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## Equity hedging and exchange rates at the London 4 p.m. fix<sup>☆</sup>



Michael Melvin<sup>\*</sup>, John Prins

BlackRock, 400 Howard St., San Francisco, CA, USA

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### ABSTRACT

We test the hypothesis that hedging by international equity portfolio managers affects exchange rates—the “hedging channel of exchange rate adjustment”. A key institutional feature of the foreign exchange market, the “London 4 p.m. fix”, is used to identify times when hedging trades concentrate. The direction of hedging trades is identified by past equity returns. The findings show that equity market appreciation over the month can be used to predict currency depreciation before the end-of-month fix, providing evidence that hedging activity plays a role in exchange rate determination.

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## 1. Introduction

An unstudied institutional feature of the foreign exchange (FX) market gives us the ability to conduct an unusually precise test of the role hedging demand plays in exchange rate determination. This institutional feature is called the “4 p.m. fix” and is the procedure whereby the benchmark price of each currency on that day is determined. This benchmark exchange rate is primarily used to value international portfolios, and international fund managers want to trade at this benchmark price to ensure that they track the relevant benchmark with minimal tracking error. Its significance for our

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<sup>\*</sup> Corresponding author.

E-mail addresses: [michael.melvin@blackrock.com](mailto:michael.melvin@blackrock.com) (M. Melvin), [john.prins@blackrock.com](mailto:john.prins@blackrock.com) (J. Prins).

purposes is that most international fund managers hedge the foreign exchange exposure of their international equity portfolios at this point in the day. Moreover, they usually do not adjust their hedges every day, but only on the last day of the month. Thus, the fact that a whole month's worth of hedging is concentrated at such a precise point in time on one day gives us the opportunity to study its effect on exchange rates in a way that would be impossible in markets as liquid as FX if such trades were spread out over the course of every business day.

There are no public data on the actual hedging trades of fund managers. However, a simple and easily accessible proxy for such trades is the return to a manager's foreign equity holdings since the last time hedges were adjusted. The amount by which hedges are adjusted will typically be calculated mechanically by the manager based on this return. Since hedges are most typically adjusted once per month at the end of the month, we can use equity returns up until the second to last day of the month to infer by how much the hedge needs to be adjusted. As for which equity returns to use, we choose the country index as a reasonable proxy for the aggregate equity holdings of managers in that country.

Thus we have the data necessary to test our main hypothesis that hedging trades generated by outperformance of a country's equity market over the course of a month, relative to other markets, will lead to *selling* of that country's currency leading up to the last fix of the month. The relationship between equity and currency markets is negative because if the value of a manager's holding of a country's equity increases in value, an additional amount of FX will need to be sold to keep it fully hedged. We test this relationship for the 2004–2013 period for the eight most liquid currencies, and find that it is statistically significant with the expected sign. This evidence indicates that hedging demand plays a role in exchange rate determination, and that the supply curve for FX is upward-sloping, at least at the short time horizons we study.

The most closely related study in the literature is probably that of [Hau and Rey \(2006\)](#), but our analysis differs from theirs in that we focus on FX demand, which arises from *hedging*, and they focus on FX demand, which arises from *rebalancing*. They develop a two-country equilibrium model in which risky asset prices in the home and foreign country are jointly determined with the exchange rate. Foreign investors demand currency when they repatriate dividends and rebalance their portfolios to reduce exposure to exchange rate risk, and their demand is met by risk-averse speculators. In practice, however, while international investors have some exposure to exchange rate risk, they also hedge a large fraction of this exposure. In [Appendix A](#), we sketch a modification to the Hau and Rey model in which hedging replaces rebalancing entirely, and show that their main result—that local equity market outperformance is associated with FX selling pressure—still holds. We therefore argue that hedging and rebalancing manifest themselves somewhat interchangeably and that the distinction, from an economic point of view, is probably not first-order. In our study, we focus solely on hedging. We emphasize that the contribution of this paper is not to comment upon or extend Hau and Rey, but to provide an empirical analysis of the role of equity hedging in exchange rate determination.

A few authors have used [Hau and Rey \(2006\)](#) to motivate an analysis of the empirical relationship between equity prices and exchange rates. [Chaban \(2009\)](#) finds that the posited negative relationship does not hold for commodity currencies, those issued by Australia, Canada, and New Zealand. [Hau and Rey \(2008\)](#) find evidence of rebalancing at the fund level using a large dataset on individual equity funds domiciled in four different currency areas. [Rizeanu and Zhang \(2013\)](#) study the relationship for 23 emerging market currencies and find that none of the countries shows evidence of the negative correlation between equity and currency returns expected with a portfolio rebalancing story. Our analysis of the link between equity and exchange rate returns takes a different approach. By focusing on a subperiod of time that should be rich in hedging trades, we are able to study their impact with a higher degree of statistical precision. And while these researchers look at the contemporaneous relationship between equity and currency returns, which is potentially subject to endogeneity,<sup>1</sup> we look at the relationship between today's currency returns and equity returns prior to today, and hence can establish the direction of causality from equity market moves to exchange rate adjustments.

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<sup>1</sup> For example, good news about a country's growth could simultaneously induce upward revisions to earnings expectations (causing equities to appreciate) and upward revisions to the expected path of interest rates (causing the currency to appreciate). Thus this third latent variable, growth expectations, could induce a positive correlation between a country's equities and its currency that would obscure the negative correlation induced by hedging.

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