CURRENCY RISK IN GLOBAL EQUITY MARKETS: DETERMINANTS, RISK, AND PREDICTABILITY

A Dissertation

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ABSTRACT

This dissertation aims to understand the impact that currency movement—in particular U.S. dollar movement—has in determining the returns to individual global equities. To that end, the dissertation focuses on three main goals. First, is to identify the optimal approach for measuring the degree of local/U.S. dollar currency exposure among so many disparate firms. Second, is to use this exposure to identify avenues for stock return predictability. And third, is to test whether currency exposure is systematic in the cross-section of returns—be that cross-section a country, region, or the world.

The first section focuses on the measurement of exchange rate sensitivity for global firms and associated predictability. The analysis reveals that firms that are most strongly sensitive to currency fluctuations tend to have higher stock returns over the short to medium run. In addition, the research finds that information in the forward currency rate structure can be used to improve the predictability for such firms.

The second section takes a risk-based approach, and tests whether or not currency risk is a systematic risk factor worldwide. The findings suggest that currency risk is largely characterized as a regional—as opposed to global—consideration. However, firm fundamentals that tend to drive variation in currency exposure (such as firm size or profitability) are considerations that extend beyond regional boundaries. The section shows that because of that, worldwide systematic predictability as a result of currency exposure can still be achieved, even if the worldwide returns to that exposure are not homogeneous.

TABLE OF CONTENTS

Page

Page

LIST OF TABLES

TABLE Page

TABLE Page

TABLE Page

LIST OF FIGURES

1. INTRODUCTION

How much do we know about how currencies affect the prices of other assets? Many researchers have tried to quantify this, as far back as Adler and Dumas (1983), or Dumas and Solnik (1995). However to this day, the field remains active with researchers questioning the effect—or even existence—of currency impacts on asset prices, and on stock returns in particular. Some evidence points to the conclusion that currency effects do not exist (e.g., Jorion, 1991), or rather only to a limited degree (Griffin and Stulz, 2001). Others find that currencies are correlated with stock returns (Dominguez and Tesar, 2006). While yet others find that this correlation is priced, the finding is that this premium can be either positive or negative at times (De Santis and Gerard, 1998), or thus far applied to U.S. based firms (Kolari, Moorman, Sorescu 2008).

Coinciding with this recent research have been studies focused on explaining dollar variation, as well as the effects that this variation has on other currencies. For example, Lustig and Roussanov (2011) find that movements in the U.S. dollar can explain a large proportion of variance in the cross-section of currencies. What's more, they find that this dollar variation is predictable by macroeconomic considerations, such as the forward discount and industrial production (Lustig, and Roussanov, 2014).

The research streams above, when examined holistically, raise a number of interesting questions. What is the importance of the U.S. dollar? Do equity markets worldwide exhibit correlation to the U.S. dollar? Does this correlation drive differences in the cross-section of stock returns globally and, if so, why?

To further the literature on currency research as applied to stock returns, this dissertation attempts to answer these questions. It does so in a number of ways. Broadly, these take the form of two approaches. The first approach is to identify, if certain firms worldwide exhibit a special

sensitivity to US dollar fluctuations, whether that sensitivity could be used to predict the stock returns of such firms. The second approach is more general, and attempts to quantify the extent to which this type of currency risk is systematic in the cross-section—be that at the country, region, or even global level.

While Sections 2 and 3 of the dissertation have elements of both predictability and risk-based methodologies, Section 2 can generally be read as a focus on predictability, whereas Section 3 can be seen through the context of its cross-sectional or factor based approach. More specifically, Section 2 discusses the optimal way to measure currency risk, particularly when studying the equity returns of so many disparate countries. Given this measurement, the section then proceeds to analyze the differences in returns among firms with varying levels of exposure to currency fluctuation. It does so in a rigorous, high dimensional fixed effects panel setting, with numerous controls so as to adequately isolate the currency effect. The section follows with a study of how the term structure of forward currency rates for a country, or forecasts thereof, can be used to enhance predictability among firms that are currency sensitive.

Section 3 turns to more traditional methodologies in empirical asset pricing, by employing Fama and French (1992) time-series factor regressions, Daniel, Grinblatt, Titman, and Wermers (1997) characteristic portfolio adjustments, and Fama-Macbeth (1973) regressions. Here, the emphasis is to use these techniques to identify factor risk, and any factor risk premia, as a result of currency fluctuations. The research takes place both at the individual country level and at the level of separate regions, studying all sufficiently liquid non-U.S. markets over the past 15 years. The finding is that the level of currency risk varies according to both countries and regions. Some regions carry signs of a positive risk premium, whereas for other regions the risk premium appears negative. Even within regions, signs can change during subsample analysis.

Section 3 concludes, therefore, that currency risk—in particular dollar risk—can be heterogeneous around the world. However, I find that some of the characteristics of the firm which can explain the variation of currency exposure in the cross-section—for instance its profitability, size, market beta, leverage, or even accruals—are in fact facets that are internationally ubiquitous. That is, although geographical differences matter in terms of compensation for bearing currency risk, fundamental drivers of currency exposure do not. Most important among these appear to be a firm's size, or the interaction of the level of both its size and profitability. In this way, the findings are consistent with Kolari et al. (2008) and Wei and Starks (2013), who argue that currency fluctuations play a greater role for firms when they are already experiencing distress.

2. CURRENCY RISK, FORWARD RATES, AND STOCK RETURN PREDICTABILITY

2.1 Introduction

Do fluctuations in currency values matter for asset pricing? This question has taken on special importance in recent years as, owing to increased globalization, competition has not only heightened across firms but also across countries. I address this question by empirical tests of the relationship between firm stock returns, forward currency rates, and current spot rates.

I find that currency risk—specifically dollar exchange rate risk—is a significant determinant in firm stock returns worldwide. Sorting on firms' past exposure to exchange rate fluctuations, I find that size, market, and book-to-market adjusted returns for more currency-sensitive firms are as high as 413 basis points over the subsequent year. The finding remains robust to a battery of macroeconomic controls and alternate specifications.

Moreover, I find that information in the forward currency rate term structure can be used to further predict abnormal returns to currency-sensitive firms. Predictability exists when measured at the monthly, quarterly, and annual level. This forward currency effect is also robust across country, time-period, and macro-economic considerations.

The finding that currency risk—and in particular dollar risk—matters in understanding the cross section of stock returns, pertains to a number of topics in international asset pricing. Notably, a number of papers have suggested that currency values have implications for firm stock returns, beginning with Dumas and Solnik (1995). Many have concluded that currency risk matters in determining stock returns (e.g., Black, 1989; Guo, Neely, Higbee, 2008), whereas others have found no such effect (e.g., Jorion, 1991; Dominguez and Tesar, 2006), or a limited effect (Griffin and Stulz, 2001).

I add to this body of knowledge by showing how dollar risk is a priced factor, relevant to a surprisingly diverse array of countries. The trick in finding a price impact, however, is a better measure of firm currency risk itself. That is to say, not only are better *ex-post* measures of firm-specific currency risk needed in order to capture an effect (e.g., higher-frequency, narrower estimation window), but alternative *ex-ante* measures are needed as well (e.g., the term structure of currency forward rates).

The reason why this dollar risk matters relate to findings beyond questions regarding predictability. In particular, recent advances have shown that while stochastic discount factors exhibit unique components *across* countries, a strong element exists *within* all of them (Bakshi, Carr, Wu, 2006). While some uniqueness in stochastic discount factors appears to be the result of inflation risk (Moerman and van Dijk, 2010), or even heterogeneous levels of private information among investors in different countries (Brennan, Cao, Strong, Xu, 2004), Lustig, Roussanov, Verdelhan (2011) find that the major common component of stochastic discount factors worldwide is, in fact, dollar risk. While they justify their result using common variation in currency returns, I extend their evidence to equities globally.

To do so, I focus on firms worldwide for the era from 2000 through 2014 for two important reasons. First, if currency risk[1] is systematic, I expect a priori that risk will be pervasive across all countries, and not just certain countries in particular. Second, globalization has increased markedly over the past few decades, which means that trade between firms across countries—and thus their exposure to currency fluctuations—has become an increasingly salient feature of the macroeconomic environment over the sample period. In addition, globalization has

[1] I use the term "currency risk" interchangeably with "dollar risk". While it should be emphasized that some firms or countries may have significant exposure to non-U.S. currencies as well, I focus on U.S. dollar risk both for reasons of tractability, and because of its dominance as the major currency over this sample period.

also led to greater integration of equity markets worldwide (Pukthuanthong and Roll, 2008), which implies that currency fluctuations should play an even greater role than before.

Using detailed daily data on all ex-US publicly listed equities, and daily data on all currency spot and forward rates, I create novel measures that better capture and predict firms' sensitivity to currency fluctuations. First, I find clear evidence that currency exposure matters: within-country beta-by-currency sorts show that, for all but the lowest beta firms, currency-sensitive firms have high average subsequent annual returns. For example, the spread among firms which are most and least sensitive to a depreciating currency ranges from 10.32% to 17.73%[2]. Taking a different approach, by estimating regressions with firm specific observations, leads to a more calibrated estimate. Controlling for country-specific lagged macroeconomic variables and contemporaneous market returns, as well as firm specific considerations including its size, book-to-market, and beta, quarter-ahead firm stock returns for the most currency sensitive firms are still 0.78% higher than the least sensitive firms—a difference which rises to 4.81% over an annual horizon[3].

Second, I find that short-term forward rates can be used as a better measure with which to predict the relative spread among currency-sensitive firms. For example, when three-month forward rates for a currency have risen relative to the values observed in the month prior (thus implying depreciation), there is a *realized* effect on the quarterly stock returns over those subsequent three months that is monotonically increasing as firms are more positively sensitive to depreciation. This amount is measured after controlling for the higher long-run expected returns of currency-sensitive firms. In other words, information in the term-structure of currency forward rates is informative about both the direction and timing in the returns to firms sharing a common currency. This finding is robust to changes in a country-specific inflation, growth,

[2] The highest spread, 17.73%, actually comes from firms in the middle market beta-sorted quintile (31.99-14.26).
[3] Table 8—Panel B.

money supply, and labor market characteristics, as well as the firm-specific characteristics (size, etc.) used above.

The analysis above shows that it useful to match maturities in the currency forward rate term-spread to the realized maturities of stock returns; that is, one month forward rate spreads can predict one month stock returns, three month forward rate spreads can predict three month returns, and so on. However, I make an additional contribution to the literature by finding that, through incorporating relevant information about the *entire* term structure at once, additional predictability at the quarterly frequency can be obtained. This is important as most studies either use relatively simple indicators of yield structures to predict equity returns (e.g., the term spread), or use more sophisticated term structure models to predict term premia in bond yields. Far fewer use term structures outside of the government bond setting.

Last, since the spread between a forward currency rate and the spot value approximates currency carry yield (at least for short horizons[4] [5]), examining *movement* in relative maturities here raises the idea that month-to-month movements in currency carry yield may also matter for pricing stock returns. This, to my knowledge, has not been studied before. More specifically, one idea in this paper is to use directional forward rate movement across the term structure in order to time the magnitude and direction of returns for currency sensitive firms. Yet, by looking at the term structure of carry (i.e., of the relative spread across countries and maturities), we may equally be able to time the magnitude and direction of firm-specific price movements. This presents a new macroeconomic consideration for future studies involving global asset prices.

[4] Differences in country risk, inflation uncertainty, and manifold other economic circumstances may create a divergence between interest rates in the currency market and realized rates. This is what is known as the forward-rate bias (Hansen and Hodrick, 1980; Fama, 1984; Bansal and Dahlquist, 2000, etc.).

[5] Indeed, many studies in the carry trade literature simply use forward-to-spot spreads when explicitly calculating the interest yield component to carry trade strategies (e.g., Menkhoff, Sarno, Schmeling, and Schrimpf, 2012).

Section I describes the data used in this study. Section II presents the initial results using various univariate portfolio sorts. Section III checks the robustness of that analyses using firm-level panel regressions, and further analyzes the influence of the currency forward rate structure. Section IV examines the efficacy of a state-space specification, and Section V includes additional robustness tests. Section VI concludes.

2.2 Methodological Overview

2.2.1 Sample and Sample Data

I use the Compustat Global daily equity database to identify all non-US firms listed on exchanges worldwide, during the approximately fourteen year period from January 1, 2000 through October 31, 2014. I choose this time period for four important reasons. First, financial markets worldwide have deepened rapidly over recent years, and as such this more recent period will present the richest source of data to test. Second, this period is long enough to contain both localized recessionary and expansionary periods (e.g., the Hong Kong SARS outbreak in early 2003, or unanticipated expansionary monetary policy in Japan in early 2013) as well as worldwide recessionary and expansionary trends (e.g., the post-2003 global expansion and 2008 financial crisis and recovery). Third, the relatively long sample period allows one to observe how firm-specific returns vary over time in response to currency spot and forward movements, controlling for macroeconomic and other cross-sectional or time-series characteristics[6]. Fourth, is the Euro, which began circulation on January 1st, 1999—starting the analysis slightly after this date simplifies some of the methodological design. Tables 2.1 and 2.2 provide some additional overview of the countries and currencies under study.

[6] Also, while data availability in Compustat Global dates as far back as January 1989, it only begins coverage with a limited set of countries.

Table 2.1 Summary of Countries in the Sample. This table displays the number of firm-month return observations according to country of incorporation.

Country	Firm-months	Country	Firm-months	Country	Firm-months
United Arab Emirates	8,013	Croatia	10,408	Russia	3,558
Argentina	7,397	Hungary	5,991	Saudi Arabia	15,186
Australia	144,429	Indonesia	44,461	Singapore	82,625
Austria	13,677	India	252,213	Slovenia	4,682
Belgium	22,464	Ireland	14,834	Sweden	53,792
Bermuda	79,889	Iceland	1,461	Thailand	67,843
Switzerland	36,819	Israel	41,917	Tunisia	5,676
Chile	14,467	Italy	44,965	Turkey	12,977
China	234,684	Jordan	19,642	Taiwan	199,668
Colombia	4,088	Japan	627,207	Ukraine	4,075
Cayman Islands	55,548	South Korea	221,544	Brit. Virgin Isl.	3,221
Cyprus	8,715	Kuwait	19,060	Vietnam	24,046
Czech Republic	2,161	Sri Lanka	9,679	Total	3,286,388
Germany	146,783	Lithuania	1,300		
Denmark	25,708	Luxemburg	7,149		
Egypt	16,314	Latvia	2,478		
Spain	28,439	Malta	1,223		
Estonia	1,978	Netherlands	28,115		
Finland	18,670	Norway	25,856		
France	114,802	Pakistan	35,653		
United Kingdom	309,704	Peru	6,254		
Greece	45,601	Philippines	21,824		
Hong Kong	42,435	Portugal	7,838		

Table 2.2 Summary of Currencies in the Sample. This table presents the number of firm-month return observations according to the currency of its listed and tradable shares.

Country-currency	Firm-months	Country-currency	Firm-months
United Arab Dirhams	7,784	Japanese Yen	627,708
Argentine Pesos	7,397	Korean Won	222,481
Swiss Franc (and Liechtenstein)	35,045	Kuwaiti Dinars	19,227
Chilean Pesos	14,474	Sri Lankan Rupees	9,679
Chinese Yuan	208,406	Latvian Lati	2,213
Colombian Pesos	4,149	Moroccan Dirham	7,657
Cyprus Pounds	1,508	Norwegian Kroner	29,451
Czech Korunas	2,378	Peruvian Nuevoas Soles	6,257
Danish Kroner	25,673	Philippine Pesos	21,737
Egyptian Pounds	16,356	Pakistani Rupees	35,722
EMU Euro	507,488	Russian Rubles	3,560
British Pounds Sterling	339,777	Saudi Riyals	15,288
Greek Drachmas	1,420	Swedish Kroner	54,614
Hong Kong Dollars	182,279	Singapore Dollars	92,468
Croatian Kunas	10,591	Slovenian Tolars	1,019
Hungarian Forints	5,827	Thai Baht	67,623
Indonesian Rupiahs	44,269	Tunisian Dinar	5,696
Isreali Shekels	38,135	Turkish Lira	12,937
Indian Rupees	252,191	Taiwanese Dollars	201,149
Iceland Kronur	1,523	Ukraine Hryvnas	4,075
Jordanian Dinars	19,642	Vietnamese Dong	24,083
		Total	3,190,956

2.2.2 Measure of a Firm's Sensitivity to Exchange Rate Movements

I collect currency and market betas simultaneously by regressing daily closing stock returns for a firm on a currency-specific value-weighted market return[7] and the daily (end of day) local currency return versus the US dollar. Because both market and currency betas may change over time (De Santis and Gerard, 1998), I use a rolling 250 trading day window for estimation[8]. That is, for each trading day t, a new market and currency beta is estimated using data from $t - 250$ through t.

In other words, for each firm i trading in currency j at any given day t, and for a trading window τ, I estimate the following regression:

$$Ret^{i}_{t\epsilon\tau} = \alpha_{i,t} + \beta_{i,t} Mkt^{j}_{t} + \delta_{i,t} CurrencyReturn^{j}_{t} + \epsilon_{i,t} \quad (1)$$

where $$CurrencyReturn^{j}_{t} = \ln\left(\frac{Foreign^{j}}{US\ Dollar_{t}} \Big/ \frac{Foreign^{j}}{US\ Dollar_{t-1}}\right)$$

Here, a positive $CurrencyReturn$ represents a strengthening in the value of the dollar, and conversely a relative depreciation of the currency j in which the stock is denominated. $Ret^{i}_{t\epsilon\tau}$ is the return of firm i on day t, given trading window τ. Thus, if a firm has a positive $\delta_{i,t}$ and the currency has depreciated on day t, its expected return is (controlling for market beta) positive. Of interest from the above estimation are the market betas and currency betas for each firm at each point in time—denoted by $\beta_{i,t}$ and $\delta_{i,t}$, respectively.

Part of the benefit of measuring firm currency betas in this way is that it assumes market participants are reasonably accurate in understanding firms' currency exposures. For example, if a firm uses sophisticated hedging techniques to avoid currency exposure, and market participants are aware of this, then movements in a currency value are likely to have comparatively little

[7] The use of local market betas follows Frazzini and Pederson (2014). "Days" t for stock and currency returns are standardized before estimation to be made synchronous with respect to Greenwich Mean Time (GMT).
[8] I exclude firms in which the stock traded for 100 days or less within the 250 day estimation window.

association with the firm's contemporaneous stock return (Bartram, Brown, Minton, 2010). Because the firm has so adequately eliminated currency risk, in other words, this measure is not calculating the firm as currency-risky.

The above approach yields a panel of betas, one for each day and firm. I do not rely on these daily loadings for the analysis, however. Rather, I compute the monthly average of $\beta_{i,t}$ and $\delta_{i,t}$ for each firm, in which the average is over the set of $\beta_{i,t}$ and $\delta_{i,t}$ extracted from the tail end of each daily rolling estimation. Put simply, I compute monthly betas for each firm by taking the monthly average of its daily betas. This approach of computing daily betas and then averaging is computationally costly. However, it has the benefit of capturing the most recent variability in firm loadings, while still not being overly influenced by noise arising from estimation windows that are too short. Moreover, daily estimation improves accuracy of the estimation of firm betas, but aggregating monthly largely avoids the problem of asynchronous trading across different parts of the globe.

Upon taking the monthly loading average for each firm, firms are sorted into (within-country) quintiles according to their market beta, β_i, then further sorted within beta quintiles into (within-country) currency beta, δ_i, quintiles. This type of conditional sort is useful, because of the possibility that independent sorts might leave some quintiles disproportionately unpopulated for some countries. I then compute the equal weighted average of these 25 portfolios.

I note that market and currency beta quintile sorts are within country, whereas estimation of market and currency betas take place at the currency level. The one geographic region where this creates a discrepancy is the Euro. However, my choice of constructing currency-level market returns is motivated by findings showing a high degree of real and financial integration in the Eurozone after 1999 EMU integration, to such an extent that Euro-wide effects now dominate country effects [e.g., Ferreira and Ferreira, 2006; Moerman, 2008; Eiling, Gerard, De Roon

2012]. Nevertheless, in the panel regressions of later sections, I test the merit of this procedural choice by including country-specific macroeconomic controls.

2.2.4 The Currency Forward Rate Structure and Stock Return Predictability

While I show in Section 2.3 that there exists an expected difference in the cross-section of stock returns attributable to currency sensitivity, an additional purpose of this study is to understand how forward rates and their expectation can play a salient role in explaining these returns. In particular, the hypothesis is twofold: One, is the premise that forward currency rates are informative about future movements in currency-sensitive stocks. Two, is that through this channel, unobserved state processes within forward rates can be measured over time to glean additional information about their expected path, and thus the expected price paths of the most currency sensitive stocks.

To construct a methodology for testing these hypotheses, I first collect daily data on spot and realized forward currency rates from Datastream—specifically the World Market PLC/Reuters quotes, as advocated by Hassan and Mano (2014). The forward rates come in standardized maturities of 1, 3, and 9 months, as well as 1 and 5 year maturities. I exclude the 1 and 5 year maturities because they are not as widely available, and are potentially subject to liquidity and other risk-related issues. These Datastream currency rates are then hand-matched to the currency codes available for each stock. The currency code for each stock is supplied by Compustat Global, and is the currency code of the exchange for which the stock is listed[9].

With this data, the two forward rate hypotheses can now be made more explicit. First, is that expectations today about currency movements in the future, as implied by observed forward rates, will be an informative signal about stock returns over the corresponding period, at least for

[9] If a firm is listed in two or more non-U.S. countries, I consider the listings as separate observations, measuring currency effects separately. However, discarding non-US dual-listings instead does not change the results of the analysis.

stocks which are most sensitive to potential changes in the currency's movement. The second is conceptually similar, but the difference is that our expectation about future currency movements derives not from forward rates today, but instead comes from predictions about forward rates which incorporate elements beyond what is available by a naïve strategy using forward rates only available at time t.

Written differently, we should expect:

$$\mathrm{E}_t\left(Ret^{i}_{t+1,\zeta} \mid E_t\left(Curr^{j}_{t+1,\zeta}\right)\right) \tag{2}$$

Where $Ret^{i}_{t+1,\zeta}$ is the conditional monthly return on currency-sensitive stock i over some duration $t+1$, with ζ denoting the corresponding maturity of the currency rate over that period. The difference between hypothesis (1) and (2) is simply the functional form used to derive the time t expectation of the currency's value over $t+1$.

2.3 Portfolio Sorts

2.3.1 Unconditional Analysis

As described above, portfolio sorts are conducted by forming within-country quintiles of stocks according to their market beta. Again, while market beta is estimated using daily data over the past 250 trading days, I use the average daily beta of the last month in the rolling window as a basis for quintile formation. Then within each of the quintiles and again within each country, I sort firms according to their currency beta.

Because the currency return variable measured in equation (1) is that of the home-country currency in question versus the dollar, a positive currency beta suggests an association such that as the locally denominated currency *depreciates*, a firm's stock is more likely to experience a positive gain. For example, a firm with a currency beta of +1.5 suggests that as the home-country's currency depreciates by 10%, the firm expected return will be 15%, holding its

market loading constant. Likewise, for a firm with a currency beta of -1, its expected return will actually be 10% lower, should its local currency depreciate by 10%.

In this way, the highest quintile of currency sensitivity firms represents those firms with the strongest positive correlation with its domestic currency movements, whereas the lowest quintile represents those firms with the most negative correlation. As such, the middle quintiles—and in particular the third quintile—represent firms which are least affected by movements in the value of the country's currency.

These differentials can be seen in Panel B of Table 2.3. Here, mean currency betas are listed along with mean market betas according to currency quintile. In quintile 1, the average firm currency beta is -1.10, whereas quintiles 3 and 5 have currency betas of 0.07 and 1.26, respectively. Meanwhile, firm market betas—controlling for currency sensitivity—vary relatively little, from a mean market beta of 0.65 in currency quintile 1 to a mean of 0.67 in quintile 2.

Table 2.3 Descriptive Statistics. This table displays basic summary statistics. Panel A displays the number of monthly firm return observations according to year. Panel B includes summary statistics of firm currency and market betas across currency beta quintiles

Panel A

Year	Firm-month obs.
2000	93,300
2001	131,939
2002	149,163
2003	159,761
2004	173,761
2005	187,912
2006	202,536
2007	220,904
2008	232,550
2009	251,474
2010	262,102
2011	272,957
2012	292,953
2013	302,114
2014	257,530
Total	3,190,956

Panel B

	Average Currency Betas Among Currency Quintiles		Average Betas By Currency Quintiles		
Currency Quintile	Mean	SD	Mean	SD	Firm-months
1	-1.10	1.66	0.65	.50	328,885
2	-0.03	0.90	0.66	.49	317,781
3	0.07	0.79	0.67	.48	313,121
4	0.49	1.17	0.67	.48	318,785
5	1.26	1.99	0.67	.50	314,190

While it is encouraging that market betas do not vary much across currency quintiles, the fact that market betas are on average less than 1 merits two further comments. First, is that since market betas are estimated simultaneously with currency betas, a reduced magnitude on market betas suggests that a non-negligible amount of market risk appears in fact to be currency risk. To make that point concrete, notice that average currency beta values for quintiles 1 and 5 are close to -1 and 1, respectively; in other words, after controlling common daily market movements, approximately $2/5^{ths}$ of global daily market movement is driven almost entirely by currency fluctuation. Second, is that market betas are estimated within currency. While this is really only a relevant issue for the Eurozone EMU countries, which comprises 15.9% of the sample (Table 2.3), it is possible that average betas in Table 1 are pulled downward if EMU exchanges are not well correlated at the daily frequency.

The above estimation and sorting procedures yield a set of 25 portfolios sorted according to market and currency sensitivity. If stock returns across countries differ systematically according to their market and currency sensitivity, then systematic differences among these portfolios should be observed.

Table 2.4 takes a first pass in examining this possibility. First, there exists some evidence that contemporaneous returns are higher for firms that are positively correlated with currency movements and that, with the exception of a few portfolios, there exists a largely monotonic relationship between currency sensitivity and contemporaneous expected returns. Average month-ahead returns to portfolios formed at the end of the previous month exhibit the same pattern: currency sensitive firms exhibit consistently higher returns in comparison to less currency sensitive firms, and this effect increases almost monotonically across levels of market sensitivity.

More interestingly, Table 2.4 further shows that this effect persists—and even widens—when the holding period for such firms is lengthened to either 6 or 12-month ahead horizons. Average 6 and 12-month (buy-and-hold, adjusted for de-listings, distributions and share splits) returns in the most positive quintiles of currency sensitivity are as high as 13.43% and 33.88%, respectively, whereas the equivalent figures for the least-sensitive firms are 10.48% and 21.58%.

The side columns to the far right of Table 2.4 test for the differences in the mean returns of currency quintiles across pooled beta portfolios. Here, differences between the 5th and 1st quintile, as well as between the 5th and 3rd quintile, generally indicate that if one were to form currency quintile portfolios this month, the quintile most likely to outperform throughout the following year would be the 5th quintile—that is, the quintile which has exhibited the greatest degree of daily positive correlation between firm returns and foreign/USD fluctuations.

In other words, the quintile that has tended to do well in the presence of (daily) depreciation and poorly in the face of appreciation tends to have higher expected returns over the longer run. The effects are most statistically significant when examining return differences over longer horizons. For example, the spread in returns between the 5th and 3rd quintiles is 10.36% per year (t-stat=4.31), whereas it is 1.21% over just the following month (t-stat=2.31).

Table 2.4 Unconditional Portfolio Sorts. This table displays the contemporaneous as well as 1, 6, and 12 month ahead equal weighted cumulative returns to portfolios sorted by market beta and currency beta.

	Contemporaneous Monthly Returns						
	Currency Beta						
Market Beta	1	2	3	4	5	(5 – 1)	(5 – 3)
1	4.84	0.93	0.90	-0.91	0.40	-4.44	-0.50
2	-0.24	1.75	1.78	1.83	2.01	2.25	0.23
3	0.95	1.37	1.07	0.64	3.64	2.69	2.57
4	-0.49	1.82	0.13	1.76	1.16	1.65	1.03
5	0.74	-0.52	1.14	0.97	2.29	1.55	1.15
					Mean difference:	0.74	0.90
					t-statistic:	0.43	0.37
	One-month Ahead Returns						
	Currency Beta						
Market Beta	1	2	3	4	5	(5 – 1)	(5 – 3)
1	0.82	0.45	0.82	0.59	0.45	-0.37	-0.37
2	-0.84	0.46	1.41	1.06	1.40	2.24	-0.01
3	2.81	5.49	0.20	0.97	1.68	-1.13	1.48
4	-0.03	0.67	1.31	1.80	1.90	1.93	0.59
5	-0.30	0.76	0.46	0.85	4.82	5.12	4.36
					Mean difference:	1.56	1.21
					t-statistic:	1.20	2.31
	Six-month Ahead Returns						
	Currency Beta						
Market Beta	1	2	3	4	5	(5 – 1)	(5 – 3)
1	10.45	4.34	4.34	-0.82	4.92	-5.53	0.58
2	7.04	7.98	10.48	9.77	13.40	6.36	2.92
3	9.59	9.02	7.34	10.12	13.32	3.73	5.98
4	6.25	6.84	4.72	11.18	12.98	6.73	8.26
5	0.36	0.45	4.01	6.16	13.43	13.07	9.42
					Mean difference:	4.87	5.43
					t-statistic:	1.17	1.79
	Annual Returns						
	Currency Beta						
Market Beta	1	2	3	4	5	(5 – 1)	(5 – 3)
1	12.20	9.69	11.41	-0.77	10.91	-1.29	-0.50
2	9.69	22.32	21.58	21.43	33.88	24.19	12.30
3	16.91	15.84	14.26	16.05	31.99	15.08	17.73
4	11.47	12.08	15.35	16.24	26.56	15.09	11.21
5	1.90	2.15	10.68	11.32	21.74	19.84	11.06
					Mean difference:	14.58	10.36
					t-statistic:	3.35	4.31
					t-statistic:	3.35	4.31

2.3.2 Forward Rates, Currency Values, And Firm Stock Returns

The above analysis presents initial evidence in which firms that are differentially exposed to currency risk have proportionally differential patterns in expected returns. This is consistent with prior literature, although the above analysis encompasses a broader set of countries and frequency than was previously researched. However, an interesting question pertains to how information in the forward rate structure can be used to glean further insight into the expected returns associated with currency risk.

As a first step towards testing this idea, I compute the average daily forward rate for a given month for each of the one-month maturity contracts that are available on each country. I then take the first difference of the average value in month t, relative to the average value in month $t - 1$. If this value is positive, it means that the forward rate on the currency for delivery one full month from now is higher than it was for an equivalent maturity in the previous month—i.e., that the currency forward rate has now depreciated relative to the US dollar. Likewise, if the forward-rate difference is negative, this means that the currency forward rate has appreciated relative to the US dollar.

Sorting firms monthly according to market and currency betas in the same manner as Table 2.4, but with the sample split on the basis of whether forward rates have appreciated or depreciated relative to the past month, one can then get a view of how market expectations in short-term currency movements can be used to predict the short-term returns for stocks with exposure to those movements. This is presented in Table 2.5.

Here, in Table 2.5—specifically in Panel B, an implied one-month depreciation of the currency corresponds with a contemporaneous increase in the expected returns for stocks most historically predisposed to benefit when that currency depreciates. The size of the effect is 46 basis points per month when averaged across market betas, with a t-statistic of 2.24 (Table 2.5,

Panel C). Thus, if forward rates for one-month delivery have weakened relative to what they were in the prior month, this tends to also bode well for returns of firms that have historically benefited in the presence of a weak currency. In comparing these firms that are positively sensitive to currency depreciation against those with a more hedge-like exposure to a depreciating currency (i.e., quintile 1) the mean spread is a statistically insignificant 9 basis points per month. Therefore, it appears that for contemporaneous forward rate depreciation at least, stock returns are really driven by the magnitude of economic currency exposure, rather than the sign.

The relative outperformance of the currency sensitive firms persists over the one, three, six, and twelve-month horizons following initial portfolio formation. For example, when one-month forward curves imply depreciation, the average return spread between the highest currency quintile and the middle currency quintile grow from 0.49% to 1.80%, 4.11%, and 9.56% over the following one, three, six, and twelve month horizon, respectively. All mean differences are significant at greater than the 5% level except the three-month ahead return (which has a t-statistic of 1.65).

In addition, Panel C of Table 2.5 also shows mild evidence that the most positive currency quintile underperforms the most negative currency quintile when one-month forward rates have shifted to imply appreciation. Mean differences between the 5^{th} and 1^{st} currency quintiles over the subsequent one through twelve-month horizon are all negative in sign, although only the six-month and twelve-month ahead returns approach statistical significance (with t-statistics of -1.13 and -2.04, respectively).

Table 2.5 Portfolio Sorts and Forward Rate Movements. This table displays the contemporaneous as well as 1, 6, and 12-month ahead equal weighted cumulative returns to portfolios sorted by market beta and currency beta. The sample is split into countries with a negative movement in forward spreads (i.e., appreciation) in Panel A, and a positive movement in forward spreads (i.e., depreciation) in Panel B. Panel C contrasts the differences among currency portfolios 5, 3, and 1.

Panel A: Appreciation Implied by Forward Rate

Contemporaneous Month Returns

	Currency Beta				
Market Beta	1	2	3	4	5
1	2.13	1.25	1.01	0.98	1.20
2	2.07	1.31	1.22	1.22	1.57
3	1.88	1.41	1.24	1.08	1.74
4	1.59	0.88	0.86	0.97	1.44
5	1.46	0.75	0.81	0.64	1.27

One-month Ahead Returns

	Currency Beta				
Market Beta	1	2	3	4	5
1	2.10	1.23	1.03	0.98	1.24
2	1.97	1.29	1.22	1.17	1.55
3	1.83	1.32	1.14	1.04	1.71
4	1.55	0.86	0.82	0.91	1.45
5	1.33	0.67	0.76	0.59	1.22

Three-month Ahead Returns

	Currency Beta				
Market Beta	1	2	3	4	5
1	6.44	3.84	3.05	2.89	3.70
2	6.27	3.92	3.62	3.65	4.80
3	5.62	4.11	3.66	3.23	5.25
4	4.85	2.69	2.58	2.83	4.47
5	4.41	2.28	2.53	1.96	4.17

Six-month Ahead Returns

	Currency Beta				
Market Beta	1	2	3	4	5
1	13.55	7.82	6.19	5.85	7.79
2	13.00	8.02	7.47	7.39	10.19
3	11.80	8.33	7.34	6.61	11.03
4	10.29	5.56	5.22	5.73	9.59
5	9.40	4.63	5.18	4.09	8.83

Twelve-month Ahead

	Currency Beta				
Market Beta	1	2	3	4	5
1	27.80	15.93	12.49	11.22	15.74
2	27.04	16.02	14.89	14.45	20.36
3	23.39	16.58	14.53	13.28	21.76
4	20.97	11.24	10.10	10.51	19.12
5	17.69	8.49	9.16	7.05	16.52

Panel B: Depreciation Implied by Forward Rate

Contemporaneous Month

	Currency				
Market	1	2	3	4	5
1	0.84	0.59	1.18	1.12	1.29
2	1.11	0.92	1.05	1.21	1.35
3	1.06	0.63	1.02	1.17	2.37
4	0.47	0.78	0.85	1.10	1.35
5	3.85	0.01	0.50	0.97	0.54

One-month Ahead Returns

	Currency Beta				
Market	1	2	3	4	5
1	0.83	0.58	1.24	1.12	1.31
2	0.96	0.94	1.05	1.24	1.42
3	0.98	0.60	0.97	1.15	2.33
4	0.45	0.83	0.95	1.27	1.49
5	3.82	0.07	0.56	1.07	0.67

Three-month Ahead

	Currency Beta				
Market	1	2	3	4	5
1	2.95	1.97	3.81	3.62	4.25
2	3.31	3.08	3.42	4.07	4.62
3	3.39	2.09	3.24	3.82	7.94
4	1.77	2.70	3.14	4.35	4.83
5	13.8	0.68	2.05	3.84	3.03

Six-month Ahead Returns

	Currency Beta				
Market	1	2	3	4	5
1	6.55	4.17	7.95	7.61	9.13
2	7.28	6.56	7.24	8.70	10.03
3	7.69	4.55	6.97	8.20	17.01
4	4.16	6.03	6.86	9.76	10.72
5	10.9	2.23	4.85	8.85	7.52

Twelve-month Ahead Returns

	Currency Beta				
Market	1	2	3	4	5
1	14.3	8.62	17.38	16.54	19.68
2	15.4	14.07	15.39	18.25	21.80
3	16.1	9.67	14.75	17.77	38.37
4	8.61	13.23	14.90	22.31	23.85
5	31.6	5.00	11.03	20.44	17.57

Table 2.5 Continued. Portfolio Sorts and Forward Rate Movements. Panel C. This table displays the contemporaneous as well as 1, 6, and 12-month ahead equal weighted cumulative returns to portfolios sorted by market beta and currency beta. The sample is split into countries with a negative movement in forward spreads (i.e., appreciation) in Panel A, and a positive movement in forward spreads (i.e., depreciation) in Panel B. Panel C contrasts the differences among currency portfolios 5, 3, and 1.

Panel C: High Minus Low/Mid Summary

Forward Rate Implied Appreciation

	Contemporaneous		One-month Ahead		Three-month Ahead		Six-month Ahead		Twelve-month Ahead	
Market Beta	(5-1)	(5-3)	(5-1)	(5-3)	(5-1)	(5-3)	(5-1)	(5-3)	(5-1)	(5-3)
1	-0.93	0.19	-0.86	0.21	-2.74	0.65	-5.76	1.60	-12.06	3.25
2	-0.50	0.35	-0.42	0.33	-1.47	1.18	-2.81	2.72	-6.68	5.47
3	-0.14	0.50	-0.12	0.57	-0.37	1.59	-0.77	3.69	-1.63	7.23
4	-0.15	0.58	-0.10	0.63	-0.38	1.89	-0.70	4.37	-1.85	9.02
5	-0.19	0.46	-0.11	0.46	-0.24	1.64	-0.57	3.65	-1.17	7.36
Mean diff.	-0.38	0.42	-0.32	0.44	-1.04	1.39	-2.12	3.21	-4.68	6.47
t-statistic	-0.49	1.35	-0.24	0.62	-0.41	9.34	-1.13	1.39	-2.04	3.03

Forward Rate Implied Depreciation

	Contemporaneous		One-month Ahead		Three-month Ahead		Six-month Ahead		Twelve-month Ahead	
Market Beta	(5-1)	(5-3)	(5-1)	(5-3)	(5-1)	(5-3)	(5-1)	(5-3)	(5-1)	(5-3)
1	0.45	0.11	0.48	0.07	1.30	0.44	2.58	1.18	5.30	2.30
2	0.24	0.30	0.46	0.37	1.31	1.20	2.75	2.79	6.40	6.41
3	1.31	1.35	1.35	1.36	4.55	4.70	9.32	10.04	22.25	23.62
4	0.88	0.50	1.04	0.54	3.06	1.69	6.56	3.86	15.24	8.95
5	-3.31	0.04	-3.15	0.11	-10.82	0.98	-3.41	2.67	-14.08	6.54
Mean diff.	-0.09	0.46	0.04	0.49	-0.12	1.80	-0.44	4.11	-0.98	9.56
t-statistic	-1.04	2.24	0.42	3.34	-1.24	1.65	-0.40	5.37	-2.67	3.15

2.4 Panel Regressions

2.4.1 "DGTW-like" Specifications

Due to the fact that the lowest and highest market beta quintiles seem to experience the largest divergence in returns across currency quintiles, one might wonder to what extent these results regarding return predictability are driven by underlying macroeconomic conditions, as well as to what other firm or country characteristics might be a source for explaining this return differential. To explore this idea further, I consider whether the predictability of forward rate information on stock returns survives a larger battery of controls.

First, there are likely to be country specific macroeconomic that could impact stock returns, in spirit of the Chen, Roll, Ross (1986) Arbitrage Pricing Theory model. To that effect, included in the regressions are the country-specific growths in real GDP, industrial production, unemployment, broad money supply, and consumer price index. To keep measurement consistent across countries, I use the highest frequency for each variable that is most commonly available. This means that I measure Real GDP growth, unemployment, and money supply for all countries at the annual frequency. Industrial production and the CPI are measured at the monthly frequency. All variables are lagged so that the dependent variable under study (i.e., monthly, quarterly, and annual stock returns) is measured at least one month after the release of the macroeconomic data.

The problem of deciding to which country a firm belongs is a difficult one. Whereas previously, I could estimate a firm's currency exposure by measuring its sensitivity to exchange rate fluctuations for the denomination of the exchange for which it is listed in (and thus using market prices as an indication), uncovering a firm's true economic exposure to a particular country is a more arduous task, particularly in the case of multi-nationals.

Second, each year, and within each currency market, I sort firms into size and book-to-market quintiles. Size is measured as market equity, defined as Compustat Global shares outstanding times the average closing price twelve months prior[10]. Book-to-Market is book equity (stockholders equity plus deferred taxes and income credits (if any), minus preferred stock) divided by market equity. The timing for the construction of these variables follows the standard for the empirical asset pricing literature—i.e., for firms with fiscal years ending in December, quintiles are formed at the end of June using the most recent annual statement, but for firms with fiscal years ending in June or earlier in the year, quintiles are formed using the most recent annual statement of the calendar year prior.

The size and book-to-market controls are motivated by a long literature documenting their effects on returns, and most recently for international data by Fama and French (2012). Standard and Poors' Global Industry Classification (GIC) industry sectors are included because of the finding by Francis, Hasan, and Hunter (2007) that, for the United States at least, currency risk is widespread across industries. Using the quintiles for size and book to market, as well as the 10 GIC sectors, I construct 250 (5x5x10) benchmark portfolios with which to compare against individual firm stock returns. The portfolios are equal weighted, rebalanced annually at the end of December, and are constructed *within* country. The "within" construction is motivated by the finding that, while value and size effects generally exist across markets worldwide, the effect is not necessarily contemporaneous across countries (Fama and French, 2012; Isreal and Moskowitz, 2013).

[10] Studies involving U.S. equity returns generally use CRSP shares outstanding instead of domestic Compustat shares outstanding for reasons of observation availability. However, an examination of the data reveals that data availability for the Compustat *Global* shares outstanding variable is actually quite good.

The methodology to test for differences in expected returns attributable to currency risk and forward rate predictions follows the procedure advocated in Gormley and Matsa (2014). Rather than examining the returns to currency sensitive stocks by subtracting the return from a characteristically matched portfolio, as in Daniel, Grinblatt, Titman, and Wermers (1997), raw firm returns are regressed on a set of indicator variables for currency and forward risk quintiles (with the lowest quintile omitted), as well as benchmark portfolio fixed effects that are interacted with the month in which the benchmark portfolio return is calculated.

The benefit of this approach is that, by adjusting *both* dependent and independent variables for benchmark characteristics through the use of fixed effects (which are, in this case, indicators for country-specific monthly benchmark portfolios), the procedure directly models any extent to which currency risk may be concentrated in a particular period, sector, country, or firm characteristic. The resulting point estimates are, then, unbiased estimates of how average stock returns in the upper currency risk quintiles differ from those in the very bottom quintile.

Therefore, the base empirical model for this section takes the following form,

$$Ret^{\tau}_{i,t+1} = \beta^{k} BetaQuintile^{k}{}_{i,t+1} + \gamma^{k} CurrencyQuintile^{k}{}_{i,t+1} + \eta_{p,t} + \nu_{c,t} + \varepsilon_{i,t+1} \quad (3)$$

In which $\eta_{p,t}$ are a set of country-specific benchmark portfolio 'p' indicators that are unique to each month t, $\nu_{c,t}$ are the set of 'c'country-specific and continuous macroeconomic growth variables described above, and β^{k}, γ^{k}, are the $(k = 2, \ldots, 5)$ coefficients of the beta and currency quintile portfolio indicators, respectively. The γ^{k} are the main effects of interest, and are interpretable as the average predicted return for a firm in the k^{th} quintile relative to a firm in the 1st quintile. In terms of measuring predicted return, $Ret^{\tau}_{i,t+1}$ represents the period ahead return (relative to all independent variables) for some horizon τ, in which τ is the buy-and-hold

firm[11] return over either the next month, quarter, or year. In addition, standard errors are clustered at the individual firm level[12].

Table 2.6 shows the results of these estimations. Columns one through three use firm forward returns at the monthly, quarterly, and annual frequency, respectively. Here, the independent variables of interest are the currency sensitivity quintiles. If firms that are differentially sensitive to currency returns also exhibit differential expected returns, we would expect to find statistically significant differences in the magnitude of the quintile indicator coefficients. More specifically, we would expect that firms more exposed to currency fluctuations—be they positive or negative—would exhibit higher expected returns to compensate for that risk. Indeed, firms which are least sensitive to currency movements tend to have quarter-ahead expected returns which are as much as 0.49% lower than those firms which are most sensitive, a figure which falls to as much as 4.1% lower when looking at an annual horizon.

In addition, Table 2.6 shows that firms that are in the highest currency quintile tend to have quarterly and annual returns that are 0.39% and 1.01% higher, respectively, in comparison to returns in the lowest currency quintile. If one interprets currency quintile 5 as being those firms which are more likely to historically weaken amid short-term appreciation in currency value, and currency quintile 1 as those firms most likely to benefit amid appreciation, Table 2.6 suggests that investors demand slightly higher returns for firms which are more negatively correlated to appreciation effects.

[11] I choose to calculate buy-and-hold return as the result of evidence in Lyon, Barber, and Tsai (1999).
[12] To decrease the possibility that a few extremely large returns bias the panel estimation, I also Winsorize returns each month at the upper 99th percentile (returns are already truncated to a global minimum of -100%, so it makes no economic sense to Winsorize at the lowest percentile).

Table 2.6 Characteristic Panel Regressions. This table displays the results of panel regressions of firm-returns on firm and macroeconomic characteristics. Firm returns and independent variables are size-value-industry adjusted (within month and country). Standard errors are clustered by firm.

	Dependent Variable: Forward-period Stock Returns		
VARIABLES	Month Ahead	Quarter Ahead	Year Ahead
Beta Quintile 2	0.132***	0.0946	-1.541***
	(0.0396)	(0.112)	(0.453)
Beta Quintile 3	0.111***	0.0180	-1.234**
	(0.0406)	(0.118)	(0.501)
Beta Quintile 4	0.0831*	-0.154	-0.639
	(0.0424)	(0.125)	(0.540)
Beta Quintile 5	-0.140***	-0.168	5.050***
	(0.0458)	(0.141)	(0.681)
Currency Quintile 2	0.0488	-0.485***	-4.080***
	(0.0381)	(0.0988)	(0.387)
Currency Quintile 3	0.0806**	-0.390***	-3.801***
	(0.0381)	(0.103)	(0.412)
Currency Quintile 4	0.0827**	-0.404***	-3.889***
	(0.0385)	(0.106)	(0.437)
Currency Quintile 5	0.0736*	0.389***	1.016*
	(0.0409)	(0.122)	(0.555)
Real GDP Growth	0.0793***	0.340***	1.559***
	(0.0202)	(0.0617)	(0.247)
Industrial Production Growth	-0.00632	0.0584***	0.161***
	(0.0155)	(0.0200)	(0.0405)
Unemployment Growth	-0.0102***	-0.0323***	-0.210***
	(0.00324)	(0.00985)	(0.0362)
Broad Money Growth	0.0266	0.0669	0.103
	(0.0374)	(0.118)	(0.513)
CPI Growth	-0.801***	-2.687***	-9.580***
	(0.186)	(0.342)	(1.009)
Constant	0.386	1.917**	11.18***
	(0.241)	(0.760)	(3.342)
Benchmark Portfolio Fixed Effects	YES	YES	YES
Observations	1,190,694	1,211,288	1,211,917
R-squared	0.434	0.478	0.495

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

2.4.2 Incorporating The Currency Term Structure

Given that it is now clear that cross-sectional differences in currency exposure lead to cross-sectional differences in subsequent returns, Table 7 considers any incrementally predictive impact of currency forward rate movement in explaining those returns. Here, it is assumed that changes in forward spreads of some maturity are indicative of changes in future realized spot rates over that same maturity; if forward spreads are indicative about expected future currency values, changes in these spreads are indicative about expected currency movements.

To operationalize a forward spread measure, an indicator variable is included which is equal to one if the forward rates for the currency in which the firm is denominated in have shifted upward (i.e., appreciated) in month t relative to month $t-1$, and is equal to zero otherwise. This positive forward rate spread indicator is interacted with currency sensitivity quintiles, which are (just as above) calculated within country for each month t. That is, for each currency, and each month t and maturity τ :

$$\text{Positive } \Delta \text{ in Forward Spread}_t^{\tau} = \begin{cases} 1 & \overline{RATE}_t^{\tau} - \overline{RATE}_{t-1}^{\tau} > 0 \\ 0 & otherwise \end{cases} \quad (4)$$

Where $\overline{RATE}_t^{\tau}$ is the average daily forward rate i, in terms of foreign currency, for maturity τ in month t:

$$\overline{RATE}_t^{\tau} = \frac{\sum_{i=1}^{N} (\frac{Foreign}{USD})_i}{N} \quad (5)$$

It is important to emphasize that $\text{Pos.}\,\Delta \text{ in Fwd. Spread}_t^{\tau}$ is maturity-specific (τ). This means that when the dependent variable in the panel regression is measured over the monthly horizon at time $t+1$, the $\text{Pos.}\,\Delta \text{ in Fwd. Spread}_t^{\tau}$ is observed using forward rate prices at time t—but that these forward rates are quotes with maturity in time $t+1$.

Thus, the aim is to use the particular maturity at t that captures market expectations of $t+1$, the horizon of the dependent variable. As an additional example, when using firm quarterly returns as a dependent variable at time $t+1$, the forward rates used to construct $\text{Pos.}\,\Delta\ \text{in Fwd. Spread}_t^{\tau}$ will be quarterly maturity rates measured at time t, with expiry at time $t+1$.

The results of this endeavor are presented in Tables 2.7 and 2.8. Table 2.7 includes beta and currency quintiles, and interacts the currency quintile with the indicator variable in equation (4) representing a positive forward spread. Table 2.8 further interacts beta quintiles with the forward spread indicator. For both of the tables, the dependent variables in each of the three columns are again the month ahead, quarter ahead, and year ahead stock returns, respectively.

Testing the interaction of beta quintiles with the forward rate spread in Table 2.8 is an important control, because of the evidence in Tables 2.4 and 2.5, which suggest that firms with particularly high market betas may have a uniquely high relationship with contemporaneous changes in expectations of the value of the country's currency. Because multiple interaction effects in a regression output can be difficult to interpret, I include in Panels B and C of Table 2.8 the margins and contrasts for the five currency quintiles and their forward-spread interactions.

Table 2.7 Forward Rates and Characteristic Portfolios. This table displays the results of panel regressions of firm-returns on firm and macroeconomic characteristics. Firm returns and independent variables are size-value-industry adjusted (within month and country). Standard errors are clustered by firm. Interactions are included between currency quintiles and an indicator for implied depreciation over the horizon of the firm-return (as measured by month-to-month growth in constant maturity forward currency spreads against the US dollar).

