregulation prior to, and during the episode,[24] probably to some degree the equivalent of the strong financial

[24] See, for example, Honkapohja et al. (1999), Vihriälä (1997), OECD (1988), or OECD (1991b). An indicator of financial liberalisation presented in Abiad et al.(2008) also shows strong increases during pre–crisis years for Finland and the UK.

Table 1. Synthetic Information Concerning "Below-Taylor" Episodes

		Real House Prices	Housing Investment	Mortgage Credit	Credit to private sector	M2	Stock Market Indices
US	2001-06	Strong increase	Very strong increase (initially)**	Very strong increase	Very strong increase	Moderate increase	Moderate increase
Canada	2001-07	Very strong increase	Very strong increase	Very strong increase	Very strong increase	Strong increase	Strong increase
Denmark	2001-04	Strong increase*	Very strong increase	Very strong increase	n.a.	Very strong increase	Strong increase
Norway	2004-07	Very strong increase	Moderate increase	Very strong increase	n.a.	Strong increase	Very strong increase
Australia	2000-03	Very strong increase	Moderate decrease	n.a.	Very strong increase	Strong increase	Moderate decrease
Portugal	1998-2005	n.a.	n.a.	Strong increase	n.a.	n.a.	Strong decrease
Spain	1998-2007	Very strong increase	Very strong increase	Very strong increase	Very strong increase	n.a.	Strong increase
Greece	2000-07	Very strong increase	Very strong increase	Very strong increase	Very strong increase	n.a.	Moderate increase
Netherlands	1998-2004	Very strong increase	Moderate decrease	Strong increase	Very strong increase	n.a.	Strong decrease
Italy	1999-2006	Strong increase	Strong increase	Very strong increase	Very strong increase	n.a.	Moderate decrease
France	2001-06	Very strong increase	Very strong increase	Very strong increase	Strong increase	n.a.	Moderate increase
Ireland	1999-2007	Very strong increase	Very strong increase	Very strong increase	Very strong increase	n.a.	Moderate increase
Finland	2000-02	Very strong increase	Strong decrease	n.a.	Strong decrease	n.a.	Very strong decrease
US	1990-93	Moderate decrease	Moderate increase	Strong increase	Moderate decrease	Moderate decrease	Very strong increase
Switzerland	1985-88	Very strong increase	Very strong increase	Very strong increase	Very strong increase	Strong increase	Very strong increase
Finland	1987-89	Very strong increase (initially)**	Very strong increase	n.a.	n.a.	n.a.	Very strong decrease
UK	1987-90	Very strong increase	Very strong increase (initially)**	Very strong increase (initially)**	Very strong increase	Moderate increase	Moderate decrease

Note: * - Strong increase in direct aftermath of episode (not taken into account in calculations). ** - Strong decrease starting shortly before end of episode excluded from calculation of period average. Real house price increases (yearly average) between 0 and 4% are classified as moderate, between 4 and 8% as strong, and above 8% as very strong. Changes in the share of housing investment in GDP (over the whole period) between 0 and 0.5% of GDP are classified as moderate, between 0.5 and 1% as strong, and above 1% as very strong. Mortgage credit increases (yearly averages) between 0 and 5% are classified as moderate, between 5 and 10% as strong, and above 10% as very strong. Credit to the private sector increases (yearly averages) between 0 and 5% are classified as moderate, between 5 and 10% as strong, and above 10% as very strong. Real M2 increases (yearly average) between 0 and 4% are classified as moderate, between 4 and 8% as strong, and above 8% as very strong. Real stock market index increases (yearly average) between 0 and 4% are classified as moderate, between 4 and 8% as strong, and above 8% as very strong. For all variables, decreases are classified correspondingly to the increases.

Source: OECD (2007, 2008), Datastream.

innovation of recent years. Both in Finland and Switzerland the end of the property boom put stress on the banking system. While in Switzerland banking failures remained fairly exceptional, Finland experienced a full-blown banking crisis.[25]

- *Atypical episodes* The US 1990–1993 episode is atypical in that it was characterised by a combination of credit crunch and recession, very weak,

[25] In Switzerland the banking sector may be particularly resilient to domestic turbulences, given its large share of non–domestic clients. In Finland, the banking crisis may also have, to some degree, been driven by the implosion of the Soviet Union and collapsing terms of trade.

though recovering, housing activity, and actual falls in house prices and monetary aggregates (see Figure 6, Annex).[26] All in all, while the possibility that it may have contributed to the dot-com bubble cannot be totally discarded, it would be hard to argue that this episode of deviation from a Taylor rule stored up housing–market problems for the future.

There are also a number of cases of credit or housing booms, as well as banking crises, in situations where monetary policy was not below what a Taylor rule would have indicated. Striking examples are Japan in the second half of the 1980s, as well as the United Kingdom since 1997 (Figure 6, Annex). While there likely are specific reasons in such cases, the UK example points to the role financial innovation may play. This would be in line with a fairly wide body of empirical evidence indicating that financial liberalisation, while beneficial in the longer-term, may initially raise the risk of financial instability.[27] In a similar vein, the recent strong innovation in financial markets, especially in derivatives and structured credit markets, may have contributed to credit booms, where effects may have been strongest in countries at the forefront of financial innovation, probably including the United States and the United Kingdom. The evidence presented in this paper with respect to the role of financial innovation is, however, only tentative, underlining the interest (and need) of further future work on this issue.

