Fear of Floating and Social Welfare

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Abstract: This paper studies the welfare implications of financial stability and inflation stabilization as distinct monetary policy objectives. Introducing asymmetric aversion to exchange rate depreciation in the Barro-Gordon model mitigates inflation bias due to credibility problems. The net welfare impact of fear of floating depends on the economy's recent track record, the credibility of monetary policy, and the central bank's discount factor. It is shown that fear of floating is more appropriate for financially-fragile developing countries with imperfectly credible monetary policy than for advanced economies.

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1 Introduction

Following the emerging market financial crises of 1997-99, consensus has emerged that financial stability is an important element in the conduct of monetary policy; see Goodhart and Illing (2002), Svensson (2002), and Svensson and Woodford (2003).[1] A central bank with explicit responsibility for financial stability would have a clearer mandate to respond to the build-up of financial imbalances even if monetary stability did not appear to be under threat. However, little work has been done on the welfare implications of financial stability as a distinct monetary policy objective, particularly in emerging market economies.

The key premise of this paper is that a welfare assessment has to consider the link between financial stability concerns and the credibility deficit often facing policymakers in developing countries. We explore this link by extending the symmetric preferences of the benchmark Barro and Gordon (1983) discretionary policy model with one-sided aversion to exchange rate depreciation. The recent adoption by many developing countries of floating exchange rates coupled with an inflation target has reinstated the policy relevance of the Barro-Gordon framework, which had earlier lost its appeal to

[1] Indeed, Borio, Filardo and English (2003) report that, since the mid-1980s, the rapid pace of financial liberalization has led to more frequent financial booms and busts in developed and developing countries alike.

self-fulfilling models of the authorities' decision to defend a fixed exchange rate under speculative pressure; see Obstfeld (1994, 1996) and Jeanne and Masson (2000).[2] Further, the lack of precommitment in the Barro-Gordon model reflects a tendency by policymakers in developing countries to use inflation surprises to improve the government's fiscal position.

We are motivated by two stylized empirical observations. First, developing country policymakers typically pursue macroeconomic stabilization against a background of significant *financial fragility*, involving a negatively skewed supply shock distribution and substantial balance-sheet mismatch. The latter occurs along both currency and maturity dimensions as the financial sector's liabilities are predominantly dollar-denominated and short-term, while its assets are home currency-denominated and long-term. Consequently, Kamisky and Reinhart (1999) find that devaluations in financially-fragile economies tend to be recessionary. Although initially restricted to the financial sector, a devaluation's aftershocks spread to other sectors and result in widespread corporate failure and unemployment.

Second, although many developing countries responded to the financial crises by adopting a floating exchange rate coupled with an inflation target—

[2] Emerging markets adopting inflation targeting since the Asian financial crises include Brazil (June 1999), Colombia (September 1999), the Czech Republic (January 1998), South Korea (January 1998), Mexico (January 1999), Poland (October 1998), South Africa (February 2000) and Thailand (April 2000).

the latter serving as a nominal anchor—in practice there is extensive *fear of floating*. As documented by Calvo and Reinhart (2001, 2002), nominal interest rates in financially-fragile developing economies are much more volatile than expected future depreciation, leading to massive rejection of the risk-neutral version of Uncovered Interest Parity. Indeed, post-crisis economies continue to actively manage their currencies so as to limit exchange rate fluctuations, and there is strong evidence of fear of floating for a wide cross section of countries formally classified as 'floaters' by the IMF.[3]

Against that background, we assume that the policy weight attached to fear of floating—originating with financial fragility concerns—is independent of the weight on inflation stabilization. This contrasts with the literature on optimal contracts for central bankers (Walsh (1995, 2003)). There, it is the coefficient on current inflation which measures the optimal penalty factor, and its magnitude is derived endogenously as function of the structural and preference fundamentals. As a result, expected inflation bias can be eliminated. Further, whereas in Walsh (1995) only current inflation enters the loss function, our one-period loss function stresses the role of inflation *change* (or, with PPP, depreciation change) as the prime determinant of financial fragility. It follows that, as the effects of the current inflation choice are

[3]See Calvo (2005), Ganapolsky (2003), Lahiri and Végh (2001), Levy-Yeyati and Sturzenegger (2005), McKinnon and Schnabl (2004), and Reinhart (2000).

incorporated in next period's payoff, the central bank's discount factor—or degree of parience—matters for average policy outcomes.[4] We thus introduce one-period persistence into the reduced-form model and solve a dynamic problem for the central bank assuming that its choice of inflation last period affects expected welfare this period.

The main results are as follows. First, asymmetric aversion to exchange rate change imparts deflation bias to the economy, mitigating excess inflation due to time-inconsistency. Given the relative magnitude of the asymmetric preference coefficient, the deflationary impact of fear of floating decreases with the central bank's discount factor. Thus, to the extent that policy-makers in financially-fragile developing countries tend to be constrained by shorter time horizons than their counterparts in advanced economies, the resulting decline in inflation bias is bigger.

Second, we show that optimal policy outcomes under fear of floating do not always yield higher expected welfare than the symmetric Barro-Gordon benchmark. The net impact of fear of floating is sensitive to the economy's recent inflation (depreciation) record, the extent of the credibility problem in monetary policy, and the policymaker's discount factor. Specifically, under symmetric information the supply shocks are observed by the private sector, hence they directly affect welfare. Adverse supply shocks in the last period

[4] We are grateful to an anonymous referee for raising this point.

improve expected welfare with fear of floating for the current period, all else equal. Although adverse shocks are sufficient for fear of floating to outperform the symmetric loss function, they are necessary only if monetary policy is fully credible. In the more realistic developing-country case where credibility is weak, fear of floating can improve upon the Barro-Gordon benchmark even if the last supply shock was expansionary. In contrast, if the monetary policy is fully credible and the last shock is favorable, the symmetric benchmark is preferred on average.