	Dependent Variable: Forward-period Stock Returns		
VARIABLES	Month Ahead	Quarter Ahead	Year Ahead
Beta Quintile 2	0.132***	0.0955	-1.541***
	(0.0396)	(0.112)	(0.453)
Beta Quintile 3	0.111***	0.0166	-1.235**
	(0.0406)	(0.118)	(0.501)
Beta Quintile 4	0.0832**	-0.157	-0.639
	(0.0424)	(0.125)	(0.540)
Beta Quintile 5	-0.140***	-0.169	5.050***
	(0.0458)	(0.141)	(0.681)
Currency Quintile 2	0.116**	-0.977***	-4.147***
	(0.0537)	(0.125)	(0.434)
Currency Quintile 3	0.146***	-1.137***	-4.039***
	(0.0530)	(0.129)	(0.458)
Currency Quintile 4	0.144***	-1.408***	-4.020***
	(0.0533)	(0.131)	(0.479)
Currency Quintile 5	0.109*	-0.999***	0.831
	(0.0570)	(0.149)	(0.592)
Positive Δ in Forward Spread	-5.581	-21.72	-28.90
	(15.27)	(19.42)	(38.86)
(Currency Quintile 2)x(Pos. Δ in Fwd. Spread)	-0.146*	1.061***	0.146
	(0.0806)	(0.153)	(0.392)
(Currency Quintile 3)x(Pos. Δ in Fwd. Spread)	-0.141*	1.610***	0.516
	(0.0800)	(0.155)	(0.393)
(Currency Quintile 4)x(Pos. Δ in Fwd. Spread)	-0.133*	2.166***	0.283
	(0.0805)	(0.159)	(0.397)
(Currency Quintile 5)x(Pos. Δ in Fwd. Spread)	-0.0764	2.995***	0.401
	(0.0877)	(0.179)	(0.459)
Real GDP Growth	0.0793***	0.341***	1.559***
	(0.0202)	(0.0617)	(0.247)
Industrial Production Growth	-0.00629	0.0574***	0.161***
	(0.0155)	(0.0200)	(0.0405)
Unemployment Growth	-0.0102***	-0.0316***	-0.210***
	(0.00324)	(0.00985)	(0.0362)
Broad Money Growth	0.0264	0.0667	0.103
	(0.0374)	(0.118)	(0.513)
CPI Growth	-0.803***	-2.649***	-9.577***
	(0.186)	(0.342)	(1.009)
Constant	2.948	11.96	24.46
	(7.017)	(9.013)	(18.22)
Benchmark Portfolio Fixed Effects	YES	YES	YES
Observations	1,190,694	1,211,288	1,211,917
R-squared	0.434	0.479	0.495

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.8 Betas Interacted with Forward Spreads. (Panel A). This table displays the results of panel regressions of firm-returns on firm and macroeconomic characteristics. Firm returns and independent variables are size-value-industry adjusted (within month and country). Standard errors are clustered by firm. Interactions are included between currency quintiles and an indicator for implied depreciation over the horizon of the firm-return (as measured by month-to-month growth in constant maturity forward currency spreads against the US dollar). Similar interactions with betas are included.

	Dependent Variable: Forward-period Stock Returns		
VARIABLES	Month Ahead	Quarter Ahead	Year Ahead
Beta Quintile 2	0.120**	0.246*	-1.165**
	(0.0550)	(0.137)	(0.493)
Beta Quintile 3	0.0583	0.247*	-0.519
	(0.0557)	(0.146)	(0.547)
Beta Quintile 4	-0.0102	0.193	-0.0525
	(0.0588)	(0.152)	(0.582)
Beta Quintile 5	-0.350***	0.272	6.406***
	(0.0632)	(0.171)	(0.720)
Currency Quintile 2	0.114**	-0.970***	-4.133***
	(0.0537)	(0.124)	(0.434)
Currency Quintile 3	0.144***	-1.131***	-4.027***
	(0.0530)	(0.129)	(0.458)
Currency Quintile 4	0.143***	-1.404***	-4.013***
	(0.0533)	(0.131)	(0.479)
Currency Quintile 5	0.111*	-1.004***	0.816
	(0.0570)	(0.149)	(0.591)
Positive Δ in Forward Spread	-5.648	-21.52	-28.42
	(15.24)	(19.33)	(38.66)
(Beta Quintile 2)x(Pos. Δ in Fwd. Spread)	0.0261	-0.322*	-0.812**
	(0.0818)	(0.168)	(0.399)
(Beta Quintile 3)x(Pos. Δ in Fwd. Spread)	0.113	-0.493***	-1.549***
	(0.0847)	(0.177)	(0.420)
(Beta Quintile 4)x(Pos. Δ in Fwd. Spread)	0.202**	-0.752***	-1.268***
	(0.0883)	(0.185)	(0.440)
(Beta Quintile 5)x(Pos. Δ in Fwd. Spread)	0.459***	-0.948***	-2.942***
	(0.0952)	(0.207)	(0.523)
(Currency Quintile 2)x(Pos. Δ in Fwd. Spread)	-0.141*	1.046***	0.112
	(0.0806)	(0.153)	(0.393)
(Currency Quintile 3)x(Pos. Δ in Fwd. Spread)	-0.137*	1.597***	0.490
	(0.0801)	(0.155)	(0.394)
(Currency Quintile 4)x(Pos. Δ in Fwd. Spread)	-0.132	2.158***	0.272
	(0.0805)	(0.159)	(0.398)
(Currency Quintile 5)x(Pos. Δ in Fwd. Spread)	-0.0819	3.006***	0.433
	(0.0876)	(0.179)	(0.459)
Real GDP Growth	0.0798***	0.339***	1.556***
	(0.0202)	(0.0617)	(0.248)
Industrial Production Growth	-0.00616	0.0571***	0.160***
	(0.0155)	(0.0200)	(0.0405)
Unemployment. Growth	-0.0102***	-0.0318***	-0.211***
	(0.00324)	(0.00985)	(0.0362)
Broad Money Growth	0.0267	0.0665	0.102
	(0.0374)	(0.118)	(0.513)
CPI Growth	-0.809***	-2.640***	-9.548***
	(0.186)	(0.342)	(1.009)
Constant	2.978	11.87	24.24
	(7.004)	(8.974)	(18.13)
Benchmark Portfolio Fixed Effects	YES	YES	YES
Observations	1,190,694	1,211,288	1,211,917
R-squared	0.434	0.479	0.495
Robust standard errors in parentheses			
*** p<0.01, ** p<0.05, * p<0.1			

Table 2.8 Continued. Betas Interacted with Forward Spreads. Panel B. This table presents currency portfolio margins and contrasts from Table 2.8, according to the presence of implied forward rate depreciation.

Margins			
	Monthly	Quarterly	Annual
Currency Quintiles			
1	0.64	2.66	14.32
2	0.69	2.17	10.24
3	0.72	2.27	10.52
4	0.72	2.26	10.44
5	0.72	3.05	15.34
Currency Quintiles x Pos. Δ in Fwd. Spread)			
1	-2.32	1.88	-1.77
2	-2.35	1.24	-5.79
3	-2.31	1.34	-5.31
4	-2.31	1.25	-5.51
5	-2.29	1.94	-0.52

Table 2.8 Continued. Betas Interacted with Forward Spreads. Panel C. This table presents currency portfolio contrasts from Table 2.6, according to the presence of implied forward rate depreciation.

Return Effect Contrasts

Portfolio	Implied	Monthly		Quarterly		Annual	
Contrast	Forward Depreciation?	% Diff.	p-val.	% Diff.	p-val.	% Diff.	p-val.
(2 vs 1)	NO	0.114	0.054	-0.970	0	-4.133	0.434
(2 vs 1)	YES	-0.027	0.057	0.075	0.543	-4.020	0.434
(3 vs 2)	NO	0.030	0.048	-0.160	0.109	0.106	0.272
(3 vs 2)	YES	0.034	0.053	0.390	0.000	0.484	0.280
(4 vs 3)	NO	-0.001	0.049	-0.272	0.006	0.014	0.265
(4 vs 3)	YES	0.005	0.054	0.288	0.005	-0.205	0.271
(5 vs 4)	NO	-0.032	0.053	0.399	0.001	4.829	0.420
(5 vs 4)	YES	0.018	0.060	1.246	0.000	4.991	0.441

First, one can take assurance in the signs and magnitudes of the macroeconomic control variables in Tables 2.7 and 2.8. For example, an increase in annual real GDP of about 1% is associated with an increase in average stock returns of about 1 ½% over the subsequent year. Similarly, an increase in monthly inflation of about 1% is associated with a decrease in average stock returns over the following months of about 80 basis points. However, broad money growth doesn't appear to impact stock returns with any statistical significance, at least after controlling for the effects of inflation rising from other components or controlling for overall economic activity. Meanwhile, unemployment growth has a significantly negative impact on subsequent stock returns in a country, as an increase in unemployment of about 1% is associated with a decrease in average stock returns over the subsequent 12 months of about 20 basis points, holding all else constant.

Interestingly, after controlling for macroeconomic effects, contemporaneous benchmark portfolio returns, and firm market betas, the results suggest that firms which have the lowest sensitivity to currencies experience slightly higher stock returns over the very short run (i.e., one month ahead), but this effect reverses over the medium term (i.e., over 3 to 12 month horizons). Specifically, for firms which are less correlated with their home country's exchange rate, returns in the short run are between 11-14 basis points higher per month, yet those returns are between 97 to 99 basis points *lower* over the subsequent quarter, and 402 to 414 basis points lower over the subsequent year. In other words, high past currency sensitivity (of both the positive and negative variety) for firms corresponds with returns in excess of their size, sector, and book-to-market matched counterparts of about 4% per year.

More interestingly, a movement towards higher implied currency depreciation—as measured by movements in the forward rate—results in noticeably higher returns, at least over the medium term. What's more, the relationship is monotonic; firms in the highest quintile of currency sensitivity (i.e., those most likely to benefit from depreciation) have quarterly returns that are 2.99% higher than the lowest quintile of sensitivity, and the effect decreases to 2.16%, 1.61%, and 1.06% for each of the successively lower quintiles. As can be seen, the more the firm's stock returns have correlated positively with recent home currency depreciation, the more useful movement in currency forward rates can be in predicting their medium-term returns. The one exception is that stock returns in the year ahead do not appear to be impacted by information in forward rates. Because the main currency quintile effects are still significant over the annual horizon, some of this lack of significance may be due to differences in relative illiquidity of the 12-month forwards, or due to the fact that other risk premiums are more likely to be strongly imbedded in the longer maturities.

One final point worth mentioning is the effect that a firm's market beta has on the prediction of future stock returns. Table 2.7 shows that firms in the highest beta quintile outperform those in the lowest quintile by 505 basis points in the subsequent year, but that such firms also underperform in the nearer term subsequent month by 14 basis points. Controlling for currency sensitivity in Table 2.8, annual outperformance of the high beta stocks grows to 641 basis points, whereas the short-term performance diverges further to -35 basis points. Yet the interaction between beta quintiles and depreciating movement in the forward rate is monotonically decreasing in beta quintiles; this means that controlling for a firm's currency exposure, some beta outperformance gets wiped out if currency forward spreads indicate depreciation.

2.4.3 State Space Estimation of Forward Rate Term Structure Dynamics

The above results show that currency exposure can be a significant determinant in understanding the cross section of expected stock returns, and that currency forward rates are a channel by which to predict changes in those expected returns. However, currency forward rates are but one number at one point in time, with just one rate per each maturity. From that perspective, it may be possible to better characterize the *expected* price path of currency forward rates by combining information from the different maturities at once—i.e., by examining current behavior of the maturity structure—, as well as by estimating each currency's tendency to persist in patterns of volatility and level (i.e., by estimating its autoregressive processes).

The reasoning is as follows. Consider the way in which forward rates have so far been used: If forward rates this month have moved much higher in relation to rates last month, then we simply assume this suggests currency depreciation. While this heuristic appears to do a good job in explaining cross-sectional returns, it still ignores potential information in dependencies across maturities and time. Instead, we can leverage the idea that rates can be autoregressive, or that the dynamics in one maturity may take time to work their way into another maturity.

These predictions can be extracted from the historical behavior of past prices in the forward rate structure. The main idea is that forward rates remain broadly stationary over short periods, but are subject to periodic and auto-correlated shocks. Not only is each term rate subject to this behavior, but the term rates are also subject to inter-temporally correlated behavior among themselves, in an unobservable and possibly non-stationary way.

For example, relative to three-month currency forwards, twelve-month forwards may exhibit comparatively less correlation to one-month forwards (e.g., as a result of the Taylor rule). However, country-specific shocks may temporarily reverse this situation, leading to a relatively stronger correlation between the 9 and 1-month currency forwards (e.g., perhaps owing to

expectations of economic growth and/or changing aggregate risk aversion). In this way, model flexibility is needed in order to capture the temporal but auto-correlated dynamics that may occur among rate maturities. By doing so, a better conditional estimate can be made of the channel through which forward rates are an indication of future spot rates.

This is accomplished using a dynamic factor methodology. With this, one can estimate a single (or multiple) unobserved factor with a vector autoregressive structure, using information from a number of endogenous variables. In this case, for each currency, a forward rate factor, f_t, is estimated as a function of its past values up to some order p, along with factor-specific explanatory variables k_t, plus some amount of potentially auto-correlated disturbance v_t. The set of currency forward rates across maturities, y_t, are a function of this unobserved factor(s), along with any exogenous variables[13] x_t and residual disturbances, u_t. The disturbances in the main equations (1), u_t, are also modeled as being explicitly auto-correlated up to some order p, where $C_{i\ (i=t-1,\ldots,t-q)}$ are autocorrelation parameters for each i^{th} lag.

$$y_t = Pf_t + Qx_t + u_t \tag{6}$$

$$f_t = A_1 f_{t-1} + A_2 f_{t-2} + \cdots + A_{t-p} f_{t-p} + Rk_t + v_t \tag{7}$$

$$v_t = B_1 v_{t-1} + B_2 v_{t-2} + \cdots + B_{t-q} v_{t-q} + \omega_t \tag{8}$$

$$u_t = C_1 u_{t-1} + C_2 u_{t-2} + \cdots + C_{t-q} u_{t-q} + \epsilon_t \tag{9}$$

The model above is written in state-space form, with (1) being the estimating equation and (2) being the state equation. This allows maximum likelihood estimation to be used, with the use of the De Jong (1998, 1991) diffuse Kalman filter to calculate the log likelihood. The diffuse Kalman filter—as opposed to the Kalman filter—is used as it tends to be more robust to non-stationarity, as well as non-normality in the disturbances v, ω, and ϵ . Here, disturbances in both

[13] In this application, no exogenous parameters are specified in either the state or estimating equation, but are added add in during the panel regressions—specifically, the set of country-specific macroeconomic variables. This is not in itself necessary, but it does enable easier interpretation of those variables.

the state equation, v_t, and the estimating equation, u_t, are modeled[14] as auto-correlated of order 3. The autoregressive lag structures of the two disturbances are parameterized with a recursive (lower triangular) structure. The residuals in the estimating equation, u_t, are modeled to be White (1980) standard errors robust to heteroskedasticity.

Included in the y_t vector are the 1, 2, 3, 6, and 9 month maturity currency forward rates. Estimation is conducted separately for each country. Rates in y_t are the average daily rates for each maturity during month t. Once the model is estimated, a point-estimate prediction can be made for each of the maturities; all the information about the autoregressive nature of that particular forward rate and of the unobserved components in the term structure at time t is made to come up with an expectation about forward rate values at time $t + 1$. Using the notation in the state space model written above, this amounts to the fitted values for equation (6), or

$$\hat{y}_t = \hat{P} f_t + \hat{Q} x_t + \hat{u}_t \tag{10}$$

In which autocorrelation estimates in the residuals, $\hat{u}_t$, are included in the expectation as well.

Once estimated, the performance of this set of expected forward rates, $\hat{y}_t$, could be compared to a naïve expectations strategy using published forward rates alone. A simple way to do this is to include an indicator for a $\hat{y}_t$ implied depreciating currency, and interact this with the currency quintiles.

This is the same procedure as above, in which month-to-month movements in naïve forward rates were used as an expected value for depreciation. But by adding these forecasted depreciation proxies to the panel regressions above, we can see if either the forecasted rates or naïve rates subsume one another, or instead both rates present useful and incremental information in the estimation of expected stock returns.

[14] Increasing or decreasing the lag orders on either equation does not change the results to follow.

This is done in Table 2.9. The results of the estimation show that both naïve and forecasted currency depreciation lead to a monotonic increase in quarterly expected stock returns among depreciation sensitive stocks. In looking at the naïve rates, quarter ahead returns are 2.88% higher for those firms in the highest sensitivity quantile, compared to the lowest—an effect which is significant at the 1% level. Controlling for these naïve rate effects, forecasted rates show that returns are 1.49% higher for firms in the highest quintile in comparison to firms in the lowest. Thus, it does not appear that either naïve or forecasted currency depreciation subsume each other, but rather that the two are independently useful in their own right.

However, it should be noted that the margins for Table 2.9 (shown in Panel B) indicate that forecasted or naïve expected deprecation in a country's currency tends to be bad news for stock returns in the country through the following year. This fits in with prior research showing deprecation to be bad for stock returns in the short run, either owing to inflationary pressure (e.g., Kaul, 1987), the prevalence of foreign-currency denominated debt for domestic firms (Eichengreen and Hausman, 2005), or its indication of a slowing economy. On the other hand, currency depreciation might entice foreign capital flows into the domestic equity market, providing a fillip to local stock prices (Hau and Rey, 2005). Regardless, one of the main arguments in this paper is not whether currency forward depreciation forecasts market downturns (although, in examining Table 2.9-Panel B, it appears to do), but rather that firms which have historically done well when their local currency depreciates also tend to outperform when further depreciation is expected ahead.

This argument is supported in Panel B of Table 2.9. First, while there is no clear difference among quintiles in the first month after a forecasted depreciation, the outperformance between the 5^{th} and 1^{st} quintile grows to 2.72% over the first quarter, before settling to 1.68% over the entire year. Both differences are significant at the 1% level. Controlling for the effect of

forecasted depreciation, predicted returns using naïve rate movement indicators also show the same dynamic: in comparing the 5th currency quintile to the 1st, differences in month-ahead returns are statistically indistinguishable, whereas quarterly returns are 1.93% higher and annual returns are 0.5% higher.

Panel C of Table 2.9 makes these differences more precise. Here, currency quintile effects are contrasted with each other. These tests are monotonic, so that quintile 2 is compared to quintile 1, quintile 3 compared to quintile 2, and so on. Comparisons are separated into whether there is a forecasted depreciation, implied depreciation, neither, or both.[15] In all cases, the results here show that the strongest returns appear in the 1st and 5th quintile portfolios. Within that, however, quarterly and annual returns are uniquely high in the 5th quintile when *both* forecasted and implied forward rate indicators are moving in the same direction. This suggests that both naïve and forecasting methods together are complementary tools in the incremental prediction of returns for such depreciation sensitive firms.

[15] Of the firm-month observations which have a monthly implied depreciation spread, 53.5% % of these also have a factor implied spread in the same direction. The percentages for quarterly and annual implied spreads are 52.4% and 55.5%, respectively.

Table 2.9 Panel Regressions with Naive and Forecasted Forward Rates. (Panel A). This table displays the results of panel regressions of firm-returns on firm and macroeconomic characteristics. Firm returns and independent variables are size-value-industry adjusted (within month and country). Standard errors are clustered by firm. Interactions are included between currency quintiles and changes in actual and forecasted forward rate movements.

VARIABLES	Month	Quarter Ahead	Year Ahead
Beta Quintile 2	0.120**	0.244*	-1.240**
	(0.0551)	(0.137)	(0.495)
Beta Quintile 3	0.0583	0.245*	-0.576
	(0.0557)	(0.146)	(0.549)
Beta Quintile 4	-0.0102	0.192	-0.0990
	(0.0588)	(0.152)	(0.586)
Beta Quintile 5	-0.350***	0.271	6.367***
	(0.0632)	(0.171)	(0.722)
Currency Quintile 2	0.103	-1.050***	-4.223***
	(0.0633)	(0.145)	(0.479)
Currency Quintile 3	0.173***	-1.396***	-4.262***
	(0.0618)	(0.149)	(0.508)
Currency Quintile 4	0.173***	-1.749***	-4.224***
	(0.0626)	(0.153)	(0.528)
Currency Quintile 5	0.0970	-1.657***	0.425
	(0.0671)	(0.174)	(0.648)
Positive Δ in Fwd. Spread	-5.652	-21.55	-28.30
	(15.21)	(19.22)	(38.61)
(Beta Quintile 2)x(Positive Δ in Fwd. Spread)	0.0261	-0.319*	-0.649
	(0.0818)	(0.168)	(0.397)
(Beta Quintile 3)x(Positive Δ in Fwd. Spread)	0.113	-0.490***	-1.421***
	(0.0847)	(0.177)	(0.418)
(Beta Quintile 4)x(Positive Δ in Fwd. Spread)	0.202**	-0.750***	-1.164***
	(0.0883)	(0.185)	(0.439)
(Beta Quintile 5)x(Positive Δ in Fwd. Spread)	0.459***	-0.946***	-2.847***
	(0.0952)	(0.207)	(0.517)
(Currency Quintile 2)x(Positive Δ in Fwd. Spread)	-0.144*	1.026***	-0.0280
	(0.0811)	(0.151)	(0.381)
(Currency Quintile 3)x(Positive Δ in Fwd. Spread)	-0.127	1.541***	0.330
	(0.0809)	(0.154)	(0.379)
(Currency Quintile 4)x(Positive Δ in Fwd. Spread)	-0.122	2.087***	0.0458
	(0.0812)	(0.157)	(0.381)
(Currency Quintile 5)x(Positive Δ in Fwd. Spread)	-0.0864	2.881***	0.0719
	(0.0883)	(0.177)	(0.438)
Positive Δ in Forecasted Fwd. Spread	-0.421	-3.536***	-4.283*
	(0.514)	(0.967)	(2.586)
(Currency Quintile 2)x(Pos. Δ in Forecasted Fwd. Spread)	0.0258	0.183	0.327
	(0.0814)	(0.144)	(0.355)
(Currency Quintile 3)x(Pos. Δ in Forecasted Fwd. Spread)	-0.0730	0.611***	0.652*
	(0.0798)	(0.144)	(0.354)
(Currency Quintile 4)x(Pos. Δ in Forecasted Fwd. Spread)	-0.0726	0.795***	0.666*
	(0.0810)	(0.148)	(0.358)
(Currency Quintile 5)x(Pos. Δ in Forecasted Fwd. Spread)	0.0347	1.492***	1.179***
	(0.0875)	(0.165)	(0.410)
Real GDP Growth	0.0799***	0.341***	1.558***
	(0.0202)	(0.0617)	(0.248)
Industrial Production Growth	-0.00629	0.0567***	0.159***
	(0.0155)	(0.0200)	(0.0405)
Unemployment Growth	-0.0102***	-0.0314***	-0.210***
	(0.00324)	(0.00984)	(0.0362)
Broad Money Growth	0.0266	0.0669	0.102
	(0.0374)	(0.118)	(0.513)
CPI Growth	-0.808***	-2.640***	-9.545***
	(0.186)	(0.341)	(1.008)
Constant	3.176	13.55	26.25
	(6.988)	(8.928)	(18.22)
Observations	1,190,694	1,211,288	1,211,917
R-squared	0.434	0.479	0.495

Robust standard errors in parentheses

Table 2.9 Continued. Panel Regressions with Naive and Forecasted Forward Rates. Panel B. This table presents currency portfolio margins from Table 2.9, according to the presence of implied forward rate depreciation or forecasted forward rate depreciation.

Marginal Effects			
	Monthly	Quarterly	Annual
Currency Quintiles	0.64	2.66	14.33
	0.69	2.17	10.24
	0.72	2.27	10.52
	0.73	2.26	10.44
	0.72	3.04	15.34
Currency Quintiles x Pos. Δ in Fwd. Spread)	-2.33	-9.20	-1.60
	-2.36	-9.13	-5.70
	-2.31	-8.76	-5.22
	-2.31	-8.48	-5.46
	-2.30	-7.27	-0.55
Currency Quintiles x Positive Spread x Positive Forecast	-2.55	-11.06	-3.87
	-2.57	-10.90	-7.79
	-2.58	-10.30	-7.15
	-2.57	-9.92	-7.38
	-2.51	-8.34	-2.19

Table 2.9 Continued. Panel Regressions with Naive and Forecasted Forward Rates. Panel C. This table presents currency portfolio contrasts from Table 2.9, according to the presence of implied forward rate depreciation or forecasted forward rate depreciation.

Effect Contrasts: Currency Quintiles x Pos. Δ in Fwd. Spread (w/ beta interactions)								
Portfolio	Implied Forward		Monthly		Quarterly		Annual	
Contrast	Depreciation?	Forecasted Depreciation?	% Diff.	p-val.	% Diff.	p-val.	% Diff.	p-val.
(2 vs 1)	NO	NO	0.103	0.103	**-1.05**	0.000	**-4.22**	0.000
(2 vs 1)	NO	YES	0.129	0.073	**-0.87**	0.000	**-3.90**	0.000
(2 vs 1)	YES	NO	-0.041	0.565	-0.02	0.866	**-4.25**	0.000
(2 vs 1)	YES	YES	-0.015	0.826	0.16	0.281	**-3.92**	0.000
(3 vs 2)	NO	NO	0.070	0.212	-0.35	0.003	-0.04	0.902
(3 vs 2)	NO	YES	-0.029	0.660	0.08	0.500	0.29	0.346
(3 vs 2)	YES	NO	0.087	0.179	0.17	0.159	0.32	0.322
(3 vs 2)	YES	YES	-0.012	0.854	**0.60**	0.000	**0.64**	0.040
(4 vs 3)	NO	NO	-0.001	0.992	**-0.35**	0.003	0.04	0.901
(4 vs 3)	NO	YES	0.000	0.998	-0.17	0.161	0.05	0.861
(4 vs 3)	YES	NO	0.005	0.944	0.19	0.111	-0.25	0.429
(4 vs 3)	YES	YES	0.005	0.936	**0.38**	0.002	-0.23	0.454
(5 vs 4)	NO	NO	-0.076	0.225	0.09	0.530	**4.65**	0.000
(5 vs 4)	NO	YES	0.032	0.664	**0.79**	0.000	**5.16**	0.000
(5 vs 4)	YES	NO	-0.040	0.585	**0.89**	0.000	**4.68**	0.000
(5 vs 4)	YES	YES	0.067	0.349	**1.58**	0.000	**5.19**	0.000

2.5 Robustness

2.5.1 Developed vs. Developing Countries

One might consider that firms which are located in countries which are less economically diversified, or in countries which are more politically and economically uncertain overall, might be more prone to currency risk in general. If that is the case, then it is possible that any predictability found in the panel regressions above are being driven largely by such developing-economy firms.

To explore this possibility, I re-run the panel regressions above using only countries in the sample with the classification of "advanced economy", as defined by the International Monetary Fund[16]. These countries include most countries in the Euro Area[17], Japan, United Kingdom, Canada, South Korea, Australia, Taiwan, Sweden, Hong Kong, Switzerland, Singapore, Norway, Israel, Denmark, New Zealand, and Iceland. The results are presented in Tables 2.10 and 2.11. Table 2.10 involves panel regressions with naïve forward rate movements as the sole depreciation signal, whereas Table 2.11 incorporates forecast-derived rate movements as well. To make a comparison with previous results, Table 2.9 results showed that differences in quarterly returns between quintiles 5 and 1 weakened by about 12 basis points (out of a total effect size of 301 basis points). By contrast, in Table 2.10 here, the impact of forecasted forward depreciation in the 5th quintile falls by just 24 basis points (out of 149 basis points). Thus, any evidence that the results are being driven by small and developing countries appears economically negligible.

[16] http://www.imf.org/external/np/exr/key/advanced.htm
[17] The IMF added the Czech Republic, Estonia, Latvia, Slovakia, and Slovenia to this list in 2006. While I do not include these countries in the analysis in Table 10, including them does not change the results.

Table 2.10 Specification among Advanced Economies. This table repeats the panel regressions in Table 2.8, but only for the sample of countries that are defined by the IMF as advanced economies (including most countries in the Euro Area, Japan, United Kingdom, Canada, South Korea, Australia, Taiwan, Sweden, Hong Kong, Switzerland, Singapore, Norway, Israel, Denmark, New Zealand, and Iceland). The results shown are of panel regressions of firm-returns on firm and macroeconomic characteristics. Firm returns and independent variables are size-value-industry adjusted (within month and country). Standard errors are clustered by firm. Interactions are included between currency quintiles and an indicator for implied depreciation over the horizon of the firm-return (as measured by month-to-month growth in constant maturity forward currency spreads against the US dollar). Similar interactions with betas are included.

	Dependent Variable: Forward-period Stock Returns		
VARIABLES	Month Ahead	Quarter Ahead	Year Ahead
Beta Quintile 2	0.102*	0.00429	-1.785***
	(0.0569)	(0.140)	(0.505)
Beta Quintile 3	0.0664	0.0144	-1.170**
	(0.0576)	(0.149)	(0.561)
Beta Quintile 4	0.0437	-0.0813	-0.528
	(0.0606)	(0.156)	(0.599)
Beta Quintile 5	-0.266***	-0.0630	6.334***
	(0.0654)	(0.176)	(0.748)
Currency Quintile 2	0.115**	-1.064***	-4.951***
	(0.0560)	(0.130)	(0.450)
Currency Quintile 3	0.124**	-1.308***	-4.861***
	(0.0554)	(0.134)	(0.472)
Currency Quintile 4	0.136**	-1.570***	-4.765***
	(0.0556)	(0.136)	(0.492)
Currency Quintile 5	0.103*	-1.048***	0.512
	(0.0593)	(0.155)	(0.615)
Positive Δ in Fwd. Spread	-5.625	-21.54	-28.52
	(14.79)	(18.82)	(37.52)
(Beta Quintile 2)x(Positive Δ in Fwd. Spread)	0.0612	-0.00321	-0.420
	(0.0851)	(0.173)	(0.387)
(Beta Quintile 3)x(Positive Δ in Fwd. Spread)	0.134	-0.122	-0.989**
	(0.0889)	(0.182)	(0.402)
(Beta Quintile 4)x(Positive Δ in Fwd. Spread)	0.191**	-0.122	-0.193
	(0.0927)	(0.192)	(0.424)
(Beta Quintile 5)x(Positive Δ in Fwd. Spread)	0.436***	-0.0206	-1.152**
	(0.101)	(0.215)	(0.508)
(Currency Quintile 2)x(Positive Δ in Fwd. Spread)	-0.202**	0.915***	-0.0738
	(0.0847)	(0.159)	(0.396)
(Currency Quintile 3)x(Positive Δ in Fwd. Spread)	-0.164*	1.509***	0.291
	(0.0843)	(0.161)	(0.392)
(Currency Quintile 4)x(Positive Δ in Fwd. Spread)	-0.143*	2.045***	0.0408
	(0.0846)	(0.165)	(0.395)
(Currency Quintile 5)x(Positive Δ in Fwd. Spread)	-0.0936	2.906***	0.291
	(0.0920)	(0.187)	(0.459)
Real GDP Growth	0.0814***	0.350***	1.589***
	(0.0196)	(0.0600)	(0.241)
Industrial Production Growth	-0.00576	0.0593***	0.162***
	(0.0151)	(0.0195)	(0.0394)
Unemployment Growth	-0.0101***	-0.0310***	-0.211***
	(0.00315)	(0.00956)	(0.0352)
Broad Money Growth	0.0264	0.0722	0.0842
	(0.0364)	(0.115)	(0.501)
CPI Growth	-0.855***	-2.707***	-9.802***
	(0.178)	(0.333)	(0.979)
Constant	2.818	11.60	23.24
	(6.731)	(8.650)	(17.08)
Benchmark Portfolio Fixed Effects	YES	YES	YES
Observations	954,186	969,567	969,881
R-squared	0.381	0.430	0.447

Table 2.11 Inclusion of State Space Forecasts. This table repeats the analysis in Table 2.10 above, but includes interactions between currency quintiles and an implied country depreciation, as forecasted by a state-space model utilizing information in the term structure of the currency forward rates.

VARIABLES	Month	Quarter	Year Ahead
Beta Quintile 2	0.102*	0.00200	-1.869***
	(0.0569)	(0.140)	(0.510)
Beta Quintile 3	0.0665	0.0123	-1.253**
	(0.0576)	(0.149)	(0.565)
Beta Quintile 4	0.0437	-0.0835	-0.622
	(0.0606)	(0.156)	(0.604)
Beta Quintile 5	-0.266***	-0.0656	6.302***
	(0.0654)	(0.176)	(0.753)
Currency Quintile 2	0.0811	-1.059***	-5.043***
	(0.0665)	(0.150)	(0.495)
Currency Quintile 3	0.115*	-1.471***	-5.066***
	(0.0646)	(0.154)	(0.519)
Currency Quintile 4	0.146**	-1.841***	-5.106***
	(0.0657)	(0.158)	(0.539)
Currency Quintile 5	0.0574	-1.612***	0.181
	(0.0706)	(0.180)	(0.672)
Positive Δ in Forward Spread	-5.624	-21.60	-28.58
	(14.77)	(18.71)	(37.42)
(Beta Quintile 2)x(Positive Δ in Fwd. Spread)	0.0613	0.000336	-0.234
	(0.0851)	(0.173)	(0.386)
(Beta Quintile 3)x(Positive Δ in Fwd. Spread)	0.134	-0.119	-0.799**
	(0.0889)	(0.182)	(0.400)
(Beta Quintile 4)x(Positive Δ in Fwd. Spread)	0.191**	-0.119	0.0137
	(0.0927)	(0.191)	(0.423)
(Beta Quintile 5)x(Positive Δ in Fwd. Spread)	0.436***	-0.0166	-1.072**
	(0.101)	(0.215)	(0.501)
(Currency Quintile 2)x(Positive Δ in Fwd. Spread)	-0.211**	0.912***	-0.0709
	(0.0850)	(0.158)	(0.385)
(Currency Quintile 3)x(Positive Δ in Fwd. Spread)	-0.167*	1.486***	0.290
	(0.0850)	(0.160)	(0.379)
(Currency Quintile 4)x(Positive Δ in Fwd. Spread)	-0.140*	2.008***	0.0367
	(0.0851)	(0.164)	(0.381)
(Currency Quintile 5)x(Positive Δ in Fwd. Spread)	-0.106	2.840***	0.129
	(0.0924)	(0.185)	(0.442)
Positive Δ in Forecasted Forward Spread	-0.375	-2.548**	-3.602
	(0.607)	(1.100)	(3.017)
(Currency Quintile 2)x(Pos. Δ in Forecasted Fwd. Spread)	0.0807	-0.00733	0.190
	(0.0856)	(0.150)	(0.358)
(Currency Quintile 3)x(Pos. Δ in Forecasted Fwd. Spread)	0.0209	0.364**	0.432
	(0.0837)	(0.149)	(0.351)
(Currency Quintile 4)x(Pos. Δ in Forecasted Fwd. Spread)	-0.0252	0.605***	0.727**
	(0.0850)	(0.153)	(0.354)
(Currency Quintile 5)x(Pos. Δ in Forecasted Fwd. Spread)	0.109	1.245***	0.853**
	(0.0919)	(0.171)	(0.411)
Real GDP Growth	0.0816***	0.351***	1.591***
	(0.0196)	(0.0600)	(0.241)
Industrial Production Growth	-0.00586	0.0589***	0.162***
	(0.0151)	(0.0195)	(0.0394)
Unemployment Growth	-0.0101***	-0.0307***	-0.211***
	(0.00315)	(0.00956)	(0.0352)
Broad Money Growth	0.0264	0.0728	0.0841
	(0.0364)	(0.115)	(0.501)
CPI Growth	-0.855***	-2.707***	-9.797***
	(0.178)	(0.333)	(0.979)
Constant	2.992	12.84	25.10
	(6.713)	(8.609)	(17.29)
Benchmark Portfolio Fixed Effects	YES	YES	YES
Observations	954,186	969,567	969,881
R-squared	0.381	0.430	0.447

Robust standard errors in parentheses

2.5.2 Floating, Fixed-Floating, and Pegged Currencies

Another possibility is that currency risk for firms will differ across countries, due to the fact that countries have variegated—and often tacit—exchange rate policies. While currency effects shown in the tables thus far are *net* of monthly average market, country, and characteristic-adjusted effects, it still may be possible that certain countries with managed currencies disproportionately influence the average currency quintile effects.

I employ two tests to explore this idea further. The first test is to re-run the panel regressions above, but use only currencies which are generally considered to be fully-convertible and fully-free floating. This includes the Euro, Australian Dollar, Japanese Yen, Israeli Shekel, British Pound, Norwegian Kroner, Chilean Peso, and Swiss Franc.

As a minor point with respect to this approach, one might argue that the Swiss Franc had a ceiling placed on it during the majority of the period between 2009 and 2014, and thus probably should not be included. I include it because (1) it was fully free floating for the majority of the sample period and (2) it was not known beforehand to market participants as to when the ceiling would be lifted. Moreover, it might be argued that periodic quantitative easing programs for the Euro, Yen, and Pound would imply that these currencies were not floating currencies in the truest sense of the word. However, such programs were (like the program implemented in the US) implemented for domestic reasons, and not with the intent of managing currency value. Regardless, these currencies above are probably among those least subject to management or outright manipulation (IMF, 2012). Thus, in relative terms at least, this set of currencies should be the set in which fluctuations are most driven by supply and demand among non-governmental market participants.

As a second test, I include the free-floating currencies above in another set of panel regressions, but additionally incorporate the observations for firms in countries which the policy adopted for the currency is a "managed float". This excludes currencies that have pegged exchange rates, or pegged exchange rates with bands, but includes countries that periodically intervene in currency markets in order to curb exchange rate volatility. According to the IMF (2014), such currency management is relatively common (and more so recently): as of 2013, 43.5% of countries adopt some form of managed float. Using the IMF managed float classifications from 2012, this test therefore includes India, South Korea, Brazil, Thailand, Indonesia, Singapore, Denmark, and a number of other smaller countries.

The first test using the completely free-float sample is presented in Tables 2.12 and 2.13, with Table 2.12 testing for the usefulness of naïve forward rate movements in determining firms' stock predictability, and Table 2.13 further including forward rate forecast movements. Compared to the all-country results, using only fully free floating currencies strengthens the effect associated with changes in depreciation expectations. The 5th currency sensitivity quintile outperforms the 1st currency sensitivity quintile by 2.97% over the following quarter, which is a relative 1.48% increase over the full-sample results. Incorporating forecasts in forward rate movements results in an incremental return difference between the 5th and 1st quintiles of 1.98% over the next quarter, and 1.13% over the next year. Positive currency exposure, in other words, precipitates incrementally positive expected returns if proxies for the forward rate term structure are indicating depreciation. And while this effect largely seems to exist over the more short-to-medium horizon of one quarter ahead, the effect does persist at an annual frequency.

The second test, which further incorporates managed-float currencies, is presented in Tables 2.14 and 2.15. These show that the naïve forward rate effect is slightly stronger when allowing a broader definition of free-float. In particular, the quarterly difference between the 5th and 1st quintile when currency forwards suggest depreciation is 3.04% in Table 14 and 2.77% in Table 2.15. The quarterly and annual returns associated with a forecasted currency forward depreciation is a further 2.25% per quarter and 1.51% per year.

In all, the results suggest that focusing the analysis on both narrow and wide definitions of floating currencies does not change the result that forward rate movements and their forecasts are useful for predicting firm stock returns over the subsequent quarter and year. Given that a more relaxed definition of a free-floating currency actually strengthens the relationship, the results suggest that the explanatory power of forward rate movements in determining the cross-section of returns is a robust and widespread phenomenon.

Table 2.12 Specification among Fully Free-Floating Currencies. This table repeats the panel regressions in Table 2.8, but only for the sample of countries for which currencies are completely free floating over the full sample period. This includes the Euro, Australian Dollar, Japanese Yen, Israeli Sheckel, British Pound, Norwegian Krone, Swiss Franc, and the Chilean Peso. The results shown are of panel regressions of firm-returns on firm and macroeconomic characteristics. Firm returns and independent variables are size-value-industry adjusted (within month and country). Standard errors are clustered by firm. Interactions are included between currency quintiles and an indicator for implied depreciation over the horizon of the firm-return (as measured by month-to-month growth in constant maturity forward currency spreads against the US dollar). Similar interactions with betas are included.

	Dependent Variable: Forward-period Stock Returns		
VARIABLES	Month Ahead	Quarter Ahead	Year Ahead
Beta Quintile 2	0.0974	-0.201	-1.293**
	(0.0625)	(0.151)	(0.538)
Beta Quintile 3	0.135**	-0.108	-0.500
	(0.0639)	(0.162)	(0.597)
Beta Quintile 4	0.157**	-0.285*	-0.160
	(0.0677)	(0.172)	(0.646)
Beta Quintile 5	-0.114	-0.279	6.021***
	(0.0732)	(0.196)	(0.821)
Currency Quintile 2	0.136**	-0.967***	-3.441***
	(0.0629)	(0.143)	(0.486)
Currency Quintile 3	0.111*	-1.097***	-3.005***
	(0.0619)	(0.147)	(0.507)
Currency Quintile 4	0.131**	-1.332***	-3.165***
	(0.0620)	(0.150)	(0.530)
Currency Quintile 5	0.0831	-0.990***	0.804
	(0.0663)	(0.171)	(0.671)
Positive Δ in Forward Spread	-5.531	-21.66	-28.18
	(14.67)	(18.67)	(37.15)
(Beta Quintile 2)x(Pos. Δ in Fwd. Spread)	-0.00799	0.400**	-0.513
	(0.0940)	(0.188)	(0.416)
(Beta Quintile 3)x(Pos. Δ in Fwd. Spread)	0.0106	0.460**	-0.758*
	(0.0989)	(0.198)	(0.433)
(Beta Quintile 4)x(Pos. Δ in Fwd. Spread)	0.0106	0.874***	0.511
	(0.104)	(0.208)	(0.461)
(Beta Quintile 5)x(Pos. Δ in Fwd. Spread)	0.229**	1.140***	0.224
	(0.113)	(0.238)	(0.562)
(Currency Quintile 2)x(Pos. Δ in Fwd. Spread)	-0.247***	0.924***	-0.427
	(0.0945)	(0.175)	(0.434)
(Currency Quintile 3)x(Pos. Δ in Fwd. Spread)	-0.215**	1.444***	-0.172
	(0.0940)	(0.177)	(0.426)
(Currency Quintile 4)x(Pos. Δ in Fwd. Spread)	-0.162*	1.933***	-0.387
	(0.0940)	(0.182)	(0.433)
(Currency Quintile 5)x(Pos. Δ in Fwd. Spread)	-0.0401	2.967***	0.448
	(0.103)	(0.206)	(0.505)
Real GDP Growth	0.0828***	0.357***	1.602***
	(0.0196)	(0.0598)	(0.239)
Industrial Production Growth	-0.00108	0.0589***	0.167***
	(0.0146)	(0.0200)	(0.0401)
Unemployment Growth	-0.0102***	-0.0306***	-0.208***
	(0.00313)	(0.00950)	(0.0349)
Broad Money Growth	0.0351	0.0863	0.189
	(0.0378)	(0.120)	(0.530)
CPI Growth	-0.813***	-2.723***	-9.861***
	(0.177)	(0.335)	(0.983)
Constant	2.683	11.15	20.23
	(6.756)	(8.606)	(17.07)
Benchmark Portfolio Fixed Effects	YES	YES	YES
Observations	726,231	737,194	737,408
R-squared	0.340	0.392	0.416

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.13 Fully Free-Floating Currencies with Forward Rate Forecasts Included. This table repeats the analysis in Table 2.12 above, but includes interactions between currency quintiles and an indicator for implied country depreciation, as forecasted by the state-space model discussed in Section IV.

VARIABLES	Month	Quarter	Year Ahead
Beta Quintile 2	0.0971	-0.204	-1.404***
	(0.0625)	(0.151)	(0.543)
Beta Quintile 3	0.135**	-0.110	-0.600
	(0.0639)	(0.162)	(0.603)
Beta Quintile 4	0.157**	-0.287*	-0.244
	(0.0677)	(0.171)	(0.653)
Beta Quintile 5	-0.114	-0.281	6.027***
	(0.0732)	(0.196)	(0.828)
Currency Quintile 2	0.0988	-1.077***	-3.395***
	(0.0759)	(0.166)	(0.536)
Currency Quintile 3	0.0688	-1.427***	-3.125***
	(0.0732)	(0.171)	(0.562)
Currency Quintile 4	0.115	-1.880***	-3.498***
	(0.0739)	(0.176)	(0.585)
Currency Quintile 5	0.0199	-1.860***	0.307
	(0.0801)	(0.199)	(0.736)
Positive Δ in Forward Spread	-5.530	-21.67	-28.35
	(14.66)	(18.47)	(37.01)
(Beta Quintile 2)x(Pos. Δ in Fwd. Spread)	-0.00773	0.403**	-0.268
	(0.0940)	(0.188)	(0.415)
(Beta Quintile 3)x(Pos. Δ in Fwd. Spread)	0.0104	0.461**	-0.536
	(0.0989)	(0.198)	(0.431)
(Beta Quintile 4)x(Pos. Δ in Fwd. Spread)	0.0106	0.875***	0.687
	(0.104)	(0.208)	(0.459)
(Beta Quintile 5)x(Pos. Δ in Fwd. Spread)	0.229**	1.143***	0.206
	(0.113)	(0.238)	(0.553)
(Currency Quintile 2)x(Pos. Δ in Fwd. Spread)	-0.255***	0.899***	-0.350
	(0.0946)	(0.172)	(0.425)
(Currency Quintile 3)x(Pos. Δ in Fwd. Spread)	-0.224**	1.375***	-0.0703
	(0.0945)	(0.174)	(0.416)
(Currency Quintile 4)x(Pos. Δ in Fwd. Spread)	-0.165*	1.821***	-0.328
	(0.0944)	(0.179)	(0.420)
(Currency Quintile 5)x(Pos. Δ in Fwd. Spread)	-0.0527	2.797***	0.357
	(0.103)	(0.202)	(0.489)
Positive Δ in Forecasted Forward Spread	-0.869	-2.920**	-6.108*
	(0.680)	(1.226)	(3.430)
(Currency Quintile 2)x(Pos. Δ in Forecasted Fwd. Spread)	0.0868	0.254	-0.171
	(0.0955)	(0.162)	(0.384)
(Currency Quintile 3)x(Pos. Δ in Forecasted Fwd. Spread)	0.0985	0.757***	0.155
	(0.0931)	(0.160)	(0.380)
(Currency Quintile 4)x(Pos. Δ in Forecasted Fwd. Spread)	0.0363	1.259***	0.648*
	(0.0945)	(0.164)	(0.382)
(Currency Quintile 5)x(Pos. Δ in Forecasted Fwd. Spread)	0.146	1.989***	1.125**
	(0.103)	(0.182)	(0.451)
Real GDP Growth	0.0832***	0.359***	1.605***
	(0.0196)	(0.0598)	(0.239)
Industrial Production Growth	-0.00123	0.0587***	0.166***
	(0.0146)	(0.0200)	(0.0401)
Unemployment Growth	-0.0102***	-0.0301***	-0.207***
	(0.00312)	(0.00949)	(0.0349)
Broad Money Growth	0.0351	0.0872	0.189
	(0.0378)	(0.120)	(0.530)
CPI Growth	-0.812***	-2.728***	-9.850***
	(0.177)	(0.334)	(0.982)
Constant	3.092	12.54	23.33
	(6.741)	(8.526)	(17.26)
Benchmark Portfolio Fixed Effects	YES	YES	YES
Observations	726,231	737,194	737,408
R-squared	0.340	0.393	0.416

Table 2.14 Specification among Managed Float Currencies. This table repeats the panel regressions in Table 2.8, but only for the sample of countries for which currencies are either completely free floating over the full sample period (as in Table 2.12), or additionally are known to have a managed float. The results shown are of panel regressions of firm-returns on firm and macroeconomic characteristics. Firm returns and independent variables are size-value-industry adjusted (within month and country). Standard errors are clustered by firm. Interactions are included between currency quintiles and an indicator for implied depreciation over the horizon of the firm-return (as measured by month-to-month growth in constant maturity forward currency spreads against the US dollar). Similar interactions with betas are included.

	Dependent Variable: Forward-period Stock Returns		
VARIABLES	Month Ahead	Quarter Ahead	Year Ahead
Beta Quintile 2	0.150**	0.153	-1.250**
	(0.0589)	(0.145)	(0.530)
Beta Quintile 3	0.127**	0.195	-0.444
	(0.0599)	(0.155)	(0.587)
Beta Quintile 4	0.0773	0.132	0.212
	(0.0636)	(0.163)	(0.628)
Beta Quintile 5	-0.278***	0.225	6.619***
	(0.0685)	(0.184)	(0.778)
Currency Quintile 2	0.131**	-0.907***	-3.799***
	(0.0582)	(0.133)	(0.469)
Currency Quintile 3	0.156***	-1.001***	-3.499***
	(0.0573)	(0.138)	(0.494)
Currency Quintile 4	0.155***	-1.284***	-3.573***
	(0.0573)	(0.140)	(0.515)
Currency Quintile 5	0.0937	-0.956***	0.803
	(0.0613)	(0.160)	(0.638)
Positive Δ in Forward Spread	-5.572	-21.56	-28.51
	(15.18)	(19.25)	(38.41)
(Beta Quintile 2)x(Pos. Δ in Fwd. Spread)	-0.0480	-0.121	-0.726*
	(0.0874)	(0.178)	(0.427)
(Beta Quintile 3)x(Pos. Δ in Fwd. Spread)	0.0228	-0.174	-1.338***
	(0.0911)	(0.189)	(0.452)
(Beta Quintile 4)x(Pos. Δ in Fwd. Spread)	0.0985	-0.216	-1.006**
	(0.0954)	(0.196)	(0.474)
(Beta Quintile 5)x(Pos. Δ in Fwd. Spread)	0.402***	-0.359	-2.539***
	(0.103)	(0.221)	(0.566)
(Currency Quintile 2)x(Pos. Δ in Fwd. Spread)	-0.179**	1.024***	0.220
	(0.0867)	(0.162)	(0.422)
(Currency Quintile 3)x(Pos. Δ in Fwd. Spread)	-0.175**	1.554***	0.600
	(0.0860)	(0.167)	(0.425)
(Currency Quintile 4)x(Pos. Δ in Fwd. Spread)	-0.176**	2.099***	0.349
	(0.0863)	(0.171)	(0.429)
(Currency Quintile 5)x(Pos. Δ in Fwd. Spread)	-0.0559	3.038***	0.725
	(0.0941)	(0.192)	(0.493)
Real GDP Growth	0.0817***	0.349***	1.591***
	(0.0203)	(0.0618)	(0.247)
Industrial Production Growth	6.86e-05	0.0550***	0.159***
	(0.0151)	(0.0206)	(0.0414)
Unemployment. Growth	-0.0102***	-0.0313***	-0.207***
	(0.00324)	(0.00983)	(0.0361)
Broad Money Growth	0.0299	0.0667	0.161
	(0.0391)	(0.124)	(0.541)
CPI Growth	-0.765***	-2.629***	-9.493***
	(0.185)	(0.343)	(1.013)
Constant	2.914	11.75	23.56
	(7.013)	(8.942)	(18.13)
Benchmark Portfolio Fixed Effects	YES	YES	YES
Observations	1,017,144	1,034,227	1,034,773
R-squared	0.416	0.462	0.483

Table 2.15 Inclusion of Forward Rate Forecasts Among Managed Float Sample. This table repeats the analysis in Table 2.14 above, but includes interactions between currency quintiles and an indicator for implied country depreciation, as forecasted by the state-space model discussed in Section IV.