The strength of the recent crisis has also been connected to the pre-crisis monetary stance. IMF (2009) estimates of the expected net fiscal cost of financial sector rescue,[28] which can be seen as a proxy for the depth of the financial crisis, are indeed correlated with the deviation of monetary policy from a Taylor rule in the pre-crisis period (Figure 4). This relationship is also confirmed by simple econometric analysis: the variable measuring the pre–crisis deviation of short term interest rates from a Taylor rule comes out statistically significant at the 1% level

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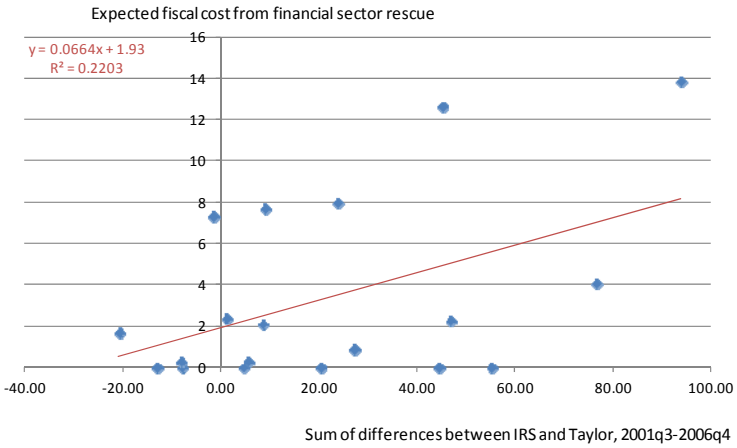
[26] For a characterisation of the credit crunch see Bernanke et al. (1991).

[27] See, for example, Drees and Pazarbasioglu (1995), Hutchinson (2002) or Demirgüç-Kunt and Detragiache (1998).

[28] IMF (2009) puts the expected net cost from direct support to imperilled financial institutions, guarantees made by governments or central banks, and liquidity provisions, at 4% of GDP on average across OECD countries, ranging from close to zero up to 14% of GDP. The size of rescue packages likely reflects not only the severity of the financial crisis, but also other factors including inter alia the responsiveness of policy makers.

when regressing it on the proxy for the depth of the financial crisis.[29] This points to a link between more relaxed monetary policy stance in the years prior to the crisis and a deeper financial crisis, as proxied by the cost of financial sector rescue.

Figure 4. Deviation from Taylor Rule versus Depth of the Financial Crisis



Source: Ahrend et al. (2009).

4 Robustness of "Below Taylor" Episodes

Given the potential difficulties in determining Taylor rates, the robustness of the identified episodes to different assumptions and methodologies has been tested. The general result is that, while the exact timing of identified episodes may differ somewhat, their identification is fairly robust. Table 2 presents cut-off points up to which episodes are robust to the weights used in the Taylor rule, as well as the assumptions about inflation targets and "neutral" rates. Further robustness checks,

[29] These regressions control for the stance of prudential regulation and a financial center dummy, which both come out statistically significant. See Ahrend et al. (2009) and Ahrend et al. (2010) for details.

with some focus on the United States, are presented in the Annex. The main results of the robustness checks are as follows:

- Identified episodes are robust to different weights on inflation and output stabilisation (see Table 2, Column 1 and Annex, Figure 7). Even under fairly extreme scenarios with weights of 0.7 and 0.3—using, in turns, a stronger weight on inflation or output stabilisation—all identified episodes remain robust.[30]
- Identified episodes are robust to different assumptions about inflation targets. Column 2 of Table 2 shows the maximum inflation target under which the classification of an episode would be preserved.[31] In spite of some ambiguity about the exact inflation level considered to be desirable by different central banks, all these maximum targets appear to be clearly above the comfort zone of the respective central banks.[32]
- Identified episodes also appear fairly robust to the level of the real "neutral" rate. The last column of Table 2 shows the degree to which the neutral rate could be below the assumed neutral rate without changing the classification of an episode as such. For the large majority of countries neutral rates could be one or several percentage points lower.[33] Similarly, Figure 8A of the Annex shows that negative neutral rates would need to be assumed in order to argue that in 2002–2005 US rates were not below Taylor rates. Also, using a fixed or

[30] A large majority of episodes would even remain robust under the extreme weights of 0 and 1.

[31] See also Annex, Figure 8B which shows that for any inflation target between 0 and 4%, actual US rates in 2002–2005 were significantly below Taylor rates.

[32] A possible exception could be the 1990–1993 episode in the United States, even though it would seem unlikely that the Federal Reserve would have aimed for long-run inflation above three per cent at the time. In any case, given that this episode is very different from all other identified episodes doubts about its correct classification would not affect the main results of the paper.

[33] Finland is the only country for which the margin of error would be (just) below half a percentage point. However, the Finnish 2000–2002 episode shows some untypical features, and its elimination would—if anything—strengthen the general results.

