Cracks in the crystal ball : What happens to firms' foreign exchange rate exposure when forecasters don't agree about the future

Aline Muller* Julien Poncelet* Remco C.J. Zwinkels† Willem F.C. Verschoor†

This version: September 2013

Abstract

The central issue of this paper is whether stock prices are exposed to total exchange rate movements as traditionally measured - or to revisions in expected future exchange rate movements and unanticipated currency shocks, and by how much of each. Based on a sample of 1675 U.S. firms operating in Europe and in Japan our results reveal that disaggregating total exchange rate changes in expected and unexpected exchange rate movements leads to a more accurate and more intuitive measurement of firms' exchange rate exposure. In addition, theory expects that investors lend more credibility to forecasts communicated by expert panels when they display a low dispersion, hinting to agreement among experts, than when they display a higher dispersion. When uncertainty is higher, and when the informational content of these forecasts may be considered as less meaningful, investors should be reluctant to incorporate experts' anticipations in stock market values. Based on a our time-varying estimates of the probability of agreement among experts, we find concluding empirical evidence in favour of this hypothesis.

1 Introduction

Foreign exchange rate volatility and its impact on firms' operations is a matter of crucial interest to managers, investors and public authorities (The Economist, 2012). Despite this interest the debate regarding the way firms' foreign exchange risk exposure should be measured continues to be an issue in the world of business and international finance. Attempts to empirically assess the impact of currency movements on firm value have met with mixed results

*HEC Management School, University of Lige, Belgium
†Erasmus School of Economics, Erasmus University Rotterdam, The Netherlands

(Jorion, 1990; He and Ng, 1998; Griffin and Stulz, 2001) even though it is clear that from a theoretical perspective exchange rate affect both firms' future cash flows and their cost of capital. To solve this puzzle, recent studies devote a lot of attention both to firm-specific (Bartram et al., 2010; Chang et al., 2013) and market-wide (Chaieb and Mazzotta, 2013) characteristics ; another strand of the literature puts more emphasis on the way firms' foreign exchange risk exposure are measured.[1] Among these papers the study of Dominguez and Tesar (2001) is one of the first to investigate the impact of the specification of the exchange rate factor used when measuring companies' foreign currency exposures. They demonstrate that since trade-weights do not correspond with individual firms' or industries' trade patterns, the use of trade-weighted exchange rate indices leads to an underestimation of the impact of exchange rate shocks.[2] Another set of questions regarding the exchange rate factor deals with the fact that empirically observed exchange rate variations may have been partly anticipated. While the new specification in the study of Amihud (1994) of the exchange rate factor only marginally increases the significance of firms' exchange rate exposures, Gao (2000) and Jongen et al. (2012) have shown that unexpected currency movements have significantly stronger effects on firm value than the original exchange variation series. Surprisingly however the literature hasn't explored yet when and how anticipations about future exchange rate movements influence firm value and to which extent this impact could complement our understanding of firms' exposure to unanticipated currency variations.

Consensus Economics exchange rate forecasts belong to highly recognized economic forecast data that are widely disseminated among market participants and highly debated in the financial press. It seems hence natural to expect that a significant proportion of multinationals' stock price movements occur because market participants revise their expectations about future exchange rate movements. In contrast to other research fields (Schmeling and Schrimpf, 2011) the foreign exchange risk exposure literature has not until now investigated in how far the disclosure of future exchange rate movement expectations may influence multinationals' firm value. To fill this gap we explore in this paper to which extent stock prices are exposed to total exchange rate movements as traditionally measured and compare this exposure to the valuation impact of revisions in exchange rate forecasts and unanticipated currency shocks. Our main goal is to explain when total exchange rate movements may be considered as poorly performing risk factors to measure firms' currency exposure - in other words when the decomposition of these exchange risk factors in expected and unexpected currency movements allows to more reliably measure the forces that are really driving multinationals' stock returns. Moreover to assess accurately the way investors incorporate publicly disseminated exchange rate forecasts in the stock price valuation process, we analyze the impact of these forecasts and the corresponding unanticipated currency shocks on multinationals' stock price movements both when market participants agree about these forecasts and when

[1] For a detailed discussion of this literature please refer to Muller and Verschoor (2006b)

[2] Subsequent empirical evidence confirms this finding (Ihrig, 2001; Fraser and Pantzalis, 2004; Muller and Verschoor, 2006a)

their expectations are widely dispersed.