VARIABLES	Month	Quarter	Year Ahead
Beta Quintile 2	0.149**	0.151	-1.335**
	(0.0589)	(0.145)	(0.532)
Beta Quintile 3	0.127**	0.193	-0.517
	(0.0599)	(0.155)	(0.590)
Beta Quintile 4	0.0773	0.131	0.149
	(0.0636)	(0.163)	(0.632)
Beta Quintile 5	-0.278***	0.224	6.569***
	(0.0685)	(0.184)	(0.781)
Currency Quintile 2	0.121*	-1.136***	-3.889***
	(0.0692)	(0.155)	(0.518)
Currency Quintile 3	0.178***	-1.452***	-3.763***
	(0.0672)	(0.160)	(0.549)
Currency Quintile 4	0.174**	-1.868***	-3.781***
	(0.0677)	(0.165)	(0.571)
Currency Quintile 5	0.0640	-1.902***	0.266
	(0.0729)	(0.187)	(0.701)
Positive Δ in Forward Spread	-5.575	-21.51	-28.41
	(15.16)	(19.08)	(38.37)
(Beta Quintile 2)x(Pos. Δ in Fwd. Spread)	-0.0479	-0.118	-0.542
	(0.0875)	(0.178)	(0.424)
(Beta Quintile 3)x(Pos. Δ in Fwd. Spread)	0.0228	-0.173	-1.178***
	(0.0911)	(0.189)	(0.449)
(Beta Quintile 4)x(Pos. Δ in Fwd. Spread)	0.0986	-0.217	-0.868*
	(0.0954)	(0.196)	(0.473)
(Beta Quintile 5)x(Pos. Δ in Fwd. Spread)	0.402***	-0.359	-2.421***
	(0.103)	(0.221)	(0.559)
(Currency Quintile 2)x(Pos. Δ in Fwd. Spread)	-0.182**	0.955***	0.0587
	(0.0870)	(0.160)	(0.410)
(Currency Quintile 3)x(Pos. Δ in Fwd. Spread)	-0.168*	1.424***	0.431
	(0.0867)	(0.163)	(0.410)
(Currency Quintile 4)x(Pos. Δ in Fwd. Spread)	-0.171**	1.932***	0.124
	(0.0869)	(0.166)	(0.413)
(Currency Quintile 5)x(Pos. Δ in Fwd. Spread)	-0.0641	2.777***	0.330
	(0.0946)	(0.187)	(0.473)
Positive Δ in Forecasted Forward Spread	-0.471	-3.749***	-4.806*
	(0.535)	(1.008)	(2.719)
(Currency Quintile 2)x(Pos. Δ in Forecasted Fwd. Spread)	0.0258	0.548***	0.342
	(0.0876)	(0.151)	(0.376)
(Currency Quintile 3)x(Pos. Δ in Forecasted Fwd. Spread)	-0.0530	1.077***	0.717*
	(0.0859)	(0.151)	(0.379)
(Currency Quintile 4)x(Pos. Δ in Forecasted Fwd. Spread)	-0.0471	1.394***	0.658*
	(0.0868)	(0.153)	(0.384)
(Currency Quintile 5)x(Pos. Δ in Forecasted Fwd. Spread)	0.0713	2.252***	1.513***
	(0.0941)	(0.171)	(0.439)
Real GDP Growth	0.0819***	0.352***	1.594***
	(0.0202)	(0.0618)	(0.247)
Industrial Production Growth	-6.11e-05	0.0546***	0.157***
	(0.0151)	(0.0206)	(0.0414)
Unemployment Growth	-0.0102***	-0.0308***	-0.207***
	(0.00323)	(0.00983)	(0.0361)
Broad Money Growth	0.0298	0.0671	0.161
	(0.0391)	(0.124)	(0.541)
CPI Growth	-0.764***	-2.635***	-9.491***
	(0.184)	(0.342)	(1.013)
Constant	3.135	13.50	25.84
	(6.998)	(8.871)	(18.26)
Benchmark Portfolio Fixed Effects	YES	YES	YES
Observations	1,017,144	1,034,227	1,034,773
R-squared	0.416	0.462	0.483

Robust standard errors in parentheses

2.6 Conclusion

This study empirically examines the risk-return tradeoff associated with differential firm currency exposure. The presence of short-term currency risk, which is measured by a firm's short-term and recent exposure to daily movements in its home currency, leads to higher medium to long term expected returns on average. This premium that is associated with exposure to currency fluctuations remains, even after controlling for a firm's local market exposure, its fundamentals such as size and book-to-market, and variation across industry and time.

Moreover, this paper has shown how currency forward rate information can be used to further understand expected returns for these firms. In general, movements in forward rate prices for a particular maturity can be used to predict returns for these firms over the realized horizon of that maturity, but especially so over a quarterly horizon.. This predictability is robust to ongoing changes in a country's macroeconomic environment, such as its real activity, changes in unemployment, or consumer price growth.

I argue that this predictability can be strengthened, by incorporating a model specification for the transitory processes inherent in a country's forward rates. By parameterizing autoregressive and latent processes inherent in the term structure of a country's currency forward rate, a predicted value for a currency's forward rate of a certain maturity can also be used to predict stock prices for that duration. Neither this form of predictability, nor the "naïve" rate expectations method discussed above subsumes each other when including them in panel regressions with various other controls. This suggests that the two methods for understanding future currency risk premiums are complementary.

The link between currency exposure and forward rate movements demonstrated here should also stimulate further theoretical and empirical research regarding how term-structure and exchange rate dynamics can be informative for cross-sectional prediction of stock returns. Thus far, there are few studies that use currency term structure dynamics (or other term structure dynamics) to explain future stock returns at the firm or characteristic-portfolio level. Here, this effect is demonstrated at the firm level: not only do certain firms seem to require a premium for bearing exposure to currency risk, but also using market forward expectations as an ex-ante proxy for future risk is a reliable signal for future risk compensation. This itself is a useful extension for studies that identify risk factors or anomalies in an ex-post manner.

3. CURRENCY FACTOR RISK AND THE ROLE OF FIRM FINANCIAL CHARACTERISTICS

3.1 Introduction

These findings in the section above have demonstrated predictability in global stock returns as a result of currency sensitivity. Firms that are most currency exposed tend to exhibit higher stock returns over the mid-horizon (a finding accentuated when utilizing the forward rate term structure), and this predictability is robust to the controlling of various characteristics of the firm as well as the macro-environment in which it operates.

However, interesting questions remain. For one, are there firm fundamentals that carry particular importance in explaining currency exposure? Thus far, we have used certain rough proxies (e.g., quintiles, country macroeconomic dynamics) of a limited set of fundamentals (size, book-to-market), but only insofar as they were assumed to be orthogonal to currency risk; we used them as control variables. While this showed currency risk to be a feature that extends beyond the common categories of risk pertaining to size, value, economy, and so on, it leaves unanswered the possibility that currency risk is concentrated within some of these features.

This raises a further point. If we can condition on such fundamentals, can predictability be improved? If, for example, currency risk is concentrated in certain size quintiles or industry sectors, the compensation for bearing risk within those market segments may be the same, or may instead be even higher. Again, since up to this point we have averaged out the effect of these variables in our measurement of currency risk—we have controlled for them—we have not yet addressed that question.

This raises the final question. If compensation varies according to firm characteristics, this necessitates the question of whether currency exposure is truly systematic. That is, can currency exposure explain the cross-section of stock returns worldwide, in just the same manner as market, size, momentum, or value?

In this analysis, I find that currency exposure, when constructed to represent a broad and systematic risk factor, is a difficult to element to capture. At best, currency exposure explains the cross-section of stock returns for only certain regions and countries—in particular, regions and countries for which economic development is relatively less advanced. At the same time, in studying currency exposure, I also find that certain firm characteristics carry explanatory power that transcends national and regional boundaries. In high exposure states, these characteristics still exhibit significant impacts on pricing.

In this research, I employ a number of specifications designed to test the robustness of my results. Not only do I examine the differences in risk-pricing as a result of country specific versus regional specifications, but I also examine differences attributable to sub-sample effects, by focusing on macroeconomic periods during which currency effects might be expected to be a more salient feature of equity valuation. I also consider the impact that granularity has on the results, by examining pricing effects among 5, as well as 25, portfolios. As well, I test how adjusting for contemporaneous currency movements among countries affects the expected returns attributable to currency exposure. And, I consider alternative construction of the factor mimicking portfolios, in order to understand the degree to which these portfolios adequately span the cross-section of firms.

Regardless of these alternative specifications, the broad takeaway remains the same. Currency risk matters, but not for the broad the set of global firms overall. Instead, regional and

country specific differences account for much of the variation, but firm-specific characteristics—in particular proxies for distress—play an even greater role.

3.1.2 A Follow-up to Kolari, Moorman, and Sorescu (2008)

The finding that currency risk may play an important role in pricing is consistent with the results found in an analysis of firms in the United States by Kolari, Moorman, and Sorescu (2008). In particular, findings in Kolari et al. (2008) show that for portfolios of U.S. firms, those that were most strongly correlated at the monthly frequency with movements in the dollar (against a weighted basket of foreign currencies) actually tended to have negative expected returns. In particular, Kolari et al. (2008) found that returns over the following year for portfolios of firms, grouped according to their resulting exchange rate sensitivity, were shown to be on average negative, if such firms were in the most sensitive tail ends of currency sensitivity.

The Kolari et al. (2008) was not a paper focusing on just predictability, per se. Instead, the focus was on whether or not exchange rate sensitivity could be classified as a risk factor. Thus, the paper employed many of the commonly used statistical methodologies to test for systematic sources of risk. To that end, one of the aims in the section of the dissertation here is to also understand currency effects on equity prices from a risk factor perspective, in the spirit of their paper. The accomplishment in this regard, however, is to extend the hypotheses and empirical procedures of Kolari et al. (2008) to a global perspective.

In addition to attempting to identify currency—and specifically *dollar*—factor risk among global stock returns, an additional aim of this study is to identify and better understand the fundamental sources for firms that drive both their currency exposure and, conditional on that currency exposure, subsequent expected returns. This idea too derives as its source the evidence in Kolari et al. (2008), as well as Wei and Starks (2013), which both suggest that firm-specific proxies for financial distress can serve as an explanatory source for exchange rate

exposure. The intuition for such an argument is that as a firm becomes more financially vulnerable in general, its financial results become more susceptible to swings (adverse *or* otherwise) in its operating currency.

3.2 Data, Sample Construction, and Theory

3.2.1 Data and Sample Construction

The main sources of data used in this section are the same as that in Section 2. That is, I use the Compustat Global daily equity database to identify all non-US firms listed on exchanges worldwide, during the approximately fourteen year period from January 1, 2000 through October 31, 2014. As in Section 2, currency and market betas are obtained simultaneously by regressing daily closing stock returns for a firm on a currency-specific value-weighted market return and the daily (end of day) local currency return versus the US dollar over a 252 trading day rolling window. The resulting daily betas are averaged over each month to produce firm betas at a monthly frequency. Firm specific fundamentals are obtained from the standardized and historical annual accounting statements provided by Compustat Global. Monthly exchange rate information is also from Compustat Global, and daily exchange rates are from Datastream.[18]

As a consequence of studying a broad cross-section of international firms, a few differences in methodology and sample construction are necessary, when compared to previous papers studying U.S. based currency risk, such as Kolari et al. (2008). One of the major differences is that the study here takes *dollar-centric* approach to currency risk worldwide. In part, this is to make sure that currency effects measured across countries and regions are statistically comparable. But it is also economically motivated by the finding in Lustig,

[18] As before, I use the Datastream provided World Market PLC/Reuters quotes, as advocated by Hassan and Mano (2014).

Roussanov, Verdelhan (2011) that a common stochastic discount can be identified among currencies worldwide, and that this common component is attributable to movement in the U.S. dollar. If currency risk is globally systematic, therefore, it should be most systematically identifiable when measuring that risk as movement in local currency versus U.S. dollar.

In addition, currency sensitivity in the research presented here has, thus far, been measured at the daily frequency over a shorter (i.e., 252 trading day) window, whereas previous studies have used stock return and currency observations measured at the monthly frequency. Some of the motivation for using monthly data in previous studies has stemmed from prior restrictions on data availability on daily global equity prices. As well, for studies involving U.S. stock returns, a richer time depth is available at the monthly frequency, in comparison to the relatively nascent timeline available for global equities. Such time-series breadth makes it easier to precisely measure currency effects amid lower frequency data. However, the limited public life of many international firms—especially in developing countries—as well the more limited time depth overall, necessitates market and currency beta estimation at the daily frequency here.

3.2.2 The Argument for Heightened Dollar Risk among Non-US Firms

As well as more statistical issues, economically fundamental considerations also may necessitate some degree of modification in the methodological approaches compared to Non-U.S. versus U.S. based studies. In particular, this is because currency risk may simply be a more salient feature for equities not denominated in U.S. dollars. As a simple example, U.S. dollar denominated firms can utilize home country denominated debt to a greater degree, thereby facilitating a closer match between cash flow and liability volatilities.[19] In addition, the inputs and outputs of many of the materials used by foreign firms—commodities—are often priced in

[19] For empirical examples, see (among others) Allayannis, Ihrig, and Weston (2001), or Kedia and Mozumdar (2003). For a theoretical justification, see Aghion, Bacchetta, and Banerjee (2004).

dollars, which can create additional layers of cost and risk as a result of the need to hedge not only commodity price movements, but also exchange rate movements (Devereux, Shi, Xu, 2010).

Separately, it is also possible that in the last one or two decades over which this study was conducted, the increased flow of trade and financial liquidity across countries makes the matter of currency fluctuation a more important business consideration for firms, and thus for investors as well. Increased capital flow in recent decades into liquid assets across countries may have occurred as a result of securitization (Lane and Milesi-Ferreti, 2008) or financial sector depth (Kose, Prasad, Rogoff, Wei, 2009), increased liberalization of asset tradability—and in emerging markets in particular (Bekaert and Campbell, 2000), or simply increased physical trade.

More generally, it has been previously documented that asset markets across countries have exhibited a number of secular trends over recent decades (Goetzmann, Lingfeng, and Rouwenhorst, 2005; Longin and Solnik, 1995), and even the last century (Quinn and Voth, 2008). Whereas in some decades, equity market correlations between distant countries have been empirically observed to be low (Grubel, 1968; Levy and Sarnat, 1970), recent decades have been shown to exhibit higher correlation (Pukthuanthong and Roll, 2009; Bekaert, Hodrick, Zhang, 2009).

In sum, there is an a priori justification for why currency risk should be observable among firms internationally. Because of the peculiarities of the dollar, in terms of its relative liquidity and pricing power in international commodity markets, firms denominated in other currencies are likely to encounter certain problems that firms in the U.S. face to a lesser degree. Moreover, due to the increase in both product and financial market globalization over recent

decades, any analyses which focuses on a more recent period is likely to find currency exposure to be more statistically relevant.

3.3 Empirical Methodology

3.3.1 Overview

To reiterate, the aim of this study is two-fold. The first aim is to apply (to the extent possible) the methodological techniques used in Kolari, Sorescu, and Moorman (2008) to the global case, and examine currency risk within this empirical context. The second aim is to understand, from a more fundamental perspective, what the firm specific drivers of currency-risk are. As Wei and Starks (2013) and others have pointed out, firms that are more likely to be impacted adversely by currency movements are those firms that are already in financial distress. Thus, one would expect firms with high leverage or poor past earnings, for example, to exhibit a higher market sensitivity to exchange rate fluctuation. It remains an unresolved question, however, as to what degree investors require additional compensation for owning such firms. And, separate from firm cross-sectional fundamentals, it remains to be studied as to whether certain regions as a whole—or even specific countries—exhibit higher levels of currency exposure and an associated risk premium.

To that end, I begin the analysis with a series of portfolio sorts and time-series factor construction and regression, using the techniques first proposed by Fama and French (1992). This entails regressing portfolios of returns on a set of factor mimicking portfolios, constructed for my sample in the same manner as Fama and French (2012) in their study of size and value risk factors within an international setting. I construct a currency risk factor as well, which is composed of the returns of currency-sensitive firms, against that of the returns of currency-insensitive firms. This risk factor is similar to that constructed by Kolari et al. (2008), albeit with

modifications as a result of the sample here being composed of international firms. I then consider the robustness of this analysis with respect to both the granularity of portfolios used (i.e., 5 or 25 currency-sorted portfolios), as well as the degree of portfolio aggregation (i.e., whether to conduct the analysis at the country level or the regional level).

I follow these time series regressions with a series of Fama-Macbeth (1973) regressions. These regressions aim to identify whether cross-sectional firm proxies for financial risk are the primary drivers in explaining currency variation. As well, the approach aims to identify whether, *conditional* on a firm's measure of currency sensitivity, differences in these proxies drive differences in firm expected returns.

I conclude this section with additional robustness tests. The first test experiments with the effect that contemporaneous currency adjustment has on the time-series regressions within any particular region, as well as the effect that alternative specifications for factor construction may have in determining factor premia and portfolio alpha. Further tests follow, which test for differences in factor risk premia and fundamental currency drivers post-2010 versus before.

3.3.2 Time-Series Regressions of Risk Factor Exposure and Potential Mispricing

To test whether currency sensitivity-formed portfolios exhibit returns in excess of common factor risk, I conduct a series of factor regressions in the manner of Fama and French (1992). To do so, I must construct size, book-to-market, and momentum factors. These factors may be country specific, or instead aggregated by region. I discuss the merits and disadvantages of both approaches in turn, but first begin with a description of their exact construction.

First, within-country firm rankings are constructed from firm-specific characteristics. The cutoffs for characteristic classification among these rankings are largely done as in Fama and French (2012). Specifically, a stock is considered small if it is in the bottom 10% of market capitalization in June, and large if it is in the top 90%. A stock is considered a value stock if it is

in the 70th percentile or above in terms of its book-to-market at the end of June, and is considered a growth stock if at the 30th percentile or below.

These cutoffs are used for both the country-level and regional-level factor construction. Country specific factors, however, are constructed from the within-country intersection of these portfolios. For regional factors, the portfolios constructed from the underlying ranking cutoffs are pooled across the region, even though the rankings are country specific.

Using these cutoffs, construction of the SMB factor is then the equal-weighted average of the returns on the small-growth, small-neutral, and small-value portfolios, subtracted from its equal-weighted large counterpart:

$$SMB = \frac{(Small\ Growth\ +\ Small\ Neutral\ +\ Small\ Value)}{3} - \frac{(Large\ Growth\ +\ Large\ Neutral\ +\ Large\ Value)}{3}$$

Again, in the country-specific specification, SMB is assembled from portfolios using only the firms based in that country. Yet when estimating by region, the set of firms is increased to include all firms in that region. For example, the regional "Small Growth" portfolio is constructed from all firms within that region, but the definition of whether a firm is "Small" and/or "Growth" is determined relative to within each country. This approach limits any single country from being overemphasized on a particular portfolio.

HML is constructed in a manner similar to SMB. It is the equal-weighted average of the small-value and large-value portfolios less the equal-weighted average of the small growth and large growth portfolios:

$$HML\ =\ \frac{(Small\ Value\ +\ Large\ Value)}{2} - \frac{(Small\ Growth\ +\ Large\ Growth)}{2}$$

A momentum portfolio for each country is also calculated, and is also in line with Fama and French (2012). Here, recent past performance for each firm is measured over the prior $t - 12$ through $t - 2$ months. A large positive momentum portfolio is constructed by taking the equal weighted average return of the 70th percentile of momentum-ranked firms and above, but

only for the top 90th percentile of market capitalization firms for the country/region. A small positive momentum portfolio is constructed likewise. The equal weighted average return of these two portfolios is taken, and a similarly constructed portfolio of negative momentum returns is subtracted from that. With the construction of the momentum factor, portfolios are rebalanced monthly. Thus for each month, the momentum factor is calculated as:

$$WML = \frac{(Small\ High + Big\ High)}{2} - \frac{(Small\ Low + Big\ Low)}{2}$$

When utilizing a factor-based methodology, as opposed to a high-dimensional fixed effects estimation a la Gormley and Matsa (2013), the question of how to appropriately study disparate countries becomes a difficult one. That is because heterogeneous sources of variation between countries can, when aggregated, produce potentially biased results. Thus, further discussion is warranted on the relative merits of conducting the study at a country-specific level, or at a regional level instead.

One might argue that the analysis should be done at the country specific level. This has numerous advantages. For one, disaggregation of the analysis down to the currency specific level is useful, because it allows for the fact that most countries exhibit a non-trivial amount of country-specific variation. Despite globalization, financial markets still exhibit segmentation—and in particular emerging markets (Bakeart, Lundblad, Siegel, 2011).

For another, it simplifies the question of what unit of measurement the returns should be measured in—if there are multiple countries being aggregated, we must convert all of our variables into US dollar equivalent or otherwise compensate for omitted exchange rate effects through a high-dimensional fixed effects specification (Gormley and Matsa, 2013). Yet at the same time, to the extent that currency exposure effects are common across countries, disaggregation down to the country level may cause a loss of statistical power, insofar that certain countries have lower cross-sectional or time-series breadth. And, more practically, it is

less of a tractable task to present and easily summarize the separate analyses of 39 separate currencies.

As such, one might instead propose aggregating at some level. While a worldwide level analysis would probably not be appropriate, given the clear heterogeneity of world markets, it still may make sense to separate the analysis by region. This makes the (perhaps reasonable) assumption that geographic regions (e.g., Asia ex-Japan, or the Middle East) exhibit relatively greater equity market co-integration, and therefore that currency effects would be approximately similar, on average, within a particular area. The one necessary consideration would be that firm-specific returns, as well as any independent variables, would have to be translated into US-dollars at their contemporaneous exchange rates in order to construct a meaningful average within countries of a particular region.

The caveat of this currency translation is that if some of these independent variables are correlated with contemporaneous exchange rates, regression analysis may either fail to measure meaningful effects (since both Y and X are essentially being averaged out by a variable of interest), or may exhibit a certain amount of bias. The latter may occur, for instance, if an independent variable (a firm's market capitalization, say) is expected to moderate the relationship between currency sensitivity and stock returns within a region but, simultaneously, two countries within that region experience directionally opposite currency shocks. Translation into US dollars in this case could potentially bias the measured effect that firm size has on the relationship between currency sensitivity and returns. Clearly, both approaches have their strengths and weaknesses. As a consequence, I present the results using a region-specific analysis first, but complement and contrast this with a currency-specific set of analyses.

A separate—but related—issue is that of how to properly construct the test assets in each of the above two specifications. For example, Kolari, Moorman, and Sorescu (2008) construct 25

portfolio-level test assets when conducting time-series analysis of factor attribution. This makes sense: we would expect to be able to find greater currency variation (and hence, a premium or discount) in the tail ends of 25 portfolios, in comparison to just 5 portfolios. Moreover, to the extent that currency risk is systematic within the cross-section, any technique that finds portfolio-level alphas to exhibit significance (e.g., through the Gibbons, Ross, and Shanken (1989) test, or "GRS" test) across a larger number of portfolios is likely to be more persuasive. Indeed, Kolari et al. (2008) find that it is predominantly the 1st and 25th portfolios which exhibit statistically significant (and economically negative) four-factor alphas, and that this leads GRS tests to fail to reject the null hypothesis that all of the portfolio alphas are nonzero.

On the other hand, the use of portfolios that slice too finely along the cross-section leaves open the possibility that the portfolios carry too few firms. If that's the case, then portfolio returns—though sorted by some characteristic—may exhibit return variation that is instead dominated by firm-specific or otherwise idiosyncratic factors. While this would not be an issue for a large, developed market such as the United States—the market studied by Kolari et al., (2008), this concern could matter for smaller, nascent, and less developed equity markets. As well, if one were to find economically meaningful factor effects in 40% of the equity market (i.e., by studying the 1st and 5th quintiles), this might present a more powerful argument about the economic pervasiveness of such a factor.

3.4 Empirical Tests: Regional Analysis of Risk Factor Exposures

3.4.1 Overview

In sum, it is at least clear that there are advantages and disadvantages to both approaches. As such, I consider estimations sorted into both 5 and 25 portfolios, and both by region and by

country. The breadth of such an approach is costly in terms of presentation, but is useful for gaining depth in understanding the drivers behind any currency alpha found.

Therefore, the test-asset construction for the time-series factor attribution is detailed as follows. First, regional-level test assets are constructed within six different regions: Latin America, the Middle East, Japan, Asia Ex-Japan, Europe (non-Euro countries), and Europe (Euro-zone countries). Specifically, firms are still grouped into 5 or 25 portfolios within country, but then a regional level set of 5 or 25 portfolios is computed as the equal-weighted average of these portfolio returns across the region. Firms in the 25th portfolio of each country's ranking, for example, are grouped into a regional 25th portfolio by taking the simple average return of each of those 25th–level portfolios. To make portfolio attribution comparable across countries, firm specific stock returns are constructed after adjusting stock prices on the beginning and end of each month by the contemporaneous local currency-to-US Dollar exchange rates for the beginning and end of that month, respectively.

Some might object to taking an equal-weighted average across countries, especially within regions that are heterogeneous in terms of equity market capitalization. This objection is reasonable. I also calculate value-weighted regional portfolio returns. This is done by first calculating value-weighted portfolio returns for each of the 25 portfolios within a country[20], and then by value-weighting country-level portfolio returns across the region by weighting according to the country's aggregate equity market capitalization, relative to the region as a whole. Both sets of value weights use firm equity market capitalizations that have been translated into USD equivalents at the local/USD exchange rate at the time.

[20] The value weighting of each firm is done with respect to the market capitalization of the local currency portfolio to which it belongs. I.e., the "first-stage" value weighting is done with respect to country-portfolio, and the "second-stage" value weighting is constructed by using country-to-region market cap weights.

Summary statistics of currency betas sorted according to region are presented in Table 3.1. This table shows that US-dollar currency correlation is relatively modest for the median firm in most regions, but that the sign of this correlation changes according to region. The median firm in Asia (excluding Japan) has a currency sensitivity of .06, implying that if a country's currency were to depreciate against the US dollar by 10% in over the year, the median firm would experience a stock price rise of just 0.6% as a result of that depreciation. This masks large deviation, however: an equivalent 10% depreciation would be expected to result in a 6.1% price impact for the 75th percentile of currency sensitive stocks—a ten fold difference in effect. Regions outside of Asia exhibit similar—albeit less extreme—levels of cross-sectional currency dispersion.

Table 3.1 Summary Statistics of Currency Betas by Region. Loadings are estimated contemporaneously with market returns. Estimates displayed are at monthly frequency, and are the last-month average of daily rolling currency betas over a 252 trading day window for each firm.

	Mean	Standard Deviation	25th Percentile	Median	75th Percentile	Number of Observations
Asia Ex-Japan	.18	31.30	-.38	.06	.61	671,846
Europe (Euro)	-.04	2.21	-.23	-.03	.16	253,689
Europe (Non-Euro)	.28	45.27	-.25	-.04	.15	195,658
Japan	.02	8.05	-.17	-.01	.16	366,141
Latin America	-.01	2.54	-.25	-.05	.09	15,014
Middle East	-.11	3.98	-.59	-.11	.38	48,107
Total	.43	16.55	-.26	0	.28	1,582,762

3.4.2 Factor Regressions: Quantile Analysis

The results of both the equal weighted and value weighted regional time-series regressions are presented in Tables 3.2 through 3.12, beginning with Japan. For Japan, the most negatively sensitive currency portfolio exhibits a significantly negative four-factor alpha, consistent with the findings in Kolari et. al (2008). In particular, since the value of the alpha is -2.24, this implies that average risk-adjusted returns for the most negatively currency sensitive firms are *negative* 26.88% per year. However, this significantly negative effect does not exist when constructing equal weighted returns (Table 3.3), which suggests that a relative few but particularly large firms may have been adversely exposed to Yen movement over this period. On the other hand, firms in the highest portfolio—those firms with the greatest degree of positive currency sensitivity—do not exhibit portfolio returns that are significantly different from zero.

A similar dynamic occurs when looking at the rest of the region in Asia. Value weighted returns (Table 3.4) in the bottom currency portfolio are significantly negative, with a negative annualized regional four-factor alpha of 9.96%. The most positively sensitive portfolio has an alpha that is insignificantly different from zero. Equal weighted returns (Table 3.5) show an insignificant alpha both for the most negatively and the most positively sensitive regional currency portfolios.

Meanwhile, for countries within the European Monetary Union (EMU), strongly sensitive currency portfolios on either end of the spectrum do not exhibit statistically significant alphas when using either value or equal weighted returns (Tables 3.6 and 3.7, respectively). This may be due to the possibility that currency risk—when measured as dollar risk—is less relevant for firms denominated within a large, highly integrated monetary system.

One may still expect that countries, which may be within the European region but do not actually use the Euro, are rather more sensitive to dollar risk when compared to Euro-

denominated countries. Yet, tables 3.8 and 3.9 show that this appears not to be the case: firms within the region of Europe (including Norway, Sweden, Denmark, Latvia, and others) that exhibit high positive or negative currency sensitivity do not, on average, exhibit significantly higher or lower four factor alphas. It is possible, however, that this weakness results from non-Euro currencies within this region for the most part being more correlated with the Euro than with the dollar.

The final set of regional time series factor regressions include Latin America and the Middle East—shown in tables 3.10 through 3.11, and 3.12 through 3.13, respectively. These indicate that for the most negatively currency sensitive firms, four-factor alphas are either insignificant or—in the case of equal-weighted returns in Latin America—significantly positive. For the most positive currency-sensitive portfolio, alphas are either marginally negative (value-weighted returns in Latin America), significantly positive (value and equal weighted returns in the Middle East), or insignificant (equal-weighted returns in Latin America).

From here, it is clear that currency exposure, if a risk, is certainly a heterogeneously characterized one. This makes sense, to the extent that we are characterizing currency risk as dollar risk—many Latin American firms exhibit strong portfolio alpha attribution, whereas Eurozone country firms exhibit almost none. In other words, dollar risk has a geographic perspective. Moreover, if one thinks in terms of macroeconomic events (the Asian currency crisis of 1999, Argentina's devaluation of the Peso in 2001, or China's successive devaluation of the Yuan in 2015, for example) currency risk compensation is also likely to possess strongly time varying characteristics. Not accounting for these time-varying aspects may thus lead to the results for some countries in effect being averaged out.

However, some of the mixed findings may also be the result of the over-aggregation that may occur when constructing currency portfolios across an entire region. Hints of this may be

found by the relatively light factor loadings across the portfolios. For example, market betas tend to be highly statistically significant across portfolios, with point estimates slightly lower for the middle currency-sensitive portfolios. Yet with the exception of perhaps a slight tilt towards smaller, growth oriented firms among the most negatively sensitive currency portfolios, most factor loadings across all portfolios in each region appear statistically insignificant.

Thus if we relax our definition of statistical significance for the moment, assuming that the aggregation here is causing a loss of power but not biasing estimated effects, we can go back and look at the portfolio alphas in order to make sense of a general pattern in exchange rate sensitivity between regions. First, is that highly developed regions (in particular, Japan and the EMU-currency countries) exhibit a monotonic effect across currency exposure rankings. This runs contrary to the effects found for regions generally thought to be still developing—especially over this time period—such as Asia (excluding Japan) and Latin America. The Middle East may be a special case, considering that much of its economic production is linked to a commodity that is priced in US dollars; its currency sensitivity alphas behave more closely to that of Japan and Eurozone Europe.

Table 3.2 Regional Factor Regressions of 25 Currency Portfolios: Japan—Value Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, this table presents the value-weighted regression results for Japan; both portfolio returns and market returns are value-weighted within the region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.37***	1.23***	1.07***	1.08***	1.00***	0.94***	1.05***	1.04***	1.05***	1.01***	1.02***	0.92***	1.12***	0.88***	1.09***	0.98***	0.99***	1.03***	1.07***	0.93***	0.93***	1.00***	1.05***	1.09***	1.04***
	(8.68)	(7.72)	(13.07)	(12.27)	(14.69)	(14.01)	(16.85)	(24.36)	(17.26)	(16.97)	(17.86)	(18.50)	(8.71)	(9.96)	(11.44)	(16.57)	(16.21)	(18.24)	(15.00)	(17.01)	(9.71)	(18.92)	(12.23)	(10.37)	(9.37)
SMB	0.58***	0.43*	0.15*	0.05	0.13*	0.08	0.08	0.08	0.01	0.10**	0.03	0.01	-0.05	0.09	-0.05	0.05	-0.14**	0.01	-0.05	-0.07	0.01	-0.07	-0.06	0.03	0.08
	(4.76)	(1.97)	(1.69)	(0.66)	(1.76)	(1.23)	(1.15)	(1.60)	(0.17)	(2.13)	(0.67)	(0.24)	(-0.42)	(1.48)	(-0.62)	(0.71)	(-2.14)	(0.21)	(-0.88)	(-1.44)	(0.16)	(-1.42)	(-0.98)	(0.40)	(0.97)
HML	0.03	0.22	0.07	-0.15	0.10	0.01	0.05	0.13*	-0.15	0.11*	0.03	0.03	-0.04	0.04	-0.05	0.06	-0.01	0.01	-0.02	-0.04	0.01	-0.04	-0.20**	-0.03	-0.06
	(0.20)	(0.99)	(0.69)	(-1.64)	(1.19)	(0.17)	(0.68)	(1.89)	(-1.38)	(1.79)	(0.34)	(0.58)	(-0.24)	(0.43)	(-0.48)	(0.80)	(-0.09)	(0.20)	(-0.25)	(-0.65)	(0.12)	(-0.61)	(-2.44)	(-0.29)	(-0.59)
WML	-0.25	-0.11	0.12	0.24**	-0.01	0.13	0.06	0.12	0.21**	0.07	0.20**	0.19**	-0.15	-0.00	-0.14	-0.13	-0.02	-0.07	0.08	-0.09	-0.19	-0.20**	-0.10	-0.18	-0.17
	(-1.02)	(-0.67)	(1.23)	(2.07)	(-0.12)	(1.14)	(0.58)	(1.56)	(2.10)	(0.82)	(2.16)	(2.40)	(-0.84)	(-0.00)	(-1.12)	(-1.58)	(-0.23)	(-0.92)	(0.90)	(-1.02)	(-1.32)	(-2.24)	(-0.99)	(-1.39)	(-1.16)
Const.	-2.24***	-0.54	-0.02	0.37	-0.08	0.13	0.10	-0.00	0.51**	-0.35	-0.03	0.26	0.04	-0.71***	0.08	0.07	0.22	0.03	0.54*	0.23	-0.54	0.33	0.57*	-0.02	0.22
	(-3.56)	(-1.08)	(-0.06)	(1.11)	(-0.27)	(0.46)	(0.37)	(-0.01)	(2.34)	(-1.39)	(-0.14)	(1.17)	(0.16)	(-2.97)	(0.29)	(0.27)	(0.88)	(0.09)	(1.85)	(0.89)	(-1.61)	(1.32)	(1.95)	(-0.07)	(0.59)
Obs.	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129
R-sq.	0.56	0.62	0.70	0.62	0.72	0.68	0.75	0.82	0.69	0.76	0.78	0.77	0.64	0.71	0.72	0.78	0.76	0.68	0.72	0.75	0.67	0.79	0.71	0.68	0.59

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.3 Regional Factor Regressions of 25 Currency Portfolios: Japan—Equal Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, this table presents the equal-weighted regression results for Japan; both portfolio returns and market returns are equal-weighted within the region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.27***	1.11***	1.11***	1.11***	1.01***	0.96***	0.94***	0.93***	0.89***	0.96***	0.94***	0.92***	0.93***	0.87***	0.90***	0.87***	0.96***	0.95***	0.92***	0.95***	1.01***	1.04***	1.05***	1.11***	1.24***
	(24.16)	(31.17)	(26.29)	(41.19)	(46.37)	(30.53)	(37.33)	(51.37)	(33.68)	(32.92)	(44.52)	(32.70)	(36.39)	(21.34)	(28.73)	(38.05)	(39.24)	(41.67)	(30.45)	(38.01)	(39.95)	(38.05)	(27.67)	(34.98)	(19.91)
SMB	0.14**	0.08**	0.06	0.04	0.04	0.05	-0.04	-0.02	-0.03	-0.02	-0.04**	-0.05**	-0.00	-0.03	-0.03	-0.01	-0.08***	-0.07***	-0.06**	-0.07**	-0.04	-0.07**	-0.04	0.02	0.17**
	(2.54)	(2.20)	(1.30)	(1.30)	(1.35)	(1.36)	(-1.23)	(-0.75)	(-1.11)	(-0.83)	(-2.27)	(-1.99)	(-0.11)	(-0.69)	(-1.01)	(-0.50)	(-3.51)	(-2.88)	(-2.15)	(-2.48)	(-1.47)	(-2.16)	(-1.08)	(0.52)	(2.49)
HML	-0.23***	-0.13***	0.00	-0.07	0.01	0.03	-0.03	0.04*	0.06*	0.06*	0.01	-0.03	0.15***	0.05	0.05*	0.09***	0.05	0.02	0.05	-0.02	0.02	-0.01	-0.02	-0.03	-0.02
	(-3.22)	(-2.68)	(0.05)	(-1.61)	(0.35)	(0.67)	(-0.75)	(1.83)	(1.83)	(1.67)	(0.32)	(-0.90)	(4.39)	(1.19)	(1.79)	(2.94)	(1.57)	(0.70)	(1.43)	(-0.63)	(0.56)	(-0.39)	(-0.57)	(-0.67)	(-0.19)
WML	-0.17*	-0.07	0.10*	0.07	0.02	0.07	0.11***	0.08**	0.03	0.09**	0.09***	0.09**	-0.02	0.02	0.02	0.03	0.02	0.00	-0.06	-0.02	-0.02	-0.02	-0.11*	-0.17***	-0.15
	(-1.79)	(-1.29)	(1.77)	(1.37)	(0.38)	(1.58)	(2.97)	(2.36)	(0.61)	(2.00)	(2.80)	(2.46)	(-0.35)	(0.42)	(0.46)	(0.61)	(0.46)	(0.03)	(-1.40)	(-0.59)	(-0.50)	(-0.41)	(-1.96)	(-3.18)	(-1.46)
Const.	-0.22	0.05	0.01	0.13	-0.08	-0.09	0.12	-0.02	0.12	0.02	-0.01	0.32**	-0.04	-0.04	0.10	0.14	0.08	0.15	-0.06	0.11	0.07	0.11	0.03	0.03	-0.14
	(-0.96)	(0.30)	(0.08)	(0.86)	(-0.70)	(-0.81)	(1.00)	(-0.22)	(1.04)	(0.13)	(-0.06)	(2.52)	(-0.39)	(-0.33)	(0.98)	(1.58)	(0.73)	(1.29)	(-0.48)	(0.90)	(0.54)	(0.87)	(0.25)	(0.17)	(-0.59)
Obs.	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129
R-sq.	0.90	0.93	0.94	0.94	0.96	0.94	0.95	0.96	0.94	0.95	0.95	0.94	0.94	0.94	0.95	0.95	0.95	0.95	0.94	0.94	0.96	0.94	0.94	0.93	0.89

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.4 Regional Factor Regressions of 25 Currency Portfolios: Asia (Ex-Japan)—Value Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, this table presents the value-weighted regression results for countries in Asia (excluding Japan); both portfolio returns and market returns are value-weighted within the region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt.	1.12***	1.02***	1.09***	1.05***	0.95***	0.97***	0.97***	0.83***	0.92***	0.98***	0.95***	0.97***	0.92***	0.95***	0.97***	0.98***	0.90***	1.01***	1.13***	0.97***	1.06***	1.10***	1.04***	1.08***	1.14***
	(20.04)	(14.26)	(19.07)	(23.91)	(23.96)	(10.70)	(16.83)	(12.06)	(18.61)	(15.51)	(17.13)	(19.36)	(18.97)	(24.71)	(20.06)	(25.84)	(12.06)	(23.70)	(25.61)	(20.21)	(17.67)	(15.47)	(19.25)	(7.64)	(17.66)
SMB	0.32***	0.11	0.20**	0.10	-0.05	0.10	-0.27**	-0.34*	0.17	-0.01	0.03	-0.05	0.04	-0.05	-0.03	0.05	-0.15	0.07	0.02	0.07	-0.14	0.22	0.33***	0.72	0.01
	(3.04)	(0.55)	(2.16)	(0.92)	(-0.49)	(1.29)	(-2.20)	(-1.85)	(1.46)	(-0.13)	(0.36)	(-0.31)	(0.32)	(-0.70)	(-0.23)	(0.55)	(-1.38)	(0.80)	(0.27)	(0.52)	(-0.86)	(1.24)	(3.24)	(1.13)	(0.04)
HML	-0.10	0.11	-0.15	-0.07	-0.06	0.15	0.11	-0.27**	0.10	-0.21***	0.18**	-0.01	-0.13	-0.03	-0.15	-0.13	-0.46**	-0.21**	-0.25*	-0.31***	-0.06	0.25*	-0.09	1.51	-0.39***
	(-1.30)	(0.68)	(-1.45)	(-0.61)	(-0.79)	(0.91)	(0.74)	(-2.21)	(0.92)	(-2.82)	(1.99)	(-0.07)	(-1.50)	(-0.41)	(-1.22)	(-0.78)	(-2.08)	(-2.50)	(-1.68)	(-3.21)	(-0.56)	(1.78)	(-0.68)	(1.05)	(-2.85)
WML	-0.18*	-0.30**	-0.21**	-0.08	0.10	0.08	-0.09	-0.02	-0.10	-0.23*	-0.10	-0.02	-0.08	-0.17**	-0.03	-0.16*	-0.37	0.00	0.16**	-0.09	-0.04	0.00	-0.30**	-0.02	-0.42***
	(-1.98)	(-2.08)	(-2.03)	(-0.52)	(1.01)	(0.44)	(-0.68)	(-0.22)	(-0.99)	(-1.84)	(-1.10)	(-0.18)	(-0.83)	(-2.03)	(-0.17)	(-1.84)	(-1.25)	(0.02)	(2.29)	(-1.14)	(-0.35)	(0.03)	(-2.29)	(-0.07)	(-2.82)
Const.	-0.83**	-0.55	-0.03	0.29	0.81*	-0.66	0.93*	1.09**	-0.13	0.82**	-0.41	0.02	0.43	-0.09	0.48	0.14	1.56**	0.17	0.31	0.41	0.26	-0.76	-0.41	-2.83	0.03
	(-1.97)	(-0.80)	(-0.08)	(0.60)	(1.81)	(-1.23)	(1.80)	(2.24)	(-0.29)	(2.11)	(-1.01)	(0.03)	(0.99)	(-0.32)	(1.07)	(0.33)	(2.22)	(0.47)	(0.71)	(0.81)	(0.52)	(-1.42)	(-0.94)	(-0.99)	(0.05)
Obs.	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141
R-sq.	0.75	0.63	0.78	0.78	0.74	0.67	0.74	0.62	0.71	0.74	0.75	0.72	0.73	0.83	0.74	0.80	0.58	0.79	0.82	0.68	0.71	0.71	0.75	0.36	0.65

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.5 Regional Factor Regressions of 25 Currency Portfolios: Asia (Ex-Japan)—Equal Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, this table presents the equal-weighted regression results for countries in Asia (excluding Japan); both portfolio returns and market returns are equal-weighted within the region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.07***	1.07***	0.99***	0.99***	0.99***	1.00***	0.99***	0.98***	0.95***	0.96***	0.95***	0.99***	1.01***	0.98***	1.00***	0.96***	1.00***	1.00***	0.99***	0.99***	1.02***	1.03***	1.03***	1.04***	1.11***
	(35.16)	(36.24)	(41.85)	(38.83)	(37.39)	(59.29)	(45.44)	(36.04)	(35.81)	(41.01)	(43.65)	(40.73)	(53.30)	(42.41)	(45.51)	(54.07)	(53.67)	(63.32)	(43.73)	(55.98)	(51.12)	(44.86)	(46.01)	(25.97)	(29.08)
SMB	0.26	-0.04	0.13***	-0.00	0.08	-0.00	-0.12	-0.31**	0.10	-0.16	0.13	0.03	-0.08	-0.10	-0.14**	-0.03	-0.18***	-0.15***	-0.06	-0.04	-0.03	-0.02	0.14*	0.24	-0.06
	(1.57)	(-0.26)	(3.07)	(-0.02)	(1.29)	(-0.06)	(-1.32)	(-2.17)	(1.01)	(-1.22)	(1.33)	(0.17)	(-1.01)	(-1.01)	(-2.27)	(-0.49)	(-3.24)	(-3.47)	(-0.96)	(-0.81)	(-0.47)	(-0.31)	(1.90)	(1.19)	(-0.32)
HML	0.03	-0.11	0.20***	-0.06	-0.21*	0.06	0.14*	-0.05	0.30	-0.13	0.14*	0.04	-0.02	0.14	-0.19**	-0.03	-0.23	-0.09	-0.09	-0.09*	0.03	0.08	-0.04	0.55	-0.20
	(0.19)	(-0.68)	(2.92)	(-0.81)	(-1.97)	(0.71)	(1.73)	(-0.46)	(1.30)	(-1.61)	(1.93)	(0.61)	(-0.31)	(1.40)	(-2.32)	(-0.21)	(-1.45)	(-1.56)	(-0.75)	(-1.72)	(0.53)	(1.06)	(-0.51)	(1.20)	(-1.24)
WML	0.04	-0.19*	-0.18***	-0.02	-0.13	0.09	0.10	0.13	-0.03	-0.06	-0.01	0.00	0.04	-0.06	0.05	0.02	-0.18	0.01	0.22***	-0.07	0.08	0.09	-0.08	0.07	-0.16
	(0.62)	(-1.72)	(-2.74)	(-0.17)	(-1.04)	(1.15)	(1.38)	(1.52)	(-0.48)	(-0.72)	(-0.12)	(0.06)	(0.53)	(-0.67)	(0.93)	(0.39)	(-0.92)	(0.26)	(3.38)	(-1.16)	(0.71)	(0.72)	(-0.99)	(0.53)	(-1.06)
Const.	0.08	0.49	-0.56**	0.51	0.35	-0.09	-0.09	0.75	-0.58	0.42	-0.26	-0.47	0.15	-0.13	0.49**	-0.00	0.92**	0.30	0.15	0.11	0.24	0.04	0.19	-1.03	0.80
	(0.18)	(0.93)	(-2.30)	(1.32)	(0.98)	(-0.32)	(-0.27)	(1.62)	(-1.25)	(1.37)	(-1.08)	(-0.96)	(0.47)	(-0.39)	(1.99)	(-0.01)	(2.11)	(1.65)	(0.48)	(0.52)	(1.03)	(0.14)	(0.73)	(-1.17)	(1.13)
Obs.	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141
R-sq.	0.87	0.84	0.93	0.88	0.85	0.91	0.92	0.83	0.88	0.88	0.93	0.85	0.91	0.89	0.94	0.92	0.83	0.95	0.91	0.94	0.87	0.85	0.92	0.75	0.74

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.6 Regional Factor Regressions of 25 Currency Portfolios: Europe (EMU Countries)—Value Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, table presents the value-weighted regression results for the European Monetary Union countries; both portfolio returns and market returns are value-weighted within the region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.42***	1.28***	1.15***	1.06***	1.17***	1.09***	1.06***	1.01***	1.00***	1.06***	1.01***	0.79***	0.96***	0.97***	1.00***	0.95***	0.96***	0.90***	0.99***	0.98***	0.98***	0.93***	0.89***	0.99***	0.81***
	(12.26)	(22.66)	(18.03)	(22.57)	(23.84)	(27.66)	(26.93)	(16.19)	(24.29)	(20.17)	(22.37)	(3.42)	(22.06)	(18.95)	(20.93)	(24.08)	(15.63)	(11.08)	(23.72)	(20.99)	(16.28)	(18.66)	(14.99)	(16.20)	(5.55)
SMB	0.50***	0.18*	0.23**	0.13	-0.05	0.03	0.03	-0.09	0.05	0.08	0.00	-0.10	0.03	0.03	0.02	-0.10*	0.08	-0.04	0.09	0.19*	-0.09	0.17**	-0.11*	0.05	0.13
	(3.69)	(1.97)	(2.51)	(1.23)	(-0.63)	(0.60)	(0.49)	(-1.15)	(0.63)	(0.93)	(0.03)	(-0.57)	(0.49)	(0.54)	(0.21)	(-1.71)	(1.21)	(-0.55)	(1.53)	(1.70)	(-1.09)	(2.36)	(-1.75)	(0.41)	(0.50)
HML	-0.23	0.02	0.09	0.00	-0.16	-0.06	0.07	0.11	-0.02	0.17*	0.03	0.07	0.14	-0.01	-0.00	0.03	0.02	-0.05	-0.01	0.02	0.02	-0.15**	-0.30***	-0.11	-0.32
	(-1.40)	(0.19)	(0.87)	(0.02)	(-1.44)	(-0.76)	(0.88)	(1.49)	(-0.24)	(1.74)	(0.52)	(0.38)	(1.58)	(-0.07)	(-0.02)	(0.43)	(0.23)	(-0.52)	(-0.20)	(0.36)	(0.19)	(-2.30)	(-3.19)	(-0.96)	(-1.15)
WML	0.17	0.02	-0.12	-0.04	0.07	-0.03	-0.02	-0.02	0.11	0.18***	0.12**	-0.20	-0.04	-0.14**	0.05	-0.01	0.06	-0.07	0.11*	0.12**	0.08	0.12**	0.00	-0.19	-0.22
	(1.21)	(0.24)	(-1.50)	(-0.51)	(1.19)	(-0.48)	(-0.38)	(-0.34)	(1.57)	(3.07)	(2.52)	(-0.99)	(-0.92)	(-2.03)	(0.83)	(-0.35)	(1.14)	(-0.79)	(1.82)	(2.45)	(1.19)	(2.20)	(0.01)	(-1.35)	(-0.96)
Const.	-0.16	-0.82**	-0.87**	-0.15	0.56	-0.00	0.15	0.13	-0.28	-0.19	0.38	0.58	-0.19	0.23	0.16	-0.10	-0.31	0.34	-0.16	-0.49	0.15	0.31	0.82***	0.50	-0.58
	(-0.26)	(-1.99)	(-2.33)	(-0.41)	(1.51)	(-0.00)	(0.56)	(0.41)	(-1.01)	(-0.83)	(1.43)	(1.19)	(-0.67)	(0.80)	(0.46)	(-0.35)	(-1.14)	(1.21)	(-0.51)	(-1.21)	(0.53)	(1.14)	(2.77)	(1.06)	(-0.57)
Obs.	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129
R-sq.	0.71	0.80	0.80	0.80	0.84	0.86	0.87	0.85	0.83	0.86	0.87	0.53	0.86	0.81	0.83	0.86	0.84	0.79	0.84	0.81	0.81	0.81	0.76	0.67	0.30