Ceteris paribus, we also find that higher discount factors—amounting to longer policy horizons for central bankers—tend to generate higher average welfare with fear of floating, particularly if monetary policy credibility is strong. Conversely, lower discount factors have the opposite effect unless credibility is weak. We argue that the conditionality implicit in this result may be consistent with the "new-environment" (post-crises) view of monetary policy put forward by Borio, Filardo and English (2003), according to which central banks should place more weight on safeguarding financial stability also in developed economies, where credibility is not an issue.

Third, the model can shed light on the result of Lahiri and Végh (2001) that fear of foating delivers less variable inflation than the symmetric benchmark. Curiously, this empirical regularity that is despite the fact that countries with less variable inflation also tend to be subject to larger external shocks. Assuming that the asymmetric preference coefficient follows an AR(1) process which covaries negatively with supply shocks, so that adverse supply shocks and fear of floating are positively correlated, we show that fear of floating delivers less variable inflation if the policymaker's discount factor is above a certain threshold. Thus, a longer policymaking horizon pays off in terms of lower inflation variability.

The paper's reduced-form approach is common to research on asymmetric policy preferences for the U.S. and other advanced economies; see Nobay and Peel (2003) and Ruge Murcia (2003a,b), among others. In that literature, the rationale for extending the monetary policy loss function involves asymmetric preferences over macroeconomic stabilization: depending on the inflation outcome, recession aversion may exceed inflation aversion or *vice versa*.

The preference asymmetry in Nobay and Peel (2003) is nonlinear (linex) and more general than the one considered here. In our case, positive deviations from target contribute an extra loss that is linear in last period's change in inflation/depreciation. This keeps the key result that $k = 0$ is not sufficient for eliminating does not remove inflation bias. On account of the extra term, the change in expected inflation is unambiguously negative, i.e. expected appreciation. Inflation bias is independent of the higher moments of shocks. However, actual inflation exhibits 1-period path dependence, which may be more relevant for developing countries, as they face more extreme shocks than advanced economies.

In that respect, the paper is also motivated by research on the impact of path-dependence on optimal monetary policy choice; see Drazen and Masson (1995). Whereas the methodology of these authors is related to second-generation models of conditional escape clauses from a fixed exchange rate mechanism, our approach follows that of third generation crisis models stressing the role of financial fragility; see Aghion, Bacchetta and Banerjee (2004), Calvo (1998, 2005) and Chang and Velasco (2000, 2001).

Our findings can be seen to offer theoretical support for the recent empirical survey of Eichengreen and Razo-Garcia (2006). Using *de facto* exchange rate data from a large number of countries, these authors report that 'heavily managed' floating exchange rates continue to be more popular for emerging markets and developing countries than advanced economies.[5] Applying the transition matrix methodology of Masson and Ruge-Murcia (2005), they also forecast that the first two country groups will only gradually move away from fear of floating, and indeed the move will extend beyond a 20-year horizon. Significantly, the strong persistence of intermediate, rather than "bipolar" exchange rate regimes is positively related to countries' reluctance to lift capital controls, as found also by Von Hagen and Zhou (2006). Hence, to the

[5] Eichengreen and Razo-Garcia's (2006) dataset comprises 24 advanced economies, 32 emerging markets, and 131 developing countries from 1990-2004.

extent that maintaining capital controls is reflecting policymakers' concerns about financial fragility, the present framework highlights the implications of such concerns for average social welfare.

The paper proceeds as follows. Section 2 reviews the one-period Barro-Gordon discretionary monetary policy model. Section 3 extends this benchmark with a value function incorporating asymmetric depreciation aversion; obtains the average policy outcomes; and derives expected social welfare. Section 4 compares the two welfare alternatives and discusses the policy implications for developing countries; and Section 5 concludes.

2 The Barro-Gordon benchmark

Let s, p and p^* denote the logs of the nominal exchange rate and the home and foreign price levels, respectively. Assuming PPP and constant foreign prices implies $\Delta s_t = p_t - p_{t-1} = \pi_t$, so depreciation and inflation coincide. PPP effectively converts the policymaker's inflation target to a target depreciation rate; see Calvo and Reinhart (2001) and Ho and McCauley (2003) for evidence that exchange rate pass-through is significantly higher in developing than industrialized countries.

The one-period quadratic-symmetric policy loss function is

$$L_t^{BG} = (y_t - y^*)^2 + \chi(\pi_t - \pi^*)^2 \ , \tag{1}$$

where $\chi > 0$ is the symmetric preference coefficient, i.e. the relative weight on inflation stabilization. The inflation and output growth targets $\pi^* \geq 0$ and $y^* \geq 0$ are constant, wlog. It is common to assume that equation (1) also describes social welfare, so in the sequel we interchangeably refer to the policymaker's and society's losses.