On a sample of a large sample of US multinationals that are active in Europe and in Japan this paper makes two important contributions: (1) We disaggregate total exchange rate movements in unanticipated and expected exchange rate movements and investigate in how far unanticipated exchange rate shocks but as well revisions in exchange rate forecasts influence the firm value of US multinationals. According to our empirical findings, this decomposition of the exchange rate factor clearly reveals that investors are very sensitive to exchange rate forecast revisions (Jongen et al., 2012) and confirms previous studies that they react also to new exchange rate movement signals to the extent to which they differ from what had been expected in the past. Our results suggest furthermore that the impact of this disaggregated exchange rate factor is unequivocally stronger than the impact of the seminal exchange rate factor previously used in the literature (Jorion, 1990). (2) We hypothesize that the degree of heterogeneity among exchange rate forecasts (which may be considered as a good proxy for the level of market agreement) has a direct negative influence on the proportion of stock movements that are significantly affected by revisions in exchange rate forecasts as well as by unanticipated currency shocks. In line with our expectation we observe that in stronger disagreement periods the impact of expected and unexpected exchange rate movements is lower. In contrast, when market participants agree about their forecasts, investors lend more credibility to these forecasts and stock prices are more significantly affected by exchange rate forecast revisions and unexpected shocks than by total exchange rate movements.

A preliminary section of this paper details the motivation of the disaggregation of the exchange rate factor. In the third section, we describe our data sample and the research design. Empirical findings are discussed in section four and we conclude in section five.

2 Motivation

In their seminal article, Adler and Dumas (1984) proposed to interpret foreign exchange risk exposure as the sensitivity of the domestic-currency value of any physical or financial asset to unanticipated exchange rate movements. In their work the exposure of an asset was estimated by regressing its domestic-currency market return on the contemporaneous unanticipated exchange rate change. As other variables might covary with exchange rate movements and stock returns, omitting them might lead to an overestimation of the proportion of variance attributable to foreign currency movements. Jorion (1990) therefore recommends an augmented market model, described in Eq. (1), which allows measuring the asset-specific exchange rate sensitivity in excess of the total market's reaction to exchange rate movements.

$$R_{i,t-k,t} = \alpha_i + \beta_i R_{m,t-k,t} + \gamma_i X_{t-k,t} + \varepsilon_{i,t-k,t} \tag{1}$$

where $R_{i,t-k,t}$ designates the total return of asset i in period $t-k$ to t, $R_{m,t-k,t}$ the overall stock market return in period $t-k$ to t, β_i asset i's return sensitivity to market risk, $X_{t-k,t}$ the exchange rate factor in period t, γ_i asset i's exposure to the exchange rate independent of the effect these currency movements have on the overall market, and $\varepsilon_{i,t-k,t}$ denotes the white noise error term.

It should be emphasized that, according to Adler and Dumas (1984)'s seminal definition, foreign exchange risk exposure relates to 'unanticipated' changes in exchange rates. The rationalization for this specification is that current market prices are assumed to have already incorporated currency fluctuations that were anticipated. Consequently it is only to the extent that exchange rates move by more or less than had been expected that they are likely to generate losses and gains in economic value. Notice that by relating firm value to innovations in exchange rate movements rather than to total exchange rate movements, we allow investors to get accustomed to the news contained in exchange rate forecasts and hence to incorporate these forecasts in stock returns. According to this approach, firm values are determined in efficient markets where asset prices are adjusted on an instantaneous basis to whatever the market regards as the currently anticipated exchange rate. Thus in Eq.(1) stock returns should not fluctuate in response to total exchange rate movements but in response to 'news' about exchange rate movements.

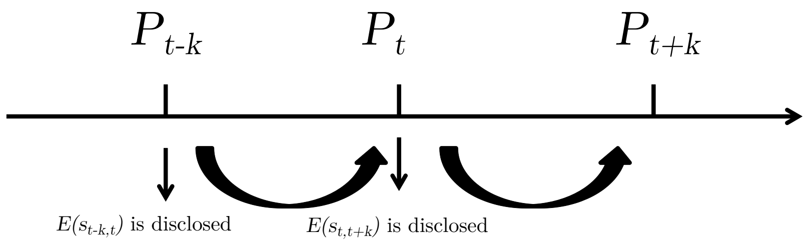
While early foreign exchange risk exposure studies hypothesize that exchange rates are unpredictable and that investors consider them as truly unpredictable (Jorion, 1990), various approaches have previously been used in the literature to obtain an estimate of unanticipated exchange rate movements. Amihud (1994) recommends the use of an AR(1) model to estimate unanticipated currency movements. After having regressed exchange rate variations on their lagged values, he estimates Eq. (1) with $X_{t-k,t}$ being defined as the residuals of the first regression – considering, hence, the residuals of the first regression as unanticipated exchange rate changes. As this procedure only marginally increases the significance of the results, some authors have constructed the exchange rate factor to be used in Eq. (1) to be orthogonal to fundamental variables, see for instance Gao (2000). More recently, Jongen et al. (2012) compared two other methods to obtain unanticipated movements, on the one hand using forwards, and on the other hand using survey information from experts' forecasts. They conclude that the latter proves more dependable to this end.

While previous literature has thus addressed the concept of using unanticipated movements in this framework, the implicit assumption they make is that all the information pertaining to expected movements is already incorporated in the equity valuation, or in other words that it is already reflected in the observed price – without specifically putting that hypothesis to the test, unlike what has been done in other research areas (see for instance Schmeling and Schrimpf, 2011).

