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Exchange rate determination, macroeconomic dynamics and stability under heterogeneous behavioral FX expectations☆

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ABSTRACT

In this paper the role of behavioral forecasting rules of chartist and fundamentalist type for the dynamic macroeconomic stability of a two-country system is investigated. The main result of the paper is that for large trend-chasing parameters in the chartist rule used in the FX market, not only this market but also the entire macroeconomic system is destabilized. This outcome takes place despite of a monetary policy conduction in both countries which satisfies the Taylor Principle, and thus highlights the limits of monetary policy as a macroeconomic stabilization instrument in a world of boundedly rational agents.

1. Introduction

In recent times a significant paradigm change has taken place in macroeconomics: after the almost exclusive development of theoretical macroeconomic models based on the assumption of forward-looking, intertemporal utility maximizing agents with rational expectations in the DSGE tradition (see e.g. Christiano et al., 2005), the profession has started to acknowledge the importance of different classes of heterogeneity (regarding preferences, the degree of risk aversion, information, etc.) and "behavioral" rules or attitudes at the microeconomic level for the dynamics of the economy at the aggregate level (see Akerlof, 2002, 2007; Yellen, 2007 for recent and important statements in this regard).

The need for an alternative foundation of macroeconomics is perhaps most evident in the international finance literature, where the so-called "New Open Economy Macroeconomics" (NOEM) approach developed by Obstfeld and Rogoff (1995) has been the workhorse theoretical framework for the study of open-economy issues in recent years, after the long-lasting predominance of Mundell–Fleming type of models. This is due to the fact that NOEM models such as Galí and Monacelli (2005) and Benigno and Benigno (2008), relying on the interaction of fully rational agents, seem unable to explain important stylized facts of the dynamics of the nominal exchange rate and its interaction with the real side of the

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economy (see Engel and West, 2005 for a contrary view on this respect). Indeed, as pointed out e.g. by De Grauwe and Grimaldi (2006a), Efficient Markets Rational Expectation (EMRE) models seem unable to explain in a satisfactory manner major stylized facts on exchange rate fluctuations, such as the non-normality of returns and their volatility clustering, their apparent disconnection with macroeconomic fundamentals, as well as the occurrence of herding behavior and currency runs.

On the contrary, models based on "bounded rationality", that is, models which feature economic agents with heterogenous beliefs and behavioral attitudes or trading schemes, seem much more successful in this task, see e.g. Frankel and Froot (1987), Allen and Taylor (1992), Cheung and Chinn (2001), De Grauwe and Grimaldi (2005a, 2006b) and Manzan and Westerhoff (2007). Indeed, the inclusion of such agent or beliefs heterogeneity, as well as of behavioral rules and therefore of a somewhat "boundedly rational" behavior by the economic agents, has proven quite valuable in providing insights and explanations concerning some of the "puzzles" which arise when "rationality" is assumed (see De Grauwe and Grimaldi, 2006a, ch. 1 for an extensive discussion of the advantages of the bounded rationality approach with heterogenous agents over the rational-expectations approach in the explanation of empirical financial market data). The analysis of this second type of models, however, has been often constrained to the foreign exchange (FX) markets (by assuming a fundamental nominal exchange rate determined by an exogenous stochastic process), so that the consequences of such non-rational behavior by FX market participants at the macroeconomic level have not been explicitly analyzed in an extensive manner so far.

In this paper an attempt is undertaken to fill in this gap in the academic literature by incorporating in a stylized two-country macroeconomic model an FX market with traders characterized by their use of behavioral rules for the forecast of the future development of the nominal exchange rate between the two model economies. By means of the resulting two-country macroeconomic model, the importance of "behavioral trading" for the stability not only of the FX market, but also for the whole two-country macrodynamic system is investigated. This seems a meaningful task given the recurrent occurrence of currency and financial crises in the last decades and the disastrous consequences for employment and economic growth which such FX market instability episodes have often brought.

The remainder of the paper is organized as following: in Section 2 the theoretical macroeconomic framework for the case of a small open economy is described. Section 3 investigates the role of the FX markets for the dynamic macroeconomic stability of two interacting large open economies by means of numerical simulations. Section 4 draws some concluding remarks from this paper.

2. The model

As it will be discussed below, the macroeconomic framework in the model of this paper is given by a simplified version of the two-country model discussed in Flaschel et al. (2008, Ch. 9). However, while in that theoretical framework a descriptive law of motion for the nominal exchange rate was formulated, in this paper the behavior of the agents in the FX market and the evolution of their beliefs concerning the future evolution of the nominal exchange rate – which in turns determines the actual nominal exchange rate level – is explicitly modeled and analyzed. Thus, given its relative importance in the analysis of this paper, let us start with the discussion of the FX market.

2.1. The international FX market

An international FX market is assumed, where traders – no matter their nationality – can freely trade domestic in foreign currency (and vice versa) and then invest in both domestic and foreign bonds given the perfect capital mobility between the two economies. This international FX market is characterized by "boundedly rational" traders which, due to informational, time and/or cognitive constraints, do not/cannot calculate "mathematically rational" expectations with respect to the future dynamics of the nominal exchange rate (as it is assumed in the NOEM/DSGE framework) but use behavioral forecasting rules for this task instead.

Now assume that the following sequence of events holds: at the beginning of a period t, only variables determined in at the end of period $t-1$ are known by the FX market participants, which build their forecasts for the nominal exchange rate at $t+1$ on the basis of that information. Independently, the monetary authorities in both countries set the nominal interest rates on the basis of the same information set. Then, given the perfect capital mobility between the two countries, the nominal exchange rate level in t is determined via the Uncovered Interest Rate Parity (UIP). Finally, the real variables output and inflation are determined in both countries.

As it is done in the majority of heterogeneous expectations models, see e.g. De Grauwe and Grimaldi (2005a) and Manzan and Westerhoff (2007), the FX traders are assumed to choose between two types of behavioral forecasting rules: one which only takes into account certain macroeconomic fundamentals (the "fundamentalist" rule), and one which is based only on the past developments of the nominal exchange rate (the "chartist" or "technical analysis" rule).

Let s_t represent the logarithm of nominal exchange S_t and E_t^j denote the expectations operator of a particular behavioral forecasting rule j based on the information set available at the beginning of period t. Then, according to the "fundamentalist" forecasting rule, the expected log nominal exchange rate at $t+1$ is given by

$$E_t^f s_{t+1} = s_{t-1} + \beta_s^f (f_{t-1} - s_{t-1}), \tag{1}$$