Output growth follows the short-run aggregate supply function

$$y_t = \overline{y} + \alpha(\pi_t - E_{t-1}\pi_t) + \varepsilon_t \ , \tag{2}$$

where $E_{t-1}\pi_t$ is determined at $t-1$, α is the economy's inverse sacrifice ratio, and ε_t is an iid $(0, \sigma_\varepsilon)$ aggregate supply shock independent of π_t. Importantly, the short-term output growth target, y^*, can exceed the economy's long-term potential, $\overline{y}$, by $y^* - \overline{y} = k > 0$. The magnitude of k is inversely related to the credibility of monetary policy. In developing and emerging market economies, in particular, $k > 0$ reflects policymakers' tendency of using inflation surprises to improve the government's fiscal position. Overreliance on the inflation tax lowers the real value of government debt and erodes public sector wages. Thus, although in principle one can allow for $k = 0$, reflecting *prudent discretion* by the monetary authority (Blinder (2000)) this is arguably unrealistic for developing countries, especially in the aftermath of financial crises.[6]

[6] The expansionary motive associated with $k > 0$ may also reflect labor market distortions and/or political business cycle considerations relevant for advanced economies.

Minimizing (1) subject to (2) and taking expectations using all information available at $t-1$ yields the Kydland and Prescott (1977) and Barro and Gordon (1983) inflation bias result: the short-term expansionary motive delivers average inflation above target with no average output gain

$$\text{bias}_t^{BG} = E_{t-1}\pi_t^{BG} - \pi^* = \frac{k\alpha}{\chi} > 0 \ \ , \ E_{t-1}^{BG} y_t = \overline{y} \tag{3}$$

where BG denotes optimal policy outcomes in the Barro-Gordon model. Equilibrium inflation and output growth and their variabilities are

$$\begin{aligned} \pi_t^{BG} &= \pi^* + \frac{k\alpha}{\chi} - \frac{\alpha}{\alpha^2+\chi}\varepsilon_t \ \ , \ y_t^{BG} = \overline{y} + \frac{\chi}{\alpha^2+\chi}\varepsilon_t \\ var\pi_t^{BG} &= \frac{\alpha^2}{(\alpha^2+\chi)^2}\sigma_\varepsilon^2 \ \ , \ vary_t^{BG} = \frac{\chi^2}{(\alpha^2+\chi)^2}\sigma_\varepsilon^2 \end{aligned} \tag{4}$$

It follows that average welfare declines at the square of inflation bias

$$\begin{aligned} E_{t-1}L_t^{BG} &= E_{t-1}[(y_t - y^*)^2 + \chi(\pi_t - \pi^*)^2] \\ &= vary_t^{BG} + \chi(\text{bias}^{BG})^2 \end{aligned}$$

Substituting (3) and (4) to this expression yields

$$E_{t-1}L_t^{BG} = \frac{\chi}{\alpha^2+\chi}\sigma_\varepsilon^2 + \frac{k^2\alpha^2}{\chi} + 2k\alpha\pi^* + \chi\pi^{*2} \tag{5}$$

Hence, when monetary policy is guided by the symmetric losses in (1) social welfare deteriorates with the expansionary motive, driving the case

See Walsh (2003) for a review of the sources of, and responses to, time-inconsistency in monetary policy.

for overcoming time-inconsistency using a reputational mechanism and/or commitment technology to set $k = 0$. Note that a more ambitious inflation target is also welfare-improving, all else equal.

3 Monetary policy with fear of floating

3.1 Asymmetric aversion to exchange rate change

In the presence of nominal wage rigidities, alternative microfoundations for the cost of exchange rate fluctuations turn on the negative impact of exchange rate changes on output and employment. A rationale for fear of floating then arises through the real costs of exchange rate *variability*, so fluctuations are costly regardless of the direction of movement; see, for example, Lahiri and Végh (2001). In this paper we, instead, assume that depreciation of the home currency involves a social cost independent of stabilization efforts. The extra cost is motivated by foreign currency exposure of the corporate sector and the resulting financial fragility.

As discussed in the Introduction, monetary policy preferences may be asymmetric if a substantial component of the financial sector's liabilities is dollarized; exchange rate devaluations can then often be recessionary, and appreciations expansionary. In this context, it is often developing countries' *original sin*—defined as the *de facto* inability to borrow in their home currency—which underlies financial fragility and induces fear of floating.[7]

We thus propose capturing asymmetric aversion to exchange rate fluctuations using the one-period loss function

$$L_t^{FF} = (y_t - y^*)^2 + \chi(\pi_t - \pi^*)^2 + 2\varphi\Delta\pi_t \ , \ \ \varphi > 0 \tag{6}$$

where $\Delta\pi_t = \pi_t - \pi_{t-1}$ is the one-period change in inflation. Coefficient φ captures the policy maker's asymmetric aversion to exchange rate depreciation, while χ measures the (symmetric) weight on inflation versus output stabilization. Importantly, the strength of fear of floating is assumed independent of χ because the underlying financial fragility is taken as given. Thus, the relative magnitudes of φ and χ reflect the weight of fear of floating and inflation stabilization as independent monetary policy objectives.

Note that the linear term in loss function (6) will only add a constant to the first-order condition. This contrasts with the nonlinear (linex) preferences of Nobay and Peel (2003), where positive inflation deviations from target change the slope of the loss function. In their very flexible reduced-form, the magnitude of excess inflation depends on higher moments of supply shocks. The authors then need to assume that actual inflation is conditionally normally distributed in order to get closed form solutions for expected inflation. We argue that, despite the consequent greater generality, this as-

[7] On the symbiotic relationship between financial fragility and original sin in developing countries see the contributions in Eichengreen and Hausmann (2004).

sumption does not fit the experience of developing countries experiencing sharp devaluations.

