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# Heterogeneity of agents, transactions costs and the exchange rate

Paul De Grauwe<sup>a,\*</sup>, Marianna Grimaldi<sup>b</sup>

<sup>a</sup>*Department of Economics, University of Leuven, Naamsestraat 69, Leuven 3000, Belgium*

<sup>b</sup>*Sveriges Riksbank, SE 103 37 Stockholm, Sweden*

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## Abstract

We develop a model of the exchange rate that has two features. First, there are non-linearities that arise from the existence of transaction costs in goods markets. Second, the model assumes heterogeneous agents who use simple forecasting rules, the ‘fitness’ of which is then controlled ex post by checking their profitability, and by switching to the more profitable rules. This model is capable of reproducing the empirical puzzles observed in exchange markets (disconnect puzzle, excess volatility, fat tails, volatility clustering). We analyse some policy implications of this type of modelling of the exchange rate.

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## 1. Introduction

Traditional exchange rate modelling has been based on the efficient market rational expectations paradigm. It is increasingly evident, however, that this model is rejected by the data. There is a whole list of empirical puzzles that the traditional

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\*Corresponding author. Tel.: +32-16 326 794; fax: +32-16 326 796.

E-mail address: [paul.degrauwe@econ.kuleuven.ac.be](mailto:paul.degrauwe@econ.kuleuven.ac.be) (P. De Grauwe).

model fails to explain. The first and foremost empirical puzzle has been called the ‘disconnect’ puzzle, i.e. the exchange rate appears to be disconnected from its underlying fundamentals most of the time. Goodhart (1989), Goodhart and Figlioli (1991) and more recently Faust et al. (2003) found that most of the changes in the exchange rates occur when there is no observable news in the fundamental economic variables. This finding contradicts the efficient market rational expectations models, which imply that the exchange rate can only move when there is news in the fundamentals.

The exchange rate disconnect puzzle was also implicit in the celebrated Meese and Rogoff studies of the early 1980s (Meese and Rogoff, 1983) documenting that there is no stable relationship between exchange rate movements and the *news* in the fundamental variables.

Other empirical anomalies have been uncovered over the years. One anomaly relates to the existence of excess volatility (Baxter and Stockman, 1989; Flood and Rose, 1995). Other puzzles are that the distribution of the exchange rate returns exhibits fat tails and volatility clustering (see de Vries, 2001; Lux, 1998; Lux and Marchesi, 2000). These empirical anomalies have also been observed in other financial markets (see e.g. Hommes, 2001). This evidence is difficult to rationalise in existing exchange rate models, since there is little evidence of fat tails and volatility clustering in the fundamental variables that drive the exchange rate in these models.

There is a need for other modelling approaches of the exchange rate. Our modelling approach combines two insights. The first one focuses on the presence of non-linearities that arise from the existence of transaction costs in goods markets. Recent research has stressed the importance of transaction costs in the goods market for our understanding of the dynamics of exchange rate adjustments (Obstfeld and Rogoff, 2000; Engel, 2000; Michael et al., 1997; Kilian and Taylor, 2001; Sarno and Taylor, 2002).

The second insight highlights the role of the heterogeneity of agents, who use incomplete information and who have different beliefs about the future exchange rate.<sup>1</sup> Recently heterogeneity of agents was also introduced in rational expectations models (see e.g. Bacchetta and van Wincoop, 2003). The implication of rational expectations in models with heterogeneous agents is that it creates ‘infinite regress’, i.e. the exchange rate depends on the expectations of other agents’ expectations, which depends on the expectations of the expectations of other agents’ expectations, and so on, ad infinitum. This leads to intractable mathematical problems except under very restrictive simplifying assumptions. Although this approach is intellectually satisfying, it is unclear that it is a good representation of what agents do in the exchange market. It requires these agents to solve a mathematical problem to which mathematicians have as yet been unable to give a general solution. This seems to us as imposing too large an informational burden on individual agents.

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<sup>1</sup>It should be noted that the heterogeneity of agents’ expectations has been recognised as being important to explain the dynamics of asset prices, including the exchange rate (see De Long et al., 1990; Frankel and Froot, 1986; Brock and Hommes, 1998; Lux and Marchesi, 2000; Hommes, 2001).

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