Research Statement

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I am a theoretical macroeconomist with particular interests in monetary economics, stabilization policies, and exchange-rate regimes.

Most of my work seeks to address questions raised by key macroeconomic events (e.g. currency crises, liquidity traps, financial crises, asset-price booms and busts) and their policy responses (e.g. monetary unification, unconventional monetary policy, Basel III). To do so, I typically build small-scale, qualitative, analytically tractable dynamic stochastic general-equilibrium (DSGE) models, often building bridges between different branches of the literature. I use these models to better understand the positive and normative implications of frictions, the role and the transmission mechanism of stabilization policies, or the short- and long-term effects of exchange-rate regimes.

Throughout this work, I have studied various stabilization policies ranging from conventional and unconventional monetary policy (interest-rate setting, quantitative easing, forward guidance) to prudential policy (bank-capital requirements) and fiscal policy (government expenditures, capital infusion into banks, income and labor-income taxes), sometimes in conjunction with structural policies (structural reforms that increase potential output or enhance price flexibility). In a separate line of research, however, I also study stabilization policy *generically*, in a broad class of dynamic rational-expectations models that arguably includes most existing DSGE models.

In the following, I present in turn the three main research areas into which my contributions can be classified: (i) exchange-rate regimes; (ii) monetary, prudential, fiscal, and structural policies; and (iii) generic stabilization policy.

1 Exchange-Rate Regimes

The macroeconomic effects of exchange-rate regimes is a key, long-standing issue in international monetary economics. I have addressed it from various theoretical perspectives, focusing on three alternative exchange-rate regimes: flexible exchange rates, fixed but adjustable exchange rates, and irrevocably fixed exchange rates (or monetary union).

In "**Coordination, Cooperation, Contagion, and Currency Crises**" (*Journal of International Economics*, 2001), Philippe Martin and I focus on fixed but adjustable exchange rates. This exchange-rate regime is well known for opening the door to exchange-rate crises in which speculative attacks lead public authorities to devalue their currency. Moreover, these crises may spread across countries,

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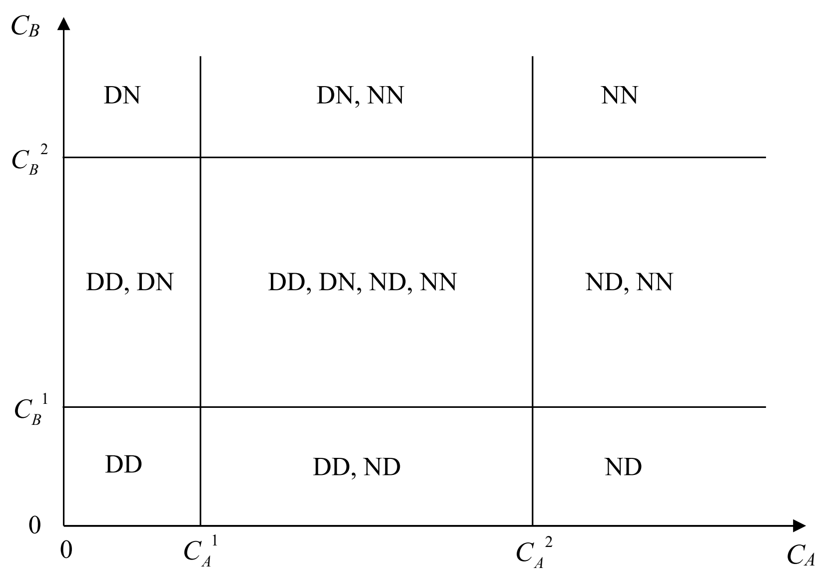
as in Europe in 1992-1993 and South-East Asia in 1997. Our goal is to study the role of international coordination and cooperation in this context. We use a second-generation model of exchange-rate crises in which speculative attacks are triggered by self-fulfilling expectations. We consider two countries and model the strategic interactions between the national public authorities by a competitive-devaluation game. Coordination equilibria are defined as Nash equilibria that are not Pareto-dominated by any other Nash equilibrium. The cooperation equilibrium is defined as the equilibrium obtained when the two national public authorities jointly maximize the sum of their national-objective functions. We show that international coordination and cooperation, to various degrees, reduce the possibility of self-fulfilling expectations of currency crises and increase social welfare. In a companion paper (Loisel and Martin, 2001b), we endogenize the devaluation rate in a non-micro-founded version of the model and find similar results.

The effects of international coordination, in particular, can be represented in a simple diagram. There are four types of candidate equilibria: neither country A nor country B devalue ("NN"), only country A devalues ("DN"), only country B devalues ("ND"), both country A and country B devalue ("DD"). Let C_A et C_B denote the fixed costs of devaluation for country A and country B respectively. Without coordination (nor cooperation), each country $i \in \{A, B\}$ may not devalue in equilibrium if and only if $C_i > C_i^1$, and may devalue in equilibrium if and only if $C_i < C_i^2$, where $0 < C_i^1 < C_i^2$. So, the equilibria are those represented in Figure 1.

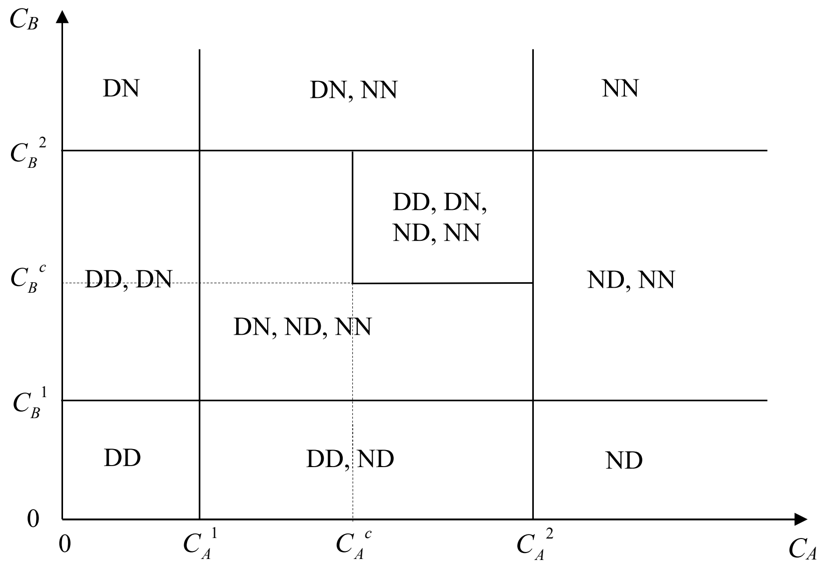
Figure 1: Equilibria with no coordination and no cooperation