The specification of loss function (6) is similar to that of the literature on optimal central bank contracts, introduced by Walsh (1995). There, the additional linear term is interpreted as a linear contract between the central bank and the government. However, the central bank is penalized for higher inflation, so it is the *level* and not the first-difference of inflation which enters the loss function. Walsh then shows there is an optimal level of the penalty factor which eliminates inflation bias, and that level is linear in actual inflation : $t(\pi_t) = t_0 - \frac{\alpha k}{\chi}\pi_t$. Thus, given π_t the optimal linear contract penalizes the central bank relatively more the higher is k.[8]

By contrast, in our model the strength of fear of floating (φ) is exogenously determined by the underlying fragility of the banking and corporate sector, whose degree of foreign currency exposure and risk of devaluation due to sharp reversals on capital account—Calvo's "sudden stops"—are in principle both unrelated to the central bank's inflation aversion. Moreover, as it is the one-period *change* in inflation/ depreciation matters to current welfare, the central bank takes into account the effects of its previous inflation choice on this period's payoff. Therefore, the one-period loss function L_t^{FF} from

[8]In Nobay and Peel (2003) the variances of inflation and output also depend on $t(\cdot)$, the optimal penalty factor.

equation (6) enters recursively into the following value function $V(\cdot)$

$$V(\pi_{t-1}) = \max_{\{\pi_t\}} \left[(y_t - y^*)^2 + \chi(\pi_t - \pi^*)^2 + 2\varphi(\pi_t - \pi_{t-1}) + \beta E_{t-1}V(\pi_t)\right] \tag{7}$$

where $\beta \in (0,1)$ is the policy discount factor, assumed constant for simplicity.

3.2 Optimal monetary policy

We proceed to solve the central bank's dynamic optimization problem. Substituting linear Phillips curve (2) into value function (7) implies

$$\begin{aligned} V(\pi_{t-1}) &= \max_{\{\pi_t\}} (\overline{y} + \alpha\pi_t - \alpha E_{t-1}\pi_t + \varepsilon_t - y^*)^2 + \chi(\pi_t - \pi^*)^2 \qquad (8) \\ &\quad +2\varphi(\pi_t - \pi_{t-1}) + \beta E_{t-1}V(\pi_t) \end{aligned}$$

Maximizing (8) with respect to π_t and applying the envelope theorem $V'(\pi_{t-1}) = -2\varphi$, yields the first-order condition

$$\alpha(\overline{y} + \alpha\pi_t - \alpha E_{t-1}\pi_t + \varepsilon_t - y^*) + \chi(\pi_t - \pi^*) = \varphi(\beta - 1) \tag{9}$$

Taking expectations at $t-1$, the average policy outcomes, denoted FF, are just

$$\begin{aligned} \text{bias}_t^{FF} &= E_{t-1}\pi_t^{FF} - \pi^* = \frac{k\alpha - \varphi(1-\beta)}{\chi} < \text{bias}_t^{BG} \qquad (10) \\ E_{t-1}y_t^{FF} &= E_{t-1}y_t^{BG} = \overline{y} \end{aligned}$$

The deflationary impact of fear of floating is $-\varphi(1-\beta)/\chi < 0$, mitigating excess inflation under the Barro-Gordon benchmark with no change to average output growth. Provided $\varphi > 0$, note that the reduction in average inflation decreases in the discount factor β. Thus, the deflationary contribution of asymmetric aversion to exchange rate depreciation declines with the central bank's rate of time preference.

Substituting (10) into (9) yields period-t equilibrium inflation and output growth

$$\begin{aligned} \pi_t^{FF} &= \pi^* + \frac{k\alpha - \varphi(1-\beta)}{\chi} - \frac{\alpha}{\alpha^2+\chi}\,\varepsilon_t \\ y_t^{FF} &= \overline{y} + \frac{\chi}{\alpha^2+\chi}\varepsilon_t \end{aligned} \tag{11}$$

Comparing equations (11) and (4) suggests that inflation and output variability are unchanged from the Barro-Gordon benchmark. That is because optimality condition (9) is still linear in the current supply shock. However, equilibrium inflation/depreciation bias is lower on account of fear of floating. As a result, the implications for average welfare are non-trivial.

3.3 Equilibrium social welfare

Expected welfare losses under fear of floating combine the output variability and squared inflation bias terms, due to symmetric losses, with the social cost of financial fragility

$$\begin{aligned} E_{t-1}L_t^{FF} &= vary_t^{FF} + \chi(\text{bias}_t^{FF})^2 + 2\varphi E_{t-1}\Delta\pi_t^{FF} = \\ &\quad \frac{\chi}{\alpha^2+\chi}\sigma_\varepsilon^2 + \frac{1}{\chi}[k\alpha - \varphi(1-\beta)]^2 + \frac{2\varphi\alpha}{\alpha^2+\chi}\varepsilon_{t-1} \end{aligned} \tag{12}$$

As output variability is unchanged under the alternative loss functions, their expected welfare differential reduces to

$$\begin{aligned} E_{t-1}\Delta L_t &\equiv E_{t-1}L_t^{FF} - E_{t-1}L_t^{BG} \\ &= \chi\left[(\text{bias}_t^{FF})^2 - (\text{bias}_t^{BG})^2\right] + 2\varphi E_{t-1}\Delta\pi_t^{FF} \end{aligned} \quad (13)$$

If the above expression is positive [*negative*], fear of floating generates higher [*lower*] expected welfare losses than the symmetric benchmark. Substituting in (13) the inflation bias expressions, from (3) and (10), and the difference between expected inflation for period t and actual inflation at $t-1$ under fear of floating, from (11), yields

$$E_{t-1}\Delta L_t = \frac{\varphi(1-\beta)}{\chi}[\varphi(1-\beta) - 2k\alpha] + \frac{2\varphi\alpha}{\alpha^2+\chi}\varepsilon_{t-1} \quad (14)$$

Thus, placing more policy weight on inflation stabilization (χ) narrows the average welfare gap between the two loss functions. Given $\chi > 0$, the expected welfare gap is a function of: the relative importance of asymmetric depreciation aversion, captured by φ; the latest shock realization ε_{t-1}; the policymaker's discount factor or "degree of patience" β; and the economy's sacrifice ratio $1/\alpha$. The dependence of average welfare on β reflects the one-period persistence built into the preference asymmetry.