In this study our objective is to investigate explicitly the exact manner by which the information contained in foreign exchange forecasts is incorporated in the stock valuation. Figure 2 illustrates the framework we will use throughout this paper.

At time t, all the information related to the forecasts formulated at time $t-k$ have already been fully reflected in the price P_t. Hence, what really

Figure 1: Illustration of the price forming process



should influence the price at the point in time is the unanticipated exchange rate movement $(X_{t-k,t} - X^e_{t-k,t})$, i.e.. the difference between the return that was forecast at time $t-k$ for time t, designated by $X^e_{t-k,t}$, and the actual return at time t. This is the reasoning assumed by the literature that has focused on unanticipated movements.

However, we also propose to investigate to what extent the forecast communicated at time t, therefore pertaining to time $t+k$, contains information that investors have assimilated and incorporated in the stock's price at time t. This information could take the form of changing market sentiment regarding the future evolution of the exchange rate (of which forecasts should, on the average, be a reflection) or in other words exchange rate expectation revisions, and also the fact that the nature of the forecast is probably somewhat leaked before the official date.

We extend hence the traditional regression approach of Jorion (1990) and estimate the impact on stock prices of revisions in expected exchange rate movements as well as unanticipated currency shocks:

$$R_{i,t-k,t} = \alpha_i + \beta_i R_{m,t-k,t} + \gamma_{i1}(X_{t-k,t} - X^e_{t-k,t}) + \gamma_{i2} X^e_{t,t+k} + \varepsilon_{i,t-k,t} \qquad (2)$$

where γ_{i1} designates the sensitivity to unanticipated movements in the exchange rates, and γ_{i2} the exposure to the next period forecast.

Should the exposure to the next period forecast prove significant, an argument could be made that the magnitude of that exposure is dependent on the perceived relevance of the provided signal. Indeed, in the situation of general agreement among forecasters concerning the evolution of the exchange rates, the data from the corresponding survey would probably be perceived as more meaningful and trustworthy by investors. Conversely, in cases of disagreement, the signal would be perceived as less clear by market participants, and consequently the exposure to the next period forecast could be expected to be lower.[3]

[3]Another possible interpretation is that different investors trust different forecasters, and in situations of disagreement, thus elaborate different personal expectations regarding the future movements of the exchange rates.

By constructing a time-varying estimate of the probability that the experts are in a state of agreement, the following model could be used:

$$
\begin{aligned}
R_{i,t-k,t} = \alpha_i + \beta_i R_{m,t-k,t} \\
&+ Prob(S_t = S_1)\gamma_{i1}(X_{t-k,t} - X^e_{t-k,t}) + Prob(S_t = S_1)\gamma_{i2}X^e_{t,t+k} \\
&+ Prob(S_t = S_2)\gamma_{i3}(X_{t-k,t} - X^e_{t-k,t}) + Prob(S_t = S_2)\gamma_{i4}X^e_{t,t+k} \\
&+ \varepsilon_{i,t-k,t} \qquad (3)
\end{aligned}
$$

where S is the discrete, unobserved, state variable which takes value 1 in a state we identify as being a state of agreement, and 2 otherwise, i.e. a state of disagreement.

3 Sample description and research design

3.1 U.S. multinational firms

Our sample is composed of U.S. multinational firms with real operations in Japan and Europe.[4] Due to their real foreign trade and production activities, it can be expected that multinational companies are affected by exchange rate movements. With the help of the Uniworld database of US Multinational Enterprises in Foreign Countries, we have identified 2026 such companies over the period 1999-2011. Of these, we have kept those for which daily stock price information was available from the University of Chicago Center for Research in Security Prices (CRSP) database, for a period of at least 60 months. This process leaves us with a sample of 1675 companies.

Table 1 gives an overview of the selected multinationals' geographical dispersion.

Table 1: Descriptive Statistics

	#	Europe	Japan
Europe	1148	-	51.05%
Japan	639	91.71%	-
Total Sample	1675	68.54%	38.15%

3.2 Exchange risk factors

Every second Monday of each calendar month *Consensus Economics of London* publishes results from a survey among up to 150 leading professional market

[4]Our focus on this sub-sample of US multinationals is motivated by the fact that Japan and Europe belong to the most important import and export partners of US multinationals, and simultaneously the USD/EUR and the USD/JPY to the most widely and frequently reported and debated exchange rates in financial media.

participants and forecasting agencies for their subjective expectations of a large number of exchange rates. Examples of panel companies include Morgan Stanley, Oxford Economic Forecasting, Deutsche Bank Research and BNP Paribas. The forecasts are point forecasts against the U.S. dollar and are available for various forecast horizons ranging from 1 month to 24 months ahead. We specifically use the 3 and 12 months ahead expectations.