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.7 Regional Factor Regressions of 25 Currency Portfolios: Europe (EMU Countries)—Equal Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, this table presents the equal-weighted regression results for the European Monetary Union countries; both portfolio returns and market returns are equal-weighted within the region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.17***	1.12***	1.10***	1.10***	1.05***	1.03***	1.04***	0.99***	0.99***	0.95***	0.92***	0.91***	0.94***	0.91***	0.99***	0.98***	0.97***	0.94***	0.94***	0.95***	1.00***	1.02***	0.98***	1.02***	1.00***
	(26.11)	(35.19)	(40.47)	(43.38)	(42.47)	(50.77)	(41.41)	(48.33)	(45.69)	(48.47)	(33.44)	(44.01)	(38.19)	(50.51)	(40.68)	(44.67)	(49.23)	(47.78)	(45.73)	(41.62)	(33.67)	(33.26)	(40.56)	(39.48)	(23.37)
SMB	0.25***	0.06	-0.05	-0.05	-0.04	-0.01	-0.12***	-0.04	-0.06*	-0.05	-0.01	0.01	-0.04	0.00	-0.01	-0.09***	-0.03	-0.08**	-0.02	-0.05	-0.04	-0.02	0.06	0.05	0.27***
	(3.38)	(1.20)	(-1.12)	(-1.03)	(-0.87)	(-0.25)	(-3.04)	(-1.29)	(-1.84)	(-1.53)	(-0.33)	(0.17)	(-1.23)	(0.04)	(-0.32)	(-2.62)	(-1.08)	(-2.23)	(-0.69)	(-1.21)	(-0.89)	(-0.48)	(1.60)	(0.89)	(3.26)
HML	0.00	0.01	-0.02	-0.13***	0.02	-0.01	0.00	0.05	0.06	0.01	0.01	-0.02	0.06	0.10***	0.08	-0.01	0.02	0.05	-0.02	-0.02	-0.04	-0.02	-0.03	-0.03	-0.23***
	(0.02)	(0.11)	(-0.35)	(-3.00)	(0.51)	(-0.14)	(0.03)	(1.46)	(1.62)	(0.36)	(0.32)	(-0.51)	(1.40)	(2.92)	(1.58)	(-0.26)	(0.43)	(1.17)	(-0.42)	(-0.40)	(-0.94)	(-0.45)	(-0.65)	(-0.39)	(-2.89)
WML	-0.37***	-0.13***	-0.15***	-0.01	-0.02	-0.01	0.02	0.02	0.02	0.06	0.03	0.09***	0.02	0.01	0.10***	0.10***	0.06***	0.03	0.05*	0.09***	0.01	0.06	-0.05	-0.07	-0.15**
	(-4.91)	(-3.06)	(-3.41)	(-0.21)	(-0.74)	(-0.39)	(0.38)	(0.71)	(0.56)	(1.35)	(1.04)	(3.59)	(0.73)	(0.45)	(3.02)	(3.55)	(2.66)	(1.12)	(1.85)	(3.13)	(0.19)	(1.49)	(-1.50)	(-0.97)	(-2.51)
Const.	0.21	-0.04	-0.30	0.06	-0.13	-0.01	0.06	-0.11	-0.11	0.02	-0.29*	-0.13	-0.34**	-0.24*	-0.14	0.35**	-0.21	0.11	0.10	0.04	0.29	0.21	0.01	0.26	0.44
	(0.64)	(-0.18)	(-1.41)	(0.31)	(-0.73)	(-0.04)	(0.38)	(-0.84)	(-0.79)	(0.10)	(-1.95)	(-0.92)	(-2.16)	(-1.78)	(-0.84)	(2.04)	(-1.48)	(0.74)	(0.71)	(0.22)	(1.64)	(0.97)	(0.09)	(1.35)	(1.45)
Obs.	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129	129
R-sq.	0.90	0.92	0.94	0.94	0.95	0.95	0.95	0.96	0.95	0.94	0.95	0.95	0.94	0.95	0.95	0.95	0.95	0.94	0.95	0.94	0.93	0.93	0.94	0.92	0.86

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.8 Regional Factor Regressions of 25 Currency Portfolios: Europe (Non-Euro Countries)—Value Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, this table presents the value-weighted regression results for Non-Euro countries in the European region; both portfolio returns and market returns are value-weighted within that region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.49***	1.55***	1.28***	1.20***	1.41***	1.27***	1.17***	1.20***	1.05***	1.07***	0.86***	0.86***	0.92***	0.92***	1.02***	0.97***	0.95***	0.80***	0.86***	0.87***	0.81***	0.90***	0.80***	1.07***	1.38***
	(13.07)	(12.72)	(18.91)	(13.36)	(8.32)	(15.47)	(16.12)	(10.02)	(15.82)	(9.11)	(6.87)	(11.19)	(8.31)	(12.64)	(12.86)	(8.21)	(13.35)	(14.57)	(12.45)	(16.09)	(13.11)	(11.93)	(7.61)	(7.25)	(11.06)
SMB	0.55*	0.14	0.02	0.04	0.02	0.21***	-0.01	-0.01	0.07	0.04	0.08	0.08	0.02	0.03	-0.05	-0.02	0.09	0.03	-0.08	0.01	0.05	0.10	0.17*	0.02	0.30*
	(1.90)	(0.77)	(0.22)	(0.45)	(0.16)	(3.07)	(-0.21)	(-0.16)	(0.96)	(0.40)	(1.13)	(1.26)	(0.43)	(0.40)	(-0.83)	(-0.20)	(1.33)	(0.50)	(-1.03)	(0.21)	(0.80)	(1.46)	(1.76)	(0.25)	(1.91)
HML	0.22	0.17	0.09	-0.08	-0.17	0.10	-0.09	-0.26*	-0.11	0.02	0.13	0.16	-0.02	-0.06	-0.07	0.20	-0.07	0.03	-0.14	-0.05	-0.03	-0.10	0.16	-0.20	-0.31
	(0.69)	(0.88)	(0.67)	(-0.78)	(-1.13)	(0.99)	(-0.93)	(-1.74)	(-1.25)	(0.13)	(1.31)	(1.50)	(-0.27)	(-0.66)	(-0.80)	(0.99)	(-0.86)	(0.44)	(-1.25)	(-0.70)	(-0.39)	(-0.81)	(1.02)	(-1.21)	(-1.55)
WML	-0.26	-0.18	-0.15*	-0.06	-0.05	0.06	-0.12	-0.03	0.04	-0.01	0.02	-0.09	-0.06	-0.03	0.02	-0.02	-0.04	0.03	-0.03	0.01	0.12***	-0.04	-0.28**	-0.26***	-0.13
	(-1.48)	(-1.48)	(-1.73)	(-0.68)	(-0.41)	(1.00)	(-1.12)	(-0.27)	(0.52)	(-0.08)	(0.29)	(-1.60)	(-0.99)	(-0.43)	(0.42)	(-0.29)	(-0.45)	(0.50)	(-0.37)	(0.09)	(2.73)	(-0.69)	(-2.20)	(-2.68)	(-0.97)
Const.	-0.56	-1.08	0.34	0.01	-0.20	-0.87*	0.25	0.59	0.79**	-0.15	-0.70	-0.45	0.06	-0.10	0.67	-0.05	-0.63	-0.40	0.76	0.37	0.53	-0.19	-0.25	0.61	0.26
	(-0.50)	(-1.32)	(0.53)	(0.01)	(-0.31)	(-1.75)	(0.58)	(1.00)	(2.02)	(-0.25)	(-1.32)	(-1.06)	(0.15)	(-0.29)	(1.35)	(-0.10)	(-1.47)	(-1.08)	(1.52)	(0.92)	(1.53)	(-0.37)	(-0.57)	(0.93)	(0.34)
Obs.	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
R-sq.	0.49	0.63	0.69	0.62	0.65	0.76	0.74	0.71	0.75	0.57	0.60	0.72	0.67	0.67	0.70	0.47	0.68	0.65	0.57	0.64	0.69	0.59	0.40	0.55	0.52

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.9 Regional Factor Regressions of 25 Currency Portfolios: Europe (Non-Euro Countries)—Equal Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, this table presents the equal-weighted regression results for Non-Euro countries in the European region; both portfolio returns and market returns are equal-weighted within that region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.20***	1.23***	1.08***	1.04***	1.09***	1.05***	1.09***	1.05***	0.97***	0.90***	0.97***	0.90***	0.89***	0.89***	0.90***	0.95***	0.91***	0.88***	0.93***	0.92***	0.95***	0.97***	0.94***	1.11***	1.23***
	(22.95)	(30.33)	(28.69)	(31.06)	(36.87)	(31.53)	(43.55)	(33.42)	(26.80)	(37.39)	(27.25)	(22.27)	(32.08)	(24.62)	(30.96)	(35.97)	(28.78)	(32.88)	(27.95)	(36.13)	(27.04)	(32.13)	(16.15)	(26.10)	(15.44)
SMB	0.13**	-0.07	0.06	-0.09**	-0.02	-0.04	0.04	-0.06	-0.01	-0.09**	-0.05	-0.08*	-0.03	-0.02	-0.04	-0.02	-0.07*	-0.04	-0.09**	-0.08**	-0.05	0.01	0.09*	-0.04	0.26***
	(2.22)	(-1.15)	(0.89)	(-2.00)	(-0.35)	(-0.81)	(1.15)	(-1.41)	(-0.28)	(-2.60)	(-1.29)	(-1.71)	(-0.85)	(-0.61)	(-0.96)	(-0.48)	(-1.93)	(-1.04)	(-2.10)	(-2.15)	(-1.07)	(0.14)	(1.83)	(-0.68)	(3.16)
HML	-0.13**	-0.07	0.11	-0.08	-0.02	0.01	-0.02	-0.08	0.08	-0.02	0.05	0.03	0.03	0.10**	0.04	0.06	-0.05	-0.02	-0.02	-0.06	0.03	0.02	0.08	-0.10	-0.15
	(-2.00)	(-1.02)	(1.25)	(-1.42)	(-0.46)	(0.11)	(-0.37)	(-1.64)	(1.42)	(-0.52)	(0.93)	(0.60)	(0.60)	(2.37)	(0.74)	(1.15)	(-1.30)	(-0.41)	(-0.46)	(-1.38)	(0.54)	(0.41)	(1.14)	(-1.30)	(-1.22)
WML	-0.11*	-0.18***	-0.07	0.01	0.01	-0.00	-0.02	0.00	0.03	-0.03	0.03	-0.02	0.01	0.08*	0.06*	0.12***	0.08**	0.04	0.00	0.05	0.09**	0.02	-0.04	-0.14***	-0.11
	(-1.89)	(-3.49)	(-1.42)	(0.23)	(0.12)	(-0.04)	(-0.57)	(0.06)	(0.76)	(-0.81)	(0.68)	(-0.44)	(0.32)	(1.82)	(1.72)	(3.30)	(2.41)	(1.11)	(0.04)	(1.16)	(2.19)	(0.41)	(-0.80)	(-2.83)	(-1.35)
Const.	0.19	0.25	-0.03	0.46	-0.26	0.20	-0.21	0.19	0.03	0.21	-0.33	-0.04	0.06	-0.26	-0.42*	0.10	0.11	0.15	0.27	0.39*	0.26	-0.21	-0.30	0.25	0.87*
	(0.58)	(0.72)	(-0.07)	(1.44)	(-1.02)	(0.59)	(-0.88)	(0.83)	(0.13)	(1.12)	(-1.26)	(-0.15)	(0.28)	(-1.09)	(-1.81)	(0.40)	(0.54)	(0.70)	(1.11)	(1.69)	(0.98)	(-0.87)	(-0.97)	(0.74)	(1.74)
Obs.	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130
R-sq.	0.90	0.90	0.87	0.88	0.93	0.90	0.93	0.92	0.91	0.93	0.91	0.91	0.91	0.91	0.92	0.90	0.93	0.90	0.89	0.90	0.90	0.90	0.86	0.88	0.80

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.10 Regional Factor Regressions of 25 Currency Portfolios: Latin America—Value Weighted. Time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for countries in the Latin American region; both portfolio returns and market returns are value-weighted within that region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.64***	0.85***	1.18***	1.13***	1.31***	0.82***	1.11***	1.06***	1.18***	1.04***	0.93***	1.25***	1.18***	0.93***	0.87***	0.68**	1.12***	0.91***	0.94***	0.98***	1.01***	1.00***	0.80***	0.60***	1.04***
	(7.93)	(5.74)	(5.78)	(7.51)	(13.93)	(9.26)	(5.89)	(8.84)	(7.48)	(8.01)	(7.60)	(5.22)	(5.68)	(7.11)	(6.15)	(2.50)	(11.69)	(7.62)	(12.06)	(10.86)	(8.34)	(9.86)	(8.51)	(2.82)	(9.12)
SMB	-0.72***	0.23	-0.09	0.07	-0.20*	0.21	0.01	-0.03	0.08	-0.15	0.21	-0.65*	-0.51	-0.02	0.18	0.22	0.15	0.07	0.10	0.06	0.00	-0.01	-0.17	-0.48	0.47***
	(-3.09)	(1.31)	(-0.47)	(0.45)	(-1.79)	(1.26)	(0.07)	(-0.27)	(0.53)	(-1.44)	(1.24)	(-1.91)	(-1.26)	(-0.15)	(1.33)	(1.06)	(1.09)	(0.47)	(1.61)	(0.49)	(0.01)	(-0.13)	(-1.26)	(-1.23)	(3.68)
HML	-0.39**	0.04	-0.09	-0.03	-0.12	0.19	0.00	-0.03	0.14	-0.16	-0.03	-0.63**	-0.30	0.03	-0.20*	0.03	0.11	-0.12	0.15*	0.01	0.03	0.04	-0.05	-0.38	0.18**
	(-2.07)	(0.31)	(-0.64)	(-0.22)	(-1.13)	(0.95)	(0.01)	(-0.23)	(1.22)	(-1.46)	(-0.10)	(-2.24)	(-0.98)	(0.19)	(-1.85)	(0.11)	(1.00)	(-1.06)	(1.93)	(0.11)	(0.20)	(0.31)	(-0.51)	(-1.24)	(2.34)
WML	-0.52*	-0.10	0.23*	0.21**	-0.21***	-0.19	-0.16*	0.06	0.02	0.09	-0.09	0.13	0.23	-0.02	-0.03	-0.02	0.15	0.08	-0.06	0.00	-0.08	0.07	0.11	0.26	-0.03
	(-1.93)	(-0.71)	(1.97)	(2.31)	(-3.09)	(-1.29)	(-1.80)	(0.59)	(0.29)	(1.26)	(-0.83)	(1.02)	(0.83)	(-0.30)	(-0.55)	(-0.12)	(1.37)	(1.45)	(-0.88)	(0.06)	(-0.88)	(1.39)	(1.15)	(1.24)	(-0.37)
Const.	-0.71	-0.99	0.05	-0.23	-0.40	-1.67	-0.12	0.51	0.31	1.13	-0.47	-1.12	2.70	-0.15	-0.12	1.85	0.61	-0.33	0.46	-0.21	0.38	0.99	0.54	0.42	-2.18*
	(-0.47)	(-0.79)	(0.05)	(-0.18)	(-0.41)	(-1.16)	(-0.12)	(0.38)	(0.23)	(0.85)	(-0.37)	(-1.04)	(1.13)	(-0.15)	(-0.12)	(0.97)	(0.56)	(-0.40)	(0.66)	(-0.26)	(0.38)	(1.28)	(0.72)	(0.35)	(-1.87)
Obs.	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
R-sq.	0.73	0.62	0.74	0.67	0.79	0.60	0.70	0.64	0.63	0.62	0.53	0.64	0.51	0.66	0.70	0.28	0.76	0.74	0.82	0.78	0.71	0.78	0.67	0.28	0.70

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.11 Regional Factor Regressions of 25 Currency Portfolios: Latin America—Equal Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, this table presents the equal-weighted regression results for countries in the Latin American region; both portfolio returns and market returns are equal-weighted within that region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.31***	1.04***	1.02***	1.14***	1.12***	0.98***	1.01***	0.93***	0.94***	1.06***	1.11***	0.87***	0.98***	0.82***	0.96***	0.92***	1.07***	0.96***	1.02***	1.01***	0.97***	0.94***	0.81***	0.87***	0.99***
	(12.70)	(10.63)	(14.57)	(8.19)	(17.82)	(14.15)	(9.96)	(10.96)	(9.36)	(18.67)	(13.34)	(11.60)	(8.45)	(14.76)	(12.26)	(10.26)	(13.41)	(10.94)	(9.26)	(15.21)	(19.44)	(14.25)	(6.24)	(8.74)	(6.18)
SMB	-0.49***	0.01	-0.13	0.07	0.01	0.05	-0.07	0.21	0.52*	-0.21*	0.13	-0.04	-0.02	-0.09	-0.00	0.12	-0.06	0.05	-0.06	-0.07	-0.00	0.03	0.12	-0.02	0.41*
	(-3.32)	(0.04)	(-1.52)	(0.51)	(0.07)	(0.57)	(-0.38)	(1.34)	(1.96)	(-1.85)	(1.04)	(-0.39)	(-0.10)	(-0.70)	(-0.01)	(0.68)	(-0.41)	(0.44)	(-0.43)	(-0.70)	(-0.06)	(0.40)	(0.82)	(-0.12)	(1.98)
HML	-0.03	-0.09	-0.18***	0.20	-0.01	0.01	-0.02	-0.02	0.43*	-0.10	0.12	-0.11	-0.16	-0.12	-0.21	-0.02	-0.01	0.04	0.08	-0.00	0.03	0.02	0.01	0.13	0.13
	(-0.26)	(-0.83)	(-2.88)	(0.99)	(-0.10)	(0.11)	(-0.16)	(-0.14)	(2.02)	(-1.04)	(0.78)	(-1.30)	(-1.04)	(-1.26)	(-1.68)	(-0.18)	(-0.13)	(0.32)	(0.64)	(-0.05)	(0.38)	(0.21)	(0.12)	(0.96)	(0.87)
WML	-0.18	-0.00	0.15***	0.05	-0.16***	-0.07	-0.01	0.01	-0.14	0.08	-0.06	0.12*	0.17	0.05	0.04	-0.15**	0.11	0.13*	-0.03	-0.01	-0.08*	0.06	0.06	0.04	-0.06
	(-1.27)	(-0.04)	(2.91)	(0.46)	(-3.02)	(-1.13)	(-0.08)	(0.06)	(-1.68)	(1.36)	(-0.86)	(1.85)	(1.33)	(0.88)	(0.53)	(-2.38)	(1.23)	(1.83)	(-0.41)	(-0.16)	(-1.87)	(1.57)	(0.83)	(0.37)	(-0.52)
Const.	-1.48*	-0.14	0.59	-2.11*	0.07	-0.71	-0.71	-0.70	0.32	0.90	-1.01	-0.41	1.45	-0.29	0.98	1.81***	0.64	-0.53	0.93	0.75	0.11	0.13	-0.38	-0.05	-0.98
	(-1.72)	(-0.13)	(0.95)	(-1.74)	(0.12)	(-0.93)	(-0.84)	(-0.82)	(0.43)	(1.27)	(-1.16)	(-0.73)	(1.12)	(-0.44)	(1.10)	(2.81)	(0.71)	(-0.64)	(1.00)	(1.08)	(0.19)	(0.20)	(-0.57)	(-0.06)	(-0.75)
Obs.	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
R-sq.	0.80	0.75	0.87	0.72	0.91	0.85	0.73	0.79	0.75	0.85	0.76	0.84	0.65	0.78	0.79	0.78	0.78	0.75	0.72	0.86	0.87	0.86	0.74	0.66	0.63

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.12 Regional Factor Regressions of 25 Currency Portfolios: Middle East—Value Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, this table presents the value-weighted regression results for countries in the Middle East; both portfolio returns and market returns are value-weighted within that region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.37***	1.07***	1.00***	0.69***	0.84***	0.73***	0.73***	0.71***	0.64***	0.96***	0.86***	0.70***	0.97***	1.16***	1.03***	0.88***	0.77***	0.94***	0.86***	0.86***	1.10***	0.87***	1.10***	1.44***	0.53***
	(7.75)	(7.80)	(10.48)	(5.74)	(6.56)	(6.83)	(6.03)	(6.62)	(7.75)	(8.62)	(7.03)	(7.15)	(7.65)	(10.31)	(7.17)	(9.65)	(5.08)	(5.83)	(7.38)	(10.58)	(9.04)	(6.13)	(6.39)	(3.68)	(3.81)
SMB	0.06	0.32*	0.15	0.33*	0.33**	0.08	-0.04	-0.33**	0.15	0.15	-0.15	-0.04	0.10	0.12	0.49**	0.18	-0.11	0.02	0.13	0.03	-0.05	-0.11	0.24	0.23	-0.39***
	(0.37)	(1.96)	(0.93)	(1.87)	(2.18)	(0.65)	(-0.34)	(-2.55)	(1.43)	(1.60)	(-1.28)	(-0.34)	(1.05)	(1.08)	(2.07)	(1.46)	(-1.04)	(0.17)	(0.84)	(0.30)	(-0.44)	(-0.80)	(1.40)	(1.15)	(-3.40)
HML	-0.14	0.15	0.27*	0.02	0.19	-0.04	0.11	-0.13	-0.03	-0.11	-0.15	-0.14	-0.02	-0.01	0.15	0.11	-0.24*	0.07	0.02	-0.03	-0.10	0.22*	0.23	0.46	-0.33***
	(-1.20)	(0.97)	(1.84)	(0.16)	(1.35)	(-0.34)	(1.04)	(-1.42)	(-0.25)	(-1.08)	(-1.31)	(-1.17)	(-0.20)	(-0.09)	(0.92)	(1.09)	(-1.75)	(0.42)	(0.16)	(-0.37)	(-0.94)	(1.72)	(1.61)	(1.43)	(-2.89)
WML	0.09	0.09	-0.02	0.14	0.14**	-0.01	0.20**	-0.06	0.12	0.18**	0.06	-0.02	0.07	0.06	0.03	0.01	-0.17**	0.11	-0.19**	-0.01	0.04	-0.05	-0.12	0.09	0.01
	(1.02)	(0.84)	(-0.15)	(0.95)	(2.26)	(-0.12)	(2.26)	(-1.02)	(1.11)	(2.52)	(0.40)	(-0.26)	(1.04)	(1.03)	(0.24)	(0.19)	(-2.50)	(0.94)	(-2.09)	(-0.13)	(0.74)	(-0.66)	(-0.99)	(0.88)	(0.10)
Const	1.26	-0.35	-1.19	0.36	0.03	0.09	-0.27	0.35	-0.12	0.68	0.92	-0.11	0.85	-0.12	-0.44	-0.24	0.35	0.82	-1.85**	0.33	0.86	-0.13	-1.47*	0.02	1.50*
	(1.48)	(-0.50)	(-1.33)	(0.46)	(0.03)	(0.15)	(-0.43)	(0.57)	(-0.19)	(1.26)	(1.51)	(-0.16)	(1.48)	(-0.19)	(-0.53)	(-0.40)	(0.60)	(1.08)	(-2.57)	(0.67)	(1.53)	(-0.20)	(-1.72)	(0.02)	(1.87)
Obs.	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79
R-sq.	0.62	0.52	0.52	0.35	0.50	0.46	0.51	0.51	0.39	0.64	0.52	0.44	0.61	0.65	0.48	0.60	0.50	0.48	0.50	0.63	0.70	0.60	0.48	0.35	0.28

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.13 Regional Factor Regressions of 25 Currency Portfolios: Middle East—Equal Weighted. This table presents time-series regressions of 25 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. In particular, this table presents the equal-weighted regression results for countries in the Middle East; both portfolio returns and market returns are equal-weighted within that region.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Mkt	1.03***	1.06***	0.99***	1.09***	0.89***	0.90***	0.78***	0.92***	0.90***	1.02***	0.99***	0.95***	0.99***	1.02***	0.99***	0.99***	0.89***	0.98***	0.91***	0.90***	0.94***	1.02***	0.92***	1.05***	1.13***
	(14.61)	(12.81)	(15.46)	(13.23)	(14.53)	(20.78)	(9.43)	(15.26)	(12.32)	(15.24)	(16.87)	(9.60)	(21.12)	(16.98)	(15.15)	(15.01)	(12.14)	(19.80)	(12.59)	(13.19)	(11.23)	(16.73)	(10.10)	(12.95)	(10.18)
SMB	0.18*	-0.01	0.00	0.08	0.08	-0.09	-0.03	-	-0.06	-0.05	-	-0.04	-0.09	-0.15**	-0.07	-0.01	0.06	-	-0.04	-0.10	-0.07	0.02	0.01	0.02	0.05
	(1.99)	(-0.14)	(0.02)	(0.78)	(1.08)	(-1.62)	(-0.34)	(-2.98)	(-0.86)	(-0.64)	(-3.88)	(-0.32)	(-1.54)	(-2.12)	(-0.94)	(-0.17)	(0.68)	(-3.12)	(-0.56)	(-1.37)	(-0.89)	(0.26)	(0.13)	(0.20)	(0.32)
HML	0.11	-0.04	0.02	-0.20**	0.07	-0.07	-0.04	-	-0.04	-0.12	-	-0.17	-0.03	-0.12*	-	-0.04	-0.06	-	-0.04	-0.06	0.03	0.01	0.01	0.02	-
	(1.61)	(-0.54)	(0.32)	(-2.22)	(1.16)	(-1.35)	(-0.51)	(-2.92)	(-0.50)	(-1.51)	(-4.00)	(-1.49)	(-0.40)	(-1.83)	(-3.55)	(-0.72)	(-0.65)	(-4.51)	(-0.42)	(-0.78)	(0.35)	(0.19)	(0.09)	(0.22)	(-3.20)
WML	0.02	0.01	-0.05	0.11	0.09***	0.04	0.06	0.01	-0.00	0.07	0.10**	-0.07	0.01	-0.07	0.05	-0.01	-0.03	0.04	0.03	0.00	0.02	-0.00	0.00	-0.04	-0.15
	(0.44)	(0.27)	(-1.21)	(1.54)	(2.68)	(0.89)	(1.10)	(0.26)	(-0.06)	(1.44)	(2.18)	(-0.73)	(0.27)	(-1.31)	(0.96)	(-0.37)	(-0.60)	(1.63)	(0.69)	(0.02)	(0.40)	(-0.00)	(0.01)	(-0.88)	(-1.39)
Const	-0.52	-	-0.39	0.71	-0.37	-0.58*	-0.43	0.61*	-0.03	0.44	0.40	-0.10	0.18	0.54	0.28	-0.33	-0.35	0.45	0.13	0.09	0.19	-0.14	0.49	-0.64	1.29**
	(-1.42)	(-2.81)	(-1.18)	(1.35)	(-1.17)	(-1.97)	(-1.09)	(1.72)	(-0.08)	(1.37)	(1.20)	(-0.26)	(0.51)	(1.50)	(0.81)	(-0.81)	(-1.15)	(1.54)	(0.35)	(0.27)	(0.51)	(-0.30)	(1.06)	(-1.42)	(2.13)
Obs.	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79
R-sq.	0.77	0.78	0.77	0.69	0.80	0.80	0.63	0.74	0.71	0.79	0.81	0.64	0.79	0.75	0.77	0.74	0.76	0.82	0.71	0.74	0.72	0.70	0.59	0.70	0.58

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.4.3 Time-series Regressions by Region with Less Portfolio Granularity

One alternative approach to the methodology above is to employ a region-wide specification, but group firm returns into portfolio *quintiles*, rather than 25 individual portfolios. While the disadvantage of using fewer portfolios is that it significantly aggregates potentially useful information in a potentially non-useful way, it does provide a benefit, in mitigating the chance that extreme portfolios (e.g., the 1st or the 25th portfolio among 25 quantiles) overly influence statistical inference. Thus, this approach is presented in Tables 3.14 through 3.25.

Here, the findings are more mixed than those found when using the 25 portfolios above. In part, this is because some of the statistical significance of the extreme portfolios—here, the 1st and 5th quintiles—dissipates. What remains is the finding that with respect to value-weighted returns, firms in Japan that are more strongly negatively correlated to movements in the Japanese Yen exhibit substantially negative four-factor alphas (Table 3.14). As well, the near monotonic relationship in portfolio alphas from the 1st to 5th quintile among firms in the Asian region (excluding Japan) remains, although the effect is also now only marginally significant (Tables 3.16 and 3.17). Moreover, European Monetary Union (EMU) countries in the middle quintiles tend to exhibit negative alphas, whereas the 1st and 5th quintiles are insignificant from zero (Tables 3.18 and 3.19). But, whereas this effect also exists at least directionally amid non-Euro European countries, the actual estimates become insignificant there (Tables 3.20 and 3.21).

Table 3.14 Quintile Regional Factor Regressions: Japan—Value Weighted. Time-series regressions of 5 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for Japan; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.37***	1.23***	1.07***	1.08***	1.00***
	(8.68)	(7.72)	(13.07)	(12.27)	(14.69)
SMB (Region)	0.58***	0.43*	0.15*	0.05	0.13*
	(4.76)	(1.97)	(1.69)	(0.66)	(1.76)
HML (Region)	0.03	0.22	0.07	-0.15	0.10
	(0.20)	(0.99)	(0.69)	(-1.64)	(1.19)
WML (Region)	-0.25	-0.11	0.12	0.24**	-0.01
	(-1.02)	(-0.67)	(1.23)	(2.07)	(-0.12)
Constant	-2.24***	-0.54	-0.02	0.37	-0.08
	(-3.56)	(-1.08)	(-0.06)	(1.11)	(-0.27)
Observations	129	129	129	129	129
R-squared	0.56	0.62	0.70	0.62	0.72
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.15 Quintile Regional Factor Regressions: Japan—Equal Weighted. Time-series regressions of 5 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the equal-weighted regression results for Japan; both portfolio returns and market returns are equal-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (EW)	1.27***	0.96***	0.94***	0.87***	1.01***
	(24.16)	(30.53)	(44.52)	(38.05)	(39.95)
SMB (Region)	0.14**	0.05	-0.04**	-0.01	-0.04
	(2.54)	(1.36)	(-2.27)	(-0.50)	(-1.47)
HML (Region)	-0.23***	0.03	0.01	0.09***	0.02
	(-3.22)	(0.67)	(0.32)	(2.94)	(0.56)
WML (Region)	-0.17*	0.07	0.09***	0.03	-0.02
	(-1.79)	(1.58)	(2.80)	(0.61)	(-0.50)
Constant	-0.22	-0.09	-0.01	0.14	0.07
	(-0.96)	(-0.81)	(-0.06)	(1.58)	(0.54)
Observations	129	129	129	129	129
R-squared	0.90	0.94	0.95	0.95	0.96
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.16 Quintile Regional Factor Regressions: Asia (ex-Japan)—Value Weighted. Time-series regressions of 5 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for Asia (excluding Japan); both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.12***	1.02***	1.09***	1.05***	0.95***
	(20.04)	(14.26)	(19.07)	(23.91)	(23.96)
SMB (Region)	0.32***	0.11	0.20**	0.10	-0.05
	(3.04)	(0.55)	(2.16)	(0.92)	(-0.49)
HML (Region)	-0.10	0.11	-0.15	-0.07	-0.06
	(-1.30)	(0.68)	(-1.45)	(-0.61)	(-0.79)
WML (Region)	-0.18*	-0.30**	-0.21**	-0.08	0.10
	(-1.98)	(-2.08)	(-2.03)	(-0.52)	(1.01)
Constant	-0.83*	-0.55	-0.03	0.29	0.81*
	(-1.95)	(-0.80)	(-0.08)	(0.60)	(1.81)
Observations	141	141	141	141	141
R-squared	0.75	0.63	0.78	0.78	0.74
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.17 Quintile Regional Factor Regressions: Asia (ex-Japan)—Equal Weighted. Time-series regressions of 5 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the equal-weighted regression results for Asia (excluding Japan); both portfolio returns and market returns are equal-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (EW)	1.07***	1.07***	0.99***	0.99***	0.99***
	(35.16)	(36.24)	(41.85)	(38.83)	(37.39)
SMB (Region)	0.26	-0.04	0.13***	-0.00	0.08
	(1.57)	(-0.26)	(3.07)	(-0.02)	(1.29)
HML (Region)	0.03	-0.11	0.20***	-0.06	-0.21*
	(0.19)	(-0.68)	(2.92)	(-0.81)	(-1.97)
WML (Region)	0.04	-0.19*	-0.18***	-0.02	-0.13
	(0.62)	(-1.72)	(-2.74)	(-0.17)	(-1.04)
Constant	0.08	0.49	-0.56**	0.51	0.35
	(0.18)	(0.93)	(-2.30)	(1.32)	(0.98)
Observations	141	141	141	141	141
R-squared	0.87	0.84	0.93	0.88	0.85
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.18 Quintile Regional Factor Regressions: Europe (EMU Countries)—Value Weighted. Time-series regressions of 5 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for European-Monetary Union (EMU) countries; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.42***	1.28***	1.15***	1.06***	1.17***
	(12.26)	(22.66)	(18.03)	(22.57)	(23.84)
SMB (Region)	0.50***	0.18*	0.23**	0.13	-0.05
	(3.69)	(1.97)	(2.51)	(1.23)	(-0.63)
HML (Region)	-0.23	0.02	0.09	0.00	-0.16
	(-1.40)	(0.19)	(0.87)	(0.02)	(-1.44)
WML (Region)	0.17	0.02	-0.12	-0.04	0.07
	(1.21)	(0.24)	(-1.50)	(-0.51)	(1.19)
Constant	-0.16	-0.82**	-0.87**	-0.15	0.56
	(-0.26)	(-1.99)	(-2.33)	(-0.41)	(1.51)
Observations	129	129	129	129	129
R-squared	0.71	0.80	0.80	0.80	0.84
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.19 Quintile Regional Factor Regressions: Europe (EMU Countries)—Equal Weighted. Time-series regressions of 5 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the equal-weighted regression results for European-Monetary Union (EMU) countries; both portfolio returns and market returns are equal-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (EW)	1.27***	0.96***	0.94***	0.87***	1.01***
	(24.16)	(30.53)	(44.52)	(38.05)	(39.95)
SMB (Region)	0.14**	0.05	-0.04**	-0.01	-0.04
	(2.54)	(1.36)	(-2.27)	(-0.50)	(-1.47)
HML (Region)	-0.23***	0.03	0.01	0.09***	0.02
	(-3.22)	(0.67)	(0.32)	(2.94)	(0.56)
WML (Region)	-0.17*	0.07	0.09***	0.03	-0.02
	(-1.79)	(1.58)	(2.80)	(0.61)	(-0.50)
Constant	-0.22	-0.09	-0.01	0.14	0.07
	(-0.96)	(-0.81)	(-0.06)	(1.58)	(0.54)
Observations	129	129	129	129	129
R-squared	0.90	0.94	0.95	0.95	0.96
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.20 Quintile Regional Factor Regressions: Europe (Non-Euro Countries)—Value Weighted. Time-series regressions of 5 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for non-Euro countries within Europe; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.49***	1.27***	0.86***	0.97***	0.81***
	(13.07)	(15.47)	(6.87)	(8.21)	(13.11)
SMB (Region)	0.55*	0.21***	0.08	-0.02	0.05
	(1.90)	(3.07)	(1.13)	(-0.20)	(0.80)
HML (Region)	0.22	0.10	0.13	0.20	-0.03
	(0.69)	(0.99)	(1.31)	(0.99)	(-0.39)
WML (Region)	-0.26	0.06	0.02	-0.02	0.12***
	(-1.48)	(1.00)	(0.29)	(-0.29)	(2.73)
Constant	-0.56	-0.87*	-0.70	-0.05	0.53
	(-0.50)	(-1.75)	(-1.32)	(-0.10)	(1.53)
Observations	130	130	130	130	130
R-squared	0.49	0.76	0.60	0.47	0.69
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.21 Quintile Regional Factor Regressions: Europe (Non-Euro Countries)—Equal Weighted. Time-series regressions of 5 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the equal-weighted regression results for non-Euro countries within Europe; both portfolio returns and market returns are equal-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (EW)	1.20***	1.05***	0.97***	0.95***	0.95***
	(22.95)	(31.53)	(27.25)	(35.97)	(27.04)
SMB (Region)	0.13**	-0.04	-0.05	-0.02	-0.05
	(2.22)	(-0.81)	(-1.29)	(-0.48)	(-1.07)
HML (Region)	-0.13**	0.01	0.05	0.06	0.03
	(-2.00)	(0.11)	(0.93)	(1.15)	(0.54)
WML (Region)	-0.11*	-0.00	0.03	0.12***	0.09**
	(-1.89)	(-0.04)	(0.68)	(3.30)	(2.19)
Constant	0.19	0.20	-0.33	0.10	0.26
	(0.58)	(0.59)	(-1.26)	(0.40)	(0.98)
Observations	130	130	130	130	130
R-squared	0.90	0.90	0.91	0.90	0.90
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.22 Quintile Regional Factor Regressions: Middle East—Value Weighted. Time-series regressions of 5 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for countries within the Middle East; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.37***	0.73***	0.86***	0.88***	1.10***
	(7.75)	(6.83)	(7.03)	(9.65)	(9.04)
SMB (Region)	0.06	0.08	-0.15	0.18	-0.05
	(0.37)	(0.65)	(-1.28)	(1.46)	(-0.44)
HML (Region)	-0.14	-0.04	-0.15	0.11	-0.10
	(-1.20)	(-0.34)	(-1.31)	(1.09)	(-0.94)
WML (Region)	0.09	-0.01	0.06	0.01	0.04
	(1.02)	(-0.12)	(0.40)	(0.19)	(0.74)
Constant	1.26	0.09	0.92	-0.24	0.86
	(1.48)	(0.15)	(1.51)	(-0.40)	(1.53)
Observations	79	79	79	79	79
R-squared	0.62	0.46	0.52	0.60	0.70
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.23 Quintile Regional Factor Regressions: Middle East—Equal Weighted. Time-series regressions of 5 monthly currency sorted and regionally-specific portfolio returns on regional specific market factors. This table presents the equal-weighted regression results for countries within the Middle East; both portfolio returns and market returns are equal-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (EW)	1.03***	1.06***	0.99***	1.09***	0.89***
	(14.61)	(12.81)	(15.46)	(13.23)	(14.53)
SMB (Region)	0.18*	-0.01	0.00	0.08	0.08
	(1.99)	(-0.14)	(0.02)	(0.78)	(1.08)
HML (Region)	0.11	-0.04	0.02	-0.20**	0.07
	(1.61)	(-0.54)	(0.32)	(-2.22)	(1.16)
WML (Region)	0.02	0.01	-0.05	0.11	0.09***
	(0.44)	(0.27)	(-1.21)	(1.54)	(2.68)
Constant	-0.52	-0.97***	-0.39	0.71	-0.37
	(-1.42)	(-2.81)	(-1.18)	(1.35)	(-1.17)
Observations	79	79	79	79	79
R-squared	0.77	0.78	0.77	0.69	0.80
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.24 Quintile Regional Factor Regressions: Latin America—Value Weighted. This table presents the value-weighted regression results for countries within Latin America; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Portfolio Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.64***	0.82***	0.93***	0.68**	1.01***
	(7.93)	(9.26)	(7.60)	(2.50)	(8.34)
SMB (Region)	-0.72***	0.21	0.21	0.22	0.00
	(-3.09)	(1.26)	(1.24)	(1.06)	(0.01)
HML (Region)	-0.39**	0.19	-0.03	0.03	0.03
	(-2.07)	(0.95)	(-0.10)	(0.11)	(0.20)
WML (Region)	-0.52*	-0.19	-0.09	-0.02	-0.08
	(-1.93)	(-1.29)	(-0.83)	(-0.12)	(-0.88)
Constant	-0.71	-1.67	-0.47	1.85	0.38
	(-0.47)	(-1.16)	(-0.37)	(0.97)	(0.38)
Observations	34	34	34	34	34
R-squared	0.73	0.60	0.53	0.28	0.71
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

Table 3.25 Quintile Regional Factor Regressions: Latin America—Equal Weighted. This table presents the equal-weighted regression results for countries within Latin America; both portfolio returns and market returns are equal-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated.

	Quintiles				
VARIABLES	1	2	3	4	5
Market (EW)	1.31***	1.04***	1.02***	1.14***	1.12***
	(12.70)	(10.63)	(14.57)	(8.19)	(17.82)
SMB (Region)	-0.49***	0.01	-0.13	0.07	0.01
	(-3.32)	(0.04)	(-1.52)	(0.51)	(0.07)
HML (Region)	-0.03	-0.09	-0.18***	0.20	-0.01
	(-0.26)	(-0.83)	(-2.88)	(0.99)	(-0.10)
WML (Region)	-0.18	-0.00	0.15***	0.05	-0.16***
	(-1.27)	(-0.04)	(2.91)	(0.46)	(-3.02)
Constant	-1.48*	-0.14	0.59	-2.11*	0.07
	(-1.72)	(-0.13)	(0.95)	(-1.74)	(0.12)
Observations	34	34	34	34	34
R-squared	0.80	0.75	0.87	0.72	0.91
Robust t-statistics in parentheses					
*** p<0.01, ** p<0.05, * p<0.1					

3.4.4 Time-Series Regressions with Country-Specific Risk Factor Exposures

As a way of getting around potential aggregation bias, I consider factor-estimation of currency effects by individual currencies, rather than region. This does not eliminate the problem of utilizing time-series that may, for some markets, be of too limited a duration to gain statistical power. However, it does at least allow portfolio returns to be constructed within currency, and consequently for alphas to be adjusted by more locally-specific considerations.

Consequently, construction of the factors is the same process as is done in the regional portfolio specification, with the exception that everything is calculated within-currency. Like the region-wide estimations, portfolio and factor returns are constructed from firm specific, dollar-adjusted returns. Since there are over 30 countries in the sample, for brevity, I plot the distribution of the portfolio level alphas and their t-statistics, arranged according to their currency sensitivity ranking.

These alpha distributions are shown in figures 3.1 through 3.4. Figure 3.1 provides a first pass, by plotting the various point estimates of portfolio-level alpha against their corresponding t-statistics. The results show the tendency for very positive alphas to exhibit statistical significance, although the same is not necessarily true for large negative alphas. This suggests that there exists some source of significant positive excess returns which is visible when sorting according to currency portfolios, but the analysis at this point does not show which currency portfolios these significant alphas are attributable to.

Figure 3.2 follows, by plotting a histogram of alpha estimates with an overlaid normal distribution. Here, we can see that the distribution of portfolio alphas is highly non-normal, with a substantial amount of kurtosis. However, while there is a slightly higher probability of observing very large alphas among the set of currency portfolios estimated, we still do not know whether or not these large alphas are attributable to the very most currency sensitive portfolios.

Figure 3.3 takes a next step in addressing that, by plotting the frequency distribution of t-statistics, sorted according to portfolio-level currency sensitivity. Specifically, alphas of each of the 25 currency portfolios (again, within each currency) are sorted into three approximately equal groups according to negative, positive, or neutral sensitivity. The negative sensitivity group contains portfolios 1 though 8, the neutral group contains portfolios 9-15, and the positive sensitivity group contains portfolios 16-25. Each of these groups is plotted by color, with negative portfolios in blue, positive in green, and neutral portfolios in red.

There are two interesting features that appear in this plot. The first is that there is a greater mass of probability that a portfolio will exhibit a statistically significant positive alpha, whereas there is a smaller probability that a portfolio will exhibit statistically significant negative alpha—yet when negative t-statistics *do* occur, they tend to be disproportionately significant. The second interesting feature is how this finding is split along currency-sensitivity lines: both positive and negative currency portfolios tend to have a greater likelihood of exhibiting alphas that are near or beyond conventional threshold levels of significance, relative to neutral portfolios.

Figure 3.4 corroborates this finding of statistical differential, by plotting the conditional distribution of the point estimates of the alphas rather than their t-statistics. Here again, there is a pronounced difference in return effects between currency sensitive and currency neutral portfolios.

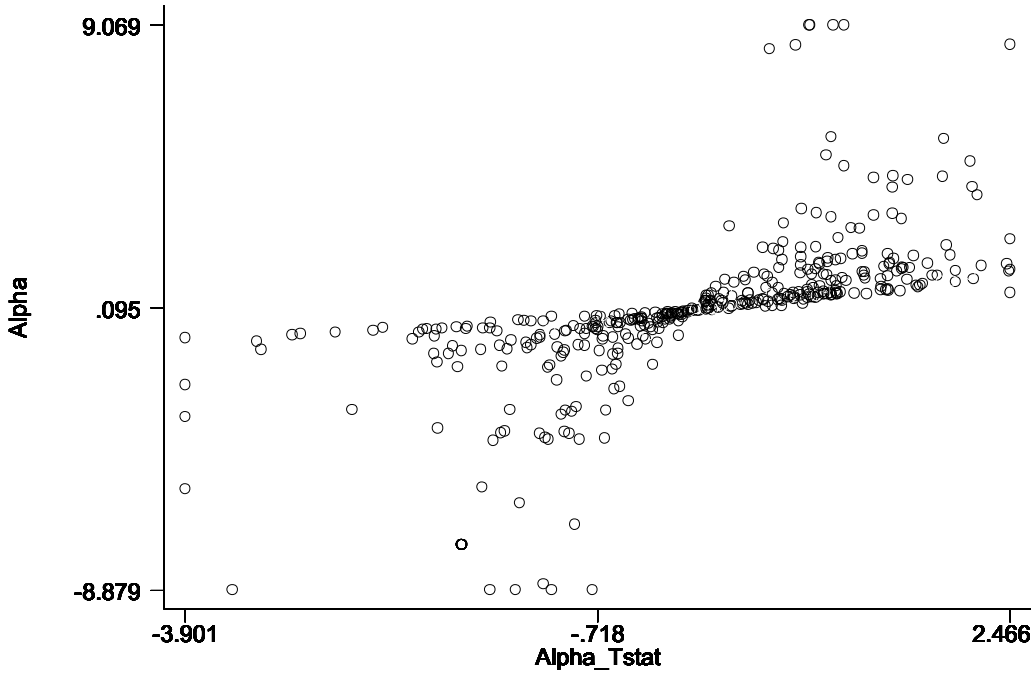

Figure 3.1 Plot of Region Specific Portfolio Alphas against Corresponding t-statistics. This graph presents a scatterplot of the t-statistics and point estimates of the alphas of country-level and currency sorted portfolios. The alphas are from four-factor (market, size, value, and momentum) adjusted regressions of 25 currency-sensitivity sorted portfolios. Each point in the graph represents an individual portfolio.

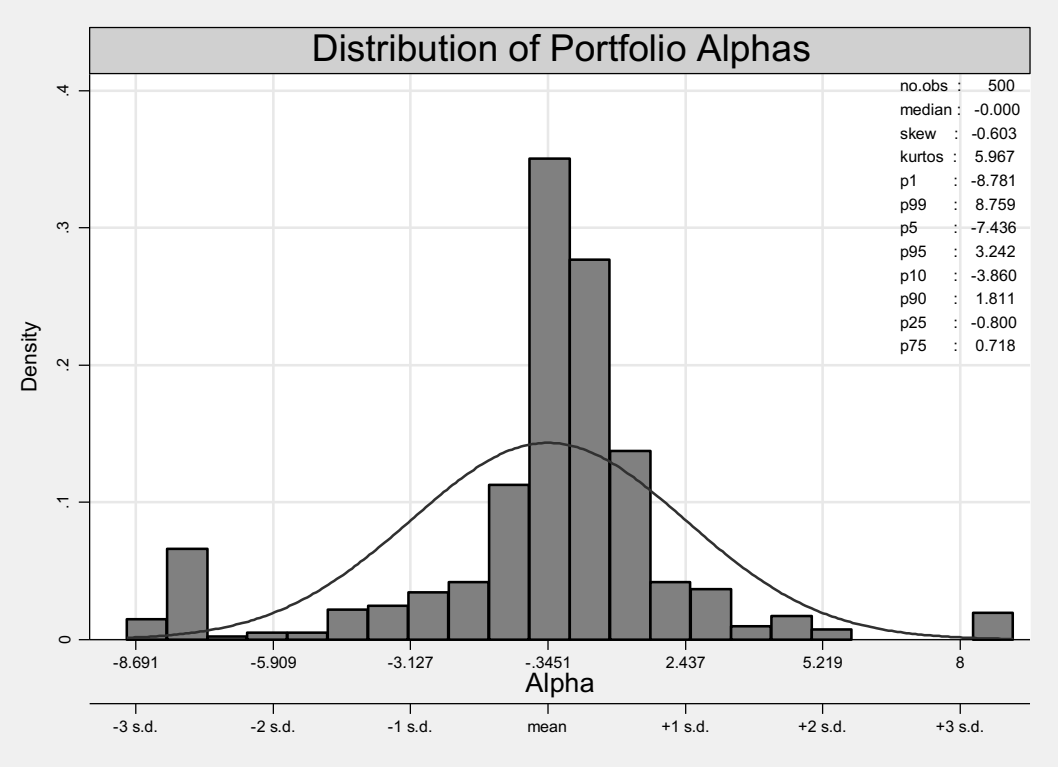

Figure 3.2 Distribution and Summary Statistics of Region Specific Portfolio Alphas. This table presents the discrete distribution of the alpha estimates from country-level and currency sorted portfolios. The alphas are from four-factor (market, size, value, and momentum) adjusted regressions of 25 currency-sensitivity sorted portfolios. The distributional overlay is that of a standard (0,1) normal. Summary statistics of the alpha estimates are plotted in the upper right hand region of the graph.

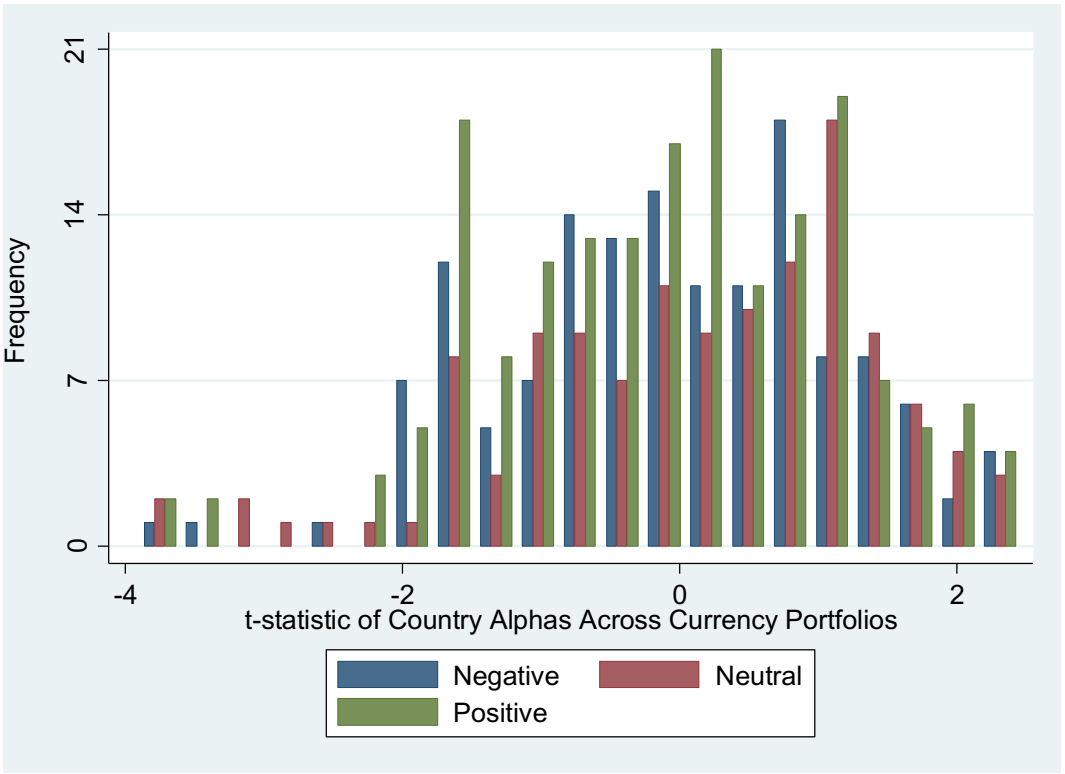

Figure 3.3 Distribution and Summary Statistics of Region Specific Portfolio Alpha t-statistics, Sorted by Currency Exposure. This table presents the t-statistics of the alpha estimates of country-level and currency sorted portfolios. The alphas are from four-factor (market, size, value, and momentum) adjusted regressions of 25 currency-sensitivity sorted portfolios. Within each area, each of the 25 alphas are grouped into (approximately) equally spaced bins. Portfolios 1-8 are considered to be made up of firms with negative currency sensitivity, and portfolios 16-25 are considered to have positive sensitivity. Portfolios in between these values are considered to be currency neutral.