Table 2. Robustness of "Below-Taylor" Episodes

		Range of weights for inflation gap under which classifi-cation as episode preserved	Inflation target up to which classifi-cation as episode preserved	Difference from assumed infl. target up to which classific. as episode preserved	Equilibrium real interest ("neutral") rate down to which classific. as episode preserved	Downward deviation from assumed "neutral" rate up to which classific. as episode preserved
US	2001-06	0-1	4,8	2,9	1,0	1,9
Canada	2001-07	0-1	5,2	3,2	1,1	1,7
Denmark	2001-04	0,2-1	2,7	0,8	1,6	0,5
Norway	2004-07	0-0,7	3,0	1,0	1,7	0,7
Australia	2000-03	0-1	5,6	3,1	1,3	1,6
Portugal	1998-2005	0-1	8,1	6,2	-1,0	3,1
Spain	1998-2007	0-1	6,0	4,1	0,0	2,1
Greece	2000-07	0-1	8,2	6,3	-1,0	3,1
Netherlands	1998-2004	0-1	7,3	5,4	-0,6	2,7
Italy	1999-2006	0-1	3,9	2,0	1,1	1,0
France	2001-06	0-1	2,8	0,9	1,6	0,5
Ireland	1999-2007	0-1	12,0	10,1	-3,1	5,2
Finland	2000-02	0-1	2,7	0,8	1,7	0,4
US	1990-93	0,3-1	3,0	1,1	2,3	0,6
Switzerland	1985-88	0-1	2,8	1,8	0,7	0,9
Finland	1987-89	0-1	5,0	3,1	0,6	1,5
UK	1987-90	0,1-1	4,6	2,6	1,7	1,3

a time-varying neutral rate does not seem of major importance for the United States (see Annex, Figure 9).

While for all member countries of the euro area the targeted inflation rate as well as the nominal policy rate are identical, it is conceivable that neutral rates differ across countries. For the large majority of recent episodes in euro area countries, however, neutral rates would have needed to be unrealistically low (usually negative) in order for episodes *not* to be preserved. Exceptions, i.e. episodes for which episodes would only have been preserved for neutral rates up to

roughly half a percentage point below the assumed neutral rate are France 2001–2006, Finland 2000–2002, as well as Denmark 2001–2004.[34] All of these countries, however, had potential growth rates in line or above euro area averages during those years, making it difficult to argue that neutral rates for these countries should have been more than half a percentage point *below* the neutral rate for the euro area.

5 Conclusion

The evidence presented in this paper suggests that "below Taylor" episodes have generally been associated with the build-up of financial imbalances in housing markets, and in some instances in credit markets. Monetary ease in the early years of this century also seems to be connected to the strength with which financial sectors were hit during the recent crisis. In contrast, there is no evidence that "below Taylor" episodes had systematic influence on equity markets, which seem to be rather driven by global conditions. There is also no evidence that "below Taylor" episodes that were largely restricted to periods of both a severe recession and a credit crunch have resulted in a built-up of financial imbalances. Such episodes have been scarce, though.

Monetary ease does not appear to be a necessary condition for imbalances. Casual evidence points to the possibility that imbalances can also emerge during periods of financial deregulation and/or innovation, even when rates are at or above those implied by a Taylor rule. This could be connected to innovation temporarily boosting the neutral rate—something the simple approach used here does not allow for. Tentative evidence also hints at particularly increased risk when below-Taylor interest rates coincide with periods of rapid financial innovation and/or deregulation.

[34] Denmark is obviously not a euro area member country. Its currency, however, has been pegged to the Euro, and its central bank has been closely following the moves of the ECB.