For $C_A \in (C_A^c, C_A^2)$ and $C_B \in (C_B^c, C_B^2)$, where $C_i^c \in (C_i^1, C_i^2)$ for each $i \in \{A, B\}$, the DD equilibrium is Pareto-dominated by the NN equilibrium. So, coordination eliminates the DD equilibrium for these values of C_A and C_B. The equilibria with coordination are, thus, those represented in Figure 2.

In "**Why Was the Euro Weak? Markets and Policies**" (*European Economic Review P&P*, 2001), Daniel Cohen and I examine the case of a monetary union in which national fiscal policies are not coordinated with each other. We show, in a very simple theoretical framework, that each national fiscal authority may have the incentive to react to the entire shock affecting its country, while it should ideally react only to the country-specific component of this shock. We use this result to explain the

Figure 2: Equilibria with coordination



depreciation of the euro during its first two years of existence (1999-2000) by the conjunction of a tightening of national fiscal policies and a loosening of the common monetary policy. We examine the empirical relevance of this explanation by estimating a structural VAR on financial data and identifying the structural shocks with short- and long-term restrictions. We conclude that, in accordance with the theoretical result, the depreciation of the euro may have been partly due to an excess of supply in the euro area, channeled abroad by a competitive depreciation.

Exchange-rate regimes may matter not only for the vulnerability to crises and for the business cycle, as studied in the above papers, but also for the structure of the economy in the long term. In "**Endogenously Asymmetric Demand Shocks in a Monetary Union**" (*Journal of Economic Integration*, 2005), I investigate the implications of alternative exchange-rate regimes both for the business cycle and for the structure of the economy. More specifically, I show that compared to the flexible-exchange-rate regime, monetary union may tend to favor national industrial specialization and thus to transform industry-specific shocks into country-specific shocks. As a consequence, the degree with which a given group of countries meets an optimal-currency-area criterion (the criterion about the degree of national production diversification in the presence of industry-specific shocks) may decrease after these countries join together to form a monetary union. I show that such a development, nonetheless, does not necessarily decrease ex ante social welfare. These results are obtained in the context of a two-country two-industry monetary model with intermediate goods and transport costs, which builds a bridge between the New Open Economy Macroeconomics literature and the New Economic Geography literature. In this model, due to short-term nominal-wage rigidity, the choice of the exchange-rate regime has a direct impact on national business cycles through various substitution and wealth effects. These effects interact with the traditional dispersion and concentration forces highlighted in the existing literature, to give rise to new dispersion forces under flexible exchange rates, and new concentration forces in a monetary union.

These analytical results can be represented in simple diagrams. For simplicity, I focus on two polar cases: concentration (defined as each industry entirely located in one country) and dispersion (defined as half of each industry in each country). Let $T \geq 1$ denote the iceberg cost of shipping goods from one country to the other. Figure 3 shows the range of values of T for which concentration is "sustainable" (i.e. is an equilibrium), in the two alternative exchange-rate regimes and in the benchmark case with no industry-specific shocks (in which case the exchange-rate regime does not matter). Since $T_{fe}^{S'} < T_{bk}^{S} < T_{mu}^{S}$ (where the superscript S stands for "sustain points"), monetary union makes concentration more sustainable, and hence makes endogenously asymmetric demand shocks more entrenched, compared to the benchmark case and the flexible exchange-rate regime.

Figure 3: Sustainability of concentration

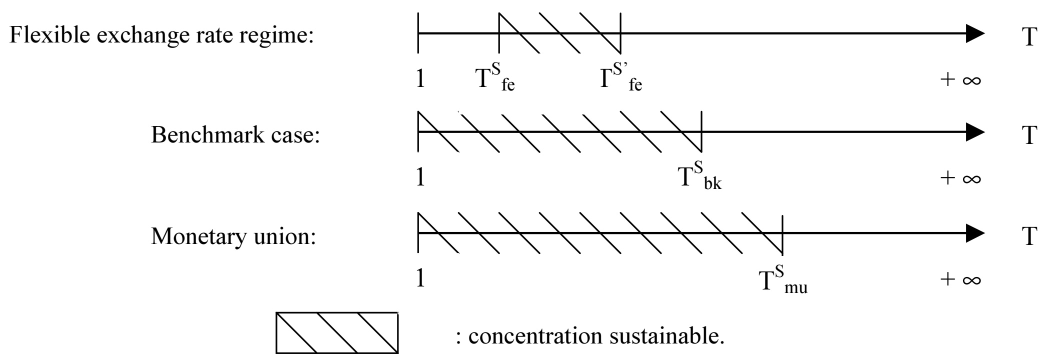
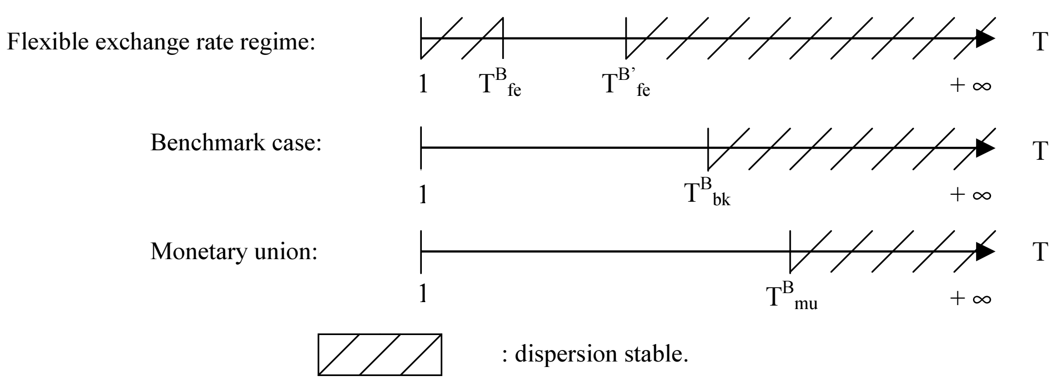