Although the survey participants have a few days time to return their expectations, we know that the vast majority send their forecasts by e-mail on the Friday before the publication day (usually second Monday of the month). We consider this Friday to be the day on which the expectations are formed. On this Friday, we also obtain spot rates data. All spot series are obtained through Datastream and have their origin either in Reuters or Barclays Bank International.

We proceed by defining the natural logarithm of the current spot rate on a particular currency j at time t as $s_{j,t}$ and the natural logarithm of the k-period ahead consensus expectation formed at time t for time $t+k$ as $s^e_{j,t,t+k}$ and make the assumption the expectation corresponds to the unobserved 'true' market observation up to a white noise random error, so that $s^e_{j,t,t+k} = E_t[s_{j,t+k}] + \varepsilon_{j,t+k}$. The k-period realized change in the exchange rate can hence be decomposed into an 'anticipated' (or expected) component and an 'unanticipated' (or noise) component:

$$s_{j,t+k} - s_{j,t} = \underbrace{(s^e_{j,t,t+k} - s_{j,t})}_{\text{anticipated}} + \underbrace{(s_{j,t+k} - s^e_{j,t,t+k})}_{\text{unanticipated}} \tag{4}$$

which corresponds to

$$X_{t-k,t} = X^e_{t-k,t} + (X_{t-k,t} - X^e_{t-k,t}) \tag{5}$$

in our previous notation.

3.3 Probability of agreement among experts

First let us define a measure based on the volatility of the forecasts scaled with respect to the average at time t, as shown in Eq. (6).

$$\nu_{t,t+k} = \sigma_{t,t+k}/\mu_{t,t+k} \tag{6}$$

An overview of the constructed series is presented in Figure 2, and summary statistics are available in Table 2.

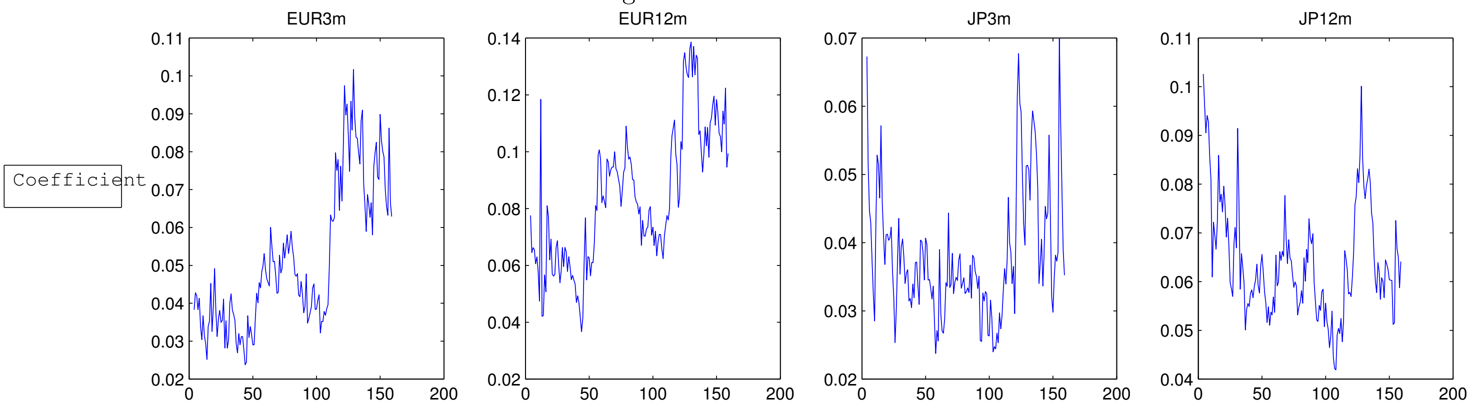
To construct a time-varying estimate of the probability of agreement among the forecasters, we use a simple form of regime change model based on a two-state Markov chain, as described in Hamilton (1994).

Our model then takes the following form:

$$\nu_{t,t+k} = \mu_1 + \varepsilon_t \quad \text{for State 1} \tag{7}$$

$$\nu_{t,t+k} = \mu_2 + \varepsilon_t \quad \text{for State 2} \tag{8}$$

Figure 2: Coefficients of variation



where:

$$\varepsilon_t \sim (0, \sigma_1^2) \quad \text{for State 1} \tag{9}$$
$$\varepsilon_t \sim (0, \sigma_2^2) \quad \text{for State 2} \tag{10}$$

The model is estimated using Maximum Likelihood, and the maximization of the log-likelihood function is carried out with the help of the Expectation Maximization (EM) Algorithm. We use MATLAB for all computations, and more specifically in this case, a modified version of the package realized by Perlin (2012).

