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Discussion of "Leaning Against the Wind When Credit Bites Back"*

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1. Introduction

The 2008–09 global financial crisis and the ensuing Great Recession forced monetary policymakers to rethink the role of financial market imbalances and asset price developments in the design of monetary policy. It has led economists to ask whether, in the buildup to the crisis, the Federal Reserve and other central banks should have responded to the rapid increase in housing prices and in debt by raising interest rates more than would normally be justified based on the behavior of inflation and real economic activity. That ex post reexamination of past policy decisions has been accompanied by a debate over whether, in the post-crisis era, policy should actively respond to credit growth by "leaning against the wind."

Gerdrup et al. (this issue) directly address the desirability of leaning against the wind, or LAW, policies. Following Svensson (2016), such policies mean "conducting, for financial stability purposes, a tighter monetary policy (a higher interest rate) than justified by standard flexible inflation targeting when the possibility of a financial crisis is disregarded." Defining LAW policies carefully is important, as a flexible inflation-targeting central bank will react to financial market developments to the extent they are useful for forecasting future developments in inflation or real economic activity.[1] The relevance of financial conditions for monetary policy was actually recognized in the Federal Reserve Reform Act of 1977, which states that "the Board of Governors of the Federal Reserve System and the Federal Open Market Committee shall maintain *long run*

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[1] See the discussion in Walsh (2009).

growth of the monetary and credit aggregates commensurate with the economy's long run potential to increase production, so as to promote effectively the goals of maximum employment, stable prices and moderate long-term interest rates." (emphasis added)

LAW policies are controversial. Several authors (e.g., see Gambacorta and Signoretti 2014, Filardo and Rungcharoenkitkul 2016) have argued that the benefits of LAW policies outweigh any costs.[2] This view has influenced policy in Norway, for example, where Norges Bank Governor Øystein Olsen (2015) has stated that "a robust monetary policy should therefore take into account the risk of a build-up in financial imbalances." Others (for example, Ajello et al. 2016) find that accounting for financial crisis concerns causes optimal policy to deviate very little from the case in which such concerns are ignored, and that optimal policy may, in some cases, actually lean *with* the wind.[3] The most prominent opponent of LAW policies has been Lars Svensson, who has argued that the costs of such policies far outweigh any potential benefit; see Svensson (2016, 2017).[4]

The broad outlines of the cost-benefit analysis of leaning against the wind are straightforward. Raising the policy rate in response to rapid credit growth may reduce such growth, reduce the probability of a crisis, and lessen the consequences of a crisis should one actually occur. These are the benefits. The costs take the form of the reduced economic activity and shortfall of inflation relative to target that are a result of the tighter policy. Given that there are both costs and benefits, the issues at debate are primarily empirical, and the challenge is to quantify accurately these costs and benefits.

Gerdrup et al. (this issue) offer a new contribution to this debate over costs and benefits. Specifically, they extend the two-period model of Ajello et al. (2016) to the infinite-horizon, small open-economy case. Importantly, they endogenize both the probability of

[2]According to Filardo and Rungcharoenkitkul (2016), "the shortcomings of macroprudential tools have left open an important role for monetary policy to lean against the wind."

[3]Ajello et al. (2016) find that the optimal extent of leaning against the wind is somewhat larger in the face of uncertainty and if the policymaker desires robustness.

[4]Other contributors to the debate include Agur and Demertzis (2013) and Gelain, Lansing, and Natvik (2015).

a financial crisis and the severity of the crisis. These aspects of the model are critical for any evaluation of LAW policies, as I discuss below. With their model in hand, they investigate the optimal coefficient on credit growth in a Taylor-type instrument rule for monetary policy. They also study the distribution of real output and inflation under the optimal LAW instrument rule.

In my comments on their paper, I begin by reviewing the costs and benefits of LAW policies. Doing so will highlight the likely importance of some channels over others. It will also identify the channels the authors incorporate into their analysis and a couple that they, like the rest of this literature, do not. I discuss the approach they take to evaluating the consequences of LAW policies and summarize their primary conclusions. I then offer some comments on their calibration approach, the specification of policy, and potential limitations of the general approach.