Figure 4 shows the range of values of T for which dispersion is stable (i.e. is an equilibrium), again in the two alternative exchange-rate regimes and in the benchmark case. Since $T_{fe}^{B'} < T_{bk}^{B} < T_{mu}^{B}$ (where the superscript B stands for "break points"), monetary union makes dispersion less stable, and hence makes endogenously asymmetric demand shocks more likely to emerge, compared to the benchmark case and the flexible exchange-rate regime.

Figure 4: Stability of dispersion



Another possible long-term consequence of exchange-rate regimes is higher or lower steady-state inflation. In "**To Be or Not To Be in Monetary Union: A Synthesis**" (*Journal of International Economics*, 2011), Laurent Clerc, Harris Dellas and I evaluate the welfare costs and benefits, for a small open economy, to move from a flexible-exchange-rate regime to a monetary-union regime, taking into account the consequences of this regime change both for the business cycle and for steady-state inflation. The literature on this issue is made of two distinct branches. The first branch focuses on the consequences of this regime change for the business cycle, and therefore on the *cost* of joining a monetary union due to the loss of national monetary policy in the presence of country-specific shocks. The second branch focuses on the consequences of this regime change for steady-state inflation, and therefore on the *benefit* of joining a monetary union due to the higher credibility (or greater ability to commit) of the supranational central bank. We build a bridge between these two branches of the literature by considering jointly this cost and that benefit. To that aim, we use a canonical New Keynesian model of a small open economy, with two modifications: the replacement of the efficient steady state by an inefficient steady state, and the introduction of shocks on the elasticity of substitution between differentiated goods. These two modifications raise two time-inconsistency problems that lead, in the discretion case, to an inflation bias and a stabilization bias. We calibrate the model and find that monetary union can be preferable to the flexible-exchange-rate regime in terms of welfare even for a moderate inflation bias (of the order of 2 or 3% per year), as soon as shocks are not too a-synchronized across countries.

2 Monetary, Prudential, Fiscal, and Structural Policies

My second line of research studies the role of various stabilization policies, sometimes in conjunction with structural policies, to achieve macroeconomic and/or financial stability. Except for the first two papers below, this line of research is essentially motivated by the financial crisis and the Great Recession of 2007-2009, which were the impetus for major changes in the practice of central banking and in our business-cycle models.

In "**Central Bank Reputation in a Forward-Looking Model**" (*Journal of Economic Dynamics and Control*, 2008), I address the issue of the credibility of optimal monetary policy. More specifically, I consider the same sources of time inconsistency for optimal monetary policy as in Clerc, Dellas and Loisel (2011) above, namely those giving rise to an inflation bias and a stabilization bias under discretion, but this time in the context of the basic New Keynesian model of a closed economy. I investigate whether reputation concerns can induce the central bank to credibly implement this time-inconsistent optimal monetary policy. Interestingly, the forward-looking nature of the model (which reflects the key role played by the private sector's expectations in the transmission of monetary policy) enables me to model the reputation of the central bank more satisfactorily by explaining the coordination of private agents on the length of the punishment period following a deviation from optimal monetary policy. The results that I obtain suggest that the inflation and stabilization biases can be overcome for all the calibrations of the model encountered in the literature. They tend to question the desirability of some monetary-policy-delegation proposals made in the literature. The paper, I think, also sheds light on the credibility challenges faced by central banks in today's high-inflation environment.

In "**Monetary Policy and Herd Behavior: Leaning Against Bubbles**" (Manuscript, 2012), Aude Pommeret, Franck Portier and I study the role of monetary policy when asset-price bubbles may form due to herd behavior in investment in an asset whose return is uncertain. We build a simple general-equilibrium model in which entrepreneurs decide sequentially to borrow from households and invest in an old technology whose productivity is known, or in a new technology whose productivity is uncertain (e.g., the Information Technology in the 1990's). Each entrepreneur takes her decision on the basis of both a private signal that she receives and the past entrepreneurs' decisions that she observes. In this context, herd behavior may arise due to an "informational cascade," and the central bank can identify this herd behavior even though it does not receive any private signal. A tightening of monetary policy, by making borrowing more expensive for entrepreneurs, can make them invest in the new technology if and only if they receive an encouraging private signal about its productivity. In doing so, it makes their investment decision reveal their private signal, and therefore prevents herd behavior and the asset-price bubble. We show that such a "leaning against the wind" monetary policy, by fostering social learning, may raise ex-ante welfare.

The 2007-2009 crisis has highlighted the importance of financial intermediation for the macroeconomy, and raised the question of the implications of financial frictions and financial shocks for policy − even in normal times. In "**Liquidity Shocks, Equity-Market Frictions, and Optimal Policy**" (*Macroeconomic Dynamics*, 2015), Harris Dellas, Behzad Diba and I ask ourselves how liquidity problems affecting the funding side of banks are transmitted to their lending side, and what is the appropriate policy response. The answers to these questions depend, of course, on what we assume about the presence and nature of frictions that banks face in debt and equity markets. The goal of the paper is to make the role of such frictions transparent by studying the positive and normative implications of financial shocks in a standard New Keynesian model that includes banks and (ad hoc) frictions in the market for bank capital. We show how such frictions influence materially the effects of bank liquidity shocks and the properties of Ramsey-optimal policy. In particular, they limit the scope for countercyclical monetary policy in the face of these shocks. A fiscal policy instrument can complement monetary policy by offsetting the balance-sheet effects of these shocks, and jointly optimal policies attain the same equilibrium that monetary policy (alone) could attain in the absence of equity-market frictions.