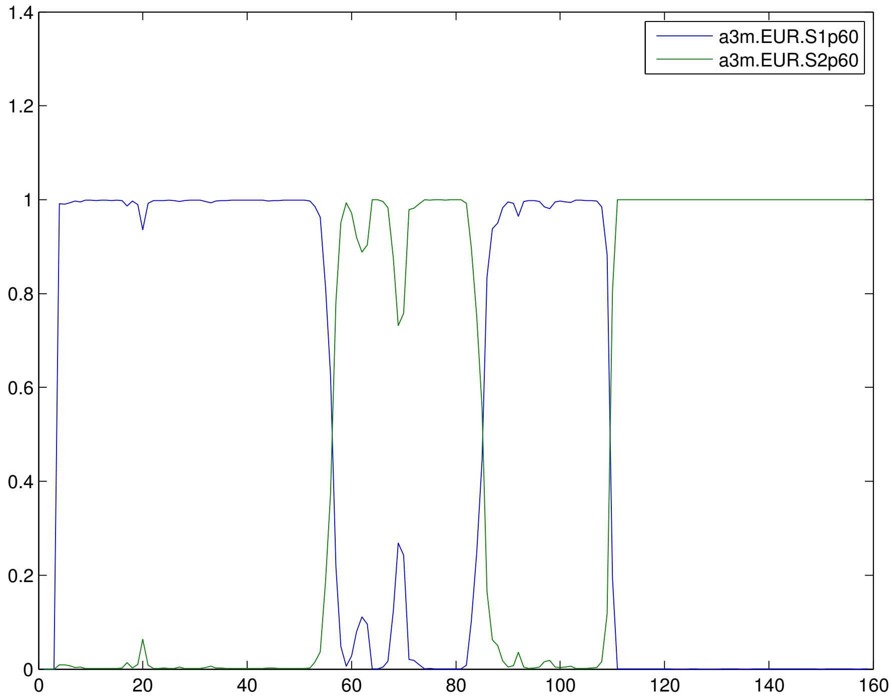
As an example, Figure 3 shows the coefficient of variation in the case of the 3-month horizon for Europe. By visually comparing this graph with Figure 2, we can identify the first state as being a state of agreement, i.e. with comparatively lower values for the coefficient of variation (which measures the dispersion in forecasts). Results show this is followed by a period of roughly 20 months of probable disagreement, then by a slightly shorter period of probable agreement, with the series ending with a highly probable disagreement. This interpretation is coherent with the results we could expect by observing Figure 2.

4 Empirical Findings

Table 3 shows the results obtained from two models. First of all, we use a simple specification using the Value Weighted Market Returns (obtained from CRSP, which we will refer to as "Market" from now on) and the total return on the previous period. We indicate the proportion of firms in the corresponding sample significantly affected, i.e., the number of firms for which the regression of their returns on the corresponding factors displayed a significant coefficient (at a level of significance of 0.05).

[TABLE 3 ABOUT HERE]

Figure 3: Example of regime switching for the 3-month EUR coefficient of variation.



The values we obtain, ranging from 26.5% to 66.7%, for the exposure to the total market returns, contrast with previous results such as Jorion (1990), who finds that only 5% of 287 U.S. multinational corporations exhibit significant exchange risk exposure, and Choi and Prasad (1995)) who find that 15% of 409 multinationals are significantly exposed. Bartram and Bodnar (2012), who study all non-financial firms and thus do not restrict their analysis to multinational firms, obtain a fraction of significant coefficients of 11.4% across 37 countries. One possible explanation for our higher numbers is that unlike most other studies, we do not rely on a basket of currencies for our foreign exchange factors. Our database allows us to determine which multinational has foreign operations in which country. This permits us to on the one hand rely on specific currencies, and on the other hand restrict our analysis to firms which are more likely to be affected by movements in those currencies.

It can also be noticed that the sign of the exposure is more often positive than negative, with positive exposures ranging from 57.2% to 61.6%. Considering the fact that the factors are constructed in such a way that an increase in the factor means that the domestic currency appreciates, this means that on the average, U.S. multinationals are exposed similarly to what theory would predict importers are.