2. Costs and Benefits

To organize a discussion of the costs and benefits of LAW policies, suppose the economy can be in one of two states. The first, denoted by subscript NC, is the non-crisis state; the second, denoted by subscript C, is the crisis state. Let L_i denote the present discounted value of losses if the economy is in state $i = NC, C$, and let l_i be the current-period loss in state i. To complete the notation, let β be the discount rate, p_C the probability of moving from a non-crisis to a crisis state, and p_N the probability of moving from the crisis to a non-crisis state.

Then L_{NC} and L_C are defined by

$$L_{NC} = l_{NC} + \beta \left[p_C L_C + (1 - p_C) L_{NC} \right] \tag{1}$$

and

$$L_C = l_C + \beta \left[p_N L_{NC} + (1 - p_N) L_C \right]. \tag{2}$$

Before proceeding, it is important to recognize that this simple specification ignores much. For example, it ignores the fact that L_{NC} (L_C) may depend on the previous state. Even so, (1) and (2) can help organize a discussion of the costs and benefits of LAW policies.

Consider the effects of an increase in the nominal interest rate i_{NC} in the non-crisis state and its effects on current and future losses. By solving (1) and (2) jointly, the effect on L_{NC} of a change in i_{NC} is given by

$$\frac{dL_{NC}}{di_{NC}} = \alpha_1 \frac{dl_{NC}}{di_{NC}} + \alpha_2 \frac{dl_C}{di_{NC}} + (L_C - L_{NC}) \left(\alpha_3 \frac{dp_C}{di_{NC}} - \alpha_4 \frac{dp_N}{di_{NC}} \right), \tag{3}$$

where the constants α_j are positive and functions of β, p_C, and p_N. The terms on the right of (3) summarize the channels through which an interest rate increase motivated by financial stability concerns causes the present value of losses to fall or rise, i.e., whether dL_{NC}/di_{NC} is negative or positive. If it is negative, the benefits outweigh the costs and leaning against the wind is desirable; it if is positive, costs outweigh benefits.

The first term, $\alpha_1 dl_{NC}/di_{NC}$, is the change in the loss in the non-crisis state. This is generally assumed to be positive—by raising the policy rate in the non-crisis state, economy activity will slow and inflation will decline, worsening outcomes in the non-crisis state. The second term, $\alpha_2 dl_C/di_{NC}$, measures the effect on losses conditional on being in a crisis. This effect could be positive (a cost) or negative (a benefit). Svensson (2016) has emphasized that the costs of a crisis are larger if the economy enters it in a weaker condition such as would be the case if the policy rate had been increased prior to a crisis. In contrast, if leaning against the wind before the crisis helps limit the growth of financial imbalances, it might also limit the severity of a crisis, should a crisis occur. This endogenous severity channel is one of the potential benefits of LAW policies that Gerdrup et al. stress.

The final two terms capture the effects of policy on the transition probabilities. If leaning against the wind reduces the probability of a crisis, $dp_c/di_{NC} < 0$, and, because $L_C > L_{NC}$, this reduces the present value of losses (a benefit). Similarly, if leaning against the wind increases the probability of exiting from a crisis and leads on average to shorter crises, than $dp_N/di_{NC} > 0$, which adds to the benefits of LAW policies.

Suppose $\beta = 0.96$ (annual frequency), $p_C = 0.032$, and $p_N = 0.5$.[5] The values of the α_i parameters can be evaluated and (3) becomes

$$\frac{dL_{NC}}{di_{NC}} \approx 23.61\frac{dl_{NC}}{di_{NC}} + 1.39\frac{dl_C}{di_{NC}} + (L_C - L_{NC})\left(22.66\frac{dp_C}{di_{NC}} - 1.34\frac{dp_N}{di_{NC}}\right). \quad (4)$$