The 2007-2009 crisis has also highlighted the interconnectedness of macroeconomic stability and financial stability, and raised the question of how best to combine monetary and prudential policies. In "**Optimal Monetary and Prudential Policies**" (*American Economic Journal: Macroeconomics*, 2017), Fabrice Collard, Harris Dellas, Behzad Diba and I address this question by characterizing the jointly optimal monetary and prudential policies, setting the interest rate and bank-capital requirements. In our New Keynesian model with banks, unlike in the related literature (which I review in Loisel, 2014), the source of financial fragility is the socially excessive amount of risk taken by banks due to limited liability and deposit insurance. This excessive risk-taking involves the *type* (risky vs. safe), not necessarily the *volume*, of credit extended by banks. Higher capital requirements can tame banks' risk-taking behavior by making them have more skin in the game and thus internalize the social cost of risk. But monetary policy may not be suited to this task as it works primarily through the volume rather than the composition of credit. We characterize the conditions under which locally optimal (Ramsey) policy dedicates the prudential instrument to preventing inefficient risk-taking by banks, and the monetary instrument to dealing with the business cycle. Under these conditions, the two instruments co-vary negatively: capital requirements are raised in response to shocks that increase banks' risk-taking incentives, and the interest rate is cut to dampen the contractionary effects of higher capital requirements. Our analysis thus identifies circumstances that can validate the prevailing view among central bankers that standard interest-rate policy cannot serve as the first line of defense against financial instability. In addition, we provide conditions under which the two instruments optimally co-move positively and counter-cyclically.

The Great Recession of 2007-2009 led central banks to peg their policy rates at the zero lower bound

(ZLB) and provide forward guidance about future policy rates. It also rekindled interest in the use of discretionary fiscal policy as a stabilization tool, and sparked debate (in Europe) about implementing structural reforms. Standard New Keynesian (NK) models typically have stark implications for policy at the ZLB: forward guidance is powerful, fiscal multipliers are large, and structural reforms that increase potential output or enhance price flexibility actually worsen the recession. In "**Pegging the Interest Rate on Bank Reserves: A Resolution of New Keynesian Puzzles and Paradoxes**" (*Journal of Monetary Economics*, 2021), Behzad Diba and I relate these stark implications to some limit puzzles and paradoxes that we view as implausible. We consider three alternative ways to introduce money into the basic NK model: two ways in which money is merely interpreted as bank reserves, and one − borrowed from Diba and Loisel (2023) below − in which it is explicitly modeled as bank reserves. The resulting models deliver local-equilibrium determinacy under an exogenous interest rate on reserves and an exogenous nominal stock of reserves. As a result, they offer a resolution of the forward-guidance puzzle, the fiscal-multiplier puzzle, and the paradox of flexibility; and their ZLB-policy implications are dramatically different from those of the basic NK model, even for an arbitrarily small monetary friction. As the monetary friction becomes vanishingly small, the models converge to the basic NK model and serve to select a particular equilibrium of that model − which also offers a resolution of the paradox of toil.

Our results are analytical and hold for any calibration of the three models. To illustrate these results graphically, we consider a specific calibration of one of these models (which we call the "simple model"). Figure 5 illustrates our resolution of the forward-guidance puzzle and the paradox of flexibility. It displays the effect of announcing at date t a one-percentage-point-per-annum cut in the policy rate at date $t+k$, on inflation at date t, as a function of $k \in \{0, ..., 20\}$, for different values of the degree of price stickiness θ. The right panel in Figure 5 replicates the implausible implications of the basic NK model: cutting the policy rate in a later quarter leads to an exponentially larger effect on current inflation (forward-guidance puzzle); and making prices more flexible, i.e. reducing θ, accelerates these explosive effects (paradox of flexibility). The left panel shows the results for our simple model: with our benchmark value of $\theta = 2/3$, the inflationary effects of the policy-rate cut are modest (about 10 basis points for a cut in one of the first five quarters) and die off relatively quickly with the horizon of the cut; as we make prices more flexible, these inflationary effects smoothly converge to the effects under perfect price flexibility ($\theta = 0$).

Figure 6 illustrates our resolution of the fiscal-multiplier puzzle and, again, the paradox of flexibility. It displays the effect of announcing at date t a one-percent-of-steady-state-output increase in government purchases at date $t+k$, on inflation at date t, as a function of $k \in \{1, ..., 20\}$, for different values of the degree of price stickiness θ. Once again, the comparison between the left and the right panels shows that our model does not share the puzzling implications of the basic NK model: the effects of anticipated fiscal policy die out as we delay the policy intervention (no fiscal-multiplier puzzle), and they converge to the flexible-price values as we make prices more and more flexible (no paradox of flexibility).

Since the end of 2008, the Federal Reserve has been communicating its monetary policy in terms of two instruments under its direct control: the interest rate on bank reserves, and the size of its balance sheet. In "**A Model of Post-2008 Monetary Policy**" (Manuscript, 2023), Behzad Diba and I introduce banks and bank reserves into the basic New Keynesian model to assess the main consequences of this policy change. We show that our model can account, in qualitative terms, for three key features of

Figure 5: Effect of a one-percentage-point-per-annum policy-rate cut at date $t+k$ on inflation at date t