Table 2: Summary statistics

		Mean	Median	Min	Max	Std. Dev.	Skew.	Kurt.	J-B	Prob	Obs
3-Month forecast horizon											
Total Return	Europe	-0.37%	-0.79%	-10.25%	16.38%	5.58%	0.49	2.84	6.18	0.0413	153
	Japan	-0.79%	-0.33%	-14.54%	11.47%	4.87%	-0.07	2.91	0.19	0.5000	153
Forecasts	Europe	-0.74%	-0.73%	-6.98%	5.74%	2.32%	-0.12	3.08	0.44	0.5000	156
	Japan	-0.07%	-0.27%	-5.68%	6.48%	2.64%	0.00	2.44	2.02	0.3016	156
Unexpected	Europe	0.44%	-0.26%	-14.52%	17.50%	6.33%	0.33	2.49	4.45	0.0783	153
	Japan	-0.73%	-0.43%	-16.08%	12.40%	5.74%	-0.12	2.62	1.28	0.4712	153
Coefficient forecasts	Europe	5.16%	4.56%	2.38%	10.17%	1.91%	0.73	2.45	15.73	0.0054	156
	Japan	3.82%	3.59%	2.38%	6.99%	0.94%	1.13	4.19	42.64	0.0010	156
12-month forecast horizon											
Total Return	Europe	-2.16%	-3.71%	-23.11%	20.05%	10.83%	0.19	2.06	6.15	0.0417	144
	Japan	-2.93%	-4.45%	-19.32%	16.22%	8.59%	0.38	2.27	6.67	0.0356	144
Forecasts	Europe	-2.13%	-1.82%	-16.32%	9.06%	5.02%	-0.41	3.10	4.33	0.0830	156
	Japan	-0.25%	-0.08%	-10.59%	9.92%	5.42%	-0.02	2.19	4.27	0.0850	156
Unexpected	Europe	0.22%	-1.93%	-19.97%	28.32%	11.72%	0.38	2.41	5.60	0.0497	144
	Japan	-2.18%	-4.52%	-20.68%	19.12%	11.36%	0.29	1.78	10.90	0.0129	144
Coefficient forecasts	Europe	8.41%	8.08%	3.67%	13.86%	2.41%	0.31	2.33	5.51	0.0517	156
	Japan	6.42%	6.16%	4.19%	10.26%	1.17%	0.94	3.78	26.80	0.0013	156

[TABLE 4 AND 5 ABOUT HERE]

The second regression corresponds to the model presented in Eq (2). We observe that by decomposing into two factors the total exposure, respectively the unanticipated return over the period, and the forecast for the next period, we obtain a larger proportion of firms significantly exposed to at least one foreign exchange factor. Increases from the previous specification vary from 7.8% to 25.9% in the case of the 3-month horizon for the Japan region.

Tables 4 and 5 provide results regarding the separate effect of the two factors we use, i.e. forecasts for the next period and unanticipated movements, respectively. We also propose for each situation to compare a regression that doesn't use information regarding the probability of agreement among experts to one that does.

We observe that in both cases, distinguishing between the two regimes provides a better fit to the return data, as measured by the Adjusted R-squared, although by a small margin. More firms are also found to be affected by the corresponding factor if we discriminate between agreement and disagreement.

In both cases, results also show that the information represented by those factors is much more relevant for explaining firms' returns in agreement regimes than in disagreement regimes, with an average increase of 20.6% for the next period forecast, and 30.4% for the unexpected return. This result supports the intuition that forecasts should be perceived by investors as carrying more information when there is a consensus among experts, than when forecasters can't seem to agree on the future evolution of the exchange rates.

[TABLE 6 ABOUT HERE]

Table 6 shows results for the complete model we presented in Eq. (3). To allow for an easier comparison, we have also reproduced the results from a simple regression using total returns in the first part of the Table.

First of all we see that the complete model is the one best able to explain the data, as the Adjusted R-squared obtained are the largest in this setting, with values ranging from 31.6% for the 3-month horizon in Europe to 49.1% for the 12-month horizon in Japan. The improvement is noticeable on a more standard framework, such as the one presented in the top of table, which corresponds to what a large number of studies use in this type of analysis.

We also see additional support for the observation that investors seem to pay more attention to forecasts when experts are in agreement, with an average of 30.6% more firms being significantly exposed to foreign exchange factors in the agreement regime. As theory and intuition would predict, widely diverging forecasts are considered less reliable by investors, and therefore have less explanatory power in the regression of the returns. This is illustrated for instance by the drop from 59.8% of significantly exposed firms for the 12-month horizon in Japan, to just 8.9% in situations of disagreement. This emphasizes the importance of discriminating between situations in which investors lend more credit to forecasts from situations in which they do less.

5 Concluding Remarks

This paper studies the exposure of U.S. multinationals to exchange rate movements. While recognizing the importance of using unanticipated movements to explain stock returns, we show that using information contained in the next forecasts proves fruitful. Furthermore, we construct a time-varying series which indicates the probability that the panel of forecasters in a situation of agreement that allows us to test whether investors are as sensitive to experts' opinion in periods of disagreement. Three key points emerge consistently from empirical findings:(1) Being able to identify the regions in which each multinational has foreign operations, which allows to measure its exposure to specific currencies rather than a weighted basket, increases the precision and significance of exposure estimates. (2) Models which incorporate next period forecasts together with unanticipated movements lead to statistically stronger exposure estimates than models which just consider the latter. (3) Modulating the exposure of factors constructed with the help of forecast information (both unanticipated movements and forecasts themselves) with respect to the probability of a situation of agreement among the panel of experts leads to a better fit of returns data. Indeed, results show that when cracks appear in forecasters' crystal balls, investors feel less inclined to lend credence to their predictions.

Table 3: The impact of total exchange rate variations *versus* disaggregated variations

The table reports results from two separate regressions. The first is $R_{i,t-k,t} = \alpha_i + \beta_i R_{m,t-k,t} + \gamma_i X_{t-k,t} + \varepsilon_{i,t-k,t}$. The second is $R_{i,t-k,t} = \alpha_i + \beta_i R_{m,t-k,t} + \gamma_{i1}(X_{t-k,t} - X^e_{t-k,t}) + \gamma_{i2} X^e_{t,t+k} + \varepsilon_{i,t-k,t}$ which corresponds to Eq. (2)in the text.