The first two terms in (14) combine the welfare impact of fear of floating, imperfect credibility, and the policymaker's rate of time preference. Note that

$-2k\alpha\varphi(1-\beta)/\chi < 0$ for all $k > 0$.[9] Therefore, less credible monetary policy strengthens the case for fear of floating in the loss function, ceteris paribus. Conversely, building up credibility—for example, by legislating central bank independence into the constitution—weakens the case for fear of floating for all $\varphi > 0$.

Equation (14) yields a necessary and sufficient condition for fear of floating to outperform the Barro-Gordon benchmark in expectation

$$E_{t-1}\Delta L_t < 0 \Leftrightarrow \frac{1-\beta}{\chi}[\varphi(1-\beta) - 2\alpha k] + \frac{2\alpha}{\alpha^2+\chi}\varepsilon_{t-1} < 0 \tag{15}$$

Inequality (15) implies the following upper bound for asymmetric preference coefficient φ in order for fear of floating to be preferred[10]

$$\varphi < \varphi^{\max} = \frac{2\alpha}{1-\beta}\left[k - \frac{\chi}{(\alpha^2+\chi)(1-\beta)}\,\varepsilon_{t-1}\right] \tag{16}$$

The magnitude of $\varphi^{\max}$ then acts as a "welfare threshold" for the presence of fear of floating. Put differently, a necessary condition for fear of floating to arise is $\varphi^{\max} > 0$. In the next Section we examine the welfare link between credibility problems, fear of floating and the economy's inflation record.

[9] From equations (5) and (12), expected welfare losses under the benchmark and fear of floating both include a term in k^2, so that cancels out of their difference.

[10] Barro-Gordon does better on average if $\varphi > \varphi^{\max}$, and the policymaker is indifferent between the two welfare alternatives if $\varphi = \varphi^{\max}$.

4 Policy implications for developing countries

4.1 Comparative welfare evaluation

We first address the case of full credibility. When $k = 0$, (16) implies that any favorable shock at $t-1$ induces $\varphi^{\max} < 0$. The inequality is then violated for all $\varphi > 0$. This is represented graphically in Figure 1 below, plotting a 3-dimensional surface of the expected welfare gain from fear of floating over the Barro-Gordon benchmark, i.e. minus the expected loss differential in equation (14), for an arbitrary positive supply shock, $\varepsilon_{t-1} = 0.04$[11]

FIGURE 1 HERE

The symmetric and asymmetric alternatives perform better, respectively, towards the lower (blue) and upper (red) ends of the color spectrum. To facilitate the comparison, we also show the flat 'zero plane' where the welfare alternatives are at par ($E_{t-1}\Delta L_t = 0$). The case $k = 0$ corresponds to points along the vertical (φ) axis. Note that the expected gain from fear of floating is always negative—the welfare surface lies below the zero plane—hence the Barro-Gordon benchmark is preferred.

[11] For illustration purposes we fix $\alpha = \chi = 1$, $\beta = 0.95$ and $\sigma_\varepsilon = 0.12$, and let k and φ vary from zero to 1 and 1.2 in steps of size 0.1. This generates a grid of 143 points for $[k, \varphi]$ over which we evaluate the expected welfare gain from fear of floating. The x, y and z-axes represent k, φ and $-E_{t-1}\Delta L_t$, respectively.

Turning to the general case of imperfect credibility, $k > 0$, inequality (16) suggests policymakers then have a greater $\varphi^{\max}$ threshold. In Figure 1, the expected gain from fear of floating grows smoothly with k; for the particular parameter and shock values, the welfare surface crosses the zero plane near $k = 0.4$. If credibility weakens further then fear of floating outperforms the benchmark. When $k > 0$, Figure 1 also shows that the welfare surface slopes up along the φ-axis. The expected gain from fear of floating rises with the asymmetric preference coefficient; it is greatest in the red region when k and φ are both large. Thus, credibility problems help explain why developing countries are likely to have bigger $\varphi^{\max}$ values than industrialized countries. Faced with imperfect credibility, developing-country policymakers tend to be more reluctant to let their home currency depreciate then their counterparts in developed economies where time-inconsistency is not an issue and k is near zero.

We next analyze the case of adverse supply shocks at $t - 1$. From the last term in expression (16), any $\varepsilon_{t-1} < 0$ results in higher $\varphi^{\max}$, hence fear of floating outperforms the benchmark for a wider range of shocks.[12] The welfare comparison for the same parameter values as above and $\varepsilon_{t-1} = -0.11$ is shown in Figure 2

[12] An adverse shock realization at $t - 1$ is sufficient for $\varphi^{\max} > 0$ and, if $k = 0$, also necessary.

FIGURE 2 HERE

The expected welfare gain from fear of floating is now in the range $[0, 0.35]$, compared to $[-0.06, 0.08]$ in Figure 1. Indeed, the zero plane lies below the welfare surface at every point on the $[k, \varphi]$ grid, so the two welfare alternatives are at par only in the degenerate case of no fear of floating ($\varphi = 0$).