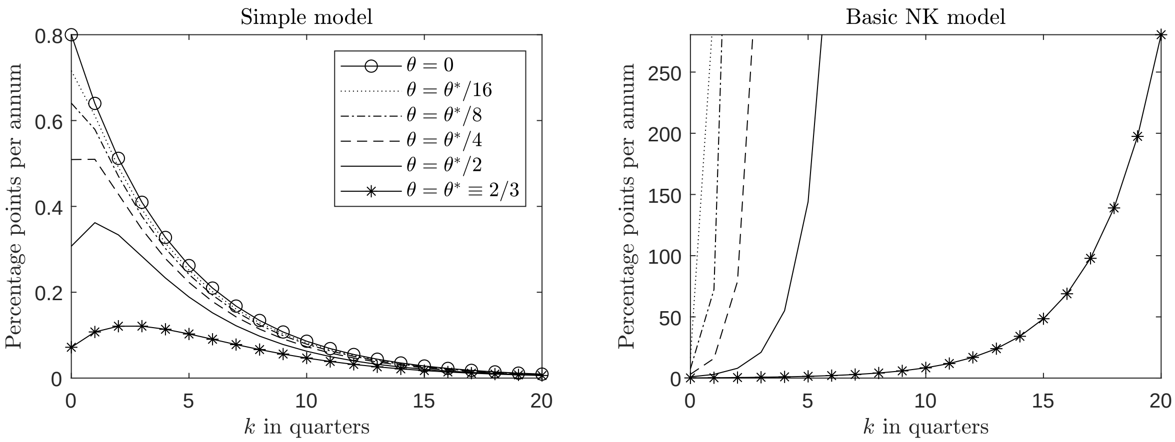
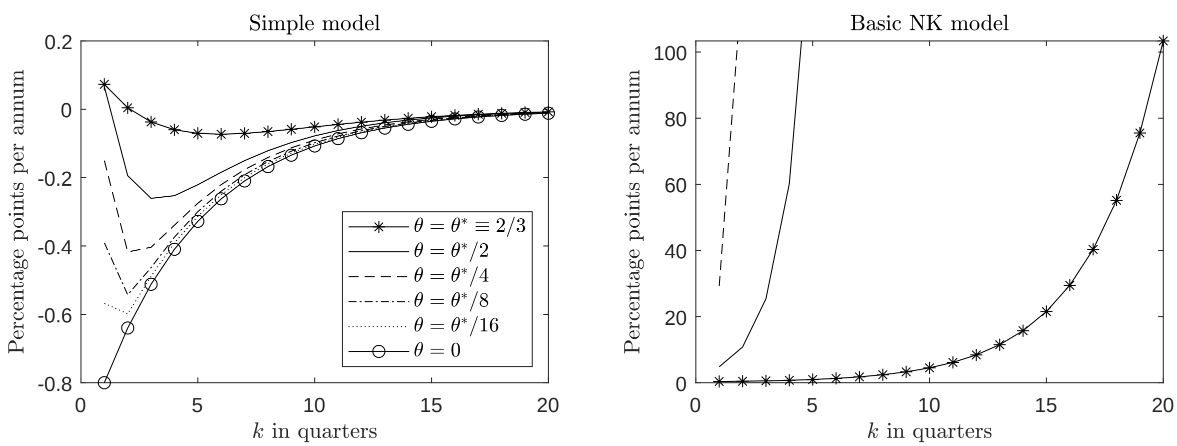


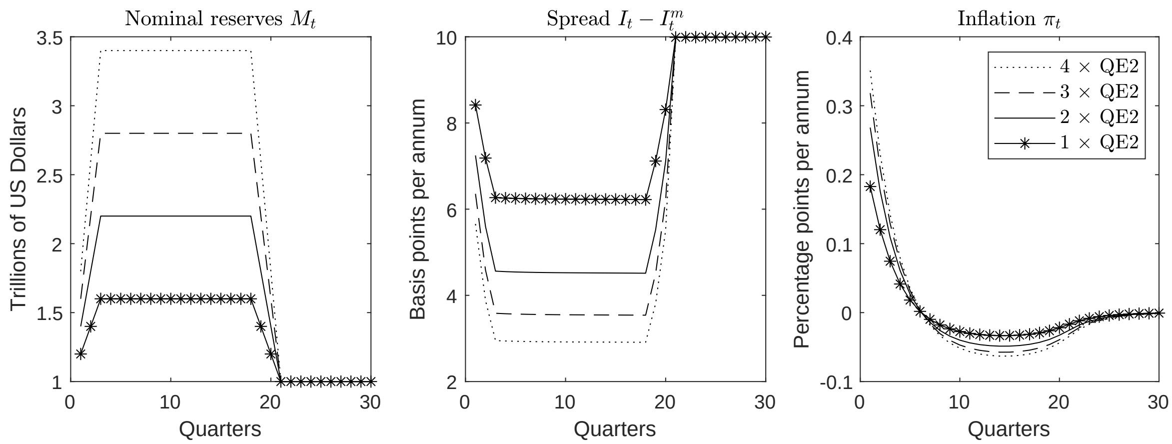
Figure 6: Effect of one-percent-of-steady-state-output government purchases at date $t+k$ on inflation at date t



US inflation during the 2008-2015 ZLB episode: no significant deflation, little inflation volatility, and no significant inflation following quantitative-easing policies. Crucial to this result is our assumption that demand for bank reserves got close to satiation, but did not reach full satiation. We introduce liquid government bonds into the model to reconcile our non-satiation assumption with the fact that Treasury-bill rates dropped below the interest rate on bank reserves during the ZLB episode. Looking ahead, we explore the implications of our model for the normalization of monetary policy and its future operational framework (floor system). In particular, we find that current and expected future policy-rate hikes and balance-sheet contractions are always deflationary in our model, thus ruling out Neo-Fisherian effects.

All these results are analytical, except the result about no significant inflation following quantitative-easing policies. To get this last result, we first calibrate our model to a steady-state equilibrium that matches some features of the US economy in November 2010, leading up to the second round of quantitative easing (QE2); then, we conduct non-linear numerical simulations of large monetary expansions. One of these expansions, like QE2, raises the stock of nominal reserves M_t from an already large value ($1 trillion) to a substantially larger one ($1.6 trillion) in the course of 3 quarters (solid line with asterisks in the left panel of Figure 7). The others raise M_t by two, three, or four times as much, i.e. from $1 to $2.2, $2.8, or $3.4 trillion (solid, dashed, and dotted lines in the left panel of Figure 7). All these expansions are temporary: M_t rises over 3 quarters, remains at its new value for 15 quarters, and goes back to its initial value over 3 quarters.