6 Annex

Figure 5. House Prices, Taylor Rule and Short-Term Interest Rates

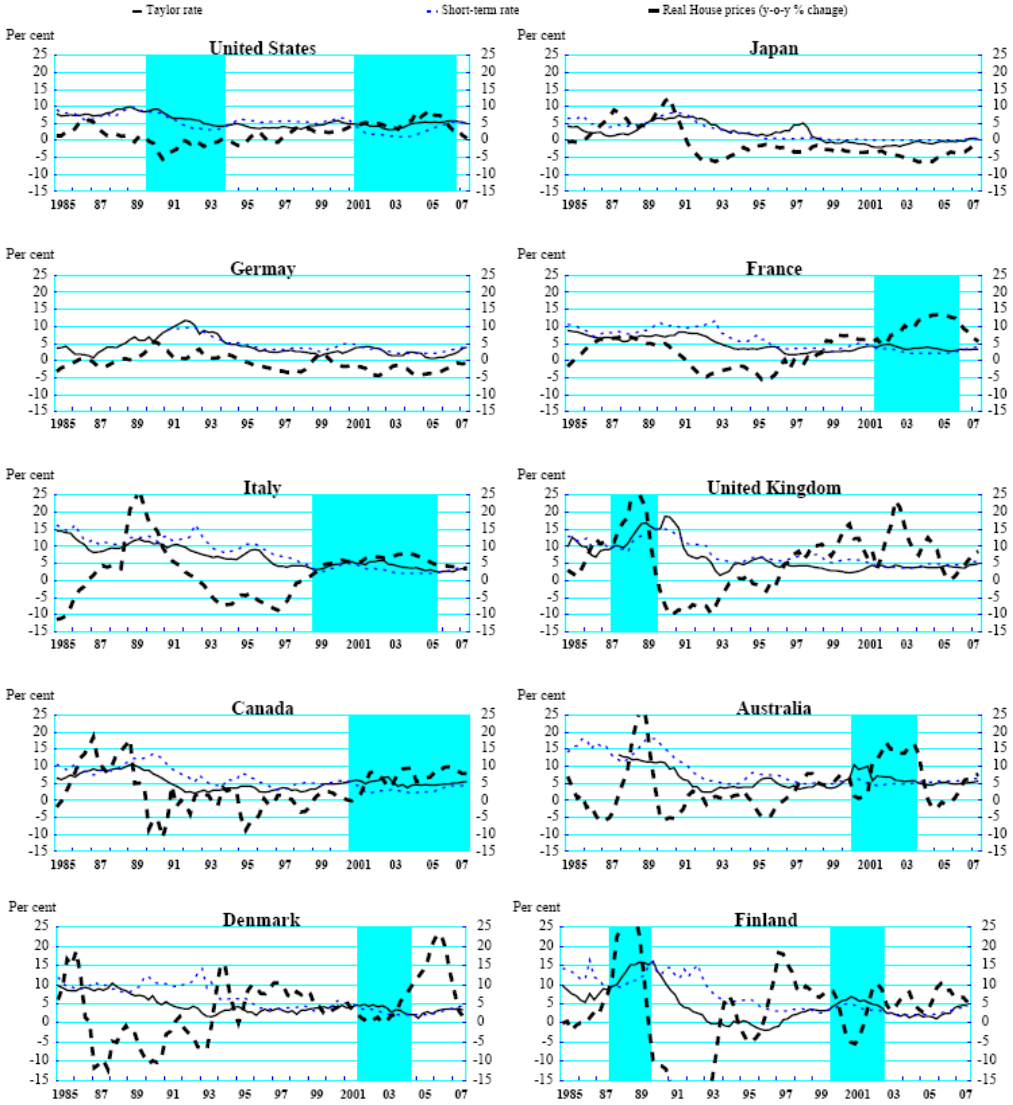
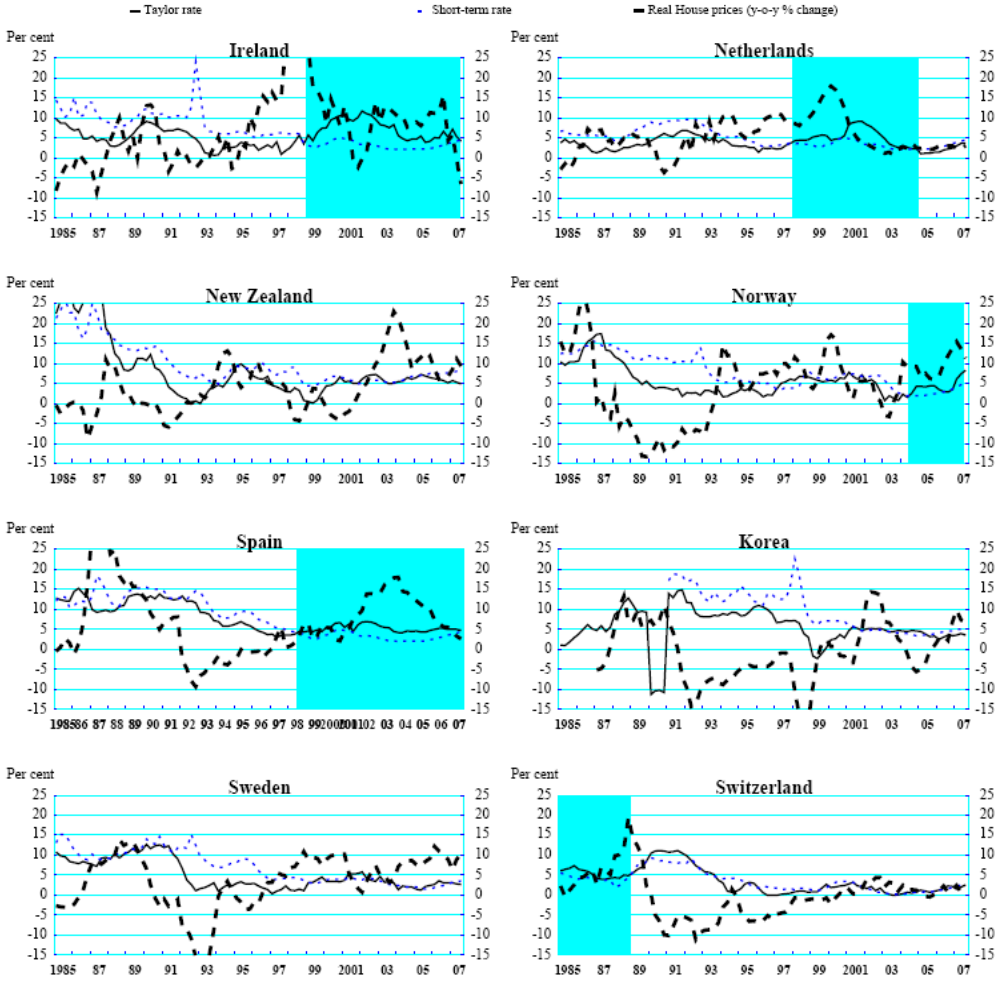


Figure 5. House Prices, Taylor Rule and Short-Term Interest Rates (cont.)



Source: OECD (2007, 2008).