The stronger case for asymmetric preferences relates to value function (7). Recall that any non-zero shock at $t-1$ is observed by the private sector, so the expected welfare gap for period t depends on the previous inflation rate. The additional losses due to the change in depreciation introduce path-dependence to the model, and that is independent of the rate of time preference. Path-dependence is asymmetric: adverse supply shocks improve average welfare under fear of floating while favorable ones render it more costly. Intuitively, the underlying financial fragility becomes highly relevant, or *salient*, immediately following a severe financial crisis triggered by devaluation. Therefore, to the extent that developing and emerging market economies tend to be chararacterized by negatively skewed shock distributions, fear of floating behavior is more appropriate from a welfare point if view.

Lastly, we assess the welfare impact of changes to the central bank's rate of time preference. Differentiating equation (14) with respect to β yields $\frac{\partial E_{t-1}\Delta L_t}{\partial \beta} = \frac{2\varphi}{\chi}[k\alpha - \varphi(1-\beta)]$. With imperfect credibility, and assuming β

is not too small this expression is positive, suggesting that $\varphi > 0$ becomes more costly with a higher discount factor. If k is at or close to zero, however, then $\frac{\partial E_{t-1}\Delta L_t}{\partial \beta} < 0$ for all $\beta \in (0,1)$. Ceteris paribus, higher β then implies that the expected welfare gain from fear of floating increases.

These comparative statics are supported by Figure 3 below, graphing the behavior of $-E_{t-1}\Delta L_t$ against k and φ.

FIGURE 3 HERE

The top panel combines the favorable shock from Figure 1 ($\varepsilon_{t-1} = 0.04$) with $\beta = 0.30$, without loss of generality.[13] Asymmetric preferences unambiguously lower average welfare for k smaller than about 0.2. However, if credibility worsens ($k > 0.2$) then fear of floating still outperforms the benchmark. This property is also highlighted in the lower panel of Figure 3, combining a large adverse shock and low discount factor, $\varepsilon_{t-1} = -0.11$ and $\beta = 0.30$. Note that, compared to the top panel, less of the $[k, \varphi]$ grid now lies below the zero plane. Thus, the earlier implication that $\varphi > 0$ improves average welfare following adverse supply shocks is robust to the discount factor, provided credibility is imperfect.

Equivalently, lower discount factors render fear of floating less appropriate than the Barro-Gordon benchmark, particularly if credibility is strong.

[13] Welfare surfaces conditional on different β and ε_{t-1} combinations are available upon request.

If credibility problems are persistent, however, then fear of floating outperforms the benchmark even with a low discount factor. Interestingly, such conditioning of the average welfare performance on policymakers' progress on the credibility front is in line with Eichengreen and Razo-Garcia's (2006) projection that developing-country policymakers will only gradually abandon 'intermediate' exchange rate regimes and float their currencies. These authors' forward-looking conclusion is that, as emerging market economies build up their institutions and develop liquid financial markets, they enter a virtuous circle (a 'path to prudence') through which fear of floating will remain attractive.

In the context of industrialized countries—whose k is arguably smaller than developing countries—the finding that fear of floating combined with large β improves average welfare is also related to the "new-environment view" of monetary policy (Borio et al. (2003)). According to that view, central banks in advanced economies need to place greater weight on financial (and exchange rate) imbalances when calibrating monetary policy; they may, consequently, also require a longer horizon for evaluating policy alternatives. Thus, proxying longer policymaking horizons with higher β values, this finding appears consistent with the new-environment view that financial stability may be an independent objective of monetary policy, also when credibility is perfect.

4.2 Fear of floating and inflation variability

A key observation of Lahiri and Végh (2001) is that fear of floating results in less variable inflation rates in countries which are subject to larger shocks. That is, instead of a monotonic relationship between nominal exchange rate variability and the size of supply shocks, the extra cost of currency depreciation appears to lower inflation variability in developing economies displaying fear of floating behavior.

If fear of floating is considered to be time-varying, then our reduced-form framework can shed light on this stylized fact. To illustrate, assume that asymmetric preference coefficient φ follows the stationary process

$$\varphi_t = \theta\varphi_{t-1} - \varepsilon_t \tag{17}$$

where $\theta \in (0,1)$ measures the persistence of φ_t, and ε_t is the period-t supply shock. Equation (17) implies the covariance between φ_t and ε_t is always negative: $cov(\varphi_t, \varepsilon_t) = -\sigma_\varepsilon^2 < 0$. Following the discussion in Section 3.1, the intuition is that the underlying financial fragility deteriorates with adverse supply shocks. Hence, adverse shocks induce *more* fear of floating while favorable shocks have the opposite effect.

Substituting (17) into equation (11), equilibrium inflation variability under fear of floating becomes

$$
\begin{aligned}
var\pi_t^{FF} \quad = \quad & \left[\frac{\alpha^2}{(\alpha^2+\chi)^2} + \frac{(1-\beta)^2}{\chi^2(1-\theta^2)}\right]\sigma_\varepsilon^2 + \frac{2\alpha(1-\beta)}{\chi(\alpha^2+\chi)}\, cov(\varphi_t, \varepsilon_t) = \\
& \left[\frac{\alpha^2}{(\alpha^2+\chi)^2} + \frac{(1-\beta)^2}{\chi^2(1-\theta^2)} - \frac{2\alpha(1-\beta)}{\chi(\alpha^2+\chi)}\right]\sigma_\varepsilon^2
\end{aligned} \tag{18}
$$

Note that inflation variability increases with σ_ε^2 by the constant factor of proportionality in square brackets Thus, in comparing inflation variability under fear of floating with its equilibrium value in the Barro-Gordon model, from equation (4), supply shock variability cancels out, and the relative position of the two welfare alternatives will depend only on reduced-form parameters α, β, χ and θ.