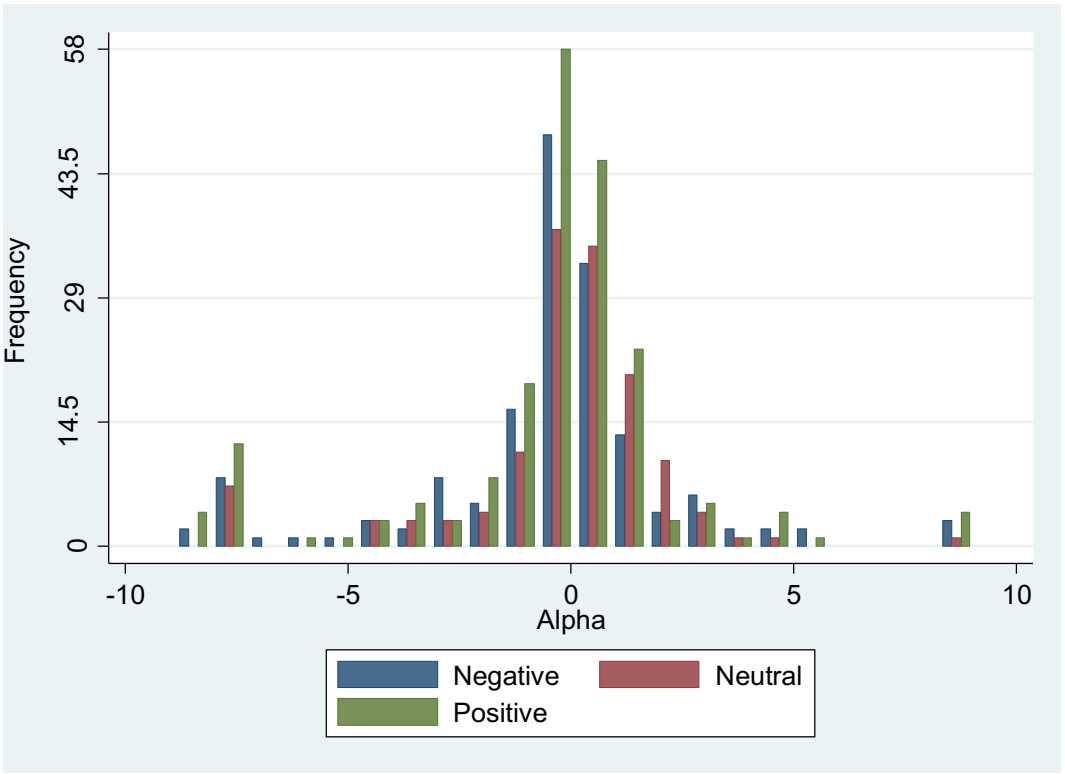

Figure 3.4 Distribution and Summary Statistics of Region Specific Portfolio Alpha Point Estimates, Sorted by Currency Exposure. This plot shows the four-factor (market, size, value, and momentum) adjusted alpha estimates of currency-area specific regressions of 25 currency-sensitivity sorted portfolios. Within each area, each of the 25 alphas are grouped into (approximately) equally spaced bins. Portfolios 1-8 are made up of firms with negative currency sensitivity, and portfolios 16-25 are considered to have positive sensitivity. Portfolios in between these values are considered to be currency neutral.

3.5 Time-Series Regressions by Region with a Currency Risk Factor

3.5.1 Overview

The evidence thus far is mixed, in showing that only some currency-exposed portfolios exhibit significantly positive alpha within a region or country. Nevertheless, it remains to be seen whether or not these portfolio alphas that are observed are actually driven by systematic currency risk, or some other as yet un-modeled factor.

To address this question, a currency factor is constructed to be the return on firms that are (in absolute terms) most sensitive to their home currency's movement against the dollar, less the return on firms that are least exposed. In particular, this currency factor ("Sensitive Minus Neutral", or "SMN") is constructed such that the long side of the portfolio is the set of firms which are in the 80th percentile and above, or 20th percentile and below in terms of their *magnitude* of currency sensitivity. From within both this high-positive and high-negative set of firms, the top 70th and bottom 30th percentile of market capitalization firms are sub-selected. The short side is then those firms that are between the 20th and 80th percentile of currency sensitivity, but also above the 70th percentile or below the 30th percentile according to market size. In other words, the "Sensitive Minus Neutral" portfolio is calculated from the following sets of portfolios:

$$SMN = \frac{(Small\ High\ Pos. + Small\ High\ Neg. + Large\ High\ Pos. + Large\ High\ Neg.)}{4} - \frac{(Large\ Neutral + Small\ Neutral)}{2}$$

Figure 3.5 below shows the spread between the most positively sensitive and the most neutral portfolio, as well as that for the most negatively sensitive against the most neutral portfolio. Here, we can identify two features.

One feature is that the currency sensitivity factor—regardless of sign—tends to yield a positive premium, on average. However, this yield is volatile, with annualized premiums averaging around 15% in 2003, to about 5% in 2004, 2007, and 2009. The spread turned slightly negative (to around minus 2-4%) in 2001 and 2008, with another sharp albeit brief reversal (about minus 12%) in 2012. This display of general factor premium volatility, in conjunction with periodic drawdowns, is suggestive of a risk-based explanation for why this premium should exist.

Another salient feature is the co-integration of the two portfolios that are most exposed to currency movement, yet are directionally opposite in the sign of that exposure. That is, the spreads of the two portfolios tend to move closely together, both in periods of relative passivity for the premium, as well as amid more unstable regimes. There appears to be a very slightly higher spread for firms with positive exposure to currency sensitivity compared to those with negative exposure, although this observation is not conclusive without further testing.[21] As well, firms with negative sensitivity do have more pronounced volatility in the spread over the more recent years of the sample.

Here, the classification of large-cap is the same as in the other factors, whereby a firm is considered large if it is in the 70th percentile of market capitalization for a country or above, and conversely is considered small if it is at the 30th percentile or below. Likewise, a firm is classified as positively sensitive if it is in the 80th percentile of estimated currency-beta magnitude for its country, and is negatively sensitive if it is at the 20th percentile or below.

[21] The spread on the negatively sensitive firms may also appear to be leading the spread on the positively sensitive firms—although if so, the effect appears quite small and this too would need further validation. This observation is left for future research.

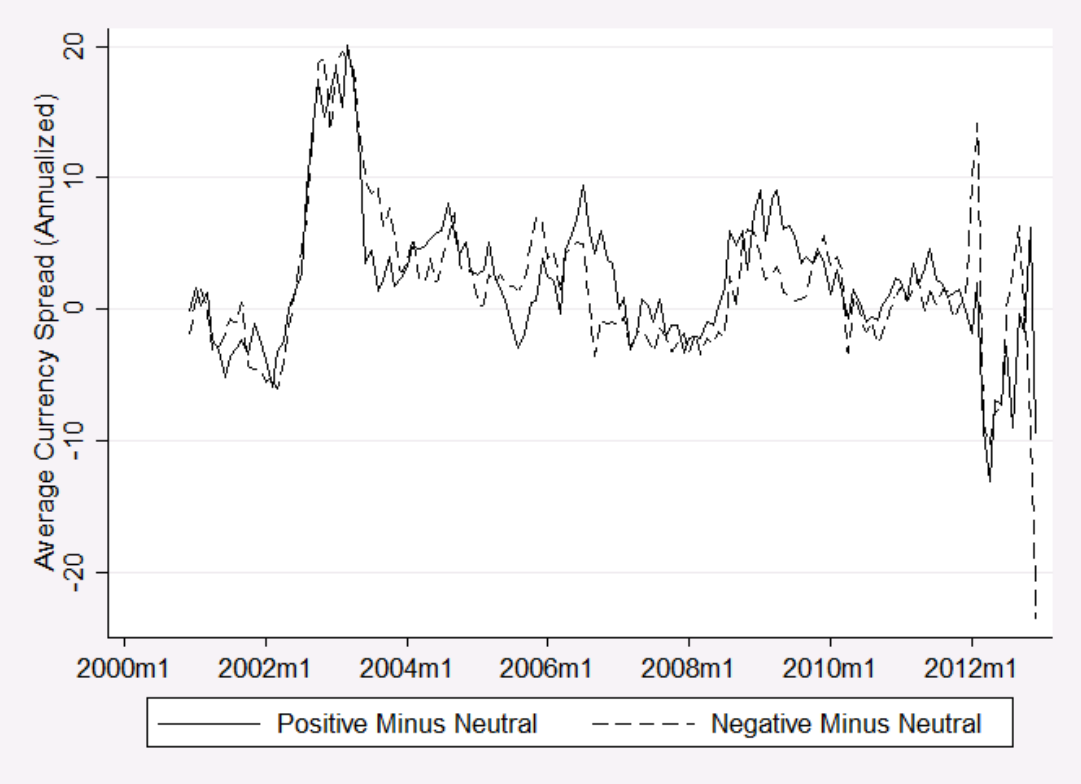

Figure 3.5 Time-series Spread of the Decomposed Currency Factor. This table displays the annualized monthly return spreads between the most positive quintile of currency sensitivity and the most neutral quintile of currency sensitivity, as well as that for the most negative quintile of currency sensitivity and the most neutral quintile of currency sensitivity.

3.5.2 Regional Time-Series Regressions with a Currency Risk Factor

The results for these five-factor regressions are presented in Table 3.26 using portfolio quintiles. Table 3.26 shows that for the quintile specification, factor loadings on SMN—i.e., on the spread in returns between strongly sensitive and weakly sensitive firms—are highly significant in Japan, with a large and significantly negative alpha for the 1st quintile, and a negative but only marginally significant alpha for the 5th quintile. A similar, albeit less pronounced, dynamic exists for the Asia ex-Japan region. However insignificant results are found for Europe, Latin America, and the Middle East.

In sum, despite the fact that currency risk was shown in the section above to largely be a regional or local consideration, the inclusion of a systematic currency risk factor does go some way toward decreasing pricing error in a time-series factor specification. Here in Table 2.36, portfolio alphas are now insignificant in most regions. The exception to this is in Japan and, to a lesser extent, broader Asia, where portfolio alphas in the most negatively currency sensitive quintiles remain significantly negative. Although the differences between the results with the currency factor inclusion in Table 3.26 and its omission in Tables 3.14 through 3.17 for Japan and Asia still represent an improvement (here in Table 3.26, estimates of 1st quintile alpha now move closer to zero by about 5% and 11%, respectively[22]), the findings for these geographic areas in particular suggest that some of what may be driving currency risk can, in fact, be captured by as yet un-modeled firm characteristics. This possibility is explored in Section 3.6.

[22] The figures for these calculations are -2.14 (Table 3.26) versus -2.24 (Table 3.14) for Japan in the 1st quintile, and -.79 (Table 3.26) versus -.88 (Table 3.16) for Asia ex-Japan.

Table 3.26 Currency Risk Factor Loading and Associated Alphas Among Regions and Currency Portfolios. This table presents the currency risk factor loadings ("SMN", or "Strong Minus Neutral") and alphas from region-specific regressions of currency-sorted portfolio returns (quintiles) on value-weighted market returns, size and value factors, momentum, and a currency factor.

	Portfolio				
	1	2	3	4	5
Japan					
SMN	2.19***	0.22	0.12	0.1	0.88***
	(4.82)	(1.11)	(0.59)	(0.42)	(3.76)
Alpha	-2.14***	0.14	-0.03	0.07	-0.50
	(-3.76)	(0.49)	(-0.12)	(0.29)	(-1.57)
Asia Ex-Japan					
SMN	0.56**	-0.97**	-0.02	0.21	0.79**
	(2.17)	(-2.05)	(-0.07)	(0.83)	(2.32)
Alpha	-0.79**	-0.56	-0.41	0.12	0.18
	(-2.07)	(-1.23)	(-1.01)	(0.27)	(0.36)
Europe (Euro)					
SMN	1.15**	-0.12	-0.40**	-0.28	-0.29
	(2.41)	(-0.57)	(-2.10)	(-1.48)	(-1.08)
Alpha	-0.41	0.03	0.46*	-0.04	0.22
	(-0.67)	(0.1)	(1.72)	(-0.12)	(0.78)
Europe (Non-Euro)					
SMN	0.23	0.19	-0.2	0.86	0.05
	(0.46)	(0.89)	(-1.02)	(1.13)	(0.28)
Alpha	-0.58	-0.88*	-0.69	-0.11	0.52
	(-0.52)	(-1.76)	(-1.33)	(-0.21)	(1.51)
Latin America					
SMN	0.25	-0.09	0.13	0.97	0.07
	(0.8)	(-0.37)	-0.31	(1.51)	(0.33)
Alpha	-0.55	-1.72	-0.39	2.43	0.43
	(-0.36)	(-1.16)	(-0.33)	(1.26)	(0.43)
Middle East					
SMN	0.39	0.05	0.33	-0.31	0.38
	(1.02)	(0.16)	(1.11)	(-1.57)	(1.39)
Alpha	1.25	0.09	0.91	-0.23	0.85
	(1.46)	(0.15)	(1.48)	(-0.38)	(1.51)

3.5.3 Country Time-Series Regressions with a Currency Risk Factor

In this section, I construct a country-level currency factor. This is done in the same manner as the regional specification in Section 3.5.2 above, but rankings and factor-mimicking portfolio specification—as well as overall estimation—are conducted at the country level. Also, as with the original country specific regressions in Section 3.4.4 above, in the interest of space I present summarize the results in graphical form below.

Figure 3.6 plots the point estimates of the factor loadings of each of the country-level, currency-sorted portfolios. These loadings are sorted by color, according to whether or not they are statistically significant (i.e., equal to or beyond +/- 1.96). Perhaps unsurprisingly, those portfolio loadings that are relatively large in magnitude also tend to be statistically significant. More interestingly, while the majority of portfolios exhibit a weak and statistically insignificant association with the currency factor, a small number of portfolios exhibit an outsized and positive association with the factor. Because the currency factor is constructed to be the returns on both strongly positively as well as negatively currency sensitive firms, less the returns on weakly currency correlated firms (i.e., it's constructed using the magnitude, not the sign), this suggests that a country-specific currency factor can do a reasonable job in capturing the more extreme levels of currency exposure.

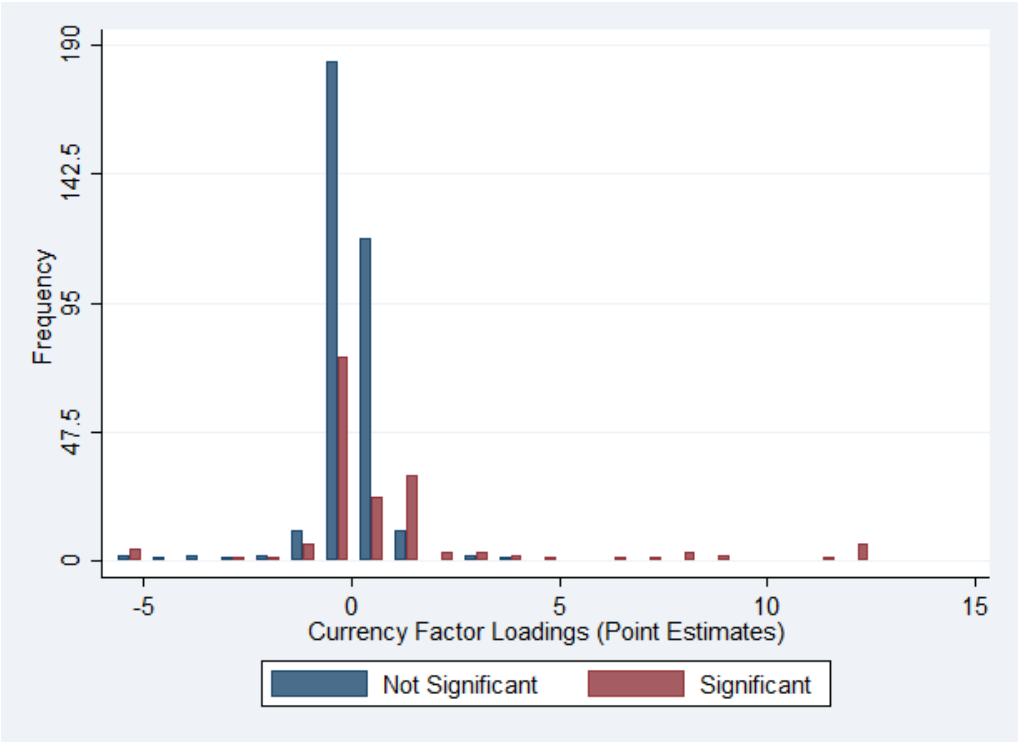

Figure 3.6 Plot of Portfolio Currency Risk Factor Loadings, Split According to Significance. This figure displays the currency factor loadings from each of the currency-sorted portfolios. Portfolios are unique to each country. The sample period is 2000-2014. In addition to a currency factor, the time-series regressions for factor loadings include size, book-to-market, market, and momentum factors.

Figure 3.7 below takes a look at the portfolio level alphas that arise as a result of the inclusion of a currency factor. As in Section 3.4.4 above, portfolios in the figure are color-coded according to the magnitude and direction of their currency sensitivity. That is, within each country, each of the 25 alphas are grouped into (approximately) equally spaced bins. Portfolios 1-8 are thus made up of firms with negative currency sensitivity, and portfolios 16-25 are considered to have positive sensitivity. Portfolios in between these values are considered to be currency neutral.

Figure 3.7 appears to show that the factor still has some trouble capturing the variation of some portfolios with negative and statistically significant mispricing, with the mispricing occurring mostly among portfolios with moderate to strong directional currency sensitivity. Overall however, most of the mass of the distribution of the alpha t-statistics is centered around zero, and in particular within the region of statistical insignificance. This stands in contrast to the Figure 3.3 in the previous country-specific section, which also depicts the t-statistics of the time-series estimation, but without the currency factor. In particular, in comparison with Figure 3.3, Figure 3.7 shows fewer portfolios outside the region of +-1.96, and consequently a greater proportion of firms within that region. In other words, just as in the regional specification in Section 3.5.2 above, the inclusion of the currency factor in the time-series regressions does go some way towards reducing portfolio-level pricing error.

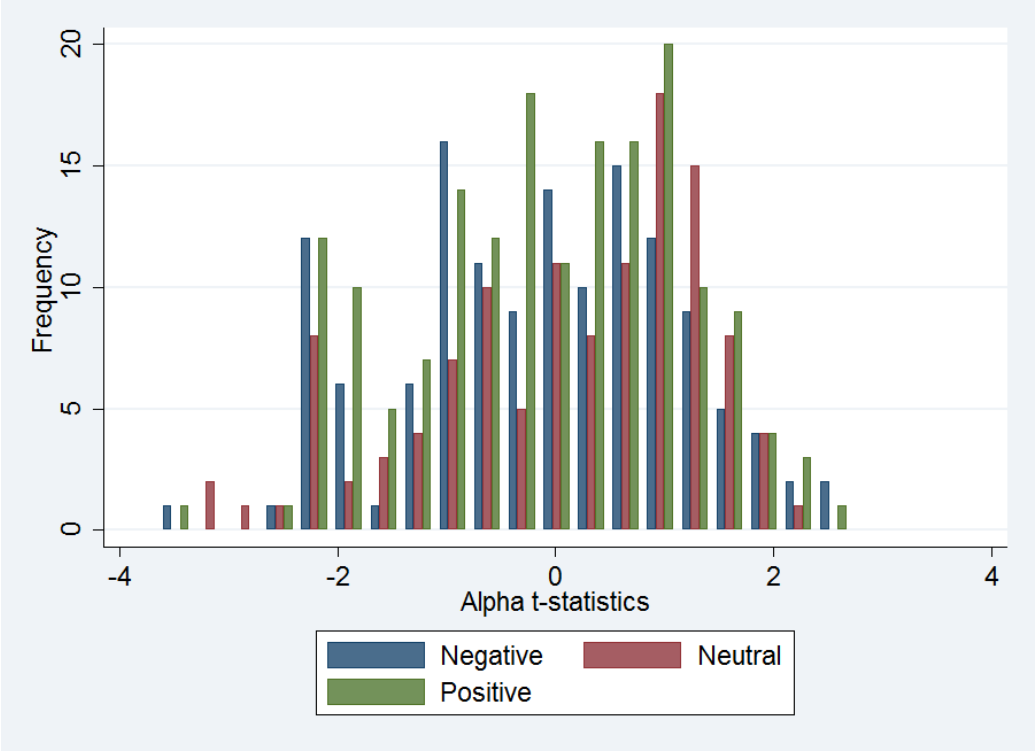

Figure 3.7 Conditional Distribution of Portfolio Alpha t-statistics from Country 5-factor Regressions. Within each country, each of the 25 alphas are grouped into (approximately) equally spaced bins. Portfolios 1-8 are denoted as firms with negative currency sensitivity, and portfolios 16-25 are considered to have positive sensitivity. Portfolios in between these values are considered to be currency neutral. The sample period is 2000-2014. In addition to a currency factor, the time-series regressions for factor loadings include size, book-to-market, market, and momentum factors.

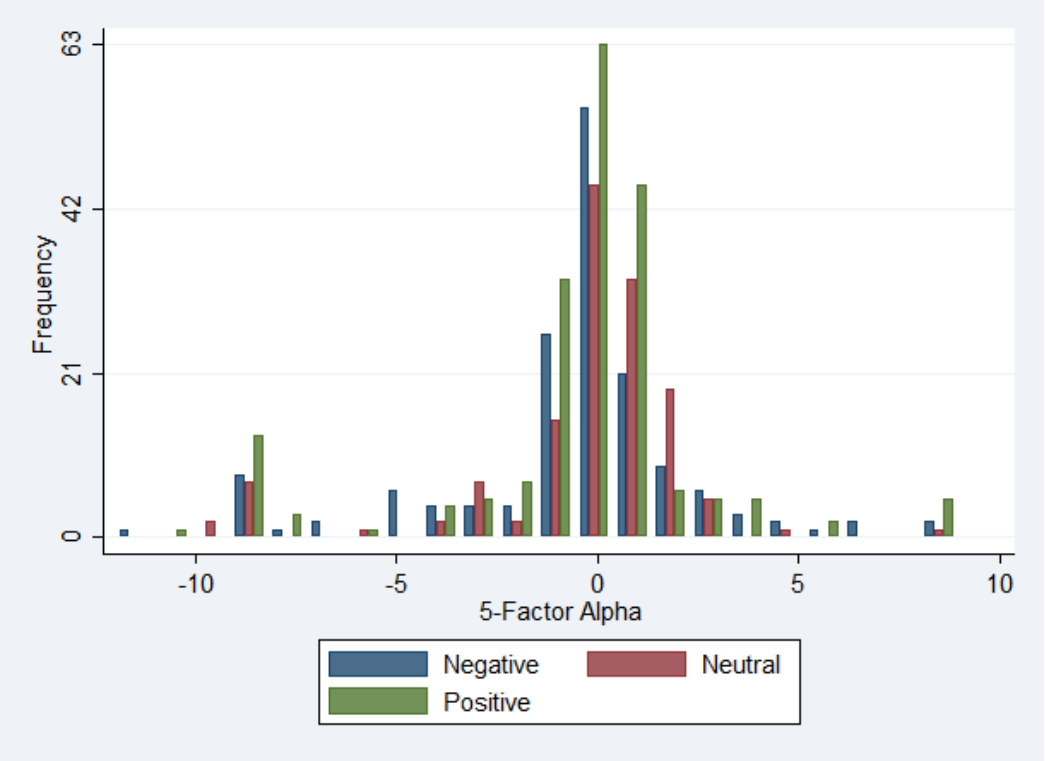

Figure 3.8 Conditional Distribution of Portfolio Alphas (Point Estimates) from Country 5-factor Regressions. Within each country, each of the 25 alphas are grouped into (approximately) equally spaced bins. Portfolios 1-8 are denoted as firms with negative currency sensitivity, and portfolios 16-25 are considered to have positive sensitivity. Portfolios in between these values are considered to be currency neutral. The sample period is 2000-2014. In addition to a currency factor, the time-series regressions for factor loadings include size, book-to-market, market, and momentum factors.

Figure 3.8 takes a final examination of the results, by looking at the *magnitude* of those alphas, sorted according to currency sensitivity. The results show that whereas currency neutral portfolios tend to have alphas around zero, currency sensitive portfolios have a greater propensity to exist on the outer regions of the distribution. There does not, however, appear to be any differential pattern with respect with to positive or negative currency exposure: both types of portfolios simply have a greater tendency to have 5-factor alphas (positive or negative) with magnitudes that are multiples of that of their currency-neutral counterparts.

3.6 Sources of Currency Risk: Cross Sectional Determinants of Currency Exposure

3.6.1 Motivation

While the results in the section above show that there may exist factor-adjusted alpha to currency-sorted portfolios, the picture remains incomplete. As mentioned previously, one reason for this may be over aggregation across regions, or small-sample size statistical issues. But another reason for the lack of clarity may be due to characteristics inherently related to currency risk, but which cannot be completely captured by value, size, or momentum constructed factors.

In particular, one finding in Kolari, Moorman, and Sorescu (2008) is that firms that are highest in exchange rate exposure tend to, on average, have significantly different accounting profiles. Such firms tend to be specialized growth firms with higher short-term leverage, lower interest coverage, and lower profitability (although, they don't appear to differ significantly with respect to the degree of foreign sales or currency adjustment). The idea here is that while firms generally can absorb foreign exchange rate volatility—and thus accounting items should not in theory be related to foreign exchange sensitivity coefficients (Doidge et al., 2006)—firms which are already near the financial brink are more likely to experience performance deterioration if hit with an exchange rate shock (Wei and Starks, 2013).

Thus the aim in this section is two-fold. First, is whether or not this empirical evidence on the connection between financial distress and currency risk can be extended to an international setting. While we might expect this finding to be extended to large, diversified economies or regions, it may even be possible that for developing or more volatile economies, for instance, firms which are less exposed to their domestic markets enjoy access to a lower cost of capital in comparison to their peer firms, as such exposure is a relatively lower risk than exposure to markets at home.

The second—and related—idea is that whereas we may find a statistical contemporaneous relation between the accounting characteristics of a firm and its currency beta, it remains to be seen whether or not firms which are more distressed *and* currency-exposed exhibit relatively higher or lower excess returns after the fact. As Kolari, Moormon, and Sorescu (2008) found, the top 8% of currency firms tended to actually exhibit lower returns relative to the other 92%. With that, it would be interesting to see whether within this sample, there was a difference in expected returns among firms that had a healthy financial status and were still currency-exposed, against firms which were financially deteriorated and currency-exposed.

3.6.2 Data, Variable Construction, and a Brief Methodological Overview

To that end, the first step would be to identify to what extent currency exposure is related to firm fundamentals, and if so, whether firms which are particularly currency-sensitive exhibit differences in those fundamentals. One methodology that would be useful in identifying an association between a firm's currency exposure and a number of its financial characteristics is Gradient Boosting Regression. This particular approach, which is common in the field of machine learning[23], has a number of benefits. The most important part the application here, is that the method can help to identify interesting and potentially non-linear interactions among independent variables, in terms of their strength in explaining why certain firms in the cross-section are more exposed to currency fluctuations[24]. While I will ultimately use more traditional techniques (e.g., Fama-Macbeth regressions), this initial approach will help to shed light on whether or not there is a deeper connection between these firm specific proxies for distress.

[23] For more on this and other ensemble techniques, see Friedman, Hastie, and Tibshirani (2010).

[24] Another benefit is its predictive capabilities within more complex data environments, which can be difficult for techniques such as ordinary least squares. Essentially this is because as an iterative regression technique, the algorithm gradually becomes more capable of successfully forecasting certain observations that were previously predicted with significant error.

Thus, I first perform a gradient-boosting regression with firm-specific currency beta as the dependent variable and firm-specific fundamental information as the set of explanatory variables. Because I use the full-set of firm-month observations for this particular analysis, I convert any currency-denominated financial characteristic (e.g., market capitalization, total assets) to US dollar equivalent values using the rate of exchange at the time. This move for comparison follows the same procedure done in Barber, De George, and Lehavy (2013) in their study of earnings announcement premiums globally.

Also, since some accounting information globally is more comparable and widely available at the annual frequency (as opposed to quarterly), I use information from firms' annual accounting statements when constructing financial ratios. As well, I merge firm currency betas with accounting characteristics such that information about firm beta at time T is matched with the most recent accounting information available at $t < T$.[25]

The variables I use by which to proxy for firm financial health are as follows. First, I include ROA as a measure of profitability. ROA is defined as income before extraordinary items (Compustat Global variable "IB") divided by total assets at the beginning of fiscal year $t - 1$ ("AT"). Though the stock return for an internationalized firm might co-vary with exchange rate movements, covariance might be diminished if the firm is perceived to be able to better weather exchange rate shocks, as in Wei and Starks (2013).

A related variable is firm leverage. This is measured as the firm's annual Debt-to-Equity ratio, specifically defined as the book value of interest bearing debt ("DLTT"+"DLC") divided by the market value of equity ("PRCC"*"CEQ"). To the extent that firm cash flows are diverted towards servicing debt, and are thus not sufficient or otherwise available for other uses in the

[25] Accounting information is also lagged two months relative to the calendar month of the firm's fiscal year end.

case of an exchange rate shock, a higher leverage ratio is likely to translate to a greater risk exposure to currency movements.

One may also proxy for bankruptcy risk more directly. This is done here, by constructing the Zmijewski (1984) measure of bankruptcy probability. Essentially, the ZM score balances net income as a share of assets, relative to debt. A lower ZM score (including negative values) means little likelihood of default, whereas a higher number indicates higher bankruptcy risk. It is defined as follows:

$$ZM\_Score = -4.336 - 4.513(\frac{net\ income}{total\ assets}) + 5.679(\frac{total\ debt}{total\ assets}) + 0.004(\frac{total\ assets}{total\ liabilites})$$

Just as how Kolari, Moorman, and Sorescu (2008) found that product specialization is higher for the very highly currency sensitive firms, other, more business-specific differences may exist as well. For that reason, I construct firm total accruals (in US dollar equivalent) as income before extraordinary items and discontinued operations ("IB") minus net cash flow from operating activities ("OANCF"), minus extraordinary items and discontinued operations ("XIDOC"). This is then scaled by year $t-1$ total assets ("AT"). Total accruals is also related to a firms financial elasticity, to the extent that firms have the discretion in managing them during periods of financial distress.

Firm size is another consideration that might be expected to relate to firm currency sensitivity. For one, this is for reasons related to financial distress, just as with the variables above: if a firm is very large, it is likely to be more easily able to draw upon external resources (e.g., bank or government financing, new debt or share issuance, etc.) or pressure suppliers and customers in an attempt to generate new financial flexibility. However, firm size may also a proxy for a firm's international exposure, to the extent that size reflects greater product and supply-chain activity in global markets—this is particularly true for firms denominated in countries which are relatively small and/or undiversified.

Firm size is measured through two conceptually distinct approaches. The first is simply the log of market capitalization (again, in US dollar equivalent). The second is firm net operating assets, or NOA. There are multiple ways in which to measure NOA. One definition of NOA equals common equity ("CEQ") plus debt in current liabilities ("DLC") plus long-term debt ("DLTT") plus preferred stock ("PSTK") less cash ("CHE") less other advances and investments ("IVAO") plus minority interest ("MIB"). Another definition, and as defined by Compustat, equals firm property, plant, and equipment ("PPENT") plus total current assets ("ACT"), minus total current liabilities ("LCT").

I consider both definitions, but with either construction, firm NOA can reasonably be contrasted to firm market capitalization by considering it to be a more asset-tangible construct with the conceptual difference of the two approximating the market's perceived level of growth opportunities (or lack thereof). It also can be thought of as a more "fundamental" measure, in the sense that it strips out the role that financial activity can play in the asset base, by instead measuring asset levels related to the core of the business.

In addition to financial characteristics, I consider the association that a firm's contemporaneous market beta (value-weighted, and within-currency) has with firm currency exposure. Particularly for less-diversified—and yet internationalized—markets, contemporaneous currency movements may heavily influence market-wide movements. If that's the case, then it can be expected that high market beta firms are also likely to be more exposed to currency fluctuation. As such, a firm's market beta will be an important feature for study[26].

Last, as a final—and simpler—measure of financial distress, I construct a negative cash-flow indicator, which is equal to one if a firm's reported cash flows (OANCF) in the previous year were negative.

[26] To what extent market and currency risk can be decomposed, however, as well as to what extent this decomposition differs globally or temporally, is an interesting point but is one that is probably beyond the scope of the analysis here.

The summary statistics of the variables described above show that most variables have well distributed behavior. The interquartile range of firm (value-weighted) market betas is .26 to 1.02, which is consistent with the notion that, when measuring exchange rate sensitivity contemporaneously with market sensitivity, some of the exposure that would normally be attributed to market risk is in fact currency risk. Total accruals are, on average, slightly negative. Since total accruals are defined as income before extraordinary items and discontinued operations, less net cash flow from operating activities, less extraordinary items and discontinued operations (all scaled by total assets), this suggests that non-U.S. companies generally tend to adhere to slightly conservative reporting with respect to cash flows. Interestingly however, non-U.S. firms also tend to use relatively small amounts of debt as a proportion of their asset base, at a ratio that is much lower than U.S. findings (e.g., see Graham, Leary, Roberts, 2014). However debt usage appears to be positively skewed: the 75th percentile debt ratio (as a proportion of total assets) is 6.41%, whereas the mean debt ratio is actually 8.08%.[27] The summary statistics also show other results which we might reasonably expect—for instance, firms generally report positive cash flow about 81% of the time, with moderate levels of profitability (with the 25th and 75th percentile exhibiting a range of 1% to 6% cash flow to total assets).

[27] The median firm in the sample carries essentially no debt, with a leverage ratio of 0.9%. If looking at the distribution of leverage among firms that have at least a 5% leverage ratio, however, the interquartile range of the leverage ratio for such firms becomes 11%-43%. These figures are much more in line with Graham, Leary, and Roberts' (2014) findings for U.S. firms.

Table 3.27 Summary Statistics of Independent Variables. This table displays summary statistics of various firm financial characteristics, including those designed to proxy for financial distress. The sample period is 2000 through 2014.

Variable	Mean	Standard	25th	75th
Market Beta	.658	.456	.265	1.021
Total Accruals (as % of Total Assets)	-.032	.078	-.072	.013
Return on Assets (Profitability)	.017	.083	.0007	.063
ZM Score (Bankruptcy Risk)	-3.86	.837	-4.315	-3.955
Leverage (as % of Total Assets)	.080	.147	.0008	.064
Net Operating Assets (as % of Total	.474	.216	.324	.640
Negative Cash Flow Indicator	.213	.409	0	0
Log Market Capitalization (Size)	18.676	1.741	17.361	19.904
Net Operating Assets * ROA	.015	.037	.0005	.032
Log Market Capitalization * ROA	.379	1.517	.014	1.206
Log Market Capitalization * NOA	8.879	4.117	5.997	12.012
ZM Score * Total Accruals	.111	.298	-.055	.266
Firm-Month Observations	1,563,250			

3.6.3 Discovering Variable Importance: Gradient Boosting Regression

While Gradient Boosting Regression is usually applied with the aim of successfully predicting the widest cross-section of observations as possible, the benefit of its use here is its capability for exploratory data analysis. To illustrate this, I plot the low-order interactions for each of the pairs of firm-specific independent variables. Although GBM is a non-linear technique, plotting this way is analogous in purpose to plotting the marginal main and interacted effects of each of the independent variables in a non-linear model such as a probit regression. What is displayed here however is not so much an absolute explanatory effect values, but rather the *relative* influence of each variable—and their interaction—in terms of their ability to explain variation in firm currency risk.

The idea here is that while firm financial elasticity matters in understanding currency risk—as measured by its existing leverage ratio, say—its impact is going to be moderated or exacerbated by other factors, such as the size of its tangible asset base, or cost of capital (as implied by market beta). These mix of effects can result in non-linear levels of firm currency exposure. A non-linear type of effect is more in line with existing theory and practice as well, considering that Doidge et al. (2006), Kolari et al. (2008), and Wei et al. (2013), essentially argue that currency exposure really only exists in the extreme. The difference with the methodological approach in Section 3.6.3 is simply that it also explores the way in which these financial variables interact.

In more detail, gradient boosting regression (GBM) trees can be thought of as follows. While still fundamentally regression, GBM first attempts to split the space of independent variables into relatively homogeneous regions, in terms of their ability to predict the dependent variable. After that comes the boosting component. This amounts to an iterative regression for each of the regions. Here, the statistical intuition is that it is easier to find many (albeit

imprecise) rules of thumb, rather than a single, completely correct but individual answer (Schapire 2003). In particular, an initial regression is fit, and then a new regression is set to fit the residuals from the first regression. This processes is repeated many times (1,000 in this case, but often more), but with the relative importance of each consecutive regression being increasingly down-weighted. To develop a final fit, the individual regression fits are then summed, but not before multiplying each by its relative importance. This leads to first-order effects coming through in the ultimate fit, but also allows complex relationships (which may have been initially missed) to play a role in prediction. In each regression, minimization of the errors can take place with respect to the usual forms (e.g., Gaussian, Binomial).[28]

In this specification, I use the absolute value of firm currency exposure as a measure of currency sensitivity. That is because it is not known, ex-ante, whether positive or negative correlation with exchange rate fluctuations is good or bad—only that exposure to the fluctuation indicates a source of risk to firm cash flows. However, it is interesting to identify whether different firm fundamentals also play a greater role in determining exposure, dependent upon whether or not that exposure is positive or negative (i.e., do investors value these characteristics differently dependent upon depreciating versus appreciating environments?). In this case, it would be more informative to use the raw value of a firm's currency exposure, preserving the sign.

However, after employing both specifications, I found that the interactions among the independent variables using the absolute value of firm currency exposure arguably showed more interesting variation. To conserve space then, I present the summary findings from just that analysis here, in Figures 3.9 through 3.18.

[28] In this specification, errors are Huber standard errors (i.e., robust to heteroskedasticity).

These figures show partial dependency plots, which are akin to marginal effects (Friedman et al., 2010). In other words, the figures plot effect estimates for two variables and their interactions over the range of their possible values. This is done by taking the subset of the two variables, X_i, from the broader set, X_s, and then evaluating the predicted value of the dependent variable at the subset values at each point. After evaluation, the mean value of the observational values at that point is taken across the region of the broader subset of other independent variables, X_s. In other words, the function aims to plot (at each point):

$$f(X_i = x_i) = \mathrm{E}(f(X_i = x_i,\ X_{si})\ \nabla\, x_i \in X$$

In looking at Figures 3.9 through 3.18, there are a few noteworthy interaction effects among some of the independent variables. One example is the variegated role that the mix of firm market beta and size play in understanding currency exposure. This is depicted in Figure 3.9. For the largest firms, market beta—and not size itself—contributes the most toward explaining currency exposure. Yet for firms that are relatively small, a higher beta increasingly implies higher currency exposure, with an effect that increases nonlinearly as the size of firms becomes smaller.

The interaction between market beta and profitability (Figure 3.10) is nonlinear as well, and appears to exhibit more of a U-shape. That is, both firms with a high degree of profitability, in addition to very unprofitable firms, tend to have a greater degree of currency exposure. At the same time, there is a generally positive association between firm beta and currency exposure, but this association is diminished for firms with a beta much closer to market levels (i.e., close to 1).

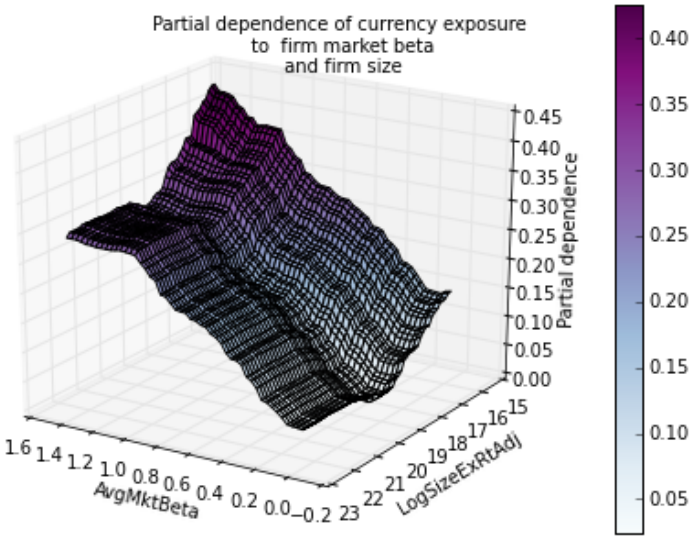

Figure 3.9 Partial Dependence Between Firm Market Beta and Size. This figure presents a partial dependence (variable influence perturbation) plot of firm specific market beta and log market capitalization, in terms of their impact in explaining firm-specific currency exposure. Both variables are translated to contemporaneous US dollar equivalent, using the average daily exchange rate in the final month of the accounting calendar year-end.

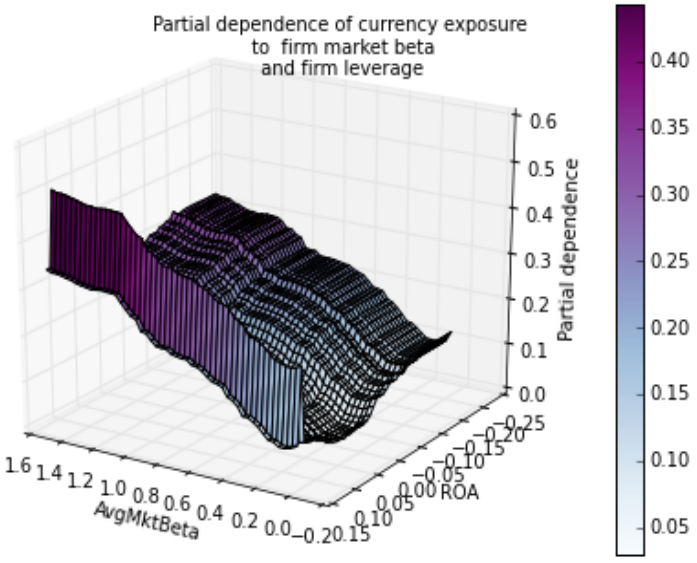

Figure 3.10 Partial Dependence Between Firm Market Beta and Profitability. This figure presents a partial dependence (variable influence perturbation) plot of firm specific market beta and percentage return on assets (profitability), in terms of their impact in explaining firm-specific currency exposure. Both variables are translated to contemporaneous US dollar equivalent, using the average daily exchange rate in the final month of the accounting calendar year-end.

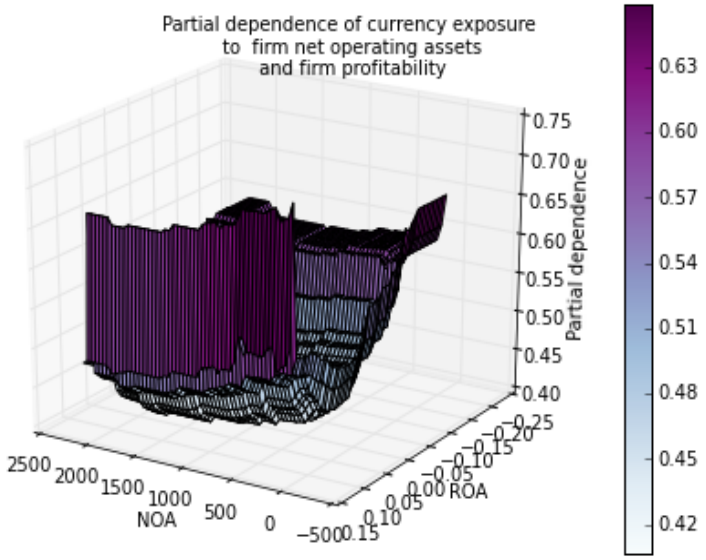

Figure 3.11 Partial Dependence Between Firm NOA and Profitability. This figure presents a partial dependence (variable influence perturbation) plot of firm specific net operating assets and percentage return on assets (profitability), in terms of their impact in explaining firm-specific currency exposure. Both variables are translated to contemporaneous US dollar equivalent, using the average daily exchange rate in the final month of the accounting calendar year-end.

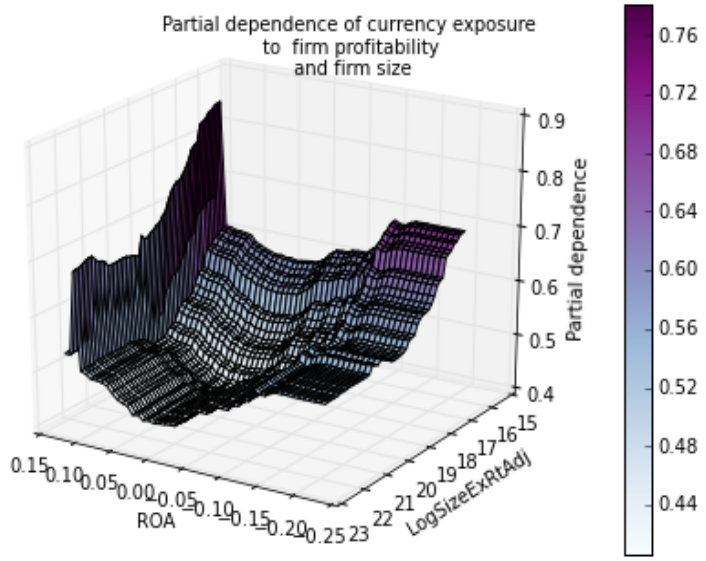

Figure 3.12 Partial Dependence Between Firm Profitability and Size. This figure presents a partial dependence (variable influence perturbation) plot of firm specific (log) market capitalization and profitability, in terms of their impact in explaining firm-specific currency exposure. Both variables are translated to contemporaneous US dollar equivalent, using the average daily exchange rate in the final month of the accounting calendar year-end.

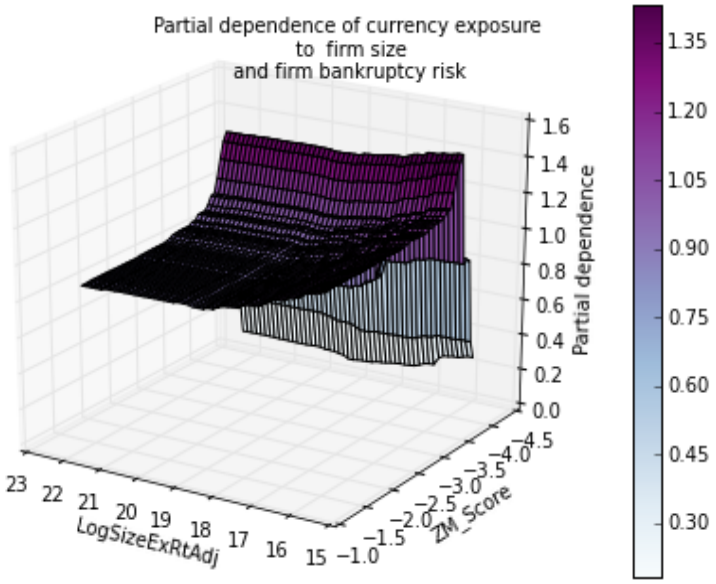

Figure 3.13 Partial Dependence Between Firm Size and Bankruptcy Risk. This figure presents a partial dependence (variable influence perturbation) plot of firm specific (log) market capitalization and bankruptcy risk, in terms of their impact in explaining firm-specific currency exposure. Both variables are translated to contemporaneous US dollar equivalent, using the average daily exchange rate in the final month of the accounting calendar year-end.

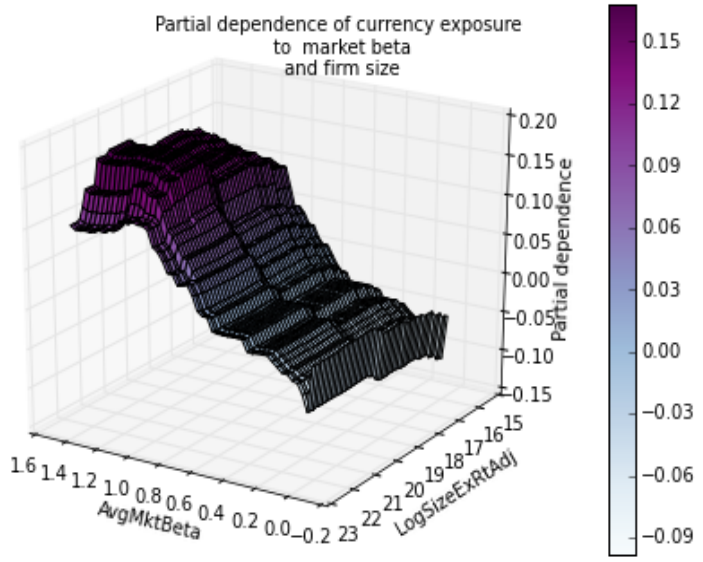

Figure 3.14 Partial Dependence Between Firm Market Beta and Size. This figure presents a partial dependence (variable influence perturbation) plot of firm specific market beta and (log) firm market capitalization, in terms of their impact in explaining firm-specific currency exposure. Both variables are translated to contemporaneous US dollar equivalent, using the average daily exchange rate in the final month of the accounting calendar year-end.

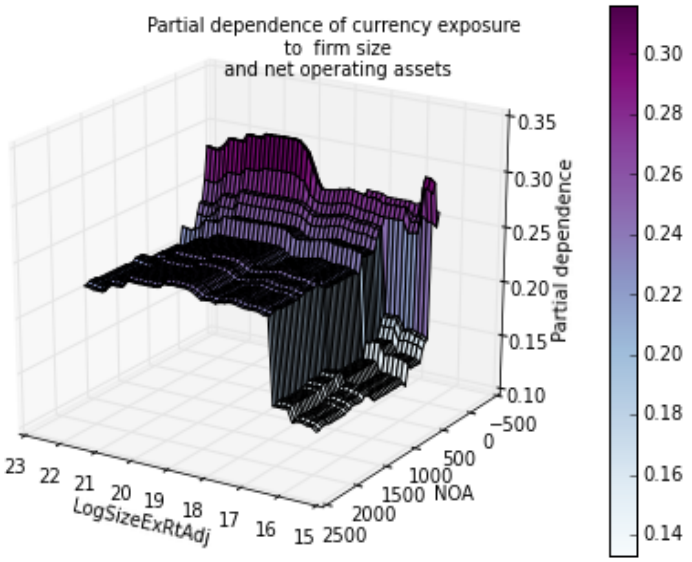

Figure 3.15 Partial Dependence Between Firm Size and NOA. This figure presents a partial dependence (variable influence perturbation) plot of firm specific (log) market capitalization and net operating assets, in terms of their impact in explaining firm-specific currency exposure. Both variables are translated to contemporaneous US dollar equivalent, using the average daily exchange rate in the final month of the accounting calendar year-end.

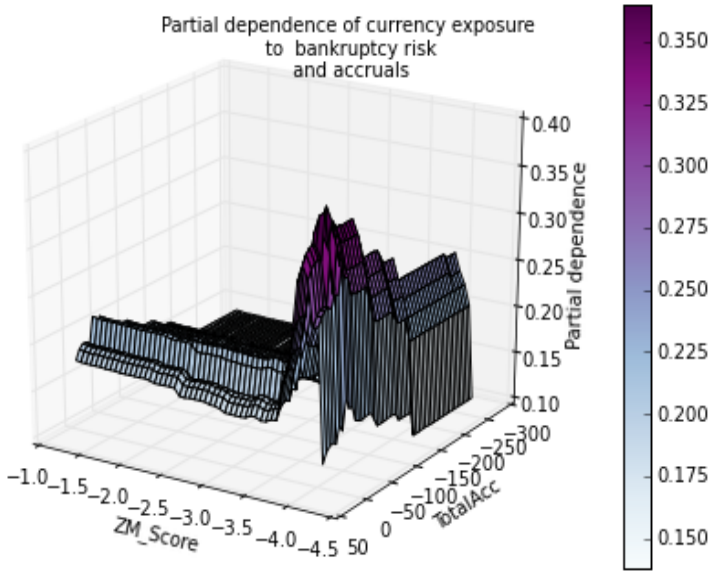

Figure 3.16 Partial Dependence Between Firm Bankruptcy Risk and Total Accruals. This figure presents a partial dependence (variable influence perturbation) plot of firm specific bankruptcy risk and accrual management, in terms of their impact in explaining firm-specific currency exposure. A higher (more positive) ZM score indicates a higher chance of bankruptcy.