Figure 7: Effects of large and temporary balance-sheet expansions



The middle and right panels of Figure 7 show the effects of these monetary expansions (announced at date 1) on the spread between the interest on bonds I_t and the interest rate on reserves I_t^m (which measures the opportunity cost of holding reserves) and on inflation π_t from date 1 to date 30. The "single QE2" expansion makes the spread fall from 10 to 6.2 basis points per annum, and raises annualized inflation by only 18 basis points upon impact. And the "multiple QE2" expansions do not have much larger inflationary effects: following the "double, triple, and quadruple QE2" expansions, the spread falls to 4.5, 3.5, and 2.9 basis points, and inflation rises by only 27, 32, and 35 basis points respectively. These results illustrate the strongly decreasing returns to scale of quantitative easing in our setup.

3 Generic Stabilization Policy

My third line of research studies stabilization policy *generically* in a broad class of locally log-linearizable dynamic rational-expectations models (which arguably includes most existing DSGE models). It is well known that these models can have "sunspot equilibria" in which the economy fluctuates around a steady state because of self-fulfilling expectations; such fluctuations, it has been argued, may have occurred in the U.S. before 1979. Since they are typically detrimental to welfare, a natural goal for stabilization policy is to eliminate these equilibria by ensuring "local-equilibrium determinacy" (i.e. existence and uniqueness of a stationary solution to the locally log-linearized model). Local-equilibrium determinacy is one of the key issues, among several others, that I address in this line of research. The results that I obtain can be readily applied to any stabilization policy in any model. To establish these general results, I use mathematical tools and theorems (mostly about polynomials) that have never or hardly ever been used in economics: Bézout's identity, Sylvester matrices, Newton's identities, Rouché's theorem, and Erdős and Turán's theorem.

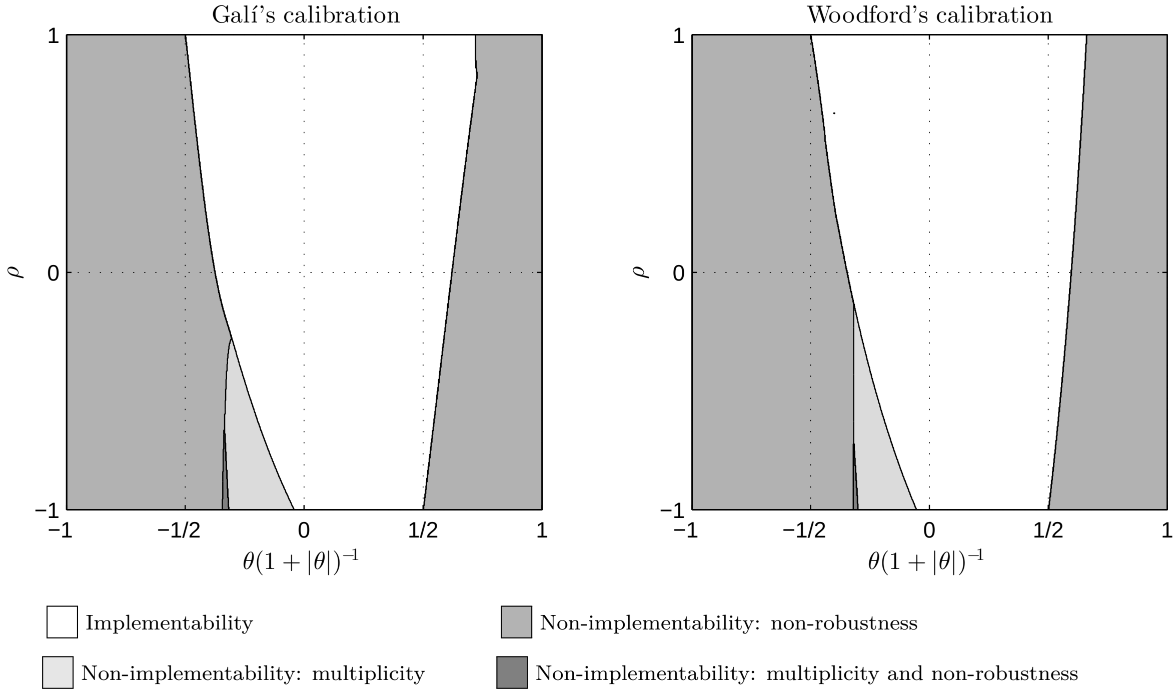
In "**Bubble-Free Policy Feedback Rules**" (*Journal of Economic Theory*, 2009), I design policy-instrument rules that stabilize the economy to a greater extent than standard rules in the literature. Standard rules (e.g., Taylor rules for monetary policy) ensure local-equilibrium determinacy, i.e. they eliminate self-fulfilling expectations making the economy fluctuate in the neighborhood of the steady state. These rules, however, do not prevent the formation of self-fulfilling expectations that make the economy gradually leave the neighborhood of the steady state (to eventually fall, for instance, in a deflationary liquidity trap of the kind that Japan may have experienced in the 1990's and 2000's). In the paper, I design policy-instrument rules that eliminate both kinds of self-fulfilling expectations. I call them "bubble-free" because they eliminate rational bubbles in linear models. In effect, these rules remove non-predetermined variables from the dynamic system by mimicking the structural equations so as to disconnect current variables from the private sector's expectations of future variables. They can be understood as the limit of a sequence of conventional rules using the structural equations as a lever to drive the modulus of the system's unstable eigenvalues towards infinity.