Comparing expressions (4) and (18), the asymmetric alternative delivers less variable inflation than the Barro-Gordon benchmark, $var\pi_t^{FF} < var\pi_t^{BG}$, if and only if

$$
\beta > \beta_{\min} = 1 - \frac{2\alpha\chi(1-\theta^2)}{\alpha^2+\chi} \tag{19}
$$

Inequality (19) suggests that the volatility comparison is driven by a lower bound for the central bank's discount factor. For values of β *above* (below) $\beta_{\min}$, fear of floating generates *less* (more) volatile inflation than the benchmark.[14] To build intuition for this result, from equation (18) note that bigger discount factors lower the contribution of σ_ε^2 on inflation variability at

[14]From the RHS of (19) it is easy to check that $\frac{\partial\beta_{\min}}{\partial\theta}$ and $\frac{\partial\beta_{\min}}{\partial\chi}$ are both positive, while $\frac{\partial\beta_{\min}}{\partial\alpha} > 0$ for $\alpha^2 > \chi$ and negative otherwise.

a quadratic rate, but raise the contribution of $cov(\varphi_t, \varepsilon_t) = -\sigma_\varepsilon^2$ at a linear rate. The net impact of a longer policymaking horizon is then to lower equilibrium inflation variability under fear of floating. We tentatively conclude that the stylized fact of Lahiri and Végh (2001) is consistent with one-sided depreciation aversion provided the central bank is sufficiently "patient".

5 Concluding remarks

This paper presented an explicit welfare evaluation between the loss function of the Barro-Gordon discretionary model, on one hand, and monetary policy preferences displaying asymmetric aversion to exchange rate depreciation in addition to the 'twin' objectives of inflation and output stabilization, on the other. Persistent fear of floating behavior by policymakers arises because financial fragility has adverse systemic spillovers. For emerging market economies, in particular, there is growing consensus that output costs are significantly higher when financial crises coincide with currency crises.

It was found that average social welfare does not unambiguously improve when the central bank employs the asymmetric loss function. The expected welfare differential of fear of floating vis-à-vis the benchmark depends on the underlying financial fragility, the credibility of the monetary policy framework, the economy's recent inflation experience, and on the policymaker's rate of time preference. Conditional on these influences the results indicate that, while accounting for financial fragility can improve average social welfare for developing and developed economies alike, fear of floating behavior is better suited to the former than the latter group. Finally, the welfare impact of the discount factor and credibility concerns appears consistent with recent empirical work suggesting that *de facto* floating exchange rates are chosen by countries at intermediate stages of development adopting a gradualist approach to liberalizing their capital account.