Figure 6. Deviation from Taylor Rule vs. Measures of Activity for Selected Countries

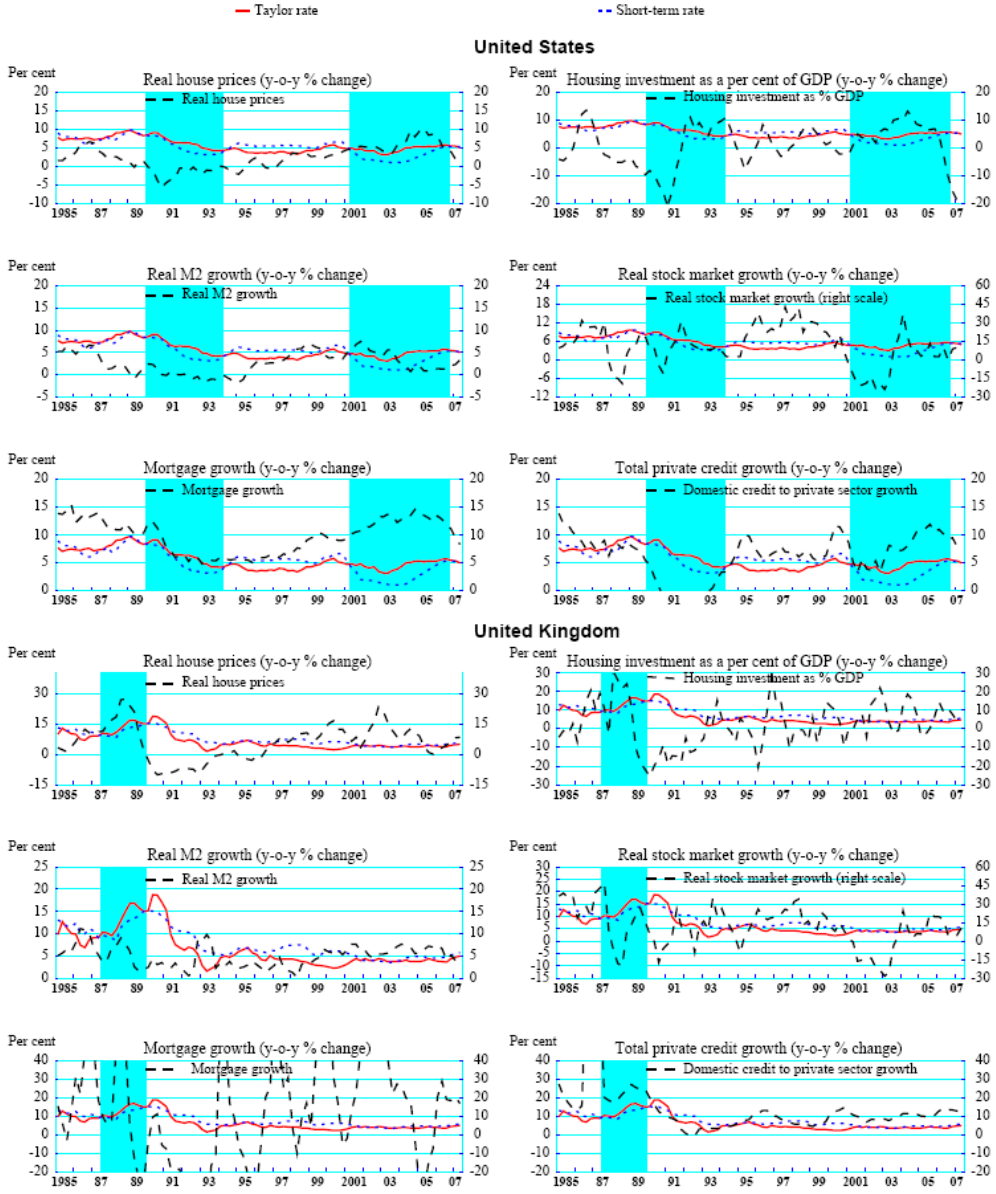
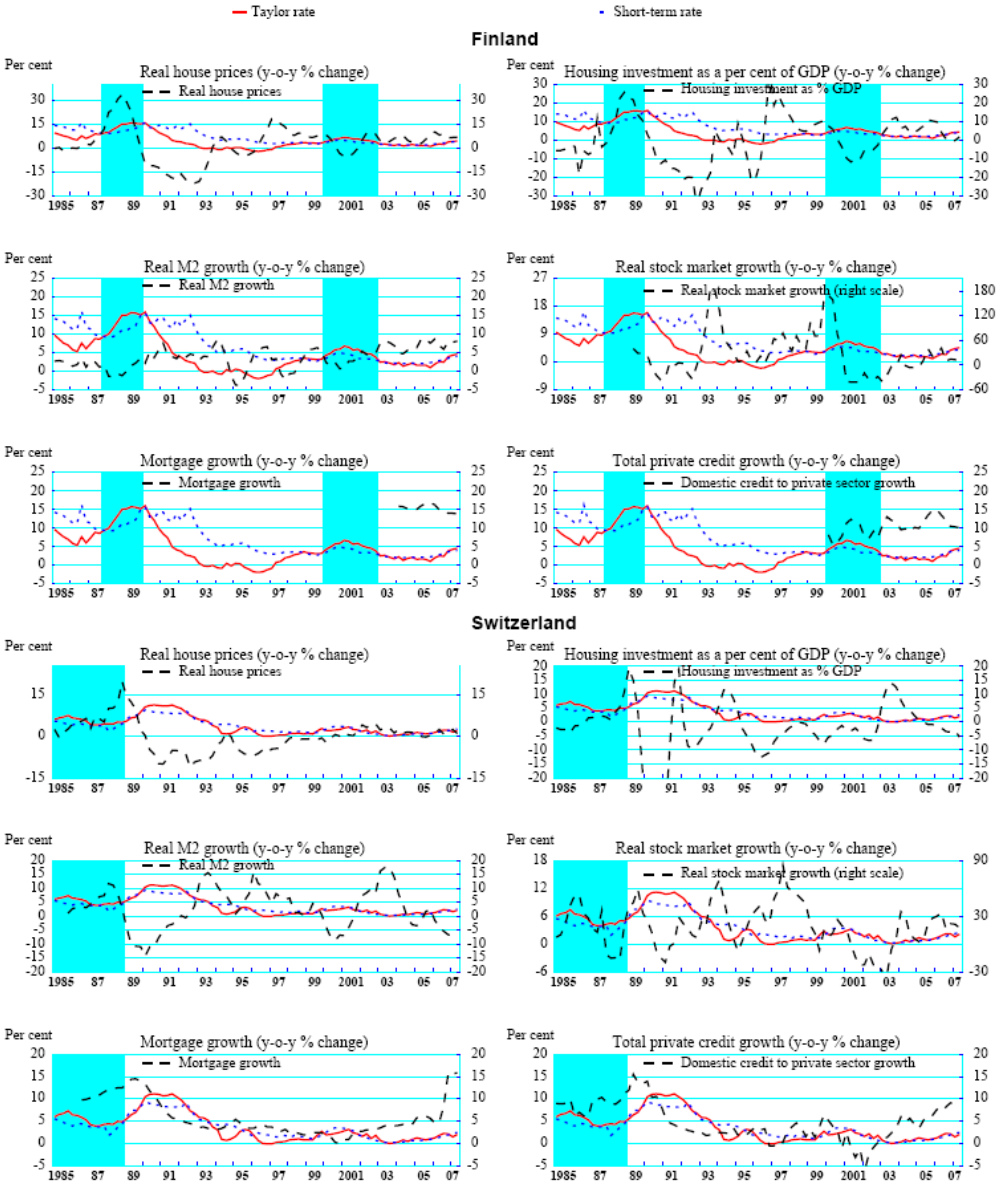
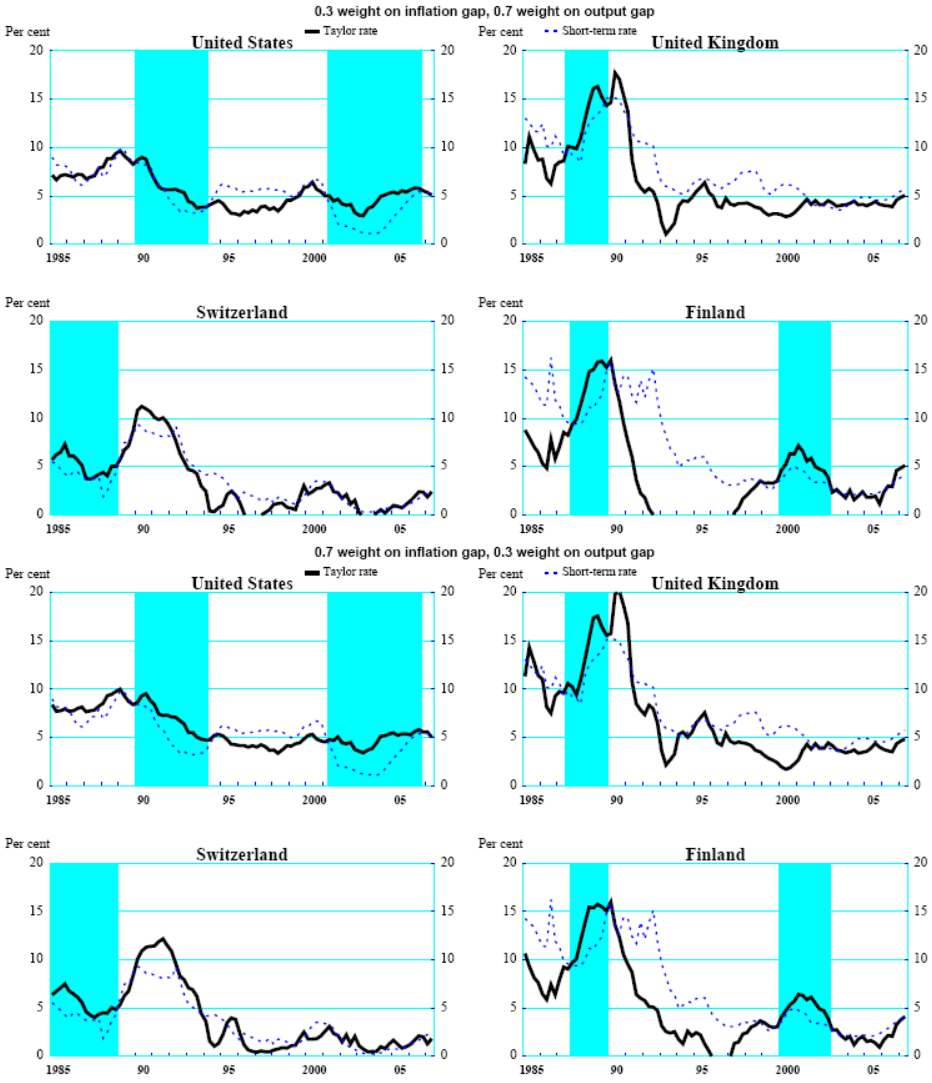