While representing the outcome of a simple exercise, (4) offers some suggestive implications. First, the coefficient $dl_{NC}/d_{i_{NC}}$, which is the impact of leaning against the wind on non-crisis welfare, is large. With crises infrequent, the loss in the non-crisis period of tighter monetary policy is likely to loom large in the cost-benefit calculation. Second, and again because crises are infrequent, the potential gain in a reduced crisis loss from LAW policies, measured by dl_C/di_{NC}, receives a much smaller weight than does dl_{NC}/di_{NC}. Third, the impact of LAW policies on the probability of a crisis is more important than its impact on the probability of exiting a crisis. However, with p_C much smaller than p_N, dp_C/di_{NC} and dp_N/di_{NC} are unlikely to be of similar magnitude. Letting e_j denote the elasticity of p_j with respect to i_{NC}, for $j = C, N$, and using the calibrated values $p_C = 0.032$ and $p_N = 0.5$,

$$\left(22.66\frac{dp_C}{di_{NC}} - 1.34\frac{dp_N}{di_{NC}}\right) = \left(\frac{1}{i_{NC}}\right)(22.66e_C p_C - 1.34e_N p_N) = \left(\frac{1}{i_{NC}}\right)(0.72e_C - 0.67e_N). \quad (5)$$

Thus, a policy that reduces the probability of a crisis by 10 percent (from 3.2 percent per year to 2.9 percent) would have similar benefit to a policy of leaning against the wind that, by leading to a more shallow crisis, increased the exit probability by 10 percent (from 50 percent per year to 55 percent). Finally, the potential gains from a LAW policy are increasing in the size of the loss during a crisis event. If crises are very costly—i.e., if $L_C - L_{NC}$ is large—then a

[5] These values are consistent with the calibration of Gerdrup et al. (this issue) and the evidence in Jordà, Schularick, and Taylor (2013, 2017).

large effect on p_C might dominate the non-crisis loss represented by dl_{NC}/di_{NC}.

The model employed by Gerdrup et al. (this issue) incorporates three of the four channels included in (3); the only one they do not endogenize is the crisis exit probability. By ignoring the exit probability channel, they follow the standard in this literature. However, the simple calculation leading to (5) suggests that policies that increase the probability of exiting from the crisis state may be as valuable as policies that decrease the probability of entering a crisis by the same percent. Jordà, Schularick, and Taylor (2013) note that "financial crisis recessions are costlier, and more credit-intensive expansions tend to be followed by deeper recessions . . . *and slower recoveries*." (emphasis added). Thus, a benefit of LAW policies may be the impact they have on shortening the recession associated with a crisis.

Setting aside any effects on p_N, (3) becomes

$$\frac{dL_{NC}}{di_{NC}} = \alpha_1 \frac{dl_{NC}}{di_{NC}} + \alpha_2 \frac{dl_C}{di_{NC}} + (L_C - L_{NC})\,\alpha_3 \frac{dp_C}{di_{NC}}.$$

The first term on the right is considered the cost of LAW policies and the third term is a benefit; the second term, dl_C/di_{NC}, is more controversial, as it may be positive (a cost) or negative (a benefit). Svensson has emphasized that if the economy enters a crisis in a weaker state, losses during the crisis will be larger. Gerdrup et al. (this issue) allow for this channel in their model, as the loss during the crisis depends on the economy's state when a crisis occurs. However, they also allow for LAW policies to contribute to a milder crisis by endogenizing the severity of the crisis. In fact, this is one of the major differences in their analysis from that of Ajello et al. (2016). The authors find that this endogenous severity channel is critically important for generating a role for LAW. In fact, consistent with Ajello et al. (2016) and Svensson (2016), the authors find that if crisis severity is exogenous, the optimal policy rule actually leans *with* the wind.

One further point is relevant before getting to the specifics of the authors' contributions. In addition to ignoring effects on exit probabilities, the analysis of Ajello et al. (2016) and Gerdrup et al. (this issue) assumes that LAW policies increase loss in the non-crisis state; that is, they assume dl_{NC}/di_{NC} is positive. This accords with

the evidence in Jordà, Schularick, and Taylor (2013), who find, during the post–World War II era, that "excess credit growth appears to be associated with longer periods of economic growth . . . and expansions last almost 5 years longer in periods of high excess credit growth." Any LAW policy that slows credit growth must shorten the pre-crisis period of economic expansion. However, if the credit boom reflects distortionary growth, a longer expansion may simply magnify the distortions associated with the boom. Such an expansion need not translate into an increase in welfare. For example, the rapid growth in housing investment in the United States in the period leading up to the global financial crisis left a legacy of abandoned, zombie housing developments in its wake. If this reflects a misallocation of capital, then the resulting efficiency losses might imply that the extended boom was not consistent with the Federal Reserve Act's call for credit growth "commensurate with the economy's long run potential to increase production."