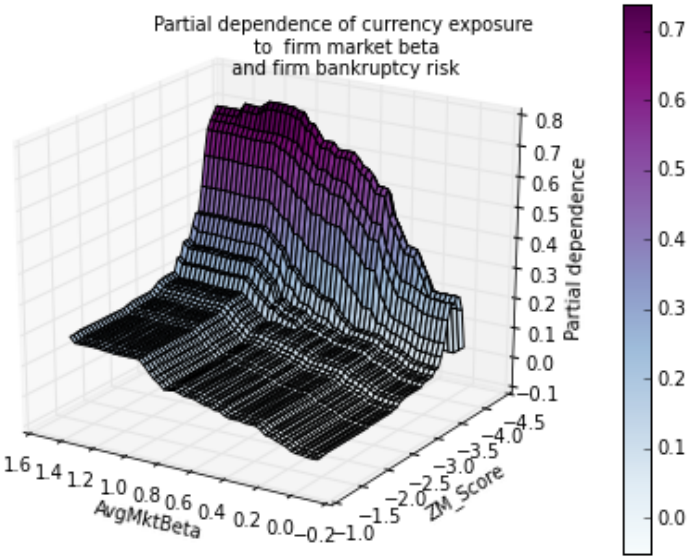

Figure 3.17 Partial Dependence Between Firm Market Beta and Bankruptcy Risk. This figure presents a partial dependence (variable influence perturbation) plot of firm specific market beta and bankruptcy risk, in terms of their impact in explaining firm-specific currency exposure.

The interactive effect between firm net operating assets and profitability, in Figure 3.11, is also interesting. This shows that the more unprofitable a firm is, the more likely it is to have high currency exposure—this is consistent with Kolari et al. (2008). However it also shows that as the level of net operating assets increases, this effect is largely mitigated. In other words, when a firm has a substantial amount of core operating assets, the market is likely to perceive it as less exposed to exchange rate shocks, even if that firm has been recently unprofitable.

A similar relationship can be seen with firm size as well (Figure 3.12), although this plot also accentuates the fact that both highly profitable and unprofitable firms tend to have higher exchange rate exposure. Drilling down into this further in Figure 3.15, it appears that this effect is reversed for very low NOA firms that simultaneously have significant market capitalizations.

3.6.4 Empirical Results

How to make sense of this all? One approach would be to complement the above analysis with a series of Fama-Macbeth (1976) regressions, in which firm beta is regressed on these characteristics, as well as a broader set of controls such as country and industry indicator variables, and verify that the importance of each of the independent variables remains. Or, one could further split the sample according to those levels of currency sensitivity, and examine whether these only the most strongly currency sensitive firms exhibited variation associated with these characteristics.

To that end, I conduct a series of Fama-Macbeth (1976) regressions, in which I regress firm monthly currency betas on the (contemporaneous) firm financial characteristics above. Alternative specifications also include country and sector fixed effects.[29] The results, presented in Tables 3.28 through 3.30, largely corroborate the interacted findings suggested by gradient boosting regression (GBM)[30], but they also shed more interesting light on the relationship between financial distress and currency exposure.

In particular, Tables 3.28 through 3.30 present the results of regressing firm currency betas on the financial characteristics above, in which the sample either includes all firms, or is split according to whether the firm currency beta is either significantly positive or significantly negative. The definition of what is a significant (in terms of magnitude) positive or negative beta is allowed to vary across the tables. For instance, Table 3.28 splits the sample simply according to whether the firm's currency beta is directionally positive or negative.

[29] Fixed effects are included in the first stage. Thus, technically, country and industry fixed effects are allowed to vary by month.

[30] However, the results in GBM do show that there are additional, nonlinear and interactive effects between the financial distress variables and cross-sectional currency sensitivity variation. To keep the method tractable, these additional effects are not parameterized within the Fama-Macbeth procedure.

However the division of the sample into whether a currency beta is positive or negative will inherently group firms with very weak (but still directional) currency sensitivity with firms that are extremely currency exposed. To test whether the relationship between firm financial risk and currency exposure still holds—or is stronger—among those firms that are highly correlated with currency movements, Table 3.29 thus presents a specification in which only firms in the 1st or 5th quintile are considered to be strongly negatively or positively sensitive, respectively. Table 3.30 then cuts the sample more finely, and provides a comparison of the financial characteristics of the 1st and 25th quantiles, relative to the 2nd through 24st quantiles.

In each of the three tables, the first three columns display the results without fixed effects, whereas the subsequent three columns include country fixed effects, the following three columns include sector fixed effects, and the final three columns include both fixed and sector specific effects. The reason for including all four sets of regressions is to gain a sense of to what extent currency exposure variation is driven by country or sector variation (including sector risk, that may transcend borders), as opposed to firm specific financial considerations. Sector risk is defined by S&P Global Industry Classification (GIC) sectors.

Table 3.28, which splits the sample simply according to a positive or negative firm currency beta, suggests that most firm financial distress variables have no asymmetric effects in explaining variation in the direction of firm currency sensitivity. The exception might be firm market beta, which does appear to exhibit some asymmetric effect. Controlling for country fixed effects, the role of a firm's market beta in explaining currency sensitivity magnitude increases by 80% when that sensitivity is positive in sign, relative to when it is negative—although this difference falls to 29% when accounting for differences attributable to both country and industrial sector.

Other differences that remain robust to industry and country specific variation are those pertaining to profitability (i.e., its main effect) as well as to the interacted effects between firm market capitalization and profitability, and that between profitability and net operating assets. Controlling for the interplay between firm tangibility and size (i.e., NOA and market capitalization), greater profitability is associated with less currency sensitivity (be it positive or negative), but this effect is about 37% stronger for firms with positive currency exposure.

The interaction differentials show that the multiplicative effect of tangibility and profitability matters significantly in explaining positive currency exposure (more asset tangible, profitable firms tend to have less exposure), but that this effect carries no weight at all in explaining negative currency exposure. If one thinks of positive currency exposure as a firm's predisposition to benefit amid depreciation, economically it would seem that well-positioned firms with a lot of assets already in place tend to be viewed as more subject to a depreciating currency than an appreciating one.

Table 3.28 Fama-Macbeth Results of Currency Exposure on Cross-Sectional Determinants: Positive/Negative Splits. This table shows the results from regressing firm monthly currency beta on contemporaneous firm proxies for financial risk, with regressions separated according to the currency sensitivity of the firm. Positive exposure is defined here as any firm with a monthly currency beta greater than zero, and vice-versa for negative exposure. 'All' columns include both. Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 3 lags.

	Level of Currency Exposure											
VARIABLES	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure
Market Beta	0.12***	0.28***	-0.17***	0.09***	0.18***	-0.10***	0.12***	0.25***	-0.12***	0.09***	0.16***	-0.07***
	(10.80)	(35.01)	(-18.18)	(8.11)	(34.58)	(-12.27)	(10.88)	(28.40)	(-14.53)	(8.16)	(21.02)	(-8.75)
Total Accruals	0.00	-0.06	0.16***	-0.01	-0.10*	0.06**	-0.01	-0.01	0.04	-0.01	0.03	-0.03
	(0.06)	(-1.52)	(5.45)	(-0.23)	(-1.69)	(2.48)	(-0.14)	(-0.16)	(0.59)	(-0.23)	(0.44)	(-0.34)
Profitability	0.39*	-3.97***	3.47***	0.34**	-2.83***	2.26***	0.38*	-3.36***	2.74***	0.38**	-2.59***	1.88***
	(1.95)	(-13.14)	(13.99)	(2.00)	(-14.53)	(11.62)	(1.89)	(-12.31)	(11.05)	(2.24)	(-9.25)	(8.35)
ZM Score	-0.04***	0.11***	-0.09***	-0.01	0.06***	-0.07***	-0.03***	0.05***	-0.07***	-0.00	0.03*	-0.05**
	(-4.13)	(4.24)	(-5.92)	(-1.02)	(3.88)	(-7.29)	(-3.54)	(3.05)	(-4.22)	(-0.37)	(1.79)	(-2.46)
Leverage	0.12**	-0.94***	0.73***	0.02	-0.42***	0.45***	0.08	-0.56***	0.54***	-0.01	-0.24**	0.30**
	(2.33)	(-6.44)	(8.39)	(0.37)	(-4.61)	(8.18)	(1.59)	(-5.60)	(5.50)	(-0.16)	(-2.47)	(2.55)
Net Op. Assets	0.12**	0.43***	-0.32***	0.09**	-0.15***	0.17***	0.12**	0.41***	-0.27***	0.09**	-0.10*	0.10***
	(2.16)	(6.62)	(-7.89)	(2.02)	(-3.05)	(6.68)	(2.25)	(6.08)	(-7.58)	(1.99)	(-1.72)	(3.54)
Neg. Cash Flow	-0.00	0.09***	-0.09***	-0.01***	0.04***	-0.03***	-0.00	0.07***	-0.06***	-0.01***	0.03***	-0.03***
	(-0.39)	(18.70)	(-18.60)	(-3.02)	(10.90)	(-13.06)	(-0.14)	(13.55)	(-14.87)	(-2.83)	(7.31)	(-9.13)
Size	-0.00	-0.03***	0.03***	-0.01***	-0.05***	0.04***	-0.00	-0.03***	0.03***	-0.01***	-0.04***	0.03***
	(-1.28)	(-7.81)	(9.17)	(-3.68)	(-25.17)	(22.70)	(-1.11)	(-8.39)	(9.66)	(-3.56)	(-15.27)	(15.78)
Proft.*NOA	0.32***	1.09***	-0.60***	0.16***	0.17***	-0.04	0.33***	0.91***	-0.39***	0.17***	0.20***	0.00
	(5.44)	(14.78)	(-7.82)	(2.84)	(3.33)	(-0.78)	(5.45)	(10.28)	(-4.18)	(2.76)	(3.02)	(0.02)
Size*Proft.	-0.02**	0.20***	-0.18***	-0.02*	0.15***	-0.11***	-0.02**	0.17***	-0.14***	-0.02**	0.13***	-0.09***
	(-2.21)	(12.12)	(-13.71)	(-1.86)	(14.54)	(-11.47)	(-2.16)	(11.53)	(-11.10)	(-2.15)	(8.71)	(-8.08)
Size*NOA	-0.01**	-0.02***	0.02***	-0.00**	0.01**	-0.01***	-0.01**	-0.02***	0.02***	-0.00**	0.00	-0.00**
	(-2.09)	(-7.24)	(8.06)	(-2.06)	(2.42)	(-5.22)	(-2.16)	(-6.66)	(7.34)	(-2.00)	(1.44)	(-2.60)
ZM*Accrual	-0.01	-0.00	0.02**	-0.00	-0.01	0.02**	-0.01	0.00	-0.01	-0.00	0.01	-0.00
	(-0.38)	(-0.36)	(2.39)	(-0.09)	(-0.98)	(2.48)	(-0.37)	(0.31)	(-0.43)	(-0.01)	(0.34)	(-0.20)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	-0.19***	1.34***	-1.23***	0.11*	1.55***	-1.29***	-0.16***	1.05***	-1.09***	0.18***	1.27***	-0.98***
	(-3.06)	(11.11)	(-16.33)	(1.75)	(16.02)	(-23.95)	(-2.78)	(11.14)	(-13.45)	(2.70)	(13.08)	(-10.46)
Observations	1,500,97	750,236	750,738	1,500,974	750,236	750,738	1,500,589	750,228	750,360	1,500,589	750,228	750,360
R-squared	0.02	0.12	0.10	0.07	0.55	0.46	0.02	0.08	0.06	0.08	0.32	0.20
Number of	155	155	155	155	155	155	155	155	155	155	155	155

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.29 next tests whether these effects are isolated—or instead accentuated—among firms that have the most negative and most positive currency sensitivity, for which "most" here means that a firm is in the 1st or 5th quintile of currency exposure for that particular currency. The findings here are really two-fold.

First, is that firm profitability carries great weight in determining currency exposure for the extreme quintiles, but plays no significant role whatsoever in explaining currency exposure variation within the middle quintile. In other words, at the tails, firm currency exposure is heavily driven by firm profitability. Table 3.29 shows that the directional relationship is such that higher firm profitability tends to be associated with relatively lower currency exposure, consistent with both Kolari et al. (2008) and Wei and Starks (2013). As firm fundamentals become shakier, a firm's sensitivity to the ramifications of a potential currency shock becomes amplified. The coefficient for the indicator on negative cash flow corroborates this idea as well: a year of negative cash flow significantly explains variation in firms which are currency-exposed, but holds no explanatory power for firms that carry relatively little exposure.

Table 3.29 Fama-Macbeth Results of Currency Exposure on Cross-Sectional Determinants: Quintiles. This table shows the results from regressing firm monthly currency beta on contemporaneous firm proxies for financial risk, with regressions separated according to the currency sensitivity of the firm. Quintile 5 represents firms with the greatest positive correlation with their country's exchange rate movement, whereas Quintile 1 represents firms with the most strongly negative correlation. Quintile 3 represents firms that are relatively uncorrelated to exchange rate movements ('Neutral'). Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 3 lags.

	Level of Currency Exposure											
VARIABLES	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest
Beta	0.36***	0.10***	-0.15***	0.23***	0.06***	-0.08***	0.36***	0.10***	-0.15***	0.22***	0.06***	-0.08***
	(33.40)	(9.08)	(-11.41)	(21.54)	(6.05)	(-5.56)	(29.24)	(8.92)	(-11.71)	(20.47)	(5.34)	(-5.31)
Total Accruals	0.08	-0.07	-0.03	0.22**	-0.11	-0.03	0.06	-0.05	-0.05	0.22*	-0.15	-0.03
	(0.62)	(-0.53)	(-0.37)	(2.10)	(-1.25)	(-0.51)	(0.55)	(-0.40)	(-0.53)	(1.86)	(-1.54)	(-0.70)
Profitability	-3.11***	0.42	2.72***	-2.76***	0.56**	2.21***	-3.57***	0.37	2.70***	-2.96***	0.50**	2.32***
	(-8.58)	(1.56)	(8.76)	(-9.18)	(2.56)	(8.26)	(-8.15)	(1.41)	(8.80)	(-7.82)	(2.17)	(9.34)
ZM Score	-0.00	-0.08	-0.32***	-0.08	-0.09	-0.27**	-0.03	-0.01	-0.26***	-0.30*	0.01	-0.20*
	(-0.02)	(-0.93)	(-2.98)	(-0.91)	(-1.29)	(-2.03)	(-0.45)	(-0.10)	(-2.89)	(-1.71)	(0.13)	(-1.69)
Leverage	-0.22	0.32	1.96***	0.40	0.48	1.59**	-0.10	-0.08	1.61***	1.65*	-0.10	1.18*
	(-0.74)	(0.64)	(3.23)	(0.85)	(1.20)	(2.08)	(-0.30)	(-0.12)	(3.21)	(1.66)	(-0.17)	(1.75)
Net Op. Assets	0.75***	-0.03	-0.35***	-0.10	-0.12*	0.04	0.82***	-0.02	-0.38***	-0.10	-0.09	-0.01
	(5.34)	(-0.43)	(-4.58)	(-0.93)	(-1.70)	(0.74)	(6.58)	(-0.32)	(-5.13)	(-0.89)	(-1.31)	(-0.08)
Neg. Cash Flow	0.10***	0.01**	-0.06***	0.05***	0.01	-0.02***	0.11***	0.01**	-0.06***	0.05***	0.01	-0.02***
	(9.93)	(2.17)	(-10.86)	(4.67)	(1.05)	(-5.15)	(7.72)	(2.60)	(-11.79)	(4.18)	(1.22)	(-5.11)
Size	-0.02***	0.00	0.02***	-0.04***	-0.00**	0.03***	-0.02***	0.00	0.02***	-0.04***	-0.00	0.03***
	(-4.07)	(1.02)	(5.85)	(-12.23)	(-2.19)	(13.20)	(-4.34)	(0.85)	(6.22)	(-10.87)	(-1.41)	(13.05)
Proft.*NOA	0.96***	0.36***	-0.25	0.04	0.10	0.06	0.94***	0.35***	-0.26	0.14	0.10	0.04
	(8.87)	(3.64)	(-1.45)	(0.51)	(1.03)	(0.39)	(7.36)	(3.39)	(-1.52)	(1.61)	(0.95)	(0.27)
Size*Proft.	0.16***	-0.03**	-0.14***	0.15***	-0.03**	-0.12***	0.19***	-0.03*	-0.14***	0.16***	-0.03**	-0.12***
	(7.66)	(-2.03)	(-8.60)	(8.66)	(-2.50)	(-8.26)	(7.25)	(-1.77)	(-8.53)	(7.39)	(-2.08)	(-9.15)
Size*NOA	-0.04***	0.00	0.02***	0.00	0.01*	-0.00	-0.04***	0.00	0.02***	0.00	0.00	0.00
	(-5.30)	(0.49)	(4.72)	(0.69)	(1.78)	(-0.40)	(-6.50)	(0.36)	(5.29)	(0.78)	(1.39)	(0.48)
ZM*Accruals	0.04	-0.04	-0.01	0.06**	-0.04	-0.00	0.04*	-0.03	-0.01	0.05	-0.04	-0.00
	(1.40)	(-1.15)	(-0.53)	(2.10)	(-1.35)	(-0.17)	(1.77)	(-0.96)	(-0.65)	(1.65)	(-1.55)	(-0.07)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	0.75***	-0.42	-2.24***	1.09***	-0.23	-1.86***	0.72***	-0.35	-2.02***	0.41	-0.10	-1.57***
	(3.33)	(-1.09)	(-4.66)	(3.22)	(-0.73)	(-3.16)	(2.99)	(-0.82)	(-5.14)	(0.72)	(-0.27)	(-3.01)
Observations	286,223	298,633	309,805	286,223	298,633	309,805	286,132	298,593	309,658	286,132	298,593	309,658
R-squared	0.13	0.05	0.08	0.49	0.23	0.34	0.16	0.06	0.09	0.50	0.25	0.35
Number of groups	155	155	155	155	155	155	155	155	155	155	155	155

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Thus, using quintiles to split the regression shows that, for the 40% of firms that carry the greatest currency exposure, proxies for financial distress play a significant role in understanding the degree of that exposure. However, in their study on U.S. firms, Kolari et al. (2008) study the fundamental characteristics of the 1st and 25th quantile instead. In particular, they then compare the performance of these firms, against the rest of the U.S. firm population as a whole.

In Table 3.30, for comparison, I do this as well. While this degree of granularity could be problematic if studying certain individual countries, doing so here should not present a small-sample problem, given that it is a pooled regression across countries[31]. The results, shown below, suggest some interesting dynamics within the extreme portfolios as compared to the rest of the population.

First, is that here, a directional difference more strongly emerges in effects among the most positively and negatively exposed firms. Accounting for country and sector specific variation, a higher firm market beta is associated with a higher firm currency beta among firms in the 25th quantile (i.e., firms in the top 4% of positive correlation with their country's currency return), whereas no significant relationship between market beta and currency beta exists for firms in the 1st quantile, and a very minor (0.07) effect exists for firms within the middle quantiles. This differential effect remains in specifications with or without sector or country fixed effects, suggesting that the dynamic is widespread.

[31] The exception to this may be the specification with country and sector fixed effects; the identification of the financial distress variables here will be relative to other firms within the same country and industrial sector. If there are some sectors that are relatively inactive within a country (a potential problem in less diversified economies), the average effect estimated for the financial distress variables could be overly influenced by a small number of firms.

Table 3.30 Fama-Macbeth Results of Currency Exposure on Cross-Sectional Determinants: Quantiles. This table shows the results from regressing firm monthly currency beta on contemporaneous firm proxies for financial risk, with regressions separated according to the currency sensitivity of the firm. Quantile 25 represents firms with the greatest positive correlation with their country's exchange rate movement, whereas Quantile 1 represents firms with the most strongly negative correlation. Quantiles 2-24 represents firms that are relatively less correlated to exchange rate movements ('Neutral'). Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 3 lags.

	Level of Currency Exposure											
VARIABLES	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest
Beta	-0.09	0.11***	-0.07***	0.12*	0.07***	-0.05	0.40***	0.11***	-0.08***	0.27***	0.07***	-0.02
	(-0.37)	(12.56)	(-3.43)	(1.87)	(9.68)	(-1.23)	(3.92)	(12.51)	(-3.64)	(3.21)	(9.58)	(-0.60)
Total Accruals	-7.81	0.06	1.30	0.24*	0.05	3.76	0.08	0.05	1.08	0.10	0.05	-0.10
	(-1.27)	(1.24)	(1.32)	(1.87)	(0.92)	(0.79)	(0.87)	(1.01)	(1.24)	(1.28)	(0.90)	(-1.28)
Profitability	18.66	0.09	2.21***	-0.28	0.03	-2.87	-1.56***	0.11	1.89***	-0.61	0.10	0.65
	(1.53)	(0.38)	(3.42)	(-0.52)	(0.14)	(-0.70)	(-3.17)	(0.47)	(3.03)	(-1.41)	(0.47)	(1.47)
ZM Score	-0.64	-0.04***	-0.82***	1.01	0.00	3.06	0.46***	-0.03***	-0.67*	0.14	0.00	-0.12**
	(-0.60)	(-3.55)	(-2.78)	(1.48)	(0.07)	(1.45)	(3.53)	(-3.25)	(-1.75)	(1.58)	(0.43)	(-2.37)
Leverage	-1.30	0.09*	4.63***	-0.93*	-0.02	-16.54	-2.10***	0.06	3.79*	-0.85*	-0.03	0.61***
	(-0.36)	(1.68)	(2.72)	(-1.74)	(-0.37)	(-1.47)	(-3.28)	(1.25)	(1.72)	(-1.67)	(-0.61)	(2.95)
Net Op. Assets	-0.92	0.11**	-0.02	-1.11	0.06	-0.31	1.34***	0.11**	-0.42	0.21	0.05	0.29
	(-0.38)	(2.17)	(-0.10)	(-1.15)	(1.30)	(-0.16)	(3.00)	(2.08)	(-1.33)	(1.62)	(1.17)	(0.56)
Neg. Cash Flow	0.23	-0.01*	-0.05***	0.02	-0.02***	-0.10	0.08	-0.01*	-0.06***	0.04*	-0.02***	-0.00
	(1.41)	(-1.94)	(-3.42)	(0.22)	(-3.99)	(-0.96)	(1.64)	(-1.74)	(-4.26)	(1.95)	(-3.90)	(-0.04)
Size	-0.08	-0.00	0.02**	-0.09**	-0.01***	0.02	0.07	-0.00	0.01	0.01	-0.01***	-0.00
	(-1.21)	(-0.89)	(2.25)	(-2.09)	(-3.75)	(0.29)	(1.63)	(-0.75)	(0.77)	(0.64)	(-3.57)	(-0.03)
Proft.*NOA	3.22	0.34***	0.14	3.55	0.15***	-0.64	0.83**	0.34***	0.05	0.12	0.14**	-0.87
	(1.09)	(6.18)	(0.27)	(1.49)	(2.81)	(-0.41)	(2.52)	(6.06)	(0.10)	(1.01)	(2.61)	(-1.12)
Size*Proft.	-1.11	-0.01	-0.13***	-0.06	-0.00	0.16	0.05	-0.01	-0.11***	0.03	-0.01	0.00
	(-1.50)	(-0.74)	(-3.08)	(-0.76)	(-0.16)	(0.74)	(1.23)	(-0.83)	(-2.77)	(1.32)	(-0.51)	(0.10)
Size*NOA	0.03	-0.01**	-0.00	0.08	-0.00	0.01	-0.07***	-0.01**	0.02	-0.01	-0.00	-0.02
	(0.23)	(-2.19)	(-0.13)	(1.33)	(-1.40)	(0.10)	(-2.65)	(-2.10)	(1.16)	(-1.11)	(-1.24)	(-0.54)
ZM*Accruals	-1.83	0.00	0.32	0.14	0.01	0.94	0.06	0.00	0.26	0.07	0.01	0.08
	(-1.22)	(0.15)	(1.34)	(1.06)	(0.58)	(0.86)	(0.58)	(0.17)	(1.19)	(1.65)	(0.63)	(0.93)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	-0.16	-0.16**	-4.69***	6.30**	0.18**	12.52	1.46	-0.13*	-3.79**	1.36**	0.25***	-1.00
	(-0.04)	(-2.38)	(-3.50)	(2.06)	(2.48)	(1.30)	(1.62)	(-1.97)	(-2.38)	(2.48)	(3.14)	(-1.48)
Observations	56,658	1,383,83	60,479	56,658	1,383,83	60,479	56,621	1,383,53	60,431	56,621	1,383,53	60,431
R-squared	0.19	0.02	0.11	0.51	0.09	0.42	0.23	0.02	0.16	0.52	0.09	0.44
Number of groups	155	155	155	155	155	155	155	155	155	155	155	155

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Another difference relates to bankruptcy risk. As measured by the Zmijewski (1984) score (essentially, a measure of net income relative to debt), for firms that have negative correlation with the exchange rate, a greater increase in bankruptcy risk coincides with a greater magnitude of currency sensitivity. Yet for firms with the most positive correlation, this is not the case. In other words, distress seems to play a greater role in determining negative exchange rate exposure when that exposure is measured in the extreme, but plays an insignificant role otherwise.

Taken together, the results from the Fama-Macbeth regressions show three things. First, is that within the broader cross-section, as well as among the finer slice of currency sensitive portfolios, those firms that are most positively correlated with exchange rate movements tend to have higher market betas as well. Yet the same effect is not observed for those firms that are most negatively correlated.

However also in the broader cross-section, profitability matters in understanding the magnitude of exchange rate exposure. Focusing on both the top and bottom 20% of firms, a firm that already has positive exchange rate exposure can expect an increase in that exposure of about .18 if falling from the 75th percentile of profitability to the 25th—or about an 26% percent increase in currency beta when compared to the average for the population.[32] Third, is that asset tangibility and size play a multiplicative role for both firms that are greatly positively as well as negatively correlated: moving from the 25th to 75th percentile of the size-by-tangibility measure equates to an increase in currency beta of nearly 1 for positively correlated firms, and an increase

[32] 0.18/(0.69). The figure for the average currency beta, 0.69, comes from the mean currency beta among the currency quintiles in Table 2.3.

in beta of 0.72 for negatively exposed firms.[33] This suggests that large, asset heavy firms are far more prone to exhibit currency sensitivity when compared to other firms.

3.7 Sources of Currency Risk: Cross-sectional Determinants of Expected Returns

3.7.1 Overview

Given that the fundamental characteristics above have a clear role to play in determining currency exposure, the next step is to understand whether or not these cross-sectional drivers of currency beta are *also* the drivers of cross-sectional differences in future returns. If higher currency beta is associated with financial proxies for firm distress, in other words, it would be interesting to note to what degree investors require compensation in bearing this interacted risk.

To that end, I conduct a series of Fama-Macbeth regressions, this time regressing firm-specific forward-period returns on firm-specific fundamentals. Specifically, I focus on returns over the following month, quarter, and year after the initial measurement of currency sensitivity. As in Section 3.6.4, for each return horizon, there are three sets of regressions. The first simply splits the sample according to whether the firm currency exposure is positive or negative, in order to determine whether the fundamental parameters are comparable. The next set of regressions then considers the magnitude of that exposure, by splitting the sample into positive, neutral, and negative currency firms and re-estimating. These regressions take the form of including only firms in the 5^{th}, 3^{rd}, and 1^{st} quintile of currency sensitivity, respectively. The final set of regressions takes a more finely-grained approach, by focusing on the 25^{th} and 1^{st} quantile of currency sensitivity, and comparing these two samples of firms to the rest of the firms in the sample—e.g., the 2^{nd} through 24^{th} quantiles. The latter approach is designed to replicate the

[33] For the most positively exposed quintile, the point estimate is .16—thus by using the estimates for the interquartile range of Size*Tangibility, the figure yielded is 0.16(12.01-5.99)=0.96. For the most negatively exposed quintile, its counterpart effect size is -.12(12.01-5.99)= 0.72.

sample construction in Kolari et al. (2008) in their time-series approach, but the aim here is to identify whether or not the fundamental drivers of returns in these 1st and 25th portfolios are, fundamentally, different.

The set of independent variables of interest are also those that were studied in the section above, when measuring the fundamental drivers of currency beta. These include a firm's market beta, an indicator for prior-year negative operating cash flow, net operating assets, leverage, bankruptcy risk, profitability, accruals, and log market capitalization. Like before, all level based variables (and any levels used to construct return-based variables) are adjusted for the contemporaneous dollar-based exchange rate. Unlike the previous specification studying the drivers of currency beta, however, the dependent variable is not contemporaneous. As mentioned above, the specification is a time $t + 1$ (be it monthly, quarterly, or annually) regression of firm returns on publicly available at time t firm characteristics.[34] The economic aim is to understand the role that measures of firm fundamental proxies of financial risk play in explaining investors' demanded compensation in bearing firm currency risk.

3.7.2 Interactions Among Proxies for Financial Distress

In addition to the raw values of these financial proxies, the results of the partial dependence analysis performed after the gradient boosting regression specification revealed a number of nonlinear and low-order interactive effects. This therefore amounts to the same specification as was conducted in Section 3.7.1 above. However, since the focus here is on the impact these fundamentals have in explaining *expected returns*—and allowing these explanations to be distinct among differing levels of currency sensitivity—further discussion is warranted about why these interactions might be important here.

[34] As such, the standard errors of each regression are Newey and West (1986) standard errors, with lag autocorrelation correction of T+1, in which T is the number of months in the horizon of the dependent variable.

For one, a mixture of low net operating assets and negative profitability (Figure 3.11) yielded a sharp increase in the explanation of cross-sectional currency beta variation. Since we measure currency beta by market-based means (with the assumption that the marginal investor incorporates daily currency fluctuation into a firm's stock price), an intuitive explanation for this nonlinear impact may be that investors perceive a low asset base—which is perhaps a firm's last chance for generating financial slack amid dire profitability—greatly increases the likelihood that a distressed firm will be "sent to the wall".

Relatedly, a great degree of interaction was shown to exist between bankruptcy risk (i.e., a firm's ZM score) and firm accrual management (Table 3.17). It may be that firms are more prone to accounting based fixes when left with little options—yet a currency shock for such firms could potentially swamp their ability to manage investor expectations regarding stable treatment of cash flows amid distressed conditions. In other words, a firm's chance to "window dress" is limited when it is closer to bankruptcy, in part because an adverse currency movement can push it over the edge.[35]

Other notable interactions again include that between a firm's log market capitalization and profitability (Figure 3.15), as well as that between its log market capitalization and net operating assets (Figure 3.16). Economic arguments for why these effects might be multiplicative are similar to that for the interaction between net operating assets and profitability. For instance, the size of firm market capitalization relative to net operating assets are a measure of its prospective growth opportunities, and thus capacity for extracting new sources of financing; if a firm has little tangible capital and few perceived sources for growth, it is likely to have little to fall back on if hit with a shock through currency exposure. Similarly, if a firm is

[35] This argument assumes somewhat that investors (in global markets) do not fully unravel the effects of window dressing into firms' stock prices. Whether that is true is probably beyond the scope of this research, although much empirical literature regarding the accruals anomaly suggests that this may be the case [e.g., Xie (2001); Francis, LaFond, Olsson, Schipper (2005); Mashruwala, Rajgopa, Sevlin (2006)].

unprofitable, and the market capitalizes this to be an effect that is non-transitory (i.e., an unprofitable year is reflected into an exceptionally low market capitalization), its sources for external financing become limited amid currency induced distress.

It should be noted that the above explanations for the interactions speak to the negative implications of currency exposure amid financial distress, but it is possible that currency exposure amid distress can become a source of financial salvation as well. Indeed, this optionality on a firm's prospects, when the firm's value is already something near zero, is the main justification, motivated by Johnson (2004), for the finding in Kolari, et al. (2008). If a firm is already near worthless, in other words, investors are willing to be compensated with a lower risk-adjusted rate of return than might otherwise be demanded, because of the possibility that currency exposure represents an implicit call option on the firm's prospects.

Whether this assertion is true or not, however, it does not need to be an argumentative crux for why firm risk characteristics (and multiplicative combinations of those characteristics) should carry explanatory power for firm currency exposure. Currency risk for a firm simply represents a source of financial volatility, and additional sources of financial volatility should be expected to magnify the impact of existing sources of financial volatility. What is important, however, is how this argument fits in with any finding in this section of differences in expected returns among firms with varying levels of currency exposure and financial risk. As a consequence, the more salient interactions—along with their main effects—are included in the Fama-Macbeth regressions below.

3.7.3 Empirical Results

The results of regressing forward-horizon returns on firm fundamentals, after separating the sample according to the degree of currency exposure, are displayed below. Tables 3.31-3.33 contain the results of regressing month-ahead firm returns, whereas Tables 3.34-3.36 and 3.37-

3.39 contain those for quarter-ahead and year-ahead returns[36]. In each of the tables, the first three columns display the pooled sample results. Columns 3 through 6 display the results with country fixed effects, and columns 7-9 employ S&P Global Industry Classification (GIC) sector fixed effects. Columns 10-12 use both country level and sector level fixed effects. The idea is to adequately identify the true source of between fundamentals, returns, and currency exposure, as currency exposure is often thought of as being prevalent only in certain industries. As well, comparison of the fixed versus country effects approach is useful, because it hints at answering whether sector or country effects tend to dominate with respect to both fundamentals and currency exposure.

The tables raise a number of important findings. One is that in general, firm distress plays a much more important role in pricing among the set of currency sensitive firms, consistent with the findings in Kolari et al. (2008) and Wei and Starks (2013). Further, this role is heightened, the greater the amount of currency sensitivity that is measured. Another finding is that while country and sector considerations can matter, this interplay of firm distress, currency sensitivity, and expected returns seems to be something that survives the inclusion of country and sector-specific effects. The connection between firm fundamentals and currency risk, in other words, has pricing implications that supersede broad industry and national boundaries.

Further findings are discussed in detail below. Beginning with Table 3.31, the regressions of month-ahead returns on fundamentals show that, when simply splitting the sample based on the directional sign of a firm's currency sensitivity, few differences in returns attributable to fundamentals are observable. Instead, fundamentals have a statistical association with returns that are almost equal, when comparing firms with positive versus negative exposure.

[36] Returns for the quarter ahead are cumulated monthly returns, although the underlying monthly returns are 'buy-and-hold' returns. Returns for the year ahead are constructed similarly.

Comparing across the columns in Table 3.31, however, this claim is strongest for the specification with both country and sector fixed effects. For instance, controlling for just country-average variation, a firm's market beta carries about 80% more magnitude in predicting month-ahead stock returns for positively-currency exposed firms, as opposed to negatively exposed ones. In other words, sector-driven effects do appear to carry some weight in explaining the connection between signed currency risk, fundamentals and expected returns.

However, when we view Table 3.32, more striking differences occur. This is the result of making a comparison of positive and negative currency sensitive firms against that of neutral firms. Here, strong differences exist when comparing the 1st and 5th quintiles of currency sensitivity to the 3rd and, in particular, differences with respect to the interacted distress variables. Consistent with the results from the cross-sectional regressions in Section 3.6.4 and the gradient boosting regressions in Section 3.6.3, which both attempted to understand the cross-sectional determinants of currency exposure, the results in Table 3.32 show that interactions among firm size and profitability, firm size and net operating assets—as well as net operating assets alone—are all statistically significant predictors of month-ahead stock returns—but only among those firms that are strongly exposed to currency movements (in either direction).

Taking a look at a finer grain of currency sensitivity in Table 3.33, shows that for the 1st and 25th quantiles, size and size interacted with profitability play a relatively much greater role in explaining month-ahead stock returns when compared to the rest of the sample. Controlling for sector and country effects, profitability point estimates are between 1.8 to 1.9 times larger for the 25st and 1st quantile of firms, relative to firms in the 2nd through 24th quantiles.

In looking at quarterly and annual return specifications, differences arise more out of firm profitability and its interaction with size. The same is not true for firms that are not currency exposed (i.e., quantiles 2-24). In particular, controlling for country and sector effects, the

relationship between profitability and quarter-ahead returns is between 1.21 and 1.27 times the effect size for currency sensitive firms when compared to the effect size for currency neutral firms (columns 10-12 of Table 3.35). By contrast, the same ratio of effect sizes among currency sensitive and currency neutral firms is just between 0.52 and 0.54 at the monthly frequency (columns 10-12 of Table 3.33).

Other contrasting effects exist between currency sensitive and currency neutral firms. For example, at the monthly, quarterly, and annual frequency, the interaction of firm size with profitability also carries a slight differential weight for currency sensitive firms, in the context of explaining forward period returns. Drawing on the summary statistics of the independent variables from Table 3.27, a firm in the 25th percentile contrasted against a firm in the 75th percentile of this interacted variable would have an expected quarter-ahead return about 12 percentage points higher as a consequence (columns 10-12, Table 3.36[37]), whereas the same differential for currency neutral firms would be about 3.6 percent. This represents an effect within currency sensitive firms that is 3.43 times the magnitude of that for non-currency sensitive firms.

[37] The 25th and 75th percentiles of log market capitalization are .014 and 1.21, respectively. The point estimates for the 1st and 25th currency quantiles at the quarterly forecast horizon are both .08 and .1, in contrast to .03 for the currency neutral firms (all point estimates are statistically significant). Thus, .014*.1=.001; and 1.21*.1=.121, for an approximately 0.12 unit difference. The equivalent figures using the effect size for currency neutral firms (.03) is a [.014*.03=.0004; 1.21*.03=.0363] .0359 unit difference. The ratio between the groups is thus .12/.035=3.43.

Table 3.31 Predictability: Role of Fundamentals in Month Ahead Returns Among Varying Degrees of Currency Sensitivity (Positive/Negative Split). This table shows the results from regressing firm month-ahead returns on firm proxies for financial risk, with regressions separated according to the (lagged) currency sensitivity of the firm. Positive exposure is defined here as any firm with a monthly currency beta greater than zero, and vice-versa for negative exposure. 'All' columns include both. Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 1 lag.

	Level of Currency Exposure											
	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure
Beta	.053	.409***	-.245***	.054	.396***	-.221***	.062*	.068*	.063*	.063*	.078**	.060
	(1.33)	(14.61)	(-13.31)	(1.39)	(14.08)	(-12.59)	(1.68)	(1.71)	(1.68)	(1.82)	(2.11)	(1.65)
Total	.114	-.777***	.604***	.144	-.532**	.493***	.074	.124	-.154	.106	.094	-.148
	(0.91)	(-3.85)	(4.31)	(1.28)	(-2.48)	(4.62)	(0.58)	(0.80)	(-0.48)	(0.91)	(0.63)	(-0.46)
Profitabilit	-.244***	-.136***	.586***	-.259***	-.121***	.518***	-.239***	-.209**	-.236**	-.259 ***	-.236**	-
	(-3.41)	(-13.04)	(12.77)	(-4.09)	(-11.37)	(9.13)	(-3.43)	(-2.25)	(-2.60)	(-4.14)	(-2.57)	(-2.98)
ZM Score	.009	.442***	-.217***	.014	.382**	-.341	.001	.066	.111	.007	.064	.127
	(0.20)	(2.91)	(-2.63)	(0.45)	(2.54)	(-1.52)	(0.02)	(0.83)	(1.07)	(0.24)	(1.10)	(1.08)
Leverage	-.086	-2.64***	1.337***	-.102	-2.181**	1.963	-.055	-.434	-.676	-.076	-.380	-.774
	(-0.38)	(-3.13)	(2.66)	(-0.57)	(-2.60)	(1.50)	(-0.26)	(-0.98)	(-1.17)	(-0.44)	(-1.12)	(-1.17)
Net Op.	.275	-.076	-.253	.229*	-.425*	.014	.286	.303*	.233	.260*	.235	.256
	(1.62)	(-0.31)	(-1.52)	(1.69)	(-1.89)	(0.08)	(1.65)	(1.66)	(1.14)	(1.92)	(1.54)	(1.46)
Neg. Cash	-.005	.208***	-.133***	-.007	.168***	-.106***	-.001	-.000	-.008	-.004	.007	-.015
	(-0.27)	(13.13)	(-14.79)	(-0.59)	(12.33)	(-10.03)	(-0.08)	(-0.01)	(-0.46)	(-0.29)	(0.30)	(-1.03)
Size	-.057***	-.161***	.029***	-.059***	-.165***	.031***	-.058***	-.058***	-.061***	-.060***	-.061***	-
	(-8.60)	(-21.53)	(4.68)	(-10.44)	(-23.54)	(4.66)	(-8.92)	(-8.03)	(-8.15)	(-11.06)	(-10.09)	(-9.03)
Proft.*NO	-.233	2.064***	-1.514***	-.242	1.615***	-.1188***	-.265	-.262	-.292	-.255	-.264	-.230
A	(-0.89)	(5.16)	(-4.74)	(-0.96)	(4.36)	(-4.13)	(-0.96)	(-1.07)	(-0.77)	(-0.95)	(-1.15)	(-0.59)
Size*Proft	.208***	.670***	-.238***	.215***	.595***	-.199***	.207***	.190***	.208***	.216***	.206***	.216***
.	(5.53)	(13.24)	(-10.08)	(6.62)	(11.23)	(-6.70)	(5.70)	(3.86)	(4.40)	(6.83)	(4.20)	(5.03)
Size*NOA	-.019**	-.011	.021**	-.016**	.009	.006	-.020**	-.023**	-.017	-.018**	-.018**	-.017*
	(-2.18)	(-0.85)	(1.98)	(-2.21)	(0.79)	(0.54)	(-2.26)	(-2.42)	(-1.54)	(-2.52)	(-2.25)	(-1.82)
ZM*Accr	.079**	-.109**	.133***	.072**	-.073	.124***	.071**	.084**	.014	.064**	.076*	.001
uals	(2.44)	(-2.12)	(3.63)	(2.46)	(-1.40)	(4.21)	(2.17)	(2.07)	(0.18)	(2.19)	(1.97)	(0.01)
Country	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	11.95***	58.41***	-22.05***	10.94***	54.60***	-28.14***	12.28***	14.73***	17.44***	11.72***	15.26***	16.11**
	(4.60)	(8.65)	(-7.56)	(5.29)	(8.18)	(-3.21)	(4.98)	(3.84)	(3.46)	(5.93)	(5.14)	(2.86)
Observatio	1,545,770	772,329	773,440	1,545,770	772,329	773,440	1,545,357	772,781	772,560	1,545,357	772,781	772,560
R-squared	0.04	0.07	0.08	0.14	0.12	0.15	0.05	0.06	0.05	0.14	0.16	0.15
Number of Obs.	157	157	157	157	157	157	157	157	157	157	157	157

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.32 Predictability: Role of Fundamentals in Month Ahead Returns Among Varying Degrees of Currency Sensitivity (Quintile Split). This table shows the results from regressing firm month-ahead returns on firm proxies for financial risk, with regressions separated according to the (lagged) currency sensitivity of the firm. Quintile 5 represents firms with the greatest positive correlation with their country's exchange rate movement, whereas Quintile 1 represents firms with the most strongly negative correlation. Quintile 3 represents firms that are relatively uncorrelated to exchange rate movements ('Neutral'). Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 1 lag.

	Currency Sensitivity Rankings											
	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest
Beta	0.005	0.004	0.006	0.006	0.003	0.006	0.008**	0.005	0.006	0.009**	0.004	0.007
	(1.40)	(0.95)	(1.35)	(1.51)	(0.67)	(1.40)	(2.14)	(1.15)	(1.51)	(2.29)	(0.99)	(1.50)
Total Accruals	-0.003	.018	.021	.005	.024	.019	.004	-.003	.020	.006	.033	.021
	(-0.09)	(0.70)	(0.62)	(0.13)	(0.94)	(0.43)	(0.10)	(-0.14)	(0.53)	(0.11)	(0.91)	(0.42)
Profitability	-.027**	.005	-.036***	-.029**	.001	-.035***	-.032 4***	0.004	-.031***	-.040***	-.003	-.033***
	(-2.28)	(0.43)	(-2.80)	(-2.35)	(0.11)	(-2.84)	(-2.72)	(0.32)	(-2.84)	(-3.13)	(-0.24)	(-2.92)
ZM Score	.154	-.149	-.064	.0251	-.112	.277	.863	-.049	-.200	1.122	-.194	.167
	(0.94)	(-1.21)	(-0.53)	(1.50)	(-0.99)	(0.42)	(1.55)	(-0.23)	(-1.27)	(1.48)	(-1.29)	(0.26)
Leverage	-.901	.779	.361	-1.403	.624	-1.628	-4.913	.161	1.118	-6.302	1.081	-1.008
	(-0.96)	(1.13)	(0.51)	(-1.46)	(0.97)	(-0.43)	(-1.56)	(0.13)	(1.26)	(-1.48)	(1.23)	(-0.28)
Net Op. Assets	.818**	.018	.125	.719**	-.087	-.086	.861**	.069	.161	.902**	.065	-.038
	(2.06)	(0.08)	(0.39)	(1.98)	(-0.37)	(-0.20)	(2.19)	(0.28)	(0.50)	(2.26)	(0.31)	(-0.09)
Neg. Cash Flow	.018	-.015	-.020	.031	-.003	-.035	.009	-.003	-.014	.015	.007	-.026
	(0.56)	(-0.66)	(-0.92)	(0.92)	(-0.10)	(-1.61)	(0.27)	(-0.12)	(-0.59)	(0.35)	(0.22)	(-1.04)
Size	-.047***	-.042***	-.081***	-.051***	-.046***	-.090***	-.053***	-.042***	-.080***	-.055***	-.046***	-.088***
	(-3.41)	(-5.04)	(-6.45)	(-4.40)	(-6.14)	(-5.93)	(-3.97)	(-4.65)	(-6.42)	(-4.64)	(-6.12)	(-6.01)
Proft.*NOA	.199	-.407	-.125	.090	-.390	-.368	-.072	-.316	-.200	-.175	-.311	-.413
	(0.36)	(-0.72)	(-0.29)	(0.19)	(-0.69)	(-0.82)	(-0.14)	(-0.55)	(-0.38)	(-0.36)	(-0.54)	(-0.70)
Size*Proft.	.212***	.037	.274***	.231***	.060	.275***	.254***	.044	.272***	.311***	.084	.269***
	(3.13)	(0.52)	(4.01)	(3.31)	(0.90)	(4.18)	(3.55)	(0.63)	(4.04)	(4.04)	(1.49)	(4.24)
Size*NOA	-.051**	-.0.05	-.010	-.045**	.002	.002	-.055**	-.009	-.013	-.058**	-.007	-.001
	(-2.36)	(-0.38)	(-0.60)	(-2.29)	(0.15)	(0.09)	(-2.54)	(-0.68)	(-0.73)	(-2.57)	(-0.61)	(-0.04)
ZM*Accruals	.059	.066	.111	.086	.061	.090	.068	.008	.102	.080	.088	.096
	(0.54)	(0.87)	(1.25)	(0.78)	(0.91)	(0.83)	(0.48)	(0.10)	(0.99)	(0.45)	(0.85)	(0.75)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	16.42**	2.45	13.05**	20.22***	4.09	27.79	33.13***	1.71	7.52	37.16**	1.36	22.28
	(2.25)	(0.43)	(2.05)	(2.80)	(0.80)	(0.94)	(2.66)	(0.27)	(0.98)	(2.58)	(0.23)	(0.79)
Observations	296,150	306,505	320,298	296,150	306,505	320,298	296,052	306,463	320,141	296,052	306,463	320,141
R-squared	0.05	0.07	0.05	0.14	0.20	0.15	0.07	0.09	0.06	0.16	0.21	0.16
Number of Obs.	157	157	157	157	157	157	157	157	157	157	157	157

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.33 Predictability: Role of Fundamentals in Month Ahead Returns Among Varying Degrees of Currency Sensitivity (Quantile Split). This table shows the results from regressing firm month-ahead returns on firm proxies for financial risk, with regressions separated according to the (lagged) currency sensitivity of the firm. Quantile 25 represents firms with the greatest positive correlation with their country's exchange rate movement, whereas Quantile 1 represents firms with the most strongly negative correlation. Quantiles 2-24 represents firms that are relatively less correlated to exchange rate movements ('Neutral'). Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 1 lag.

	Currency Sensitivity Rankings											
	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest
Beta	-.016	.049	.059	.366	.051	-.348	.458	.059	.015	.356**	.061*	-.0078
	(-0.04)	(1.19)	(1.14)	(1.64)	(1.28)	(-0.92)	(1.36)	(1.51)	(0.31)	(2.08)	(1.70)	(-0.94)
Total Accruals	11.744	.085	-.338	-.434	.153	3.550	-1.857	.034	.690	.077	.105	.002
	(0.84)	(0.65)	(-0.08)	(-0.71)	(1.28)	(0.21)	(-0.98)	(0.26)	(0.12)	(0.16)	(0.87)	(0.63)
Profitability	-.215	-.161**	-.854***	-.423***	-.186***	1.263	-.489***	-.159**	-1.087***	-.525***	-.186***	-.554***
	(-0.01)	(-2.33)	(-2.77)	(-2.85)	(-3.26)	(0.66)	(-3.07)	(-2.33)	(-3.34)	(-3.73)	(-3.34)	(-3.29)
ZM Score	2.117	-.006	-.867	.890	.001	-7.533	1.118**	-.010	-.486	.723*	-.003	.087
	(1.06)	(-0.14)	(-0.76)	(0.67)	(0.04)	(-0.54)	(2.18)	(-0.26)	(-0.58)	(1.87)	(-0.11)	(0.22)
Leverage	-7.505	-.011	4.965	-6.007**	-.027	44.046	-4.451**	.002	2.645	-3.817*	-.011	-1.435
	(-0.85)	(-0.05)	(0.74)	(-2.18)	(-0.15)	(0.57)	(-2.02)	(0.01)	(0.52)	(-1.77)	(-0.06)	(-0.86)
Net Op. Assets	-5.406	.119	.934	-.961	.073	11.836	2.270*	.121	2.224	.676	.099	.830
	(-0.67)	(0.78)	(1.11)	(-0.61)	(0.59)	(0.82)	(1.76)	(0.77)	(1.45)	(1.29)	(0.81)	(1.55)
Neg. Cash Flow	.292	-.006	-.023	.188	-.009	-.738	-.119	-.002	-.023	.201	-.004	.384
	(0.91)	(-0.36)	(-0.45)	(1.08)	(-0.78)	(-1.09)	(-0.59)	(-0.11)	(-0.34)	(1.43)	(-0.35)	(0.59)
Size	-.401	-.055***	-.099***	-.056	-.057***	.261	-.115*	-.056***	-.053	-.071	-.058***	.225
	(-1.53)	(-8.11)	(-3.75)	(-0.50)	(-9.92)	(0.55)	(-1.85)	(-8.49)	(-1.18)	(-1.32)	(-10.79)	(0.56)
Proft.*NOA	-2.841	-.277	-.221	-10.714	-.270	20.223	-.832	-.291	-.225	-.282	-.267	-.860
	(-0.35)	(-0.96)	(-0.14)	(-1.39)	(-0.96)	(1.04)	(-1.25)	(-0.95)	(-0.18)	(-0.58)	(-0.89)	(-0.79)
Size*Proft.	.179	.161***	.568***	.677***	.174***	-.1099	.384***	.161***	.697***	.433***	.176***	.551***
	(0.16)	(4.51)	(3.22)	(2.69)	(6.13)	(-0.74)	(2.84)	(4.70)	(3.86)	(4.59)	(6.53)	(3.63)
Size*NOA	.243	-.011	-.048	.058	-.008	-.698	-.099	-.012	-.123	-.041	-.010	-.247
	(0.56)	(-1.39)	(-1.10)	(0.66)	(-1.17)	(-0.82)	(-1.18)	(-1.45)	(-1.49)	(-1.29)	(-1.50)	(-1.19)
ZM*Accruals	2.621	.074**	.019	.253	.078**	1.101	-.291	.065*	.220	.330	.070**	1.739
	(0.80)	(2.05)	(0.02)	(1.00)	(2.27)	(0.27)	(-0.47)	(1.78)	(0.17)	(1.35)	(2.05)	(1.08)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	169.29	10.92***	-19.41	55.33	11.37***	-356.63	66.61***	11.65***	-8.92	42.32**	11.01***	-19.69
	(1.40)	(4.26)	(-0.39)	(0.92)	(5.10)	(-0.54)	(2.85)	(4.78)	(-0.23)	(2.19)	(5.18)	(-0.29)
Obs.	59,142	1,423,521	63,107	59,142	1,423,521	63,107	59,104	1,423,196	63,057	59,104	1,423,196	63,057
R-sq.	0.15	0.04	0.10	0.26	0.14	0.26	0.17	0.05	0.14	0.28	0.15	0.28
Months	157	157	157	157	157	157	157	157	157	157	157	157

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.34 Predictability: Role of Fundamentals in Quarter Ahead Returns Among Varying Degrees of Currency Sensitivity (Positive/Negative Split). This table shows the results from regressing firm quarter-ahead returns on firm proxies for financial risk, with regressions separated according to the (lagged) currency sensitivity of the firm. Positive exposure is defined here as any firm with a monthly currency beta greater than zero, and vice-versa for negative exposure. 'All' columns include both. Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 3 lags.