In "**The Implementation of Stabilization Policy**" (*Theoretical Economics*, 2021), I build a bridge between two separate traditions in macroeconomics. One tradition studies some specific exogenous-shock-contingent paths of interest for the endogenous variables (e.g., the path that they follow under Ramsey-optimal policy), without asking whether and how these paths could be implemented as the unique local equilibrium given the policymaker's observation set. The other tradition considers some specific policy-instrument rules ensuring local-equilibrium determinacy and involving only observed variables (e.g., Taylor rules for monetary policy), without requiring these rules to implement a given exogenous-shock-contingent path of interest. To build this bridge, I introduce the concepts of *feasible* paths (paths on which the policy instrument can be expressed as a function of the policymaker's observation set) and *implementable* paths (paths that can be obtained, in a minimally robust way, as the unique local equilibrium under a policy-instrument rule consistent with the policymaker's observation set). I show that, for relevant observation sets, the optimal feasible path under monetary policy can be non-implementable in the New Keynesian model, while constant-debt feasible paths under tax policy are always implementable in the Real Business Cycle model. The first result sounds a note of caution about one of the main lessons of the New Keynesian literature, namely the importance for central banks to track some key unobserved exogenous rates of interest, while the second one restores to some extent the role of income- or labor-income taxes in safely stabilizing public debt.

The result about the non-implementability of the optimal feasible path in the New Keynesian model, in particular, can be illustrated graphically. I assume that the two exogenous (discount-factor and cost-push) shocks in the model follow stationary ARMA(1,1) processes with the same autoregressive parameter $\rho \in (-1, 1)$ and the same moving-average parameter $\theta \in \mathbb{R}$. I consider, at each date t, an observation set O_t for the central bank that includes all the past endogenous variables (but excludes the current endogenous variables as well as the current and past exogenous shocks). The optimal feasible path, denoted by P, is the path that maximizes welfare subject to the structural equations and to the central bank's observation-set constraint. As shown in Figure 8, I find that P is not implementable for many values of ρ and θ, broadly the same values under the two classic calibrations that I consider (corresponding to the two panels in the figure).

For some values of ρ and θ (light-gray areas in Figure 8), P is not implementable because all the interest-rate rules consistent with O_t and P lead to local-equilibrium multiplicity. For other values of ρ and θ (dark-gray areas in Figure 8), it is not implementable because adding an exogenous monetary-

Figure 8: Implementability of the optimal feasible path, in the basic NK model, when the central bank observes only past endogenous variables



policy shock (even of arbitrarily small variance) to any interest-rate rule consistent with O_t and P leads to non-existence of a local equilibrium. For still other values of ρ and θ (very-dark-gray areas in Figure 8), P is not implementable because all the interest-rate rules consistent with O_t and P lead to local-equilibrium multiplicity in the absence of exogenous monetary-policy shocks and to non-existence of a local equilibrium in the presence of such shocks. In the first two cases, the system composed of the structural equations and the rule does not meet the *root-counting* condition for determinacy because it has strictly fewer (in the first case) or strictly more (in the second case) eigenvalues outside the unit circle than non-predetermined variables. In the third case, this system meets the *root-counting* condition but not the *no-decoupling* condition for determinacy.

In "**Stabilization Policy and Lags**" (Manuscript, 2023), I investigate the implications of lags for stabilization policy. Macroeconomic stabilization policy is notoriously subject to inside lags (which delay the reaction of policy to the state of the economy) and outside lags (which delay the effects of policy on the economy). In a broad class of dynamic rational-expectations models, I show that under a weak condition, neither inside lags nor outside lags of any length restrict the ability of the policymaker to ensure local-equilibrium determinacy and to control the anticipation and convergence rates, no matter how many different variables the policymaker observes. To establish this result, I invert the problem usually addressed in the literature: I start from a targeted characteristic polynomial, and I derive a corresponding policy-instrument rule. For any lags, this method offers some degrees of freedom that can be exploited to design rules with additional properties; I illustrate this possibility by designing non-superinertial rules, which the literature suggests may be more robust under model uncertainty.

In the three papers above, I study whether and how policy-instrument rules with some specific properties can be designed. These rules are not arbitrarily restricted to belong to a specific parametric family of rules; in particular, the number of variables in these rules is finite but unbounded. In "**New Principles For Stabilization Policy**" (Manuscript, 2023), by contrast, I study the determinacy properties of any given parametric family of rules, in order to establish new, general, simple "principles" for stabilization policy. The best known principle in the literature is the Taylor principle for monetary policy, which states that the rule should make the interest rate react more than one-for-one to the inflation rate (when it reacts only to the inflation rate). This principle is a good guide for determinacy in many monetary-policy models, but a poor one in others. For monetary policy as for other stabilization policies, no general determinacy conditions have yet been established, and we lack a general understanding of determinacy outcomes depending on the structural equations, the policy instrument, the variables in the policy-instrument rule, and the coefficients and time horizons of these variables.

In this paper, I consider, in a broad class of discrete-time rational-expectations models, stabilization-policy rules making a generic policy instrument react with coefficient $\phi \in \mathbb{R}$ to a (past, current, or expected future) generic variable at time horizon $h \in \mathbb{Z}$, possibly among other variables. Using two complex-analysis theorems, I establish some simple, easily interpretable, necessary or sufficient conditions on ϕ and h for these rules to ensure local-equilibrium determinacy. These conditions lead to new, general principles for stabilization policy in terms of whether, and how strongly or weakly, to react to any variable, at any horizon, in any model. Building on these conditions, I characterize the circumstances under which the long-run Taylor principle is (not) necessary, (not) sufficient, or irrelevant for determinacy. I also provide the first hard guidelines for finding rules with robust determinacy properties across alternative models.

The necessary or sufficient determinacy conditions on ϕ and h can be represented diagrammatically. To start with, consider the basic New Keynesian model with a rule making the interest rate react to the inflation rate: $i_t = \phi \mathbb{E}_t\{\pi_{t+h}\}$. The determinacy status of the dynamic system composed of the model and the rule can be either "determinacy" (unique stationary solution), or "multiplicity" (infinity of stationary solutions), or "explosiveness" (no stationary solution). It is well known that the determinacy status is multiplicity under an interest-rate peg ($\phi = 0$) in this model. I show that there exist two thresholds $\underline{\phi} = 1$ and $\bar{\phi} > 1$ such that the determinacy status, as a function of $(|\phi|, h) \in \mathbb{R}_+ \times \mathbb{Z}$, can be represented as in Figure 9.