3. The Model

Now let me turn to the specifics of the authors' model. As already mentioned, it extends the two-period framework of Ajello et al. (2016) to an infinite-horizon model of a small open economy. To highlight the basic structure, though, I will ignore the open-economy aspects.[6] In this case, a stripped-down version of their model consists of an expectational Euler equation given by

$$x_t = \mathrm{E}_t x_{t+1} - \sigma^{-1}\left(i_t - \mathrm{E}_t \pi_{t+1} - \varepsilon_t\right), \tag{6}$$

where[7]

$$\varepsilon_t \equiv \left(\epsilon_{g,t} - \mathrm{E}_t \epsilon_{g,t+1}\right) - \left(z_t - \mathrm{E}_t z_{t+1}\right),$$

and a New Keynesian Phillips curve given by

$$\pi_t = \beta \mathrm{E}_t \pi_{t+1} + \kappa x_t. \tag{7}$$

[6] Their model also includes habit persistence and partial indexation of prices, and distinguishes between domestic and CPI inflation, output and domestic consumption, imperfect pass-through, and deviations from uncovered interest parity condition. These additions lead to a model better able to match data but are not central to the issues I want to raise.

[7] My notation differs slightly from that of the authors.

A crisis is represented by a positive realization of z_t, which constitutes a negative aggregate demand shock. Specifically, the financial shock z_t is governed by

$$z_t = \rho_{z,t} z_{t-1} + \Omega \kappa_t$$
$$\kappa_t = (1 - \Omega)(\gamma + \gamma_L L_t) + \rho_\kappa \Omega \kappa_{t-1},$$

where $\Omega = 0$ in the non-crisis regime, $\Omega = 1$ in the crisis regime, and L_t is the cumulative five-year growth of real, household credit.

Consider what happens if the economy begins in a steady-state, non-crisis state with $\Omega = 0$ and $z_t = 0$. If a crisis occurs, the size of the negative shock to z_t equals $\gamma + \gamma_L L_t$ and is increasing in the extent to which credit has grown during the previous five years. Cumulative real credit growth is, in turn, assumed to depend on the output gap, inflation, and the real rate of interest (and therefore on monetary policy). The dependence of the severity of the crisis, as measured by κ_t, on pre-crisis credit growth and monetary policy is one channel through which a LAW policy can affect outcomes during a crisis. The second channel Gerdrup et al. (this issue) incorporate is to allow credit growth to affect the probability that a crisis occurs. In normal times, there is no feedback from credit growth to either the real economy or inflation unless monetary policy reacts to credit growth. What credit growth does affect is the probability that a crisis occurs and the severity of a crisis when it does occur.

3.1 Policy

The central bank is assumed to employ an asymmetric version of a Taylor rule:

$$i_t = \rho_i i_{t-1} + (1 - \rho_i)\left[\theta_\pi \pi_t + \theta_x x_t + (1 - \Omega)\,\theta_L\,(\Delta cr_t - \pi_t)_{\Delta cr_t \geq 0}\right], \tag{8}$$

where Δcr_t is nominal credit growth. In this formulation, the central bank only responds to growth in real credit in non-crisis periods and then only when credit growth is positive.[8] In the context of

[8]Gerdrup et al. (this issue) also introduce a monetary shock into (8), but that is not relevant for discussing LAW policies and so I ignore it.

(8), a policy of leaning against the wind is interpreted to mean that $\theta_L > 0$.