	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure
Beta	0.02	0.08***	-0.04***	0.02	0.08***	-0.03***	0.02**	0.02**	0.02*	0.02**	0.02**	0.02*
	(1.58)	(12.95)	(-10.82)	(1.58)	(12.16)	(-10.35)	(1.99)	(2.10)	(1.96)	(2.08)	(2.51)	(1.92)
Total Accruals	0.03	-0.21***	0.10***	0.04	-0.16***	0.08**	0.02	0.02	-0.06	0.03	0.04	-0.05
	(1.10)	(-4.60)	(4.78)	(1.55)	(-3.57)	(2.46)	(0.55)	(0.51)	(-0.93)	(1.02)	(1.29)	(-0.80)
Profitability	-0.39**	-2.20***	0.96***	-0.41***	-1.94***	0.79***	-0.38**	-0.23	-0.43***	-0.41***	-0.35*	-0.45***
	(-2.52)	(-13.07)	(12.17)	(-2.96)	(-11.51)	(8.73)	(-2.58)	(-1.03)	(-2.86)	(-3.09)	(-1.82)	(-3.33)
ZM Score	0.01	0.04**	-0.02*	0.01	0.04**	-0.03***	0.00	0.02	0.01	0.00	0.02	0.01
	(0.54)	(2.46)	(-1.79)	(0.74)	(2.30)	(-3.85)	(0.35)	(0.72)	(0.77)	(0.53)	(1.16)	(0.88)
Leverage	-0.05	-0.29***	0.13**	-0.05	-0.22**	0.16***	-0.04	-0.11	-0.07	-0.04	-0.11	-0.08
	(-0.78)	(-2.92)	(2.00)	(-0.97)	(-2.39)	(3.71)	(-0.65)	(-0.89)	(-1.06)	(-0.83)	(-1.23)	(-1.16)
Net Op. Assets	0.04	-0.06	-0.05**	0.03	-0.14***	0.00	0.05	0.07	0.02	0.04	0.05	0.02
	(1.17)	(-1.48)	(-2.15)	(0.95)	(-3.47)	(0.06)	(1.27)	(1.38)	(0.59)	(1.29)	(1.34)	(0.61)
Neg. Cash Flow	-0.00	0.04***	-0.03***	-0.00	0.03***	-0.02***	-0.00	-0.00	-0.00	-0.00	-0.00	-0.01
	(-0.67)	(13.00)	(-18.34)	(-1.17)	(11.20)	(-17.17)	(-0.47)	(-0.23)	(-0.65)	(-0.87)	(-0.02)	(-1.30)
Size	-0.02***	-0.03***	0.00***	-0.02***	-0.03***	0.00***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***
	(-10.50)	(-23.25)	(4.03)	(-12.04)	(-24.20)	(5.30)	(-10.82)	(-9.13)	(-11.23)	(-12.79)	(-10.76)	(-12.55)
Proft.*NOA	-0.12**	0.28***	-0.30***	-0.13**	0.21***	-0.24***	-0.13**	-0.15*	-0.13*	-0.13**	-0.13*	-0.11
	(-2.09)	(4.31)	(-8.31)	(-2.40)	(3.28)	(-6.64)	(-2.05)	(-1.87)	(-1.80)	(-2.21)	(-1.95)	(-1.57)
Size*Proft.	0.04***	0.11***	-0.04***	0.04***	0.10***	-0.03***	0.04***	0.03***	0.05***	0.04***	0.04***	0.05***
	(5.27)	(12.57)	(-8.65)	(6.49)	(11.38)	(-5.46)	(5.53)	(3.10)	(5.58)	(6.91)	(4.28)	(6.68)
Size*NOA	-0.00*	0.00	0.00***	-0.00	0.00**	0.00	-0.00*	-0.01**	-0.00	-0.00**	-0.00**	-0.00
	(-1.77)	(0.12)	(2.80)	(-1.60)	(2.17)	(0.58)	(-1.96)	(-2.02)	(-1.21)	(-2.06)	(-2.04)	(-1.27)
ZM*Accruals	0.02***	-0.03**	0.02***	0.02***	-0.03**	0.02**	0.02***	0.02*	0.01	0.02**	0.02**	0.00
	(3.08)	(-2.38)	(4.79)	(2.90)	(-2.29)	(2.60)	(2.72)	(1.76)	(0.31)	(2.55)	(2.10)	(0.05)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	0.36***	1.00***	-0.27***	0.33***	0.98***	-0.33***	0.36***	0.41***	0.40***	0.34***	0.43***	0.38***
	(5.12)	(12.10)	(-5.36)	(6.47)	(12.87)	(-8.90)	(5.41)	(3.81)	(5.70)	(6.45)	(4.97)	(5.68)
Obs.	1,489,402	746,374	743,028	1,489,402	746,374	743,028	1,489,021	744,575	744,446	1,489,021	744,575	744,446
R-sq.	0.05	0.07	0.09	0.15	0.13	0.16	0.06	0.07	0.07	0.16	0.18	0.17
Months groups	155	155	155	155	155	155	155	155	155	155	155	155

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.35 Predictability: Role of Fundamentals in Quarter Ahead Returns Among Varying Degrees of Currency Sensitivity (Quintile Split). This table shows the results from regressing firm quarter-ahead returns on firm proxies for financial risk, with regressions separated according to the (lagged) currency sensitivity of the firm. Quintile 5 represents firms with the greatest positive correlation with their country's exchange rate movement, whereas Quintile 1 represents firms with the most strongly negative correlation. Quintile 3 represents firms that are relatively uncorrelated to exchange rate movements ('Neutral'). Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 1 lag.

	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest
Beta	0.02	0.01	0.01	0.02*	0.01	0.01	0.03**	0.02	0.02	0.03**	0.01	0.01
	(1.65)	(1.08)	(1.32)	(1.85)	(0.76)	(1.18)	(2.28)	(1.35)	(1.60)	(2.46)	(1.26)	(1.41)
Total Accruals	-0.01	0.09	-0.05	0.02	0.09	-0.02	-0.01	0.06	-0.08	0.00	0.13	-0.05
	(-0.19)	(1.25)	(-0.71)	(0.27)	(1.19)	(-0.29)	(-0.18)	(0.90)	(-0.86)	(0.06)	(1.28)	(-0.48)
Profitability	-0.55	-0.28	-0.72***	-0.64**	-0.37	-0.73***	-0.70**	-0.25	-0.63**	-0.80***	-0.43	-0.65**
	(-1.64)	(-0.64)	(-2.81)	(-2.11)	(-0.83)	(-2.68)	(-2.40)	(-0.57)	(-2.54)	(-2.79)	(-1.00)	(-2.43)
ZM Score	0.01	-0.03	0.05	0.02	-0.03	0.12	0.04	-0.06	0.02	0.04	-0.06	0.08
	(0.38)	(-0.76)	(0.73)	(0.78)	(-0.68)	(1.41)	(0.82)	(-1.24)	(0.26)	(0.55)	(-1.15)	(1.07)
Leverage	-0.09	0.17	-0.28	-0.12	0.18	-0.68	-0.25	0.34	-0.12	-0.20	0.34	-0.47
	(-0.44)	(0.70)	(-0.77)	(-0.74)	(0.69)	(-1.47)	(-0.88)	(1.17)	(-0.31)	(-0.55)	(1.15)	(-1.14)
Net Op. Assets	0.20*	-0.04	0.03	0.14	-0.05	-0.01	0.21*	-0.02	0.05	0.19*	-0.03	-0.01
	(1.71)	(-0.76)	(0.51)	(1.42)	(-1.16)	(-0.06)	(1.78)	(-0.39)	(0.75)	(1.81)	(-0.81)	(-0.07)
Neg. Cash Flow	-0.00	-0.01	-0.00	-0.00	-0.01	-0.01	-0.01	-0.01	-0.00	-0.00	-0.00	-0.00
	(-0.56)	(-1.55)	(-0.49)	(-0.41)	(-1.32)	(-1.23)	(-0.65)	(-1.06)	(-0.06)	(-0.27)	(-0.56)	(-0.62)
Size	-0.01***	-0.02***	-0.02***	-0.02***	-0.01***	-0.02***	-0.02***	-0.01***	-0.02***	-0.02***	-0.01***	-0.02***
	(-3.64)	(-7.73)	(-8.35)	(-5.20)	(-7.78)	(-6.36)	(-3.95)	(-7.94)	(-7.73)	(-5.09)	(-8.63)	(-6.24)
Proft.*NOA	-0.02	-0.11	-0.04	-0.04	-0.06	-0.08	-0.05	-0.09	-0.05	-0.07	-0.04	-0.09
	(-0.14)	(-0.91)	(-0.38)	(-0.40)	(-0.53)	(-0.67)	(-0.35)	(-0.82)	(-0.44)	(-0.60)	(-0.38)	(-0.73)
Size*Proft.	0.05***	0.03	0.06***	0.05***	0.04*	0.06***	0.06***	0.03	0.06***	0.07***	0.04**	0.06***
	(2.61)	(1.65)	(4.41)	(3.26)	(1.80)	(4.64)	(3.74)	(1.56)	(4.29)	(4.42)	(2.03)	(4.64)
Size*NOA	-0.01*	0.00	-0.00	-0.01*	0.00	-0.00	-0.01**	-0.00	-0.00	-0.01**	0.00	-0.00
	(-1.93)	(0.39)	(-0.82)	(-1.67)	(0.80)	(-0.12)	(-2.07)	(-0.12)	(-1.16)	(-2.09)	(0.29)	(-0.16)
ZM*Accruals	0.00	0.04*	0.01	0.01	0.04*	0.01	0.00	0.04*	-0.00	0.00	0.05	0.00
	(0.20)	(1.96)	(0.34)	(0.46)	(1.75)	(0.35)	(0.02)	(1.76)	(-0.02)	(0.21)	(1.62)	(0.06)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	0.36*	0.17	0.58**	0.39***	0.12	0.90**	0.49**	0.04	0.47	0.53**	-0.01	0.76**
	(1.95)	(0.87)	(2.16)	(3.01)	(0.59)	(2.37)	(2.48)	(0.19)	(1.60)	(2.59)	(-0.04)	(2.21)
Observations	284,735	295,790	307,629	284,735	295,790	307,629	284,643	295,751	307,481	284,643	295,751	307,481
R-squared	0.06	0.08	0.06	0.16	0.22	0.17	0.08	0.10	0.08	0.18	0.23	0.19
Number of	155	155	155	155	155	155	155	155	155	155	155	155

Table 3.36 Predictability: Role of Fundamentals in Quarter Ahead Returns Among Varying Degrees of Currency Sensitivity (Quantile Split). This table shows the results from regressing firm quarter-ahead returns on firm proxies for financial risk, with regressions separated according to the (lagged) currency sensitivity of the firm. Quantile 25 represents firms with the greatest positive correlation with their country's exchange rate movement, whereas Quantile 1 represents firms with the most strongly negative correlation. Quantiles 2-24 represents firms that are relatively less correlated to exchange rate movements ('Neutral'). Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 3 lags.

	Currency Sensitivity Rankings											
VARIABLES	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest
Beta	0.06**	0.02	0.02	0.05*	0.02	-0.02	0.16*	0.02	0.02	0.09*	0.02*	-0.06
	(2.05)	(1.22)	(1.25)	(1.85)	(1.28)	(-0.65)	(1.79)	(1.55)	(1.10)	(1.73)	(1.68)	(-1.13)
Total Accruals	-2.35	0.04	0.29	0.01	0.05*	-0.27	-0.31	0.02	0.66	-0.07	0.04	0.07
	(-1.54)	(1.19)	(0.49)	(0.02)	(1.71)	(-0.26)	(-1.40)	(0.62)	(1.30)	(-0.76)	(1.29)	(0.92)
Profitability	2.46	-0.12	-2.26***	-0.68	-0.16	-2.35*	-0.60	-0.11	-2.06***	-1.21**	-0.17	-1.27***
	(0.83)	(-0.63)	(-3.26)	(-1.55)	(-1.02)	(-1.76)	(-1.10)	(-0.58)	(-3.23)	(-2.52)	(-1.11)	(-3.05)
ZM Score	0.34	0.00	-0.07	-0.05	0.00	-0.48	0.35	0.00	-0.40	0.06	0.00	0.10
	(1.63)	(0.07)	(-0.49)	(-0.30)	(0.31)	(-0.47)	(1.61)	(0.04)	(-0.90)	(0.45)	(0.25)	(1.29)
Leverage	-1.21	-0.02	0.47	-0.36	-0.03	3.47	-0.60	-0.02	2.36	-0.30	-0.02	-0.22
	(-1.29)	(-0.25)	(0.54)	(-0.41)	(-0.46)	(0.58)	(-0.84)	(-0.28)	(0.91)	(-0.39)	(-0.44)	(-0.76)
Net Op. Assets	-1.60	0.03	0.21	-0.37	0.00	-0.18	0.04	0.03	0.51	0.22	0.01	-0.50
	(-1.17)	(0.64)	(0.96)	(-0.39)	(0.08)	(-0.19)	(0.19)	(0.66)	(1.41)	(1.56)	(0.35)	(-0.94)
Neg. Cash Flow	0.01	-0.00	0.02	0.01	-0.00*	-0.01	0.05	-0.00	0.01	0.00	-0.00	0.06
	(0.67)	(-0.74)	(0.74)	(0.32)	(-1.70)	(-0.22)	(1.04)	(-0.56)	(0.31)	(0.05)	(-1.29)	(1.27)
Size	-0.08*	-0.02***	-0.04***	-0.04	-0.02***	-0.04	-0.01	-0.02***	-0.02***	-0.02**	-0.02***	-0.02
	(-1.72)	(-8.40)	(-3.59)	(-1.01)	(-9.48)	(-1.21)	(-0.24)	(-8.71)	(-2.81)	(-2.44)	(-10.38)	(-0.73)
Proft.*NOA	-1.45	-0.11	-0.35	0.21	-0.11*	0.72	-0.18	-0.11	-0.04	-0.03	-0.11	-0.19
	(-1.17)	(-1.45)	(-0.85)	(0.73)	(-1.66)	(0.43)	(-0.78)	(-1.33)	(-0.11)	(-0.20)	(-1.45)	(-0.71)
Size*Proft.	-0.06	0.03***	0.15***	0.05	0.03***	0.13*	0.10**	0.03***	0.14***	0.08***	0.03***	0.10***
	(-0.45)	(2.78)	(4.18)	(1.56)	(3.69)	(1.73)	(2.12)	(2.85)	(4.12)	(3.20)	(4.02)	(3.85)
Size*NOA	0.08	-0.00	-0.01	0.02	-0.00	0.01	0.01	-0.00	-0.03	-0.01*	-0.00	0.01
	(1.14)	(-1.19)	(-0.85)	(0.31)	(-0.70)	(0.18)	(0.44)	(-1.30)	(-1.44)	(-1.90)	(-1.10)	(0.51)
ZM*Accruals	-0.58	0.03***	0.10	0.00	0.03***	-0.02	0.11	0.02***	0.18	-0.03	0.02***	0.12
	(-1.51)	(3.00)	(0.75)	(0.04)	(2.82)	(-0.09)	(0.77)	(2.81)	(1.40)	(-1.23)	(2.74)	(1.13)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	2.89*	0.31***	0.30	0.34	0.30***	-1.16	1.51	0.33***	-1.28	0.56	0.31***	1.05
	(1.84)	(3.61)	(0.44)	(0.35)	(4.30)	(-0.24)	(1.48)	(3.92)	(-0.65)	(0.87)	(4.53)	(1.53)
Observations	56,426	1,372,74	60,230	56,426	1,372,74	60,230	56,391	1,372,45	60,180	56,391	1,372,45	60,180
R-squared	0.15	0.05	0.12	0.28	0.16	0.27	0.19	0.06	0.16	0.31	0.17	0.30
Number of groups	155	155	155	155	155	155	155	155	155	155	155	155

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.37 Predictability: Role of Fundamentals in Year Ahead Returns Among Varying Degrees of Currency Sensitivity (Positive/Negative Split). This table shows the results from regressing firm year-ahead returns on firm proxies for financial risk, with regressions separated according to the (lagged) currency sensitivity of the firm. Positive exposure is defined here as any firm with a monthly currency beta greater than zero, and vice-versa for negative exposure. 'All' columns include both. Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 12 lags.

VARIABLES	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure	All	Positive Exposure	Negative Exposure
Beta	0.08	0.22***	-0.05***	0.05	0.17***	-0.05***	0.09*	0.09*	0.08*	0.06	0.07*	0.05
	(1.62)	(6.48)	(-4.52)	(1.19)	(5.83)	(-3.96)	(1.84)	(1.77)	(1.85)	(1.57)	(1.78)	(1.38)
Total Accruals	-0.03	-0.59***	0.30***	-0.03	-0.48***	0.40**	-0.06	0.10	-0.32	-0.04	0.11	-0.29
	(-0.30)	(-4.09)	(4.65)	(-0.26)	(-4.07)	(2.20)	(-0.58)	(0.42)	(-1.50)	(-0.47)	(0.55)	(-1.27)
Profitability	-0.92*	-5.46***	1.45***	-0.77	-4.35***	1.01***	-1.01*	-0.58	-1.25**	-0.87	-0.50	-1.21**
	(-1.67)	(-4.19)	(5.88)	(-1.33)	(-3.11)	(3.62)	(-1.75)	(-0.54)	(-2.36)	(-1.46)	(-0.45)	(-2.37)
ZM Score	0.05	0.20*	-0.03	0.04	0.12	-0.01	0.04	-0.01	0.09	0.04	-0.06	0.07
	(0.81)	(1.82)	(-0.79)	(0.86)	(1.26)	(-0.50)	(0.63)	(-0.07)	(1.07)	(0.72)	(-0.36)	(1.02)
Leverage	-0.35	-1.25*	0.17	-0.32	-0.76	0.04	-0.32	-0.02	-0.62	-0.30	0.27	-0.50
	(-0.90)	(-1.97)	(0.79)	(-1.07)	(-1.33)	(0.32)	(-0.78)	(-0.02)	(-1.26)	(-1.02)	(0.27)	(-1.25)
Net Op. Assets	0.35	-0.00	-0.14**	0.21	-0.31	-0.03	0.39	0.69**	0.09	0.26	0.55**	-0.00
	(1.37)	(-0.00)	(-2.26)	(1.19)	(-0.99)	(-0.47)	(1.50)	(2.18)	(0.32)	(1.46)	(2.30)	(-0.00)
Neg. Cash Flow	-0.03	0.09***	-0.05***	-0.03***	0.05***	-0.04***	-0.02	-0.04*	-0.01	-0.03***	-0.03**	-0.03**
	(-1.58)	(4.87)	(-16.97)	(-2.86)	(3.45)	(-11.62)	(-1.47)	(-1.68)	(-0.58)	(-2.75)	(-2.26)	(-2.18)
Size	-0.05***	-0.10***	0.00	-0.05***	-0.09***	0.00	-0.05***	-0.04***	-0.06***	-0.05***	-0.04***	-0.05***
	(-5.24)	(-11.35)	(1.13)	(-5.52)	(-11.18)	(1.03)	(-4.84)	(-2.65)	(-6.20)	(-5.32)	(-2.78)	(-6.37)
Proft.*NOA	-0.08	0.94**	-0.54***	-0.18	0.54	-0.42***	-0.04	0.37	-0.20	-0.12	0.33	-0.24
	(-0.32)	(2.52)	(-7.14)	(-0.76)	(1.32)	(-6.97)	(-0.14)	(0.53)	(-1.00)	(-0.40)	(0.44)	(-1.18)
Size*Proft.	0.10***	0.29***	-0.06***	0.08**	0.23***	-0.03**	0.10***	0.06	0.12***	0.09**	0.05	0.11***
	(2.82)	(3.82)	(-4.47)	(2.31)	(2.78)	(-2.25)	(2.76)	(0.74)	(4.07)	(2.29)	(0.62)	(4.01)
Size*NOA	-0.02	-0.01	0.01***	-0.01	0.01	0.00	-0.02*	-0.04**	-0.01	-0.02*	-0.03**	-0.00
	(-1.57)	(-0.42)	(2.91)	(-1.48)	(0.45)	(1.00)	(-1.77)	(-2.36)	(-0.57)	(-1.82)	(-2.45)	(-0.29)
ZM*Accruals	0.09***	-0.04	0.06***	0.04**	-0.06**	0.09***	0.08***	0.10***	0.02	0.04**	0.06**	-0.01
	(3.49)	(-1.29)	(5.84)	(2.31)	(-2.20)	(2.72)	(3.52)	(2.93)	(0.35)	(2.40)	(1.99)	(-0.22)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	1.30***	3.10***	-0.46***	1.32***	2.69***	-0.38***	1.29***	0.97	1.69***	1.26***	0.73	1.54***
	(3.76)	(5.93)	(-3.25)	(4.62)	(5.56)	(-3.82)	(3.67)	(1.29)	(4.32)	(4.58)	(0.81)	(4.85)
Observations	1,258,99	641,217	617,774	1,258,99	641,217	617,774	1,258,72	625,515	633,208	1,258,72	625,515	633,208
R-squared	0.06	0.07	0.10	0.15	0.13	0.17	0.07	0.09	0.08	0.16	0.18	0.17
Number of groups	146	146	146	146	146	146	146	146	146	146	146	146

t-statistics in parentheses
*** p<0.01, ** p<0.05, *

Table 3.38 Predictability: Role of Fundamentals in Year Ahead Returns Among Varying Degrees of Currency Sensitivity (Quintile Split). This table shows the results from regressing firm year-ahead returns on firm proxies for financial risk, with regressions separated according to the (lagged) currency sensitivity of the firm. Quintile 5 represents firms with the greatest positive correlation with their country's exchange rate movement, whereas Quintile 1 represents firms with the most strongly negative correlation. Quintile 3 represents firms that are relatively uncorrelated to exchange rate movements ('Neutral'). Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 12 lags.

VARIABLES	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest
Beta	0.09*	0.07	0.07	0.07	0.03	0.05	0.10**	0.07	0.07*	0.08*	0.03	0.05
	(1.74)	(1.35)	(1.57)	(1.36)	(0.65)	(1.08)	(1.99)	(1.47)	(1.69)	(1.71)	(0.88)	(1.21)
Total Accruals	-0.27	0.08	-0.23	-0.58**	0.06	-0.15	0.03	-0.06	-0.29*	-0.43**	-0.07	-0.17
	(-1.55)	(0.51)	(-1.43)	(-2.02)	(0.34)	(-0.89)	(0.09)	(-0.44)	(-1.80)	(-2.33)	(-0.37)	(-1.07)
Profitability	0.92	-1.63*	-1.01	1.64	-1.50*	-1.24*	0.30	-1.63**	-0.81	0.76	-1.81**	-0.96
	(0.42)	(-1.85)	(-1.55)	(0.59)	(-1.92)	(-1.68)	(0.15)	(-1.98)	(-1.15)	(0.32)	(-2.30)	(-1.42)
ZM Score	0.04	-0.04	0.20	0.02	-0.47	-0.02	-0.09	-0.24	0.69	-0.14	-0.73	0.58
	(0.32)	(-0.43)	(0.98)	(0.19)	(-1.09)	(-0.13)	(-0.50)	(-1.18)	(1.05)	(-0.81)	(-1.17)	(0.98)
Leverage	-0.30	0.19	-1.17	-0.24	2.65	0.01	0.52	1.30	-3.95	0.69	4.08	-3.43
	(-0.37)	(0.34)	(-1.04)	(-0.39)	(1.07)	(0.01)	(0.46)	(1.07)	(-1.08)	(0.71)	(1.15)	(-1.02)
Net Op. Assets	1.46*	0.39	0.17	1.25	0.24	0.06	1.71	0.46	0.28	1.47	0.36	0.16
	(1.71)	(0.98)	(0.66)	(1.58)	(0.67)	(0.29)	(1.65)	(1.13)	(1.00)	(1.59)	(0.99)	(0.70)
Neg. Cash Flow	-0.03	-0.03	-0.02	-0.02	-0.03*	-0.04***	-0.04	-0.02	-0.02	-0.02	-0.02*	-0.04***
	(-1.30)	(-1.41)	(-1.51)	(-0.88)	(-1.79)	(-2.99)	(-1.54)	(-1.11)	(-1.24)	(-0.92)	(-1.67)	(-3.27)
Size	-0.02	-0.05***	-0.06***	-0.02	-0.04***	-0.06***	-0.02	-0.04***	-0.06***	-0.02	-0.04***	-0.06***
	(-0.46)	(-4.87)	(-4.84)	(-0.50)	(-4.72)	(-5.56)	(-0.37)	(-4.33)	(-4.06)	(-0.49)	(-4.47)	(-4.83)
Proft.*NOA	0.97	-0.19	0.11	0.84	-0.19	0.18	1.16	-0.09	0.28	0.98	-0.16	0.29
	(0.77)	(-0.97)	(0.31)	(0.69)	(-0.91)	(0.44)	(0.78)	(-0.39)	(0.59)	(0.71)	(-0.71)	(0.59)
Size*Proft.	-0.04	0.13***	0.10***	-0.08	0.12***	0.11***	-0.01	0.13***	0.09**	-0.03	0.14***	0.09**
	(-0.25)	(2.88)	(2.97)	(-0.41)	(2.87)	(2.98)	(-0.08)	(3.03)	(2.23)	(-0.18)	(3.25)	(2.55)
Size*NOA	-0.09*	-0.02	-0.01	-0.07	-0.01	-0.01	-0.10*	-0.03	-0.02	-0.09	-0.02	-0.01
	(-1.74)	(-1.02)	(-0.91)	(-1.63)	(-0.73)	(-0.55)	(-1.69)	(-1.24)	(-1.31)	(-1.64)	(-1.09)	(-1.04)
ZM*Accruals	0.01	0.11***	0.04	-0.10	0.05	0.01	0.07	0.08**	0.03	-0.06	0.02	0.01
	(0.22)	(2.75)	(0.68)	(-1.04)	(1.33)	(0.19)	(1.48)	(2.10)	(0.42)	(-1.03)	(0.50)	(0.13)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	0.70	0.78*	2.15**	0.60	-1.22	1.24	0.11	-0.02	4.25	-0.10	-2.06	3.77
	(0.68)	(1.94)	(2.56)	(0.74)	(-0.64)	(1.59)	(0.08)	(-0.02)	(1.59)	(-0.08)	(-0.80)	(1.53)
Observations	238,055	252,183	257,145	238,055	252,183	257,145	237,989	252,155	257,041	237,989	252,155	257,041
R-squared	0.09	0.09	0.07	0.18	0.21	0.18	0.11	0.11	0.10	0.20	0.23	0.20
Number of groups	146	146	146	146	146	146	146	146	146	146	146	146

t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.39 Predictability: Role of Fundamentals in Year Ahead Returns Among Varying Degrees of Currency Sensitivity (Quantile Split). This table shows the results from regressing firm year-ahead returns on firm proxies for financial risk, with regressions separated according to the (lagged) currency sensitivity of the firm. Quantile 25 represents firms with the greatest positive correlation with their country's exchange rate movement, whereas Quantile 1 represents firms with the most strongly negative correlation. Quantiles 2-24 represents firms that are relatively less correlated to exchange rate movements ('Neutral'). Independent variables are exchange-rate adjusted prior to estimation. T-statistics are reported below point estimates, constructed from Newey-West standard errors with 12 lags.

VARIABLES	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest	25 Highest	2-24 Middle	1 Lowest
Beta	0.05	0.09*	-0.03	0.03	0.06	0.18	0.08*	0.10*	-0.04	-0.03	0.07*	-0.09
	(1.30)	(1.68)	(-0.48)	(0.67)	(1.31)	(0.75)	(1.76)	(1.88)	(-0.51)	(-0.45)	(1.72)	(-1.12)
Total Accruals	-0.69	0.02	-12.20	-0.87	0.03	2.85	0.22	-0.02	-3.28	27.54	0.01	-0.19
	(-1.19)	(0.18)	(-1.13)	(-0.81)	(0.28)	(0.19)	(0.22)	(-0.13)	(-0.93)	(1.04)	(0.05)	(-0.46)
Profitability	1.73	-0.46	-7.15*	-3.50	-0.29	4.60	4.18	-0.54	-5.75**	-5.41	-0.39	-2.46
	(0.77)	(-0.80)	(-1.81)	(-1.05)	(-0.49)	(0.57)	(1.11)	(-0.89)	(-2.05)	(-1.01)	(-0.64)	(-1.44)
ZM Score	0.73	0.03	-0.96	3.24	0.03	38.63	-1.27	0.03	-0.12	0.56	0.04	-0.32
	(0.85)	(0.41)	(-0.46)	(1.58)	(0.59)	(0.99)	(-0.56)	(0.43)	(-0.21)	(0.55)	(0.69)	(-0.44)
Leverage	-4.14	-0.21	5.87	-18.52	-0.23	-48.96	7.45	-0.26	-2.13	-1.49	-0.29	-0.86
	(-0.85)	(-0.53)	(0.44)	(-1.59)	(-0.78)	(-0.96)	(0.57)	(-0.60)	(-1.10)	(-0.23)	(-0.96)	(-0.57)
Net Op. Assets	0.61	0.30	-0.18	1.06	0.17	52.37	0.58	0.33	-0.94	4.70	0.21	-0.36
	(0.66)	(1.20)	(-0.25)	(1.14)	(0.97)	(1.00)	(0.55)	(1.33)	(-0.64)	(1.60)	(1.24)	(-0.58)
Neg. Cash Flow	0.02	-0.03	-0.14*	0.07	-0.03***	-0.27	0.02	-0.02	-0.04	-0.72	-0.03***	-0.24
	(0.56)	(-1.51)	(-1.81)	(0.96)	(-2.84)	(-1.48)	(0.43)	(-1.34)	(-0.83)	(-1.08)	(-2.65)	(-1.44)
Size	-0.07***	-0.05***	-0.09***	-0.04	-0.05***	1.46	-0.07***	-0.05***	-0.09***	0.06	-0.05***	-0.05
	(-4.51)	(-5.87)	(-4.07)	(-1.32)	(-6.15)	(0.95)	(-4.02)	(-5.42)	(-4.63)	(0.57)	(-6.09)	(-1.19)
Proft.*NOA	-0.00	-0.20	0.14	2.83	-0.29	20.82	0.49	-0.14	0.61	3.95	-0.22	1.02
	(-0.01)	(-0.91)	(0.08)	(1.04)	(-1.41)	(1.09)	(0.74)	(-0.54)	(0.53)	(1.05)	(-0.83)	(0.84)
Size*Proft.	-0.05	0.07**	0.46*	0.17	0.06*	-0.60	-0.20	0.08**	0.35**	0.21	0.06*	0.14
	(-0.35)	(2.17)	(1.92)	(1.31)	(1.73)	(-0.78)	(-0.85)	(2.12)	(2.15)	(1.13)	(1.73)	(1.48)
Size*NOA	-0.03	-0.02	-0.00	-0.06	-0.01	-3.25	-0.03	-0.02	0.05	-0.27	-0.02	0.02
	(-0.61)	(-1.40)	(-0.03)	(-1.25)	(-1.24)	(-1.01)	(-0.46)	(-1.60)	(0.66)	(-1.62)	(-1.59)	(0.57)
ZM*Accruals	-0.08	0.11***	-3.09	-0.14	0.06***	0.40	0.12	0.10***	-0.90	6.22	0.06**	-0.24
	(-0.56)	(4.03)	(-1.12)	(-0.50)	(2.62)	(0.12)	(0.57)	(4.04)	(-0.99)	(1.04)	(2.59)	(-1.25)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	4.58	1.18***	-2.27	14.84*	1.24***	143.40	-4.10	1.26***	1.38	1.46	1.32***	0.17
	(1.26)	(3.53)	(-0.25)	(1.69)	(4.77)	(0.99)	(-0.41)	(3.73)	(0.58)	(0.29)	(4.96)	(0.06)
Observations	45,704	1,164,26	49,027	45,704	1,164,26	49,027	45,681	1,164,05	48,989	45,681	1,164,05	48,989
R-squared	0.15	0.06	0.16	0.30	0.15	0.31	0.20	0.08	0.20	0.35	0.17	0.33
Number of groups	146	146	146	146	146	146	146	146	146	146	146	146

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.8 Robustness

3.8.1 Overview

In this section, I explore the robustness of the results presented in Section 3 thus far to alternative specifications. In particular, I consider the possibility that alternate accounting for currency fluctuations, factor construction, or time period sampling may have in the measurement of the effect of currency exposure on stock returns. More specifically, Section 3.8.2 aims to understand the impact that monthly currency adjustment has when analyzing returns at a regional level, and also re-specifies the characteristic factor classifications (i.e., size, value, momentum, and currency) in an attempt to make them better span the set of firm returns. Section 3.8.3 follows, by re-estimating models for currency exposure over two sub-samples, during which currency effects might anecdotally be thought of as exhibiting separate regimes.

3.8.2 Alternative Specifications of Regional Time-Series Tests

One of the surprising results of this study was the relatively weak loading of factor effects—including size, value, as well as currency—when conducting region-wide time-series factor regressions in Sections 3.4.2 and 3.4.3. At the least, one might expect size and value to be captured, on account of the results presented in Fama and French (2012). And, by comparison, Hou, Karolyi, and Kho (2011) find that a country-specific size and value specification—combined with a cash-to-price factor—achieves lower pricing error than a regionally specified version.[38]

With that in mind, I consider alternative methods for aggregating portfolios across countries. Specifically, I consider two approaches. The first alternative is to not adjust monthly stock returns for currency movements when conducting the above analysis. This allows for the

[38] However, and as with Fama and French (2012), Hou et al. (2011) also studied a more limited set of developed countries and regions.

possibility that the factors employed as independent variables (e.g., the mimicking portfolios for size or value) are strongly driven by local—and in particular, local *currency*—variation; we may be finding weak evidence, therefore, as a result of netting out from these variables a significant source of price variation.

The second alternative factor construction (wholly separate from above) involves questioning the appropriate weighting of value, size, etc., firm rankings within a region. In other words, what truly constitutes a value firm within a region? Does it matter whether the firm is measured as a value firm with respect to counterparts denominated in the same currency or, instead, whether it is considered a value firm with respect to the entire region? To that end, I implement the above analysis while using rankings constructed *within region*, rather than within country. That is, I construct 5 (or 25) currency sensitive portfolios by ranking among firms across the region, and likewise construct factors by using rankings developed across the entire region.

There are a couple of reasons behind this alternative factor construction. A more technical argument would be that doing so probably allows the factor variables to more easily span the space of firms within the region. This is because with rankings done at the region level, less fragmentation occurs in the case that countries have too few firms in some of the factor-mimicking portfolios[39].

A related possibility is the sparsity of the size factor portfolios—i.e., the use of the top and bottom deciles of the size rankings for each region. Because the size factor is ultimately constructed from the intersection of these deciles *and* the value/growth classifications, too few firms in the top and bottom deciles—that are also required to be value or growth firms—may lead to small sample bias in the size factor. To that end, I relax the decile classification used by

[39] Here, before ranking, firm market and book-equity are translated to US dollar equivalents, so that the comparison is meaningful among countries within a region but with different currencies.

Fama and French (2012) and instead classify a small stock here as being in the 40th percentile or below, and a large stock as being in the 60th percentile or above.

The results from the approach that does not adjust monthly stock returns for currency effects are presented below in Table 3.40. Broadly speaking, the results are similar to those found in previous sections and so to save space, I only present the estimates of portfolio-level alphas for the quintile specification. To summarize, Table 3.40 shows that while some differences in portfolio alphas exist between equal and value-weighted specifications within a region, the largest differences exist between comparisons among the regions themselves.

The robustness test containing the alternative specification for factor construction is more interesting. Here, there seems to be greater propensity for the risk factors to be highly significant. By not restricting the rankings to be measured with respect to within country characteristics, it may be that the factors are better able to capture the space of truly regional risk. More simply, it avoids the issue of having too few characteristic-ranked firms in some countries overly exert influence in the averaging procedure that takes place during factor construction.

Table 3.40 Region-Wide Factor Regressions without Currency Adjustment. This table presents the equal-and value weighted portfolio level alphas, from regional four-factor regressions (using Size, Book-to-Market, Momentum, and Market risk factors). Portfolios are made up with firms within the region, sorted into quintiles according to currency sensitivity (3 being the most neutral set of firms, 5 being the most positive, 1 being the most negative). In this specification, firm returns are not adjusted for contemporaneous currency movements prior to portfolio aggregation.

	Currency Sensitivity Quintile				
	1	2	3	4	5
Japan					
Equal Weighted					
Constant	0.35	-1.02*	-0.29*	-0.06	-0.06
	(0.65)	(-1.87)	(-1.77)	(-0.34)	(-0.39)
Value Weighted					
Constant	0.38	-1.02*	-0.26	-0.02	-0.03
	(0.66)	(-1.84)	(-1.09)	(-0.07)	(-0.15)
Asia Ex-Japan					
Equal Weighted					
Constant	1.94*	-0.02	0.10	1.13***	-0.46
	(1.91)	(-0.01)	(0.29)	(2.99)	(-0.28)
Value Weighted					
Constant	-0.94**	-0.41	0.62	-0.14	0.54
	(-2.15)	(-0.63)	(0.60)	(-0.34)	(1.05)
Europe - Euro					
Equal Weighted					
Constant	-4.86	1.01**	0.01	0.02	0.64
	(-0.91)	(2.43)	(0.02)	(0.09)	(1.18)
Value Weighted					
Constant	-0.35	-0.82*	-0.83**	-0.35	1.71
	(-0.52)	(-1.97)	(-2.01)	(-1.01)	(0.94)
Europe - Non Euro					
Equal Weighted					
Constant	-0.59	16.74	4.12**	1.39	0.2
	(-0.18)	(1.34)	(2.01)	(0.65)	(0.21)
Value Weighted					
Constant	-0.35	-0.82*	-0.83**	-0.35	1.71
	(-0.52)	(-1.97)	(-2.01)	(-1.01)	(0.94)
Latin America					
Equal Weighted					
Constant	-1.64	-0.05	0.65	-1.66	0.17
	(-1.41)	(-0.04)	(0.65)	(-1.08)	(0.17)
Value Weighted					
Constant	0.21	-0.46	1.36	0.63	0.99
	(0.13)	(-0.32)	(1.52)	(0.45)	(0.86)
Middle East					
Equal Weighted					
Constant	-0.35	-1.15**	1.23	0.55	-0.04
	(-0.76)	(-2.32)	(1.13)	(0.89)	(-0.11)
Value Weighted					
Constant	0.51	-1.03	-1.32	0.29	-0.24
	(0.59)	(-1.44)	(-1.63)	(0.35)	(-0.34)

To make this more concrete, we can examine Tables 3.41 through 3.52. In Japan, for instance (Table 3.41), firms with high positive currency exposure are now much more likely to be reversal stocks, as indicated by their negative loadings on momentum. Similarly, firms most negatively sensitive to currency movement in Japan have a significant and positive loading on the small stock risk factor. Including a currency risk factor, in Table 3.42, demonstrates that negatively sensitive firms have a significantly positive loading on this factor, although the (again, positive) coefficient on the most positively exposed firms is insignificant. By contrast, currency risk loading is significant and negative for the most currency neutral firms. The impact on the portfolio alphas, however, is such that the neutral portfolios tend to exhibit statistically significant and positive returns, whereas in contrast to previous results, 4 and 5 factor alphas are now insignificant.

The dynamic with the sign of alphas then reverses when looking at Asia (ex-Japan). Here, both 4 and 5 factor alphas for the currency neutral portfolios become significantly negative, whereas alphas for the currency sensitive portfolios are both positive in sign, but only significant for the 5^{th} quintile. Moreover, in contrast to Japan, the 5^{th} quintile (i.e., the firms most positively exposed to currency sensitivity) for the broader Asia region is not composed of firms with momentum reversal, as evidenced by its insignificant loading on regional WML. What's more—and completely contrary to the results for Japan—1^{st} quintile firms actually appear to be large firms, as evidenced by their strongly negative loading on SMB.

European firms denominated in Euros (Tables 3.45 and 3.46) have characteristics more similar to Japan. Here, 5^{th} quintile firms have a marginal tendency to be firms with poor recent momentum, and 1^{st} quintile firms tend to be small. Here too again, the currency neutral portfolio has a positive alpha, though this is only marginally significant. European firms not denominated

in Euros (Tables 3.47 and 3.48) have some tendencies consistent with their Euro-denominated counterparts, though statistical evidence is much weaker here.

As in previous sections, the Middle East (Tables 3.49 and 3.50) and Latin America (Tables 3.51 and 3.52), both exhibit their own peculiar traits. Firms in the highest quintile of currency sensitivity in Latin America actually tend to be firms with strong positive momentum, and highly currency exposed firms in the Middle East tend to be firms that are of larger size relative to their currency neutral counterparts. In both cases, 4 and 5 factor alphas tend to be insignificant.

In all, while this robustness test falls short of providing clear evidence of any currency based mispricing—positive or otherwise—it does clearly illustrate one point. In particular, regardless of specification, the attributes accompanying currency exposure are very region specific (and perhaps even country specific). Any future studies which study currency effects on a global scale will either have to focus the analysis on a small subset of countries and limit generalization or, perhaps, find alternate but tractable statistical methods that can adequately characterize the high degree of heterogeneity across countries and regions.

Table 3.41 Alternative Factor Construction: Japan. Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for Japan; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.151***	0.985***	0.883***	0.928***	0.951***
	(14.01)	(28.75)	(14.18)	(22.40)	(13.92)
SMB (Region)	0.365***	0.0561	-0.198	-0.130	0.112
	(3.024)	(0.634)	(-1.462)	(-1.395)	(0.829)
HML (Region)	-0.180*	-0.0412	-0.279***	-0.141***	-0.0459
	(-1.794)	(-0.689)	(-3.178)	(-2.634)	(-0.542)
WML (Region)	-0.0677	0.0845	0.0391	-0.119**	-0.364***
	(-0.598)	(1.396)	(0.423)	(-2.275)	(-4.536)
Constant	0.337	0.348**	0.427**	0.232	0.126
	(0.878)	(2.018)	(2.453)	(1.383)	(0.588)
Observations	142	142	142	142	142
R-squared	0.705	0.858	0.807	0.851	0.749

Robust t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.42. Alternative Factor Construction—With Currency Risk Factor: Japan. Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors, including a currency sensitivity factor. This table presents the value-weighted regression results for Japan; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.050***	0.974***	0.926***	0.944***	0.929***
	(14.18)	(27.21)	(15.07)	(18.74)	(12.72)
SMB (Region)	0.267**	0.0459	-0.156	-0.114	0.0901
	(2.096)	(0.503)	(-1.353)	(-1.145)	(0.663)
HML (Region)	-0.145	-0.0376	-0.294***	-0.146***	-0.0381
	(-1.368)	(-0.623)	(-3.731)	(-2.643)	(-0.426)
WML (Region)	-0.0187	0.0896	0.0184	-0.127**	-0.353***
	(-0.160)	(1.487)	(0.188)	(-2.368)	(-4.253)
SMN (Region)	0.628***	0.0649	-0.265**	-0.0979	0.139
	(4.061)	(0.879)	(-2.024)	(-0.705)	(0.876)
Constant	0.186	0.332*	0.491***	0.256	0.0930
	(0.531)	(1.902)	(2.805)	(1.543)	(0.412)
Observations	142	142	142	142	142
R-squared	0.737	0.859	0.818	0.853	0.751

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.43 Alternative Factor Construction: Asia (ex-Japan). Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for Asia (ex-Japan); both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	0.926***	1.006***	0.955***	0.998***	0.939***
	(19.20)	(22.53)	(18.64)	(24.65)	(13.99)
SMB (Region)	-0.362***	0.212**	0.138	-0.0964	-0.377***
	(-4.416)	(2.271)	(1.376)	(-1.123)	(-3.980)
HML (Region)	0.184	0.277***	0.318***	0.0243	-0.188
	(1.511)	(3.629)	(2.883)	(0.251)	(-1.473)
WML (Region)	-0.202	-0.0832	-0.0208	-0.243*	-0.219
	(-1.264)	(-0.746)	(-0.155)	(-1.765)	(-1.038)
Constant	0.0782	-0.846***	-0.984***	-0.421	1.112**
	(0.228)	(-3.343)	(-3.409)	(-1.313)	(2.380)
Observations	142	142	142	142	142
R-squared	0.801	0.879	0.829	0.860	0.717

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.44 Alternative Factor Construction—With Currency Risk Factor: Asia (ex-Japan). Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors, including a currency sensitivity factor. This table presents the value-weighted regression results for Asia (ex-Japan); both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	0.933***	1.002***	0.948***	1.000***	0.902***
	(17.31)	(22.29)	(17.17)	(22.37)	(14.44)
SMB (Region)	-0.361***	0.212**	0.137	-0.0962	-0.382***
	(-4.352)	(2.249)	(1.350)	(-1.115)	(-4.027)
HML (Region)	0.199	0.269***	0.302***	0.0267	-0.269**
	(1.601)	(3.259)	(2.786)	(0.285)	(-2.058)
WML (Region)	-0.204	-0.0825	-0.0194	-0.243*	-0.212
	(-1.291)	(-0.734)	(-0.146)	(-1.768)	(-0.975)
SMN (Region)	-0.131	0.0700	0.138	-0.0214	0.699
	(-0.333)	(0.306)	(0.596)	(-0.131)	(1.576)
Constant	0.0898	-0.852***	-0.996***	-0.419	1.050**
	(0.253)	(-3.379)	(-3.333)	(-1.302)	(2.577)
Observations	142	142	142	142	142
R-squared	0.803	0.880	0.830	0.860	0.752

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.45 Alternative Factor Construction: Europe (Euro). Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for Europe (Eurozone); both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.205***	1.040***	0.924***	0.970***	0.909***
	(19.16)	(35.78)	(17.83)	(29.98)	(21.06)
SMB (Region)	0.202	0.0470	-0.159*	0.159**	0.275**
	(0.979)	(0.401)	(-1.748)	(2.288)	(1.979)
HML (Region)	0.0572	0.0326	-0.0217	-0.0447	-0.333***
	(0.365)	(0.403)	(-0.442)	(-0.871)	(-3.141)
WML (Region)	-0.0874	0.0571	-0.00544	0.0637	-0.224***
	(-0.741)	(1.133)	(-0.0983)	(1.446)	(-2.625)
Constant	-0.234	0.0589	0.405**	0.0749	0.560*
	(-0.536)	(0.242)	(2.097)	(0.426)	(1.696)
Observations	142	142	142	142	142
R-squared	0.870	0.947	0.934	0.949	0.845

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.46 Alternative Factor Construction—With Currency Risk Factor: Europe (Euro). Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors, including a currency sensitivity factor. This table presents the value-weighted regression results for Europe (Eurozone); both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.205***	1.040***	0.924***	0.969***	0.910***
	(24.85)	(43.70)	(17.61)	(29.51)	(22.51)
SMB (Region)	0.319**	0.105	-0.147	0.136*	0.347**
	(2.161)	(1.197)	(-1.524)	(1.952)	(2.573)
HML (Region)	0.207*	0.106	-0.00655	-0.0750	-0.241**
	(1.697)	(1.623)	(-0.124)	(-1.396)	(-2.200)
WML (Region)	0.0109	0.105**	0.00453	0.0438	-0.164*
	(0.101)	(2.124)	(0.0742)	(0.955)	(-1.916)
SMN (Region)	0.377***	0.185***	0.0382	-0.0761**	0.230***
	(4.837)	(4.530)	(0.757)	(-2.068)	(2.778)
Constant	-0.635*	-0.139	0.364*	0.156	0.315
	(-1.754)	(-0.647)	(1.673)	(0.822)	(0.952)
Observations	142	142	142	142	142
R-squared	0.886	0.953	0.935	0.950	0.853

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.47 Alternative Factor Construction: Europe (Non-Euro). Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for Europe (Non Euro); both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.478***	1.045***	0.950***	0.875***	0.984***
	(15.49)	(21.28)	(24.74)	(26.83)	(20.58)
SMB (Region)	0.366	0.0812	0.0995*	0.0715	0.147
	(1.610)	(0.999)	(1.759)	(1.098)	(1.428)
HML (Region)	-0.0158	0.0306	0.0149	0.0410	-0.00948
	(-0.0835)	(0.376)	(0.224)	(0.497)	(-0.0756)
WML (Region)	-0.180	-0.0856	0.0270	-0.151**	-0.554***
	(-1.522)	(-1.222)	(0.530)	(-2.312)	(-5.311)
Constant	-0.114	-0.0284	-0.0168	-0.172	-0.215
	(-0.174)	(-0.0794)	(-0.0590)	(-0.562)	(-0.473)
Observations	142	142	142	142	142
R-squared	0.721	0.866	0.893	0.876	0.769

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.48 Alternative Factor Construction—With Currency Risk Factor: Europe (Non-Euro). Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors, including a currency sensitivity factor. This table presents the value-weighted regression results for Europe (Non Euro); both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.447***	1.057***	0.973***	0.869***	0.968***
	(12.58)	(21.78)	(25.69)	(24.84)	(17.91)
SMB (Region)	0.345	0.0886	0.115**	0.0680	0.137
	(1.463)	(1.108)	(2.103)	(1.021)	(1.321)
HML (Region)	-0.0232	0.0333	0.0205	0.0397	-0.0132
	(-0.118)	(0.422)	(0.325)	(0.486)	(-0.106)
WML (Region)	-0.0797	-0.122	-0.0473	-0.133*	-0.505***
	(-0.521)	(-1.420)	(-0.873)	(-1.940)	(-4.747)
SMN (Region)	0.275	-0.0986	-0.204***	0.0478	0.136
	(0.923)	(-0.941)	(-2.661)	(0.578)	(0.876)
Constant	-0.0838	-0.0392	-0.0389	-0.167	-0.200
	(-0.123)	(-0.113)	(-0.148)	(-0.547)	(-0.448)
Observations	142	142	142	142	142
R-squared	0.724	0.867	0.898	0.876	0.770

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.49 Alternative Factor Construction: Middle East. Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for the Middle East; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.011***	0.840***	0.844***	0.754***	0.710***
	(13.30)	(8.529)	(6.684)	(7.049)	(7.274)
SMB (Region)	-0.160	0.615***	0.503***	0.571***	-0.180
	(-1.292)	(4.335)	(3.271)	(3.772)	(-1.349)
HML (Region)	0.112	0.00427	0.0399	0.0729	0.0295
	(0.918)	(0.0268)	(0.269)	(0.479)	(0.223)
WML (Region)	0.0589	0.0298	0.0968	-0.263	-0.152
	(0.529)	(0.185)	(0.494)	(-1.466)	(-0.807)
Constant	-0.111	0.157	0.305	-0.146	-0.541
	(-0.272)	(0.296)	(0.634)	(-0.282)	(-1.157)
Observations	88	88	88	88	88
R-squared	0.826	0.525	0.559	0.519	0.628

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.50 Alternative Factor Construction—With Currency Risk Factor: Middle East. Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors, including a currency factor. This table presents the value-weighted regression results for the Middle East; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	1.004***	0.831***	0.852***	0.742***	0.702***
	(13.30)	(8.490)	(6.912)	(6.376)	(7.397)
SMB (Region)	-0.185	0.584***	0.533***	0.523***	-0.209
	(-1.502)	(4.072)	(3.494)	(3.272)	(-1.371)
HML (Region)	0.0983	-0.0124	0.0559	0.0473	0.0136
	(0.809)	(-0.0788)	(0.370)	(0.309)	(0.108)
WML (Region)	0.0907	0.0701	0.0581	-0.202	-0.114
	(0.796)	(0.430)	(0.305)	(-1.089)	(-0.571)
SMN (Region)	0.177	0.224	-0.215	0.344*	0.212
	(1.531)	(1.328)	(-0.992)	(1.681)	(0.640)
Constant	-0.0898	0.183	0.280	-0.105	-0.516
	(-0.222)	(0.341)	(0.587)	(-0.206)	(-1.085)
Observations	88	88	88	88	88
R-squared	0.830	0.533	0.567	0.540	0.636

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.51 Alternative Factor Construction: Latin America. Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors. This table presents the value-weighted regression results for Latin America; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	0.984***	1.039***	0.997***	0.936***	0.891***
	(11.49)	(15.56)	(15.23)	(28.55)	(17.08)
SMB (Region)	0.153	0.342*	0.0178	0.0217	0.180*
	(0.723)	(1.851)	(0.195)	(0.216)	(1.694)
HML (Region)	0.211*	0.0849	-0.0544	-0.0245	0.128
	(1.800)	(1.082)	(-0.778)	(-0.438)	(1.602)
WML (Region)	-0.0677	-0.0203	0.0521	0.0708	0.234**
	(-0.378)	(-0.177)	(0.747)	(1.347)	(2.569)
Constant	0.0453	-0.238	0.0198	0.227	-0.420
	(0.0875)	(-0.510)	(0.0646)	(0.881)	(-1.184)
Observations	80	80	80	80	80
R-squared	0.673	0.778	0.861	0.874	0.770

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3.52 Alternative Factor Construction—With Currency Risk Factor: Latin America. Time-series regressions of 5 monthly currency sorted and region-specific portfolio returns on regional specific market factors, including a currency factor. This table presents the value-weighted regression results for Latin America; both portfolio returns and market returns are value-weighted within the region. Portfolio 5 contains firms that are most positively correlated with local-to-dollar exchange rate returns, and Portfolio 1 contains firms that are most negatively correlated. Construction of the region-specific factors is as described in Section 3.8.2.