Figure 6. Deviation from Taylor Rule vs. Measures of Activity for Selected Countries (cont.)



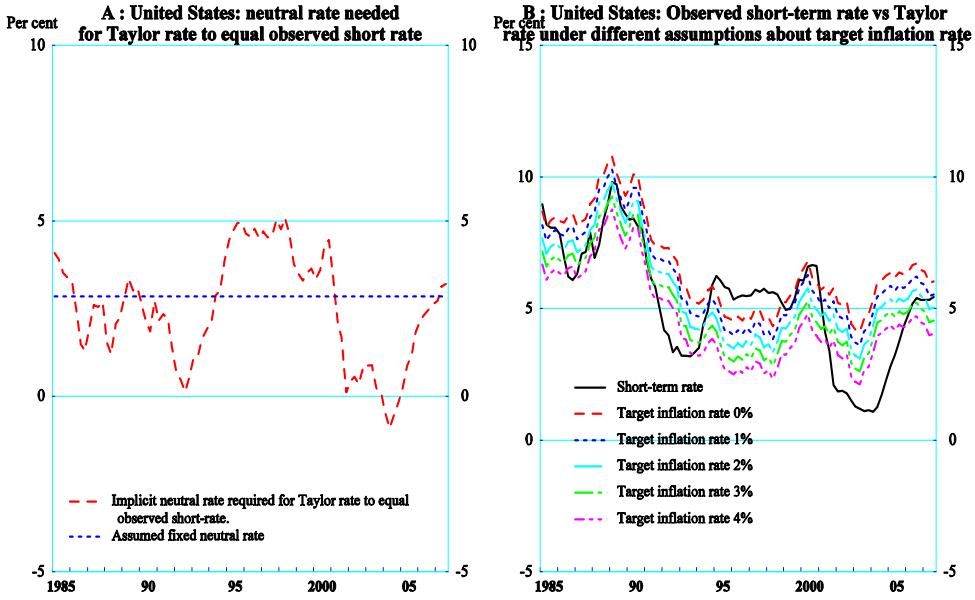
Source: OECD (2007, 2008), Datastream.

Figure 7. Robustness of Taylor Rates to Variations in weights for Inflation and Output Stabilisation



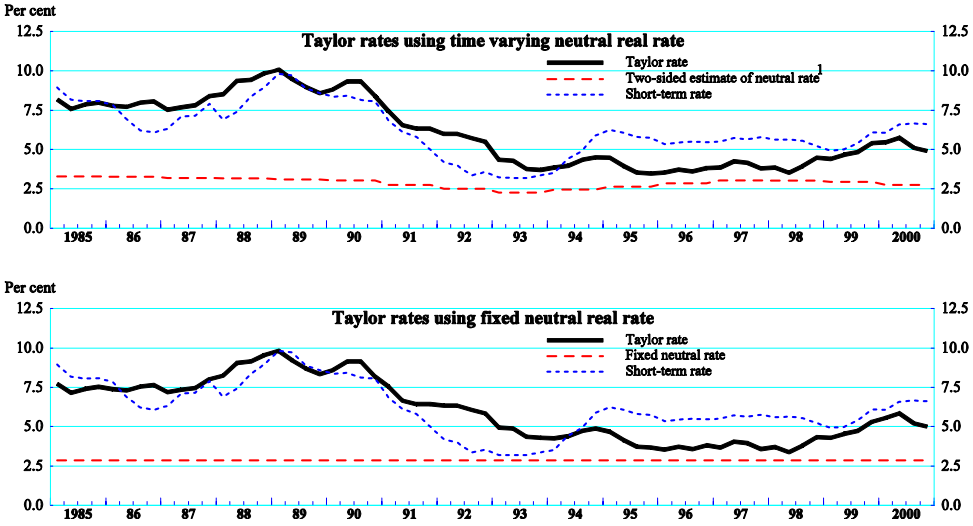
Source: OECD (2007, 2008). For detailed information on the assumptions underlying the Taylor rates see Figure 1.

Figure 8. Robustness of US Taylor Rates: Variation in Assumptions



Source: OECD (2007, 2008).

Figure 9. Robustness of US Taylor Rates: Fixed vs. Time Varying Neutral Rate



[1] Time varying neutral rates are taken from Wu (2005).

Source: OECD (2007, 2008).

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References

Abiad, A., E. Detragiache, and T. Tressel (2008). A New Database of Financial Reforms. IMF Working Papers, WP/08/266. Washington, D.C.

Ahrend, R., J. Arnold, and F. Murtin (2009). Prudential Regulation and Competition in Financial Markets. OECD Economics Department Working Papers, No. 735. Paris.

Ahrend, R., J. Arnold, and F. Murtin (2010). Have More Strictly Regulated Banking Systems Fared Better During the Recent Financial Crisis? *Applied Economic Letters,* forthcoming.

Ahrend, R., P. Catte, and R. Price (2006). Factors Behind Low Long-Term Interest Rates. *Financial Market Trend*s, 91, 99–141.

Ahrend, R., B. Cournede and R. Price (2008). Monetary Policy, Market Excesses and Financial Turmoil. OECD Economics Department Working Papers, No. 597. Paris

Bernanke, B., C. Lown and B. Friedman (1991). The Credit Crunch. *Brookings Papers on Economic Activity*, 2, 205–239.

Bordo, M.D., and A. Filardo (2005). Deflation in a Historical Perspective. BIS Working Papers, No. 186. Basel.