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FIGURE 1: AVERAGE WELFARE COMPARISON WITH FAVORABLE SUPPLY SHOCKS

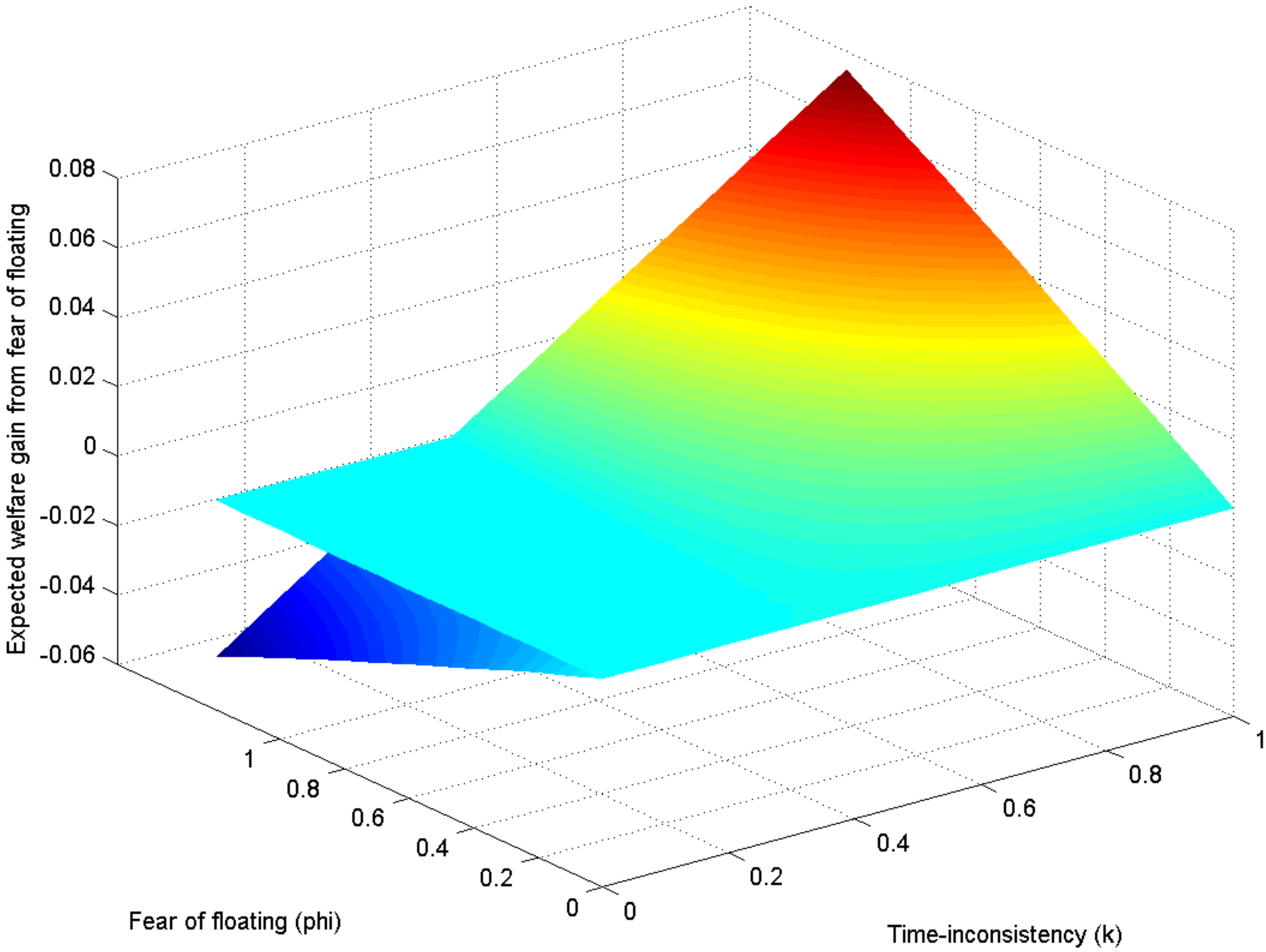

FIGURE 2: AVERAGE WELFARE COMPARISON WITH ADVERSE SUPPLY SHOCKS

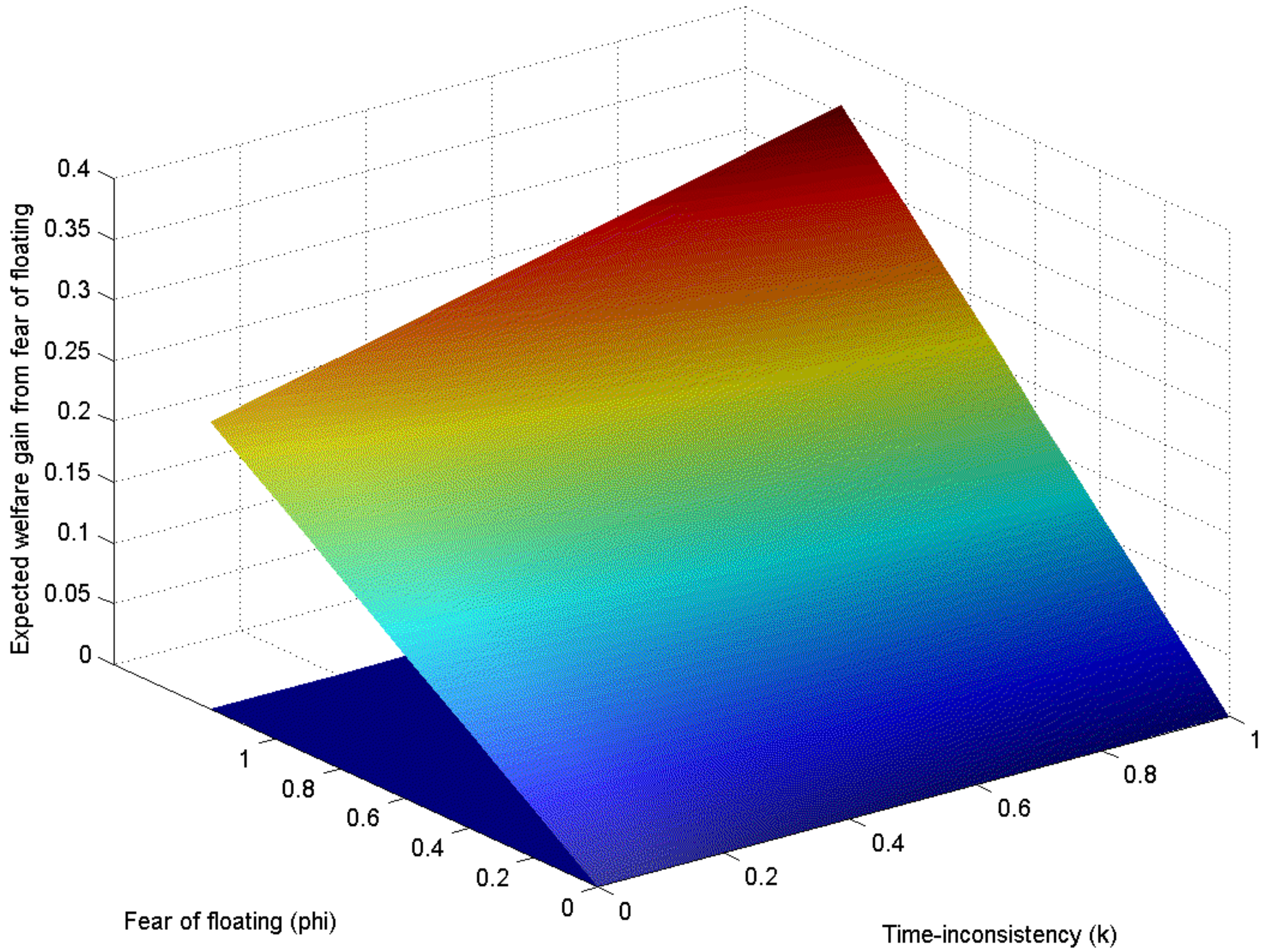

FIGURE 3: AVERAGE WELFARE COMPARISON WITH LOW DISCOUNT FACTOR AND FAVORABLE SUPPLY SHOCK