	EUR		JP	
	3m	12m	3m	12m
Constant	24.5%	61.9%	25.7%	63.9%
Market	95.0%	92.8%	97.5%	96.1%
$\boldsymbol{X_{t-k,t}}$	**31.9%**	**60.6%**	**26.5%**	**66.7%**
of which positive	*58.9%*	*59.6%*	*61.6%*	*57.2%*
of which negative	*41.1%*	*40.4%*	*38.4%*	*42.8%*
Adj R-squared	30.5%	40.4%	33.1%	43.8%
Constant	24.2%	61.7%	28.1%	66.1%
Market	95.1%	93.5%	97.6%	96.5%
$X^e_{t,t+k}$	17.2%	45.9%	31.7%	59.7%
of which positive	*36.5%*	*39.8%*	*86.6%*	*65.8%*
of which negative	*63.5%*	*60.2%*	*13.4%*	*34.2%*
$X_{t-k,t} - X^e_{t-k,t}$	28.6%	47.9%	39.9%	70.5%
of which positive	*55.4%*	*53.5%*	*78.0%*	*61.5%*
of which negative	*44.6%*	*46.5%*	*22.0%*	*38.5%*
% of firms with significant FX factor	**39.2%**	**68.4%**	**52.4%**	**78.8%**
of which positive	*49.2%*	*47.8%*	*79.0%*	*61.5%*
of which negative	*50.8%*	*52.2%*	*21.0%*	*38.5%*
Adj R-squared	31.0%	43.5%	34.4%	48.7%

Table 4: How disagreement among forecasters affects the impact of Expected Returns

	EUR		JP	
	3m	12m	3m	12m
Constant	24.1%	60.9%	24.6%	59.7%
Market	96.9%	93.9%	98.0%	96.5%
$X^e_{t,t+k}$	18.7%	57.8%	19.3%	46.3%
Adj R-squared	29.9%	40.4%	32.7%	41.3%
Constant	24.5%	60.9%	23.9%	60.0%
Market	96.8%	94.2%	98.0%	96.5%
$X^e_{t,t+k}$ in agreement regime	18.5%	56.3%	16.5%	46.6%
$X^e_{t,t+k}$ in disagreement regime	6.4%	38.2%	5.5%	5.7%
% of firms with significant expected FX factor	**23.7%**	**73.9%**	**20.7%**	**49.6%**
Adj R-squared	30.0%	42.2%	32.7%	41.4%

Table 5: How disagreement among forecasters affects the impact of Unexpected Returns

	EUR		JP	
	3m	12m	3m	12m
Constant	27.3%	62.8%	25.4%	63.6%
Market	95.4%	93.4%	97.8%	96.2%
$X_{t-k,t} - X^e_{t-k,t}$	29.4%	58.4%	32.2%	65.5%
Adj R-squared	30.4%	40.5%	33.3%	43.9%
Constant	27.4%	63.5%	25.6%	63.0%
Market	95.7%	93.7%	97.6%	96.4%
$X_{t-k,t} - X^e_{t-k,t}$ in agreement regime	29.0%	56.9%	32.3%	65.0%
$X_{t-k,t} - X^e_{t-k,t}$ in disagreement regime	15.1%	20.9%	16.3%	9.4%
% of firms with significant unexpected FX factor	**39.6%**	**66.5%**	**42.9%**	**69.4%**
Adj R-squared	30.9%	41.3%	33.8%	44.1%