Borio, C., and P. Lowe (2002). Asset Prices, Financial and Monetary Stability: Exploring the Nexus. BIS Working Papers, No. 114. Basel.

Borio, C., and W. White (2004). Whither Monetary and Financial Stability? The Implications of Evolving Policy Regimes. BIS Working Papers, No. 147. Basel.

Cecchetti, S.G. (2006). Measuring the Macroeconomic Risks Posed by Asset Price Booms. NBER Working Paper, No. 12542. Cambridge, MA.

Cournede, B., R. Ahrend, and R. Price (2008). Have Long-Term Financial Trends Changed the Transmission of Monetary Policy? OECD Economics Department Working Papers, No. 634. Paris.

Demirgüç-Kunt, A. and E. Detragiache (1998). Financial Liberalization and Financial Fragility. IMF Working Papers, WP/98/83. Washington, D.C.

Detken, C., and F. Smets (2004). Asset Price Booms and Monetary Policy. ECB Working Papers, No. 364. Frankfurt.

Drees, B., and C. Pazarbasioglu (1995). The Nordic Banking Crises: Pitfalls in Financial Liberalization? IMF Working Papers, WP/95/61. Washington D.C.

Gerlach, S., and G. Schnabel (2000). The Taylor Rule and Interest Rates in the EMU Area: A Note. *Economic Letters*, 67 (2), 165–171.

Girouard, N., M. Kennedy, P. van den Noord and C. André (2006). Recent House Price Developments: The Role of Fundamentals. OECD Economics Department Working Paper*s*, No. 475. Paris.

Hoeller, P., and D. Rae (2007). Housing Markets and Adjustment in Monetary Union. OECD Economics Department Working Papers, No. 550. Paris.

Honkapohja, S., E. Koskela, S. Gerlach and L. Reichlin (1999). The Economic Crisis of the 1990s in Finland. *Economic Policy*, (29), 399–436.

Hutchinson, M.M. (2002). European Banking Distress and EMU: Institutional and Macroeconomic Risks. *Journal of Economics*, 104, 365–389.

IMF Fiscal Affairs Department (2009). Companion Paper – The State of Public Finances: Outlook and Medium-Term Policies after the 2008 Crisis. Washington, DC.

IMF (2003). When Bubbles Burst. *World Economic Outlook*, April. Washington, DC.

Jiménez, G, S. Ongena, J.L. Peydró and J. Saurina (2007). Hazardous Times for Monetary Policy: What do Twenty–three Million Bank Loans Say about the Effects of Monetary Policy on Credit Risk. CEPR Discussion Papers, No. 6514, October. London.

Kohn, D. (2004). How Should Policymakers Deal with Low–Probability, High-Impact Events? Speech presented at the European Central Bank Conference on Monetary Policy and Imperfect Knowledge, Würzburg, Germany, 15 October.

Kohn, D. (2007). John Taylor Rules. Speech presented at the Conference on John Taylor's Contributions to Monetary Theory and Policy, Federal Reserve Bank of Dallas, Dallas, Texas, 12 October.

Negro del, M., and C. Otrok (2007). 99 Luftballons: Monetary Policy and the House Price Boom across US States. *Journal of Monetary Economics*, 54, 1962–1985.

Nelson, E. (2000). UK Monetary Policy 1972–1997: A Guide Using Taylor Rules. Bank of England Working Papers, No. 120. London.

van den Noord, P. (2006). Are House Prices Nearing a Peak? A Probit Analysis for 17 OECD Countries. OECD Economics Department Working Papers, No. 488. Paris.

OECD (1988). *OECD Economic Surveys: Switzerland*. Paris: OECD.

OECD (1991a). *OECD Economic Surveys: New Zealand*. Paris: OECD.

OECD (1991b). *OECD Economic Surveys: Finland*. Paris: OECD.

OECD (1992). *OECD Economic Surveys: Switzerland*. Paris: OECD.

OECD (2007). *OECD Economic Outlook No. 82*. Paris: OECD. www.oecd.org/oecdEconomicOutlook

OECD (2008). *Main Economic Indicators*. Paris: OECD. www.oecd.org/std/mei

Pain, N., I. Koske and M. Sollie (2006). Globalisation and Inflation in the OECD Economies. OECD Economics Department Working Papers, No. 524. Paris.

Rae, D., and P. van den Noord (2006). Ireland's Housing Boom – What has Driven It and Have Prices Overshot? OECD Economics Department Working Papers, No. 492. Paris.

Rajan, R. (2006). Monetary Policy and Incentives. Address delivered at the Bank of Spain Conference on Central Banks, 8 June.

Taylor, J. (1993). Discretion versus Policy Rules in Practice. *Carnegie-Rochester Conference Series on Public Policy*, 39, 195–214.

Taylor, J. (2002). The Role of Exchange Rate in Monetary Policy Rules. *American Economic Review*, 91, 263–267.

Taylor, J. (2007). Housing and Monetary Policy. NBER Working Paper, No. 13682. Cambridge, MA.

Vihriälä, V. (1997). Banks and the Finnish Credit Cycle, 1986–1995. Bank of Finland Studies. Helsinki.

White, W. (2006). Is Price Stability Enough? BIS Working Papers, No. 205. Basel.

Wu, T. (2005). Estimating the 'Neutral' Real Rate in Real Time. *FRBSF Economic Letter*, 2005–27.