To determine whether a LAW policy is desirable, the authors postulate that loss depends on volatility in inflation, the output gap, and the change in the nominal rate of interest. Thus, the coefficients in (8) are chosen to minimize

$$W_0 = \mathrm{E}_0 \sum_{t=0}^{\infty} \beta^t \left[\pi_t^2 + \lambda_x x_t^2 + \lambda_i \left(\Delta i_t \right)^2 \right], \tag{9}$$

with $\lambda_x = 2/3$, $\lambda_i = 1/4$ when inflation is expressed at an annual rate. Importantly, credit does not appear in the loss function. If it is optimal to respond to credit growth (i.e., if $\theta_L > 0$), this will not be due to any inherent desire to stabilize credit growth but will instead mean that responding to credit growth helps better achieve objectives defined in terms of inflation, the output gap, and interest rate changes.

The results on the optimized coefficients in (8) will depend on the relative weights put on the terms in the loss function. By way of comparison, therefore, it is worth noting that in their similar exercise, Ajello et al. (2016) assume $\lambda_x = 1/16$, $\lambda_i = 0$. Thus, relative to Ajello et al., Gerdrup et al. put more weight on output gap stabilization and on reducing volatility in nominal interest rate changes.

4. Calibration and Results

The authors draw on the existing literature and their own estimation to calibrate model parameters. Some parameters are standard, but the critical aspects of the exercise are these related to the sensitivity of credit growth to monetary policy, crisis probability to credit growth, and crisis severity to credit growth. The first of these (monetary policy effects on credit growth) is estimated using data from Norway; the second and third are based on data from twenty-two OECD countries. I will come back to this issue below.

The basic policy experiment assumes myopic private agents in the sense that the central bank knows the true crisis process, but private agents perceive the probability of a crisis to be zero. In this

environment, the optimal instrument rule is found under three alternative specifications: (1) the central bank is also myopic in ignoring the possibility of a crisis and does not respond to credit growth (labeled the benign neglect case); (2) the central bank takes into account the possibility of a crisis but does not directly respond to credit growth (i.e., it maintains $\theta_L = 0$); and (3) the LAW case in which θ_L in (8) can differ from zero. The optimal policy coefficients for these three cases are reported in table 3 of the paper. Taking into account the possibility of a crisis but without responding directly to credit (moving from case 1 to case 2) has two effects on the optimized instrument rule. First, the responses to both inflation and output are muted. For example, the coefficient on inflation falls from 6.51 to 4.42 while that on output falls slightly from 1.35 to 1.11. Second, the response to output relative to inflation increases. Table 4 of the paper shows that the benign neglect policy produces more stable inflation and interest rates but more volatile output relative to the constrained LAW policy.

The key results are those for case 3. The optimal responses to inflation (5.63) and output (1.25) fall between the benign neglect and constrained LAW cases, but, more importantly, the optimal value of θ_L is positive (0.61). Policy leans against the wind. Comparing outcomes in table 4 under the LAW policy and the constrained LAW policy, credit crises are marginally less likely to occur (the annual probability of a crisis falls from 3.28 percent to 3.17 percent), and as shown in figure 5 of the paper, the distribution of losses given by (9) is shifted to the left and the likelihood of large losses is reduced under the LAW policy. When credit growth is positive, the nominal interest averages 28 basis points higher under the LAW policy.

5. Comments

The authors' results provide a very useful contribution to the LAW debate. My comments will be directed to three issues: the parameter values employed for the calibration exercises, the specification of policy, and the potential limitations of the general approach.

5.1 Consistency of Parameters

Using an empirically grounded model to investigate the desirability of LAW policies is commendable, and it is an important contribution.

Employing a small open-economy framework is also a nice contribution. To assign values of the model's parameters, however, the authors draw on a number of sources. The basic parameters of the open-economy model are drawn from Justiniano and Preston (2010), who estimate a DSGE model using data from Australia, Canada, and New Zealand. The equation describing the evolution of credit and the impact of monetary policy on credit growth is estimated using data from Norway. The relationship between credit growth and both the probability of a financial crisis and its severity is estimated by extending the work of Anundsen et al. (2016) to include data from twenty-two OECD countries over the period 1975:Q1–2014:Q2. None of these choices is unreasonable, but it does open up the question of exactly how realistic the resulting mix is as a representation of a generic open economy. Australia, Canada, New Zealand, and Norway are all exporters of non-manufactured goods, primarily commodities and agricultural products; for other small open economies, the calibration based on Justiniano and Preston (2010) may be less realistic.