Table 6: Complete model with MS regimes

	EUR		JP	
	3m	12m	3m	12m
Constant	24.5%	61.9%	25.7%	63.9%
Market	95.0%	92.8%	97.5%	96.1%
$\boldsymbol{X_{t-k,t}}$	**31.9%**	**60.6%**	**26.5%**	**66.7%**
of which positive	*58.9%*	*59.6%*	*61.6%*	*57.2%*
of which negative	*41.1%*	*40.4%*	*38.4%*	*42.8%*
Adj R-squared	29.2%	35.1%	32.0%	38.3%
Constant	24.9%	61.5%	27.6%	64.7%
Market	95.6%	93.7%	97.6%	96.4%
$X^e_{t,t+k}$ in agreement regime	16.5%	46.2%	29.7%	59.8%
of which positive	*38.6%*	*42.2%*	*86.2%*	*65.9%*
of which negative	*61.4%*	*57.8%*	*13.8%*	*34.1%*
$X^e_{t,t+k}$ in disagreement regime	6.6%	39.6%	6.0%	8.9%
of which positive	*55.3%*	*33.6%*	*73.7%*	*57.9%*
of which negative	*44.7%*	*66.4%*	*26.3%*	*42.1%*
$X_{t-k,t} - X^e_{t-k,t}$ in agreement regime	28.8%	47.4%	40.2%	70.3%
of which positive	*59.6%*	*51.3%*	*78.5%*	*61.2%*
of which negative	*40.4%*	*48.7%*	*21.5%*	*38.8%*
$X_{t-k,t} - X^e_{t-k,t}$ in disagreement regime	15.4%	21.9%	17.7%	11.1%
of which positive	*15.9%*	*36.0%*	*16.8%*	*54.9%*
of which negative	*84.1%*	*64.0%*	*83.2%*	*45.1%*
% of firms with significant factor in agreement regime	38.7%	67.8%	51.6%	79.0%
of which positive	*51.0%*	*48.4%*	*80.1%*	*61.2%*
of which negative	*49.0%*	*51.6%*	*19.9%*	*38.8%*
% of firms with significant factor in disagreement regime	20.9%	53.2%	22.3%	18.5%
of which positive	*37.4%*	*38.0%*	*40.8%*	*59.7%*
of which negative	*62.6%*	*62.0%*	*59.2%*	*40.3%*
% of firms with significant FX factor	**51.4%**	**85.2%**	**62.2%**	**82.7%**
of which positive	*45.2%*	*44.0%*	*61.4%*	*58.1%*
of which negative	*54.8%*	*56.0%*	*38.6%*	*41.9%*
Adj R-squared	31.6%	46.0%	35.0%	49.1%

References

Adler, M. and Dumas, B. (1984). Exposure to currency risk: Definition and measurement. *Financial Management (1972)*, 13(2):41 – 50.

Amihud, Y. (1994). Exchange rates and the valuation of equity shares. *Exchange rates and corporate performance*, pages 49–59.

Bartram, S. M. and Bodnar, G. M. (2012). Crossing the lines: The conditional relation between exchange rate exposure and stock returns in emerging and developed markets. *Journal of International Money and Finance*, 31(4):766 – 792. ¡ce:title¿Emerging Markets Finance¡/ce:title¿.

Bartram, S. M., Brown, G. W., and Minton, B. A. (2010). Resolving the exposure puzzle: The many facets of exchange rate exposure. *Journal of Financial Economics*, 95(2):148 – 173.

Chaieb, I. and Mazzotta, S. (2013). Unconditional and conditional exchange rate exposure. *Journal of International Money and Finance*, 32(0):781 – 808.

Chang, F.-Y., Hsin, C.-W., and Shiah-Hou, S.-R. (2013). A re-examination of exposure to exchange rate risk: The impact of earnings management and currency derivative usage. *Journal of Banking & Finance*, 37(8):3243 – 3257.

Choi, J. J. and Prasad, A. M. (1995). Exchange risk sensitivity and its determinants: A firm and industry analysis of us multinationals. *Financial Management*, pages 77–88.

Dominguez, K. M. E. and Tesar, L. L. (2001). A reexamination of exchange-rate exposure. *The American Economic Review*, 91(2):pp. 396–399.

Fraser, S. P. and Pantzalis, C. (2004). Foreign exchange rate exposure of us multinational corporations: a firm-specific approach. *Journal of Multinational Financial Management*, 14(3):261–281.

Gao, T. (2000). Exchange rate movements and the profitability of us multinationals. *Journal of international Money and Finance*, 19(1):117–134.

Griffin, J. M. and Stulz, R. M. (2001). International competition and exchange rate shocks: a cross-country industry analysis of stock returns. *Review of Financial Studies*, 14(1):215–241.

Hamilton, J. D. (1994). *Time series analysis*, volume 2. Cambridge Univ Press.

He, J. and Ng, L. K. (1998). The foreign exchange exposure of japanese multinational corporations. *The Journal of Finance*, 53(2):733–753.

Ihrig, J. (2001). Exchange-rate exposure of multinationals: focusing on exchange-rate issues. *FRB International Finance Discussion Paper*, (709).

Jongen, R., Muller, A., and Verschoor, W. (2012). Using survey data to resolve the exchange risk exposure puzzle: Evidence from u.s. multinational firms. *Journal of International Money and Finance*, 31(2):148 – 169.

Jorion, P. (1990). The exchange-rate exposure of u.s. multinationals. *The Journal of Business*, 63(3):pp. 331–345.

Muller, A. and Verschoor, W. (2006a). Asymmetric foreign exchange risk exposure: Evidence from us multinational firms. *Journal of Empirical Finance*, 13(4-5):495–518.

Muller, A. and Verschoor, W. (2006b). Foreign exchange risk exposure: Survey and suggestions. *Journal of Multinational Financial Management*, 16(4):385–410.

Perlin, M. (2012). Ms_regress-the matlab package for markov regime switching models. *Available at SSRN 1714016*.

Schmeling, M. and Schrimpf, A. (2011). Expected inflation, expected stock returns, and money illusion: What can we learn from survey expectations? *European Economic Review*, 55(5):702–719.