Figure 9: Determinacy status for the basic New Keynesian model and Rule $i_t = \phi \mathbb{E}_t\{\pi_{t+h}\}$

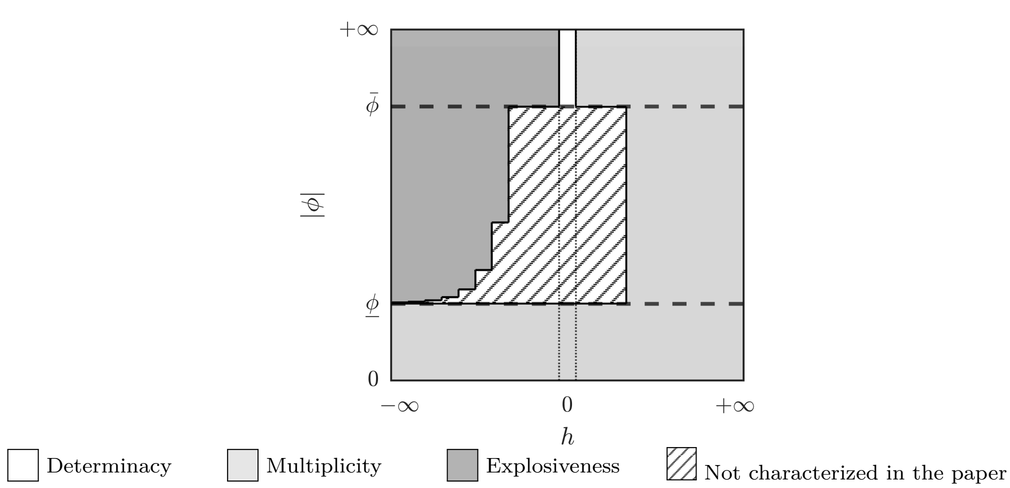


Figure 9 can be interpreted as follows. First, for any $|\phi| < \underline{\phi}$ and any h, the rule does not change the system's dynamics enough to affect the determinacy status, and the latter is the same as under an interest-rate peg ($\phi = 0$), i.e. multiplicity. Second, for any $|\phi| > \bar{\phi}$, the rule dominates the structural equations in the system's dynamics: a sufficiently large weight $|\phi|$ on past (resp. expected future) outcomes favors exploding (resp. imploding) paths and leads to explosiveness (resp. multiplicity). Third, for h above a certain threshold, we have multiplicity for any $|\phi| \in (\underline{\phi}, \bar{\phi})$ and, therefore, for any $|\phi|$. The reason is that large positive horizons h do not much "perturb" the imploding equilibrium paths obtained under a peg, as the reaction of the interest rate prescribed by the rule on these paths decreases exponentially with h; so, these horizons preserve the determinacy status obtained under a peg, i.e. multiplicity. Fourth, for any $|\phi| \in (\underline{\phi}, \bar{\phi})$, as $h \to -\infty$, the roots of the system's characteristic polynomial distribute themselves between inside and outside the unit circle $\mathcal{C}$ of the complex plane in proportion of the share of $\mathcal{C}$ on which the structural equations dominate the rule and the share of $\mathcal{C}$ on which the rule dominates the structural equations; so, we eventually get more roots outside $\mathcal{C}$ than non-predetermined variables, and hence explosiveness.

I generalize these results to a broad class of models (arguably encompassing most existing DSGE models) and to a broad class of policy-instrument rules. I distinguish between three kinds of models, depending on whether their determinacy status under a policy-instrument peg, S_{peg}, is multiplicity (M), or determinacy (D), or explosiveness (E). For simple rules of type $i_t = \phi \mathbb{E}_t\{v_{t+h}\}$, where i_t is the policy instrument and v_t is an arbitrary endogenous variable (or linear combination of endogenous variables), there exist two coefficient thresholds $\underline{\phi}$ and $\bar{\phi} > \underline{\phi}$, and a horizon threshold h^*, such that the determinacy status can be diagrammatically represented as in Figure 10.

Figure 10: Determinacy status for a generic model and a generic rule of type $i_t = \phi \mathbb{E}_t\{v_{t+h}\}$

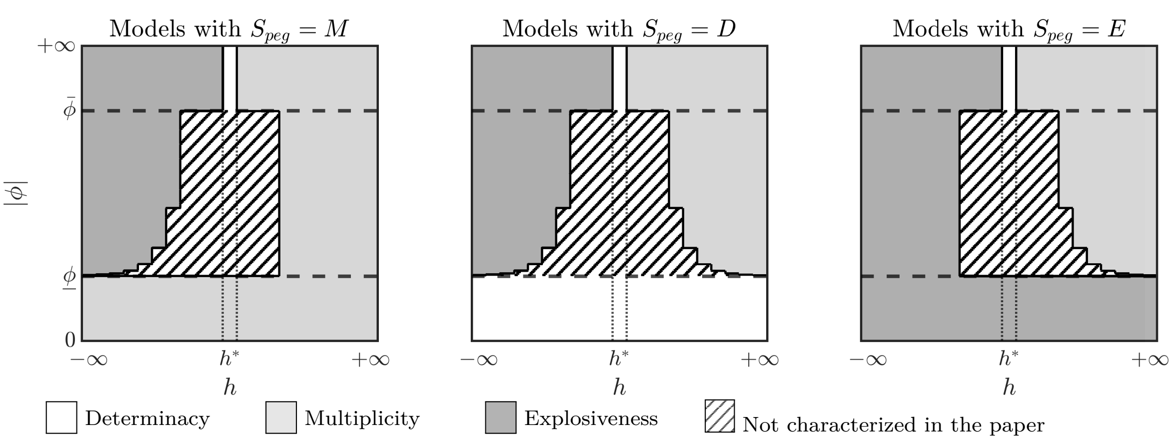


Figure 10 can be interpreted in broadly the same way as Figure 9. It can also be further extended to rules involving several variables with different horizons and coefficients, one of which is a variable with horizon h and coefficient ϕ; and to inertial rules, i.e. rules involving the past values of the policy instrument in addition to a variable with horizon h and coefficient ϕ.

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