The empirical model of credit growth for Norway is significantly different from that employed by Ajello et al. (2016) based on U.S. data, and the differences are likely to be important. For example, Ajello et al. link nominal credit growth in the United States to the output gap, inflation, and the nominal interest rate and obtain

$$\Delta cr_t = 0.18x_t - 0.26i_t + 1.43\pi_t. \tag{10}$$

Based on Norwegian data, Gerdrup et al. obtain

$$\Delta cr_t = 0.31x_t - 0.79\left(i_t - \mathrm{E}_t\pi_{t+1}\right). \tag{11}$$

Conditional on the other variables, a rise in the nominal interest rate has a much larger contractionary effect on credit growth in a model based on (11) then if the Ajello equation were used. This matters for the analysis; all else equal, the marginal benefit of a LAW policy will be larger in the calibrated model based on (11) than if it were based on (10), as a smaller rise in the policy rate is needed to achieve a given reduction in credit growth.

For a small open-economy model, the estimates based on Norway are perhaps more relevant then those based on the United States. But the critical linkages between credit growth, the probability of a

crisis, and the severity of a crisis come from a larger sample of OECD countries that includes, for example, the United States. In this case, there is the question of whether the estimated relationships are the right ones to employ for the small open-economy setting the authors have in mind.

Fortunately, the authors do conduct some robustness checks, and the general qualitative conclusions appear robust. But it would be nice—and this is along the lines of a suggestion for future research—to have a model calibrated consistently to represent a specific country (such as Norway). This could be done for most of the parameters using existing models that have been estimated for various small open economies. The hardest parameters to pin down for an individual country would be those related to the impact of credit growth on the probability and severity of a crisis.

A second issue also related to the calibration is the question of the economic significance of the results. The authors find clear support for LAW policies, and their findings emphasize the importance of incorporating feedback from policy to credit growth to the probability and severity of a crisis. But the quantitative magnitude of the effects they find seems small. For example, the policy rate averages 28 basis points higher under the optimal LAW policy. A natural question is whether this magnitude is statistically significant once parameter estimation error is factored in. How confident can we be that the hypothesis that central banks should not lean against the wind can be rejected?

5.2 The Policy Framework

The core of the authors' contribution is their investigation of the optimal value of the policy parameter θ_L in the instrument rule (8). The authors assume policy is implemented via a rule whose specific form is given by (8). To determine how policy should respond to credit growth, they need a metric by which to rank outcomes for different values of the response coefficients in (8). This ranking is done by using the objective function given in (9). But given the objective function (9), one could dispense with (8) and examine optimal policy, i.e., the policy that minimizes (9) without the additional constraint that the resulting description of policy coincide with (8).

Of course, there is a huge literature examining optimized instrument rules. But given that the Norges Bank has been at the forefront in deriving policy from a specification of the objective function rather then by assuming a rule, it is perhaps surprising that the authors took the approach they did. However, there are some advantages to focusing on simple rules. The LAW debate is about whether central banks should respond to credit growth, and focusing on the response coefficients in (8) allows one to have a direct answer to the question simply by determining whether outcomes (valued in terms of (9)) are improved for positive values θ_L.

However, one would like to understand better the extent to which a policy recommendation is inherent to the economic environment in which the probability and severity of a financial crisis are endogenous. A danger with simple rules is that credit growth may appear in an optimized instrument rule because the chosen rule is suboptimal and the presence of credit growth allows the rule to approximate more closely an optimal policy.

