



Equity order flow and exchange rate dynamics

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ABSTRACT

This paper contributes to the literature on international portfolio choice in several ways. First, I generalize the model of Dunne et al. (2010) and derive order flow as the result of correlated belief changes by heterogeneous investors. This strategy delivers testable implications for the daily dynamics of stock flows, equity returns, and exchange rate changes. Second, I empirically confirm these conditions using fifteen years of high-frequency data for US stocks and daily data for twenty US bilateral exchange rates. Third, the model relies on differences in the volatility of country-specific shocks to account for the empirical results. It can explain why the 'portfolio rebalancing motive' is not important for commodity countries, as well as the asymmetric structure of currency and stock returns.

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1. Introduction

It is well-known that standard macroeconomic models of exchange rates have low explanatory power at both short and medium term frequencies (see for example Frankel and Rose, 1995; Meese and Rogoff, 1983). One possible explanation for the notorious poor performance of traditional theory is the OTC nature of currency trades. Therefore recent research has favored micro-founded models, showing that one important element for understanding currency movements is order flow (i.e. the difference between buyer-initiated and seller-initiated trades). In their seminal work, Evans and Lyons (2002a, 2002b, 2005) use currency order flow and are able to explain about 60% of daily mark/dollar exchange rate changes between May and August 1996.¹ Building on these results, a growing literature has focused on portfolio choice models as a new approach to study the interconnections between currencies and international financial markets. Leading contributions in this area are Dunne et al. (2010), Hau and Rey (2004, 2006), and Pavlova and Rigobon (2007).²

In this paper, I contribute to the literature on international portfolio choice in several ways. First I derive order flow as the result of correlated belief changes by heterogeneous investors, and then obtain testable implications for the daily dynamics of stock flows, equity returns, and exchange rate changes. I empirically confirm these implications using high-frequency data for US stocks and daily data for US bilateral exchange rates. The model uses volatility of country-specific shocks to explain the empirical

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¹ See also Lyons (2001). These early results have been corroborated by new studies using larger datasets. For example Berger et al. (2006) use a five-year sample (1999–2004) of order flow and exchange rate data for the euro/dollar and dollar/yen currency pairs, at the one-minute frequency from EBS (the electronic broking system).

² For other important references on the relationship between exchange rates and the stock market, see for example Albuquerque et al. (2007, 2008) or Korajczyk and Viallet (1992).

behavior of currencies and stocks. It can also account for why the ‘portfolio rebalancing motive’ of [Hau and Rey \(2006\)](#) is not important for commodity countries, confirming previous empirical results in the literature ([Chaban, 2009](#); [Chanthapun, 2010](#)).

In particular I modify the model of [Dunne et al. \(2010\)](#) to allow for correlated belief changes, by assuming that investors include a country-specific component in their revisions about the performance of international equity markets. The volatility of these shocks shapes the correlation structure for the beliefs. The heterogeneous agents will then review their valuation of stocks and place market orders according to their assessment of country volatility. Moreover I assume that competitive market makers are not able to price discriminate between investors. Given the total order flows in each market, they take into account the distributional structure of belief changes to set the market price. This framework allows me to rewrite both home stock order flow and returns as a function of the beliefs, and then derive the model-implied correlations between these variables.

Empirically there is a clear pattern for the dynamics of currencies and stocks. My dataset spans the period from January 1993 to May 2008, covering fifteen years of high-frequency data for the US stock market and daily data for twenty US bilateral exchange rates. I find a highly significant correlation between US stock order flow and exchange rate changes. This correlation is stronger at higher frequencies and during more volatile periods, and the result is robust across industries and time. Most countries exhibit a positive correlation between home order flow and currency returns (so an increase in order flow is associated with an appreciation of the US dollar) but for the group of ‘commodity countries’ (Australia, Canada, New Zealand and South Africa) the correlation is negative. Furthermore my results also confirm previous empirical findings regarding the asymmetric structure of equity and exchange rate returns – i.e. the correlation of the USD return with the US equity market index has the same sign as the correlation of the same USD return with other foreign equity markets.

[Dunne et al. \(2010\)](#) rely on differences in risk aversion to explain the later asymmetry. Unlike their paper, I use volatility of country-specific shocks to account for the joint empirical behavior of currencies and stocks. The intuition is as follows. The relative country volatility determines the correlation structure of the belief changes between different types of investors. For example, when home volatility is relatively higher compared to foreign volatility, a positive revaluation of home stock performance by the international investor is strongly correlated with an also positive revision by the home fund. The increase in total market orders is accompanied by an increase in the home currency demand by the international investor, which translates to a positive correlation between order flow and currency returns.

This positive correlation is consistent with the ‘portfolio rebalancing motive’ of [Hau and Rey \(2006\)](#). As mentioned above, this conjecture is empirically verified for most cases but not for commodity countries. To the best of my knowledge, my paper is the first to deliver these cross-sectional results as model implications and to relate them with country volatility. First I find that the ‘portfolio rebalancing motive’ is less important when foreign volatility is relatively higher, justifying the weak role of international stock flows in the case of commodity countries. Second the model accounts for the asymmetry between equity and currency returns, and this asymmetry is still present for commodity countries (so when the USD appreciates relatively to these currencies, both the US and the foreign commodity-country stock markets tend to underperform). Finally, I relate the macro volatility in commodity countries to the higher variance of their terms of trade (for a discussion on this link, see [Andrews and Rees, 2009](#)).

The rest of the paper is organized as follows. [Section 2](#) introduces the setup of the two-country portfolio choice model, develops the equilibrium conditions, and discusses the main implications in terms of the model dynamics for stocks and currencies. [Section 3](#) describes the data. [Section 4](#) presents the main empirical findings and performs several robustness checks. [Section 5](#) discusses the results, relates the observed cross-sectional patterns with the underlying country volatilities, and elaborates on the role of the portfolio rebalancing channel. [Section 6](#) concludes.

2. The model

2.1. Basic setup

I generalize the model of [Dunne et al. \(2010\)](#) to allow for simultaneous (and correlated) belief changes about the liquidation value of equity. This correlation structure is based on the existence of country-specific shocks, and it will be fundamental to explain the dynamics of stock order flow and currency returns. As in their model, I consider that there are two countries (home and foreign) and different types of agents.

The first type is investment funds and there are four of them: a home country fund (h), which invests in the home equity market and the home bond; a foreign country fund (f), which invests in the foreign equity market and the foreign bond; an international equity fund (e), which invests in both home and foreign equities; finally an international bond fund (b), which invests in both home and foreign bonds. There are also market makers, who provide liquidity. They are assumed to be competitive and they set the price conditional on the observed total order sizes.

The investment funds may review their beliefs about the liquidation value of equity.³ These belief changes are denoted by μ . Following [Dunne et al. \(2010\)](#), I use superscripts to denote home/foreign country and subscripts to denote the fund type. Therefore, the belief changes of the home fund about home stocks are given by μ_h^H ; the belief changes of the foreign fund about foreign stocks are μ_f^F ; and the belief changes of the international equity fund about home (foreign) stocks are μ_e^H (μ_e^F). It is easy to show that only the difference ($\mu_e^H - \mu_e^F$) will be relevant for the equilibrium.

Moreover I assume that the belief changes μ have two stochastic components, θ and ε . The first component θ is a country-specific shock, where $\theta = [\theta^H \quad \theta^F]'$ is normally distributed with zero means and variances given by σ_H^2 and σ_F^2 (with θ^H and θ^F

³ Since the international bond fund does not invest in stocks, it is the only investor that does not experience any belief change.

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