To illustrate this issue, consider a simplified version of the model in which the interest rate smoothing objective in (9) is ignored. In this case, the policy problem is

$$\min \mathrm{E}_0 \sum_{t=0}^{\infty} \beta^t \left(\pi_t^2 + \lambda_x x_t^2\right)$$

subject to

$$x_t = \mathrm{E}_t x_{t+1} - \sigma^{-1} \left(i_t - \mathrm{E}_t \pi_{t+1} - \varepsilon_t\right),$$
$$\pi_t = \beta \mathrm{E}_t \pi_{t+1} + \kappa x_t,$$

and the specification of the error term ε_t. Under either optimal discretion or commitment, $x_t = \pi_t = 0$ in equilibrium, and

$$i_t = \varepsilon_t = \left(\epsilon_{g,t} - \mathrm{E}_t \epsilon_{g,t+1}\right) - \left(z_t - \mathrm{E}_t z_{t+1}\right). \tag{12}$$

This equilibrium cannot be achieved with the policy rule (8). Thus, it may be that a LAW policy (i.e., $\theta_L > 0$) appears optimal only because the exercise forces one to find the best rule among a class of suboptimal rules. In this example, a cost-benefit trade-off arise only because policy is (suboptimally) restricted to follow a simple instrument rule.

Because an interest rate smoothing objective appears in the loss function (9), a zero output gap and zero inflation will not be the equilibrium, as it was in my simple example. But there is a general point to make. I would like to see optimal policy as the reference case so that one can assess the extent to which responding to credit in a simple rule is able to approximate a possibly more complex but optimal policy response to the possibility of credit crises. As it stands, any effects of the credit shock and a crisis on output and inflation arise only because (i) Δi_t^2 is in loss function and (ii) policy is suboptimal in following a simple rule.

5.3 Limitations of the Approach

The authors adopt a simple model that helps to organize and guide their analysis. But, as a simple model, it naturally has limitations. Let me mention three.

First, as in Ajello et al. (2016), there is no real role for credit in the model. Absent a crisis, the model displays a type of "credit dichotomy": the evolution of real activity and inflation is independent of credit growth (unless of course policy responds to credit growth). In models displaying the classic "monetary dichotomy," the real side was independent of money demand and supply, and only nominal values were affected by shifts in either the demand or supply of money. Here, the separation is more extreme. The specification of the equation for credit growth affects nothing except credit growth and the probability of a crisis. Rapid, possibly distortionary, credit growth does not affect investment, consumption, aggregate demand, marginal costs, inflation, or any other variable. This may be useful as a simplifying assumption, allowing the analysis to focus on the crisis implications of credit, but it does represent a limitation. For example, if financial markets are not frictionless in non-crisis times, excessive credit growth may reflect a misallocation of resources, and there may be a benefit of LAW policies that this analysis (and others) are missing. And the model cannot provide any guidance on whether excess credit growth creates distortions that would justify it appearing in the policy objective function along with inflation and a measure of real activity.

Second, the authors, following Ajello et al. (2016), assume that private agents do not see a crisis coming. As a description of the period leading up to the global financial crisis, that is a plausible

assumption, though the crisis also caught policymakers by surprise. The assumption of myopic private agents is more problematic as the benchmark in an analysis of post-crisis monetary policy and may not be the best benchmark for analyzing LAW policies. It is not just central bankers who are more aware of the potential for financial crises; so are private agents. When private agents react to expectations of a future crisis, (12) shows that the optimal policy response is to raise the nominal interest rate, that is, to lean with the wind rather than against it.

Third, any effective lower bound on the policy interest rate is ignored. Taking this additional constraint into account might increase the value of LAW policies that reduce the probability of and the severity of a crisis.

6. Conclusions

Gerdrup et al. make a real contribution in providing an evaluation of LAW policies in the context of a dynamic, quantitative, open-economy model, using historical data on credit and crises to endogenize the probability of crises and their severity. Within the class of policy instrument rules they investigate, they find a clear role for LAW policies when private agents, but not the central bank, ignore the possibility of a crisis. The benefits in reducing the chance that a crisis occurs and the severity of one if it does occur outweigh the costs arising from a policy that keeps interest rates higher than would be justified by a focus solely on inflation and output.

Interesting extensions of their analysis would be to adopt a model that does not display a credit dichotomy but instead incorporates real linkages between credit growth and economic activity, to allow pre-crisis policies that dampen the severity of a crisis to also affect the probability of exiting a crisis, and to consider whether there are long-term effects such as scarring or growth effects of a financial crisis. Such costs may significantly affect the cost-benefit calculation of LAW policies.

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