	Currency Quintile				
VARIABLES	1	2	3	4	5
Market (VW)	0.947***	1.033***	1.004***	0.943***	0.888***
	(10.81)	(14.36)	(14.60)	(27.25)	(17.70)
SMB (Region)	0.119	0.337*	0.0244	0.0283	0.177
	(0.556)	(1.761)	(0.271)	(0.290)	(1.651)
HML (Region)	0.231**	0.0882	-0.0583	-0.0284	0.129
	(2.031)	(1.099)	(-0.823)	(-0.496)	(1.603)
WML (Region)	-0.109	-0.0270	0.0599	0.0786	0.231**
	(-0.630)	(-0.246)	(0.870)	(1.439)	(2.519)
SMN (Region)	0.310*	0.0506	-0.0591	-0.0587	0.0238
	(1.741)	(0.249)	(-0.476)	(-0.947)	(0.225)
Constant	0.153	-0.220	-0.000590	0.207	-0.412
	(0.296)	(-0.440)	(-0.00188)	(0.795)	(-1.117)
Observations	80	80	80	80	80
R-squared	0.691	0.778	0.862	0.875	0.770

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In addition to the time-series factor regressions, characteristic portfolio returns are displayed in Table 3.53. Characteristic portfolios are formed by annual rankings of firms into quintiles according to firm size, book-to-market, and global industry sector classification. Size and book-to-market rankings are formed within region. With the rankings here however, the size and book-to-market ranking for each firm is formed with respect to the set of firms within the entire region, adjusted to US dollar equivalent. The intersection of two characteristic quintiles, along with the 10 industry section classifications, then becomes the (5x5x10=225) characteristic portfolios; portfolio returns are then the equal weighted average monthly return among these firms.

Each firm monthly return is then characteristically adjusted, by subtracting the average monthly return of the characteristic portfolio to which it belongs. The average characteristically adjusted return for the firms is then presented in Table 3.53, sorted along the dimensions of firm market and currency sensitivity.

This table shows that while there may be a general pattern of firms with strongly positive currency sensitivity to consequently exhibit higher characteristic adjusted returns, this trend becomes diminished among firms that are strongly currency sensitive *yet* have very high or very low market betas. For instance, firms in the top 20% of currency sensitivity for the region have an expected characteristic adjusted excess return of 0.97% to 2.03% if they are within the 20^{th} to 80^{th} percentile of market sensitivity, but have an expected return of -0.35% to -1.85% if they are in the top or bottom quintile of market sensitivity. Thus, high currency sensitive firms generally have a range of expected returns above that for other firms. However, such firms will actually exhibit a comparatively lower range than other firms, *if* the firm's currency sensitivity coincides with considerably strong positive or negative correlation with the market as well.

The same dynamic also occurs for firms that are strongly negatively correlated with currency movement, although here there is less evidence that the 20th to 80th percentile of this sample of firms outperforms overall. In addition, the standard deviation of monthly returns is higher for firms that are strongly currency exposed, with standard deviations that are about 20% higher in comparison to firms that are essentially currency neutral (e.g., 10.93 vs. 9.09). Notably, this spread in return dispersion is higher than the analogous spread observed among different beta quintiles.

Table 3.53. Characteristic Adjusted Portfolio Returns. This table presents the average 0adjusted returns of firms sorted according to beta and currency quintiles. Characteristic portfolios are formed by size (5), book-to-market (5), and S&P 500 GIC Sector (10) classifications interactions. Adjusted returns shown are equal weighted.

	Currency Quintile					
Beta Quintile	1	2	3	4	5	Mean
1	-0.79	0.36	-0.43	-0.08	-0.35	-0.25
	11.92	10.36	9.80	9.94	11.92	
2	0.02	0.89	0.92	0.70	2.03	0.91
	10.75	9.41	9.09	9.31	10.93	
3	0.67	0.00	0.61	1.59	1.05	0.78
	10.92	9.54	9.26	9.51	11.03	
4	0.38	-0.05	0.85	0.75	0.97	0.58
	11.16	9.64	9.42	9.70	11.25	
5	-2.57	-0.60	-0.89	-0.49	-1.85	-1.28
	11.70	10.27	10.13	10.35	12.15	
Mean	-0.46	0.12	0.21	0.49	0.37	0.15

In sum, this section aimed to provide an alternative approach to the construction of region-level assets, in order to serve as robustness to the results in the previous sections. By allowing firm characteristics to be ranked across a region, rather than within country and then by region, the attempt was to allow factor effects to better span the region as a whole. If regional effects dominated local effects, then factors constructed by this approach should better explain the cross-section of stock returns.

This turned out to be the case. In Tables 3.41 through 3.52, factor exposure among all currency sorted portfolios were heightened, both in economic and statistical significance. This suggests that a considered approach taken toward portfolio construction may carry special importance in asset pricing studies involving international stock returns. However, the findings of the previous sections carry through, in the sense that abnormal returns to currency sensitive portfolios are largely a region-specific occurrence, as opposed to an internationally systematic dynamic. In other words, currency risk matters, but only for certain regions.

That being said, the characteristic adjusted portfolio returns depicted in Table 3.53 do suggest some average effects distinguishable worldwide. In particular, by adjusting for a firm's regionally classified characteristic portfolio, average returns worldwide do exhibit interesting cross-sectional differences in returns among beta and currency sorted portfolios. In particular, averaging across regions, firms in the top and bottom quintiles of market sensitivity have lower characteristically adjusted returns—an effect that appears exacerbated among firms that are also in the top and bottom quintiles of currency sensitivity. What this may suggest is that irrespective of region, there is a strong market component to the measurement of currency risk, or vice-versa.

3.8.3 Sub-period Analysis

It is possible that despite the general trend toward greater economic and political integration across countries over the entire sample (2000-2014), the degree to which currency movements have mattered for asset prices has further increased over more recent years. In particular, since 2010, currency movements have played a salient role along both the political and macroeconomic dimension. For instance, many national policymakers have engaged in currency management either as an attempt to extricate their country out of long-term economic malaise (i.e., Japan and "Abenomics"), or as a short-term tactical activity to stimulate growth after the global financial crisis (e.g., see Rickard, 2011). Perhaps more influentially, ongoing news about the prospect of the breakup of the European Monetary Union—the largest currency block in the world—has been thought to carry a great effect in influencing asset prices and other currencies. Likewise, China's recent attempts to liberalize its exchange rate has led to much focus on relative currency values (and thus firm competitiveness) within Asia.

Given that currency values played a more frontline role in economic activity post-2010, it would be interesting to identify whether the effects documented thus far remain—or are even strengthened—over the period 2010-2015. To that end, I re-conduct the analysis shown above. Specifically, I show below time-series factor regressions within regions, as well the Fama-Macbeth estimates of expected future returns as a result of exchange rate sensitivity.[40]

The findings are displayed in Table 3.54. This table shows a few noteworthy subsample findings. One is that high positive-sensitivity firms in Asia (ex-Japan) had, prior to 2010, significantly positive four factor alphas—such firms had annualized four factor excess returns of 19.1%. (This annualized alpha falls to 16.68%, after including a currency factor). However, post-

[40] Due to the fact that factor exposure loadings were more significant when using the alternative specification in Section 3.8.2, I use these factor specifications when conducting the time-series tests. However, the sample construction for the Fama-Macbeth methodology remains the same as in the main section.

2009, factor-estimated alpha falls to zero for highly currency sensitive firms in the region, although this compares to slightly negative and statistically significant alphas for firms with moderate insensitivity to currency movements within the region.

The other notable region of this table would probably be the non-EMU countries within Europe. Prior to 2010, the most currency sensitive firms appeared to outperform their currency-insensitive counterparts, albeit with weak statistical significance. However after 2010—i.e., amid the Euro crisis—this dynamic was completely reversed. Firms with weak exposure to currency fluctuation had marginally positive alphas, whereas firms with strong exposure had negative returns. In particular, firms in the 5th quintile exhibited an annualized 4-factor alpha of -19.61%, whereas firms that were currency neutral had a 4-factor alpha of +9.36%.

It is difficult to do anything but conjecture why this subsample effect may have occurred for Non-EMU countries. Nevertheless, it could be possible that, given that this time period coincided with Euro weakening, 5th quintile non-Euro firms, which were only pre-disposed to benefit amid dollar depreciation, instead tended to face increased competitive pressure as a result of Euro-area firms experiencing a depreciated currency. This argument could be further supported, by looking at the 4-factor alpha for the 5th quintile of firms within the Euro-denominated region over that same time period: here, the 4-factor alpha was a positive annualized 11.34%. Thus, it is possible that positive correlation with Euro depreciation benefitted Euro denominated firms, but this may have come at the expense of non-Euro denominated firms nearby.

Table 3.54 Subsample 4 and 5 Factor Alphas. This table displays the subsample results of four and five-factor time series regressions. The left panel displays factor alphas estimated over the period 2000-2009. The right panel displays alphas estimated over 2010-2014.

	Before 2010					After 2010				
Japan										
4 Factor	0.482	0.318	-0.0735	0.103	0.365	0.486	0.433	0.516	-0.185	-0.334
	(0.783)	(1.514)	(-0.359)	(0.508)	(1.085)	(1.048)	(1.613)	(1.627)	(-0.502)	(-1.056)
4 Factor + Currency	-0.179	0.329	0.0549	0.134	0.0402	0.263	0.379	0.583*	-0.188	-0.354
	(-0.386)	(1.546)	(0.306)	(0.629)	(0.117)	(0.652)	(1.404)	(1.733)	(-0.502)	(-1.020)
Asia Ex-Japan										
4 Factor	0.423	-0.763**	-1.001***	-0.0156	1.592***	-0.835	-1.050**	-0.952	-1.239*	-0.141
	(1.277)	(-2.520)	(-2.724)	(-0.0456)	(3.063)	(-1.089)	(-2.185)	(-1.644)	(-1.947)	(-0.156)
4 Factor + Currency	0.301	-0.763**	-0.896**	-0.0678	1.390***	-0.891	-1.038*	-0.91	-1.266**	-0.0651
	(0.910)	(-2.474)	(-2.492)	(-0.206)	(2.957)	(-1.097)	(-2.012)	(-1.424)	(-2.062)	(-0.0827)
Europe (Euro)										
4 Factor	-0.709	-0.0811	0.329	-0.150	0.338	-0.0157	0.0686	0.237	0.309	0.945*
	(-1.162)	(-0.388)	(1.468)	(-0.934)	(0.744)	(-0.0369)	(0.170)	(0.757)	(0.979)	(1.859)
4 Factor + Currency	-0.794	-0.0818	0.381*	-0.160	0.302	-0.463	-0.510	-0.0577	0.441	0.297
	(-1.323)	(-0.390)	(1.707)	(-0.958)	(0.663)	(-1.183)	(-1.476)	(-0.151)	(1.063)	(0.637)
Europe (Non-Euro)										
4 Factor	0.0908	-0.550	-0.624*	-0.515	0.721	-0.0580	0.624	0.780*	0.208	-1.634***
	(0.105)	(-1.256)	(-1.826)	(-1.146)	(1.251)	(-0.0602)	(1.180)	(1.762)	(0.613)	(-3.185)
4 Factor + Currency	-0.228	-0.554	-0.548	-0.472	0.549	0.0127	0.566	0.610	0.368	-1.866***
	(-0.284)	(-1.186)	(-1.659)	(-1.046)	(0.872)	(0.0128)	(1.050)	(1.466)	(1.199)	(-3.793)
Latin America										
4 Factor	0.831	-1.038	0.396	0.475	-0.0566	-0.885	0.626	-0.378	-0.240	-0.953*
	(0.976)	(-1.646)	(0.941)	(1.663)	(-0.140)	(-1.447)	(1.213)	(-0.745)	(-0.527)	(-1.697)
4 Factor + Currency	0.975	-1.081	0.360	0.399	0.0175	-0.711	0.721	-0.391	-0.215	-1.027*
	(1.093)	(-1.631)	(0.804)	(1.375)	(0.0425)	(-1.255)	(1.303)	(-0.739)	(-0.459)	(-1.712)
Middle East										
4 Factor	-0.213	0.397	0.869	0.0169	-0.872	-0.117	0.678	-0.0514	0.121	-0.404
	(-0.381)	(0.603)	(1.305)	(0.0219)	(-1.321)	(-0.272)	(0.944)	(-0.129)	(0.272)	(-0.956)
4 Factor + Currency	-0.175	0.417	0.816	0.0874	-0.839	-0.150	0.859	-0.00560	0.162	-0.388
	(-0.316)	(0.626)	(1.238)	(0.118)	(-1.248)	(-0.349)	(1.470)	(-0.0152)	(0.373)	(-0.931)

In looking at the differences in cross-sectional determinants among currency sensitive versus non-sensitive portfolios, and this cross-sectional impact on forward horizon returns, further sub-sample differences can be noted. These are displayed in Tables 3.55 through 3.60. These tables display Fama-Macbeth regressions of monthly, quarterly, and annual forward horizon returns on firm characteristics and sector/country controls, with regressions separated according to degrees of firm currency sensitivity. Tables 3.55 through 3.57 contain the sub-sample results for the period 2000-2009, and Tables 3.58 through 3.60 contain sub-sample results for the period 2010-2014.

In particular, when measuring over the sub-sample 2000-2009, in the month after a firm's currency exposure is measured, significant differences in the relationship between a firm's profitability and forward month returns are observed only for those firms that are the most currency sensitive (i.e., the 1st and 5th currency quintiles). This effect remains after controlling for country and sector effects. Yet, no such relationship exists for the firms that are currency neutral (i.e., the 3rd quintile). This result is shown in Table 3.55. However, Table 3.58, which presents the same analysis for 2010-2014, shows that after 2009—and after controlling for country and sector effects—profitability is not a significant driver of forward-month stock returns for *either* currency sensitive or currency neutral firms.

This suggests that post-2009, the drivers for currency exposure compensation have changed. This would be consistent with the intuitive notion that during this more recent period, currency movements—and thus their impact on firms—were driven more by macroeconomic (or cross-sectionally broader) events, and perhaps rather less by firm-specific considerations. Further supporting evidence can be seen be the relatively high economic and statistical importance of the negative cash flow indicator in its impact on monthly firm returns during the period leading up to 2010 (Table 3.55), but its lack of any discernable impact after that.

Similar patterns exist when looking at quarterly returns (Table 3.56 and 3.59) as well as annual returns (Table 3.57 and 3.60). Profitability related variables either become statistically insignificant post-2009 (e.g., profitability, the negative cash flow indicator), or are diminished in statistical or economic importance (profitability*size, or profitability*NOA). The importance of size-related variables also seems to change. Pre-2010, a firm's size counted for roughly twice the economic importance in explaining quarterly stock returns among firms that were highly currency sensitive (Table 3.56), whereas after this period, the effect becomes economically marginal and statistically insignificant (Table 3.59).

Other observations remain worth mentioning. One is that the proportion of explained variation seems to increase along with the time horizon of the dependent variable. Contrasting the adjusted R-squared from the monthly regressions (specifically, those without country and sector fixed effects, as fixed effects tend to artificially inflated R-squared values—e.g., see DeAngelo and Roll, 2013) with that for the annual regressions (e.g., contrasting columns 1-3 in Table 3.55 with Table 3.57), annual R-squared values are as high as 13% post-2009 and as high as 8% prior to that. For regressions forecasting returns at the monthly horizon, equivalent values are as high as 7% and 6%, respectively. This makes sense, to the extent that it is easier to capture the impact of firm fundamentals when measuring returns over a longer horizon (e.g., see Bandi and Perron, 2008; Cochrane, 2011).

Table 3.55 Monthly Returns—Cross-sectional Determinants, Pre-2010. This table displays the results of regressing month ahead stock returns on lagged values of firm characteristics, for the period 2000 through 2009. Regressions are separated according to currency sensitivity quintiles, with 5 being the strongly (and positively sensitive), 3 being neutral, and 1 also being strongly (but negatively) sensitive. T-statistics, presented in parentheses, are corrected for autocorrelation (2 lags) and heteroskedasticity. Columns 1 through 3 contain the raw regressions, columns 4-6 include country fixed effects, columns 7-9 include Global Industry Classification (GIC) sector effects, and columns 10-12 contain both country and sector fixed effects.

VARIABLES	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest
Beta	0.70	0.80	0.74	0.55	0.47	0.52	0.88*	0.95*	0.82*	0.70	0.65	0.58
	(1.30)	(1.38)	(1.43)	(1.08)	(0.84)	(1.00)	(1.82)	(1.74)	(1.70)	(1.58)	(1.26)	(1.28)
Total Accruals	1.33	0.85	2.94	1.54	1.09	3.34	1.48	-0.24	2.88	1.59	0.45	3.23
	(0.51)	(0.34)	(1.28)	(0.61)	(0.45)	(1.43)	(0.58)	(-0.10)	(1.25)	(0.64)	(0.19)	(1.37)
Profitability	-3.04***	-0.04	-0.38***	-0.31***	-0.08	-0.36***	-0.31***	-0.06	-0.39***	-0.33***	-0.09	-0.37***
	(-3.09)	(-0.43)	(-3.56)	(-3.57)	(-0.88)	(-3.98)	(-3.31)	(-0.59)	(-3.71)	(-3.68)	(-1.06)	(-4.13)
ZM Score	1.40	-1.58	-0.30	1.79	-0.91	-0.13	1.11	-1.74	-0.54	1.49	-1.14	-0.27
	(0.82)	(-0.94)	(-0.30)	(1.47)	(-0.60)	(-0.15)	(0.70)	(-1.05)	(-0.58)	(1.25)	(-0.75)	(-0.34)
Leverage	-8.70	8.02	0.81	-10.49	5.14	-0.27	-7.21	8.67	2.02	-9.09	6.11	0.39
	(-0.93)	(0.85)	(0.15)	(-1.49)	(0.59)	(-0.06)	(-0.83)	(0.94)	(0.40)	(-1.34)	(0.71)	(0.09)
Net Op. Assets	1.74	2.78	1.49	0.20	2.51	1.16	1.63	3.22	2.56	0.24	3.30	2.43
	(0.53)	(1.05)	(0.57)	(0.07)	(1.25)	(0.54)	(0.49)	(1.20)	(0.97)	(0.09)	(1.65)	(1.12)
Neg. Cash Flow	-0.15	-0.07	-0.21	-0.14	-0.04	-0.29**	-0.17	0.02	-0.27	-0.17	0.02	-0.33**
	(-0.71)	(-0.30)	(-0.89)	(-0.80)	(-0.25)	(-2.00)	(-0.80)	(0.10)	(-1.17)	(-1.01)	(0.10)	(-2.29)
Size	-0.73***	-0.52***	-0.78***	-0.71***	-0.46***	-0.76***	-0.77***	-0.55***	-0.78***	-0.75***	-0.49***	-0.76***
	(-6.66)	(-5.42)	(-8.15)	(-7.10)	(-5.41)	(-10.41)	(-7.21)	(-5.71)	(-8.29)	(-7.70)	(-5.75)	(-10.42)
Proft.*NOA	-0.03	-0.06**	-0.02	-0.04	-0.07**	-0.02	-0.03	-0.07**	-0.02	-0.03	-0.06**	-0.02
	(-1.41)	(-2.02)	(-0.95)	(-1.61)	(-2.32)	(-0.99)	(-1.37)	(-2.09)	(-1.01)	(-1.45)	(-2.31)	(-0.97)
Size*Proft.	0.02***	0.01*	0.02***	0.02***	0.01**	0.02***	0.02***	0.01*	0.02***	0.02***	0.01***	0.02***
	(4.47)	(1.68)	(4.67)	(5.00)	(2.40)	(5.33)	(4.73)	(1.93)	(4.89)	(5.08)	(2.63)	(5.50)
Size*NOA	-0.14	-0.16	-0.12	-0.05	-0.14	-0.09	-0.14	-0.19	-0.19	-0.06	-0.19*	-0.17
	(-0.83)	(-1.14)	(-0.83)	(-0.34)	(-1.36)	(-0.76)	(-0.81)	(-1.37)	(-1.31)	(-0.39)	(-1.85)	(-1.43)
ZM*Accruals	1.06	0.59	1.11*	0.91	0.49	1.02*	1.11	0.41	1.05*	0.92	0.38	0.97
	(1.53)	(0.96)	(1.87)	(1.41)	(0.81)	(1.76)	(1.63)	(0.68)	(1.75)	(1.46)	(0.64)	(1.63)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	20.70**	3.44	13.94***	21.30***	3.96	12.68***	21.09***	3.23	13.87***	21.11***	4.35	11.40***
	(2.60)	(0.45)	(2.77)	(3.66)	(0.57)	(2.79)	(2.88)	(0.43)	(2.91)	(3.77)	(0.63)	(2.85)
Observations	194,369	198,661	209,398	194,369	198,661	209,398	194,279	198,627	209,302	194,279	198,627	209,302
R-squared	0.05	0.06	0.04	0.15	0.19	0.15	0.06	0.07	0.06	0.16	0.20	0.16
Number of groups	109	109	109	109	109	109	109	109	109	109	109	109

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.56 Quarterly Returns—Cross-sectional Determinants, Pre-2010. This table displays the results of regressing quarter ahead stock returns on lagged values of firm characteristics, for the period 2000 through 2009. Regressions are separated according to currency sensitivity quintiles, with 5 being the strongly (and positively sensitive), 3 being neutral, and 1 also being strongly (but negatively) sensitive. T-statistics, presented in parentheses, are corrected for autocorrelation (2 lags) and heteroskedasticity. Columns 1 through 3 contain the raw regressions, columns 4-6 include country fixed effects, columns 7-9 include Global Industry Classification (GIC) sector effects, and columns 10-12 contain both country and sector fixed effects.

VARIABLES	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest
Beta	0.02	0.02	0.02	0.01	0.01	0.01	0.03*	0.03	0.02*	0.02	0.02	0.02
	(1.32)	(1.23)	(1.37)	(0.94)	(0.74)	(0.81)	(1.84)	(1.62)	(1.71)	(1.45)	(1.18)	(1.09)
Total Accruals	-0.01	0.07	0.06	0.00	0.07	0.08	-0.01	0.04	0.06	0.00	0.06	0.07
	(-0.15)	(1.20)	(1.01)	(0.03)	(1.29)	(1.34)	(-0.14)	(0.78)	(0.97)	(0.03)	(1.05)	(1.29)
Profitability	-0.61**	0.00	-0.83***	-0.67***	-0.09	-0.76***	-0.62**	0.00	-0.83***	-0.68***	-0.09	-0.78***
	(-2.10)	(0.01)	(-3.31)	(-2.99)	(-0.41)	(-3.81)	(-2.19)	(0.01)	(-3.36)	(-2.99)	(-0.45)	(-3.96)
ZM Score	0.03	0.00	-0.01	0.02	0.02	-0.01	0.02	0.00	-0.02	0.01	0.02	-0.01
	(0.55)	(0.10)	(-0.46)	(0.59)	(0.59)	(-0.37)	(0.38)	(0.07)	(-0.90)	(0.39)	(0.46)	(-0.69)
Leverage	-0.19	-0.05	0.03	-0.15	-0.12	0.01	-0.14	-0.05	0.08	-0.11	-0.10	0.03
	(-0.67)	(-0.21)	(0.31)	(-0.69)	(-0.60)	(0.07)	(-0.52)	(-0.21)	(0.72)	(-0.54)	(-0.51)	(0.36)
Net Op. Assets	0.09	0.04	0.03	0.04	-0.00	0.01	0.09	0.05	0.05	0.05	0.01	0.03
	(1.03)	(0.58)	(0.37)	(0.61)	(-0.04)	(0.15)	(0.97)	(0.77)	(0.64)	(0.66)	(0.35)	(0.65)
Neg. Cash Flow	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01**	-0.01	-0.00	-0.01	-0.01	-0.00	-0.01**
	(-0.97)	(-0.93)	(-0.79)	(-1.37)	(-1.43)	(-2.13)	(-1.05)	(-0.54)	(-1.00)	(-1.48)	(-1.05)	(-2.42)
Size	-0.02***	-0.02***	-0.02***	-0.02***	-0.01***	-0.02***	-0.02***	-0.02***	-0.02***	-0.02***	-0.01***	-0.02***
	(-7.41)	(-6.33)	(-8.40)	(-7.26)	(-6.19)	(-9.46)	(-8.18)	(-6.86)	(-8.60)	(-8.00)	(-6.89)	(-9.79)
Proft.*NOA	-0.14*	-0.15**	-0.12*	-0.16**	-0.16***	-0.12**	-0.14*	-0.14**	-0.11*	-0.15**	-0.16***	-0.11**
	(-1.78)	(-2.46)	(-1.82)	(-2.31)	(-2.98)	(-2.19)	(-1.77)	(-2.41)	(-1.80)	(-2.16)	(-2.86)	(-2.09)
Size*Proft.	0.05***	0.02	0.07***	0.06***	0.02*	0.06***	0.05***	0.02	0.07***	0.06***	0.02**	0.06***
	(3.44)	(1.33)	(4.64)	(4.71)	(1.97)	(5.65)	(3.60)	(1.41)	(4.77)	(4.70)	(2.08)	(5.87)
Size*NOA	-0.01	-0.00	-0.00	-0.00	-0.00	-0.00	-0.01	-0.00	-0.00	-0.00	-0.00	-0.00
	(-1.28)	(-0.68)	(-0.62)	(-0.87)	(-0.14)	(-0.39)	(-1.24)	(-0.98)	(-0.97)	(-0.95)	(-0.66)	(-0.99)
ZM*Accruals	0.02	0.03***	0.03*	0.01	0.03**	0.03*	0.02	0.03**	0.03	0.01	0.02**	0.02
	(1.24)	(2.67)	(1.76)	(0.98)	(2.20)	(1.73)	(1.34)	(2.40)	(1.66)	(1.02)	(2.05)	(1.63)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	0.51**	0.32	0.37***	0.46***	0.32*	0.37***	0.52**	0.33*	0.36***	0.47***	0.31*	0.35***
	(2.18)	(1.62)	(3.12)	(2.63)	(1.93)	(4.12)	(2.35)	(1.72)	(3.15)	(2.83)	(1.89)	(3.92)
Observations	185,587	190,401	199,913	185,587	190,401	199,913	185,503	190,372	199,822	185,503	190,372	199,822
R-squared	0.06	0.07	0.06	0.18	0.22	0.18	0.08	0.09	0.07	0.19	0.24	0.19
Number of groups	107	107	107	107	107	107	107	107	107	107	107	107

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.57 Annual Returns—Cross-sectional Determinants, Pre-2010. This table displays the results of regressing year ahead stock returns on lagged values of firm characteristics, for the period 2000 through 2009. Regressions are separated according to currency sensitivity quintiles, with 5 being the strongly (and positively sensitive), 3 being neutral, and 1 also being strongly (but negatively) sensitive. T-statistics, presented in parentheses, are corrected for autocorrelation (2 lags) and heteroskedasticity. Columns 1 through 3 contain the raw regressions, columns 4-6 include country fixed effects, columns 7-9 include Global Industry Classification (GIC) sector effects, and columns 10-12 contain both country and sector fixed effects.

VARIABLES	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest
Beta	0.10	0.09	0.12**	0.03	0.01	0.06	0.11*	0.11*	0.12**	0.05	0.03	0.06
	(1.50)	(1.38)	(2.03)	(0.54)	(0.28)	(0.99)	(1.87)	(1.73)	(2.26)	(0.98)	(0.72)	(1.21)
Total Accruals	-0.24	0.20	-0.10	-0.20	0.19	-0.05	-0.27	0.12	-0.11	-0.20	0.14	-0.06
	(-1.33)	(1.15)	(-0.47)	(-1.23)	(1.13)	(-0.22)	(-1.45)	(0.70)	(-0.56)	(-1.35)	(0.84)	(-0.29)
Profitability	-1.61*	-1.99**	-1.85**	-1.76***	-2.11**	-1.61**	-2.01**	-2.02**	-1.91**	-2.13***	-2.16**	-1.62**
	(-1.76)	(-2.16)	(-2.53)	(-2.91)	(-2.30)	(-2.32)	(-2.33)	(-2.22)	(-2.39)	(-3.69)	(-2.41)	(-2.19)
ZM Score	0.08	-0.05	-0.07	-0.01	0.06	-0.07	0.03	-0.02	-0.11*	-0.05	0.07	-0.10
	(0.43)	(-0.44)	(-1.21)	(-0.07)	(1.07)	(-1.05)	(0.20)	(-0.18)	(-1.72)	(-0.38)	(1.24)	(-1.45)
Leverage	-0.52	0.18	0.34	-0.06	-0.36	0.31	-0.29	-0.01	0.51	0.12	-0.45	0.46
	(-0.49)	(0.29)	(0.92)	(-0.07)	(-1.09)	(0.77)	(-0.30)	(-0.02)	(1.35)	(0.17)	(-1.39)	(1.10)
Net Op. Assets	0.80**	0.53	0.11	0.61*	0.33	-0.00	0.80**	0.62	0.20	0.61*	0.44	0.09
	(2.32)	(0.95)	(0.38)	(1.90)	(0.63)	(-0.00)	(2.35)	(1.10)	(0.64)	(1.93)	(0.83)	(0.36)
Neg. Cash Flow	-0.05*	-0.04**	-0.03**	-0.06**	-0.05***	-0.04***	-0.05**	-0.04	-0.04**	-0.06***	-0.05***	-0.05***
	(-1.95)	(-2.06)	(-2.08)	(-2.57)	(-3.39)	(-4.56)	(-2.10)	(-1.64)	(-2.32)	(-2.76)	(-3.15)	(-4.94)
Size	-0.06***	-0.05***	-0.08***	-0.05***	-0.04***	-0.07***	-0.06***	-0.05***	-0.08***	-0.06***	-0.04***	-0.07***
	(-3.98)	(-3.75)	(-5.19)	(-3.51)	(-3.50)	(-4.92)	(-4.27)	(-3.78)	(-5.39)	(-3.72)	(-3.68)	(-5.19)
Proft.*NOA	-0.30**	-0.21	-0.10	-0.40***	-0.30	-0.16	-0.36***	-0.17	-0.08	-0.43**	-0.26	-0.14
	(-2.61)	(-0.88)	(-0.33)	(-2.65)	(-1.29)	(-0.71)	(-2.69)	(-0.81)	(-0.27)	(-2.37)	(-1.21)	(-0.59)
Size*Proft.	0.13***	0.14***	0.15***	0.14***	0.14***	0.13***	0.16***	0.14***	0.15***	0.16***	0.14***	0.13***
	(2.67)	(2.96)	(3.52)	(4.08)	(2.84)	(3.35)	(3.41)	(3.09)	(3.37)	(5.01)	(3.03)	(3.20)
Size*NOA	-0.05**	-0.03	-0.01	-0.04**	-0.02	-0.00	-0.05**	-0.04	-0.02	-0.04**	-0.03	-0.01
	(-2.36)	(-0.95)	(-0.63)	(-2.03)	(-0.69)	(-0.24)	(-2.45)	(-1.16)	(-0.95)	(-2.09)	(-0.93)	(-0.67)
ZM*Accruals	0.04	0.13**	0.05	-0.01	0.07	0.02	0.03	0.11**	0.04	-0.01	0.06	0.01
	(0.82)	(2.31)	(0.56)	(-0.26)	(1.44)	(0.19)	(0.71)	(2.11)	(0.47)	(-0.48)	(1.25)	(0.11)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	1.58**	0.79*	1.22***	1.18**	1.10***	1.08***	1.50**	1.01**	1.17***	1.04**	1.22***	1.01**
	(2.29)	(1.76)	(2.96)	(2.34)	(3.68)	(2.68)	(2.49)	(2.41)	(2.94)	(2.50)	(4.09)	(2.50)
Observations	149,585	156,840	161,770	149,585	156,840	161,770	149,524	156,822	161,718	149,524	156,822	161,718
R-squared	0.07	0.08	0.07	0.18	0.20	0.18	0.09	0.10	0.09	0.20	0.22	0.20
Number of groups	98	98	98	98	98	98	98	98	98	98	98	98

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.58 Monthly Returns—Cross-sectional Determinants, Post-2010. This table displays the results of regressing month ahead stock returns on lagged values of firm characteristics, for the period 2010 through 2014. Regressions are separated according to currency sensitivity quintiles, with 5 being the strongly (and positively sensitive), 3 being neutral, and 1 also being strongly (but negatively) sensitive. T-statistics, presented in parentheses, are corrected for autocorrelation (2 lags) and heteroskedasticity. Columns 1 through 3 contain the raw regressions, columns 4-6 include country fixed effects, columns 7-9 include Global Industry Classification (GIC) sector effects, and columns 10-12 contain both country and sector fixed effects.

VARIABLES	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest
Beta	0.05	3.36***	-2.02***	0.56	3.67***	-1.79***	0.02	0.18	0.13	0.54	0.85	0.63
	(0.11)	(5.97)	(-7.26)	(1.19)	(6.46)	(-6.87)	(0.05)	(0.36)	(0.28)	(1.22)	(1.45)	(1.12)
Total Accruals	-0.29	-7.93	7.08	0.33	-5.38	6.24*	-0.79	2.34	-7.79	-0.29	1.53	-8.88
	(-0.11)	(-1.63)	(1.44)	(0.15)	(-0.94)	(1.86)	(-0.29)	(0.65)	(-1.00)	(-0.12)	(0.44)	(-1.09)
Profitability	-0.26	-1.59***	0.75***	-0.26	-1.38***	0.72***	-0.24	-0.08	-0.27	-0.26	-0.12	-0.29
	(-1.62)	(-5.82)	(6.24)	(-1.50)	(-4.55)	(4.14)	(-1.49)	(-0.33)	(-1.22)	(-1.48)	(-0.46)	(-1.19)
ZM Score	-0.10	6.60	-3.17	-0.44	6.30	-8.72	-0.13	0.07	4.19	-0.41	0.02	4.06
	(-0.24)	(1.42)	(-1.36)	(-1.04)	(1.31)	(-1.12)	(-0.33)	(0.12)	(1.28)	(-0.95)	(0.03)	(1.04)
Leverage	1.68	-37.17	20.08	2.73	-35.28	49.97	1.79	0.76	-22.80	2.79	1.01	-22.98
	(0.63)	(-1.43)	(1.38)	(1.00)	(-1.32)	(1.11)	(0.67)	(0.21)	(-1.24)	(0.98)	(0.26)	(-1.04)
Net Op. Assets	4.70	3.04	-4.40	4.47	-0.28	-3.71	4.22	5.06	2.43	4.27	4.36	4.20
	(1.24)	(0.51)	(-0.93)	(1.37)	(-0.05)	(-0.72)	(1.09)	(1.28)	(0.51)	(1.30)	(1.23)	(0.95)
Neg. Cash Flow	0.26	2.35***	-1.21***	0.18	1.94***	-1.01***	0.32	0.23	0.29	0.28	0.43	0.17
	(0.72)	(6.21)	(-4.83)	(0.53)	(5.57)	(-3.03)	(0.83)	(0.35)	(0.73)	(0.78)	(0.62)	(0.44)
Size	-0.44***	-1.57***	0.28	-0.54***	-1.71***	0.25	-0.42***	-0.33**	-0.54***	-0.53***	-0.49***	-0.59***
	(-3.59)	(-10.70)	(1.67)	(-5.30)	(-13.70)	(1.30)	(-3.54)	(-2.28)	(-3.48)	(-5.66)	(-4.38)	(-3.78)
Proft.*NOA	0.01	0.32**	-0.17	0.01	0.26**	-0.14	-0.01	0.01	-0.01	0.01	0.02	0.01
	(0.15)	(2.65)	(-1.54)	(0.25)	(2.37)	(-1.46)	(-0.03)	(0.12)	(-0.12)	(0.08)	(0.39)	(0.04)
Size*Proft.	0.02***	0.07***	-0.03 ***	0.02**	0.06***	-0.03***	0.02***	0.01	0.02**	0.02***	0.01	0.02**
	(2.92)	(6.57)	(-5.92)	(2.61)	(4.87)	(-3.67)	(2.85)	(0.99)	(2.21)	(2.71)	(1.15)	(2.12)
Size*NOA	-0.33	-0.36	0.33	-0.30*	-0.13	0.29	-0.30	-0.40*	-0.17	-0.29*	-0.35*	-0.26
	(-1.67)	(-1.10)	(1.07)	(-1.77)	(-0.44)	(0.83)	(-1.49)	(-1.94)	(-0.67)	(-1.69)	(-1.88)	(-1.09)
ZM*Accruals	0.56	-1.39	1.89	0.60	-0.46	1.66*	0.41	1.02	-1.07	0.45	1.21	-1.49
	(0.72)	(-1.13)	(1.45)	(0.83)	(-0.33)	(1.72)	(0.54)	(0.99)	(-0.52)	(0.65)	(1.24)	(-0.72)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	8.70***	66.94***	-26.49***	7.09**	65.66***	-49.10	7.95***	7.90***	28.85*	10.55***	7.76***	25.82
	(3.06)	(3.30)	(-3.42)	(2.46)	(3.17)	(-1.61)	(3.07)	(2.74)	(1.89)	(3.92)	(2.83)	(1.40)
Observations	524,216	259,106	265,110	524,216	259,106	265,110	524,109	268,040	256,055	524,109	268,040	256,055
R-squared	0.03	0.07	0.07	0.11	0.11	0.14	0.04	0.06	0.06	0.11	0.14	0.13
Number of groups	47	47	47	47	47	47	47	47	47	47	47	47

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.59 Quarterly Returns—Cross-sectional Determinants, Post-2010. This table displays the results of regressing quarter ahead stock returns on lagged values of firm characteristics, for the period 2010 through 2014. Regressions are separated according to currency sensitivity quintiles, with 5 being the strongly (and positively sensitive), 3 being neutral, and 1 also being strongly (but negatively) sensitive. T-statistics, presented in parentheses, are corrected for autocorrelation (4 lags) and heteroskedasticity. Columns 1 through 3 contain the raw regressions, columns 4-6 include country fixed effects, columns 7-9 include Global Industry Classification (GIC) sector effects, and columns 10-12 contain both country and sector fixed effects.

VARIABLES	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest
Beta	0.01	-0.01	-0.00	0.04*	0.00	0.01	0.02	-0.01	-0.00	0.05**	0.00	0.01
	(0.88)	(-0.69)	(-0.04)	(1.95)	(0.05)	(1.03)	(1.16)	(-1.16)	(-0.02)	(2.05)	(0.39)	(0.96)
Total Accruals	-0.03	0.20	-0.22*	0.04	0.20	-0.13	-0.06	0.17	-0.26	-0.08	0.36	-0.15
	(-0.15)	(1.11)	(-1.79)	(0.21)	(0.99)	(-0.83)	(-0.34)	(0.98)	(-1.27)	(-0.48)	(1.26)	(-0.60)
Profitability	-0.36	-1.07	-0.90	-0.50	-1.11	-1.09	-0.77	-0.92	-0.57	-1.00	-1.26	-0.76
	(-0.41)	(-0.82)	(-1.50)	(-0.61)	(-0.79)	(-1.36)	(-1.08)	(-0.69)	(-1.02)	(-1.29)	(-0.94)	(-0.95)
ZM Score	-0.02	-0.08	0.16	0.03	-0.11	0.39	0.10	-0.17	0.10	0.10	-0.19	0.30
	(-0.41)	(-0.77)	(0.77)	(0.93)	(-0.95)	(1.48)	(0.70)	(-1.24)	(0.41)	(0.46)	(-1.47)	(1.20)
Leverage	0.17	0.49	-0.91	-0.11	0.62	-2.20	-0.50	0.98	-0.54	-0.49	1.08	-1.68
	(0.54)	(0.79)	(-0.74)	(-0.55)	(0.98)	(-1.49)	(-0.65)	(1.23)	(-0.39)	(-0.40)	(1.48)	(-1.21)
Net Op. Assets	0.47	-0.23*	0.09	0.38	-0.20	-0.03	0.54*	-0.19*	0.09	0.57**	-0.18	-0.11
	(1.50)	(-1.91)	(0.65)	(1.47)	(-1.57)	(-0.09)	(1.71)	(-1.85)	(0.69)	(2.14)	(-1.56)	(-0.36)
Neg. Cash Flow	0.00	-0.02	-0.00	0.00	-0.01	-0.01	0.00	-0.02	0.01	0.01	-0.00	0.00
	(0.19)	(-1.30)	(-0.08)	(0.18)	(-0.70)	(-0.56)	(0.02)	(-0.95)	(0.45)	(0.33)	(-0.12)	(0.02)
Size	-0.00	-0.01***	-0.01**	-0.01	-0.02***	-0.02*	-0.00	-0.01***	-0.01**	-0.01	-0.02***	-0.02*
	(-0.07)	(-3.73)	(-2.56)	(-1.31)	(-4.17)	(-2.00)	(-0.27)	(-3.60)	(-2.05)	(-1.19)	(-4.63)	(-1.95)
Proft.*NOA	0.28	-0.01	0.24	0.26	0.17	0.09	0.15	0.03	0.15	0.14	0.22	-0.04
	(0.64)	(-0.04)	(0.63)	(0.78)	(0.44)	(0.20)	(0.30)	(0.08)	(0.37)	(0.36)	(0.65)	(-0.08)
Size*Proft.	0.03	0.07	0.07**	0.04	0.08	0.08**	0.06	0.06	0.05*	0.09**	0.08	0.07**
	(0.64)	(1.26)	(2.33)	(0.95)	(1.17)	(2.32)	(1.57)	(1.08)	(2.01)	(2.07)	(1.35)	(2.05)
Size*NOA	-0.03	0.01	-0.01	-0.02	0.01	0.00	-0.03*	0.01	-0.01	-0.04**	0.01	0.00
	(-1.63)	(1.50)	(-0.86)	(-1.65)	(1.22)	(0.01)	(-1.92)	(1.33)	(-0.97)	(-2.34)	(1.16)	(0.28)
ZM*Accruals	-0.03	0.07	-0.03	-0.01	0.09	-0.01	-0.06	0.06	-0.04	-0.04	0.13	-0.01
	(-0.46)	(1.22)	(-0.58)	(-0.13)	(1.25)	(-0.22)	(-0.71)	(1.18)	(-0.49)	(-0.56)	(1.32)	(-0.18)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	-0.04	-0.03	0.97	0.25	-0.20	2.08*	0.40	-0.41	0.66	0.65	-0.52	1.62
	(-0.16)	(-0.07)	(1.10)	(1.47)	(-0.39)	(1.71)	(0.91)	(-0.68)	(0.67)	(1.10)	(-0.93)	(1.44)
Observations	91,734	97,323	99,799	91,734	97,323	99,799	91,726	97,316	99,745	91,726	97,316	99,745
R-squared	0.06	0.10	0.07	0.14	0.22	0.16	0.09	0.13	0.09	0.17	0.24	0.18
Number of groups	45	45	45	45	45	45	45	45	45	45	45	45

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 3.60 Annual Returns—Cross-sectional Determinants, Post-2010. This table displays the results of regressing year ahead stock returns on lagged values of firm characteristics, for the period 2010 through 2014. Regressions are separated according to currency sensitivity quintiles, with 5 being the strongly (and positively sensitive), 3 being neutral, and 1 also being strongly (but negatively) sensitive. T-statistics, presented in parentheses, are corrected for autocorrelation (13 lags) and heteroskedasticity. Columns 1 through 3 contain the raw regressions, columns 4-6 include country fixed effects, columns 7-9 include Global Industry Classification (GIC) sector effects, and columns 10-12 contain both country and sector fixed effects.

VARIABLES	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest	5 Highest	3 Neutral	1 Lowest
Beta	0.03	-0.02	-0.05	0.14	0.03	0.00	0.02	-0.05	-0.05*	0.14	0.00	-0.01
	(0.42)	(-0.25)	(-1.63)	(1.30)	(0.53)	(0.10)	(0.30)	(-1.13)	(-1.89)	(1.25)	(0.05)	(-0.24)
Total Accruals	-0.08	0.17	-0.10	-1.15*	0.04	0.18	0.94	-0.14	-0.30	-1.27	-0.32	0.19
	(-0.22)	(0.97)	(-0.35)	(-1.97)	(0.11)	(0.46)	(0.92)	(-0.89)	(-1.42)	(-1.60)	(-0.63)	(0.55)
Profitability	8.44	-1.35	-0.83	11.62	-1.41	-2.45	6.96	-0.95	0.42	9.32	-2.24	-0.97
	(1.28)	(-0.62)	(-0.64)	(1.30)	(-0.92)	(-1.41)	(1.24)	(-0.50)	(0.54)	(1.25)	(-1.12)	(-1.00)
ZM Score	-0.03	-0.20	0.63	0.16	-2.14	-0.17	-0.46	-0.99	2.72	-0.34	-3.11	2.35
	(-0.14)	(-1.02)	(0.88)	(1.53)	(-1.44)	(-0.32)	(-0.84)	(-1.65)	(1.10)	(-0.71)	(-1.58)	(1.02)
Leverage	0.29	1.35	-3.32	-0.99	12.16	0.96	2.93	5.75	-15.16	2.02	17.74	-13.23
	(0.21)	(1.10)	(-0.86)	(-1.53)	(1.43)	(0.33)	(0.89)	(1.63)	(-1.10)	(0.72)	(1.57)	(-1.02)
Net Op. Assets	3.29	-0.23	0.47	3.33	-0.12	0.34	4.16	-0.21	0.62	4.03	0.06	0.47
	(1.11)	(-0.60)	(0.90)	(1.24)	(-0.39)	(0.95)	(1.18)	(-0.44)	(1.04)	(1.32)	(0.16)	(1.00)
Neg. Cash Flow	-0.01	-0.00	-0.02	0.05	0.03	-0.07	-0.03	-0.00	-0.00	0.06***	0.03	-0.05
	(-0.45)	(-0.28)	(-1.27)	(1.39)	(1.33)	(-1.36)	(-0.77)	(-0.17)	(-0.00)	(3.77)	(1.46)	(-1.30)
Size	0.11	-0.04**	-0.02	0.10	-0.04**	-0.03***	0.13	-0.03	-0.01	0.10	-0.03*	-0.02
	(0.93)	(-2.47)	(-1.12)	(0.87)	(-2.48)	(-3.41)	(0.96)	(-1.67)	(-0.23)	(0.89)	(-1.83)	(-1.12)
Proft.*NOA	5.02	0.01	0.91	4.95	0.62	1.45	5.90	0.28	1.52	5.50	0.63	1.85
	(1.12)	(0.02)	(0.69)	(1.17)	(0.85)	(0.94)	(1.15)	(0.33)	(0.88)	(1.18)	(0.83)	(1.01)
Size*Proft.	-0.58	0.14	0.08*	-0.74	0.13	0.16**	-0.53	0.11	0.00	-0.62	0.18	0.07
	(-1.15)	(1.10)	(1.95)	(-1.18)	(1.45)	(2.54)	(-1.11)	(1.00)	(0.05)	(-1.12)	(1.55)	(1.57)
Size*NOA	-0.20	0.01	-0.03	-0.20	0.01	-0.02	-0.25	0.01	-0.04	-0.24	-0.00	-0.03
	(-1.18)	(0.46)	(-1.05)	(-1.29)	(0.34)	(-1.19)	(-1.24)	(0.28)	(-1.17)	(-1.37)	(-0.26)	(-1.20)
ZM*Accruals	-0.06	0.13**	0.11	-0.29	0.04	0.11	0.16	0.07	0.08	-0.29	-0.04	0.13*
	(-0.59)	(2.43)	(1.67)	(-1.12)	(0.50)	(1.63)	(1.22)	(1.13)	(1.54)	(-1.06)	(-0.30)	(1.83)
Country FE	NO	NO	NO	YES	YES	YES	NO	NO	NO	YES	YES	YES
Sector FE	NO	NO	NO	NO	NO	NO	YES	YES	YES	YES	YES	YES
Constant	-1.92	-0.09	3.14	-1.22	-8.57	0.11	-4.03	-3.49	11.91	-3.36	-12.04	9.83
	(-0.64)	(-0.13)	(1.07)	(-0.51)	(-1.36)	(0.05)	(-0.93)	(-1.37)	(1.16)	(-0.87)	(-1.48)	(1.08)
Observations	60,620	65,300	65,865	60,620	65,300	65,865	60,617	65,299	65,825	60,617	65,299	65,825
R-squared	0.13	0.11	0.08	0.20	0.23	0.19	0.17	0.16	0.12	0.25	0.27	0.22
Number of groups	36	36	36	36	36	36	36	36	36	36	36	36

t-statistics in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.9 Conclusion

In sum, the research in Section 3 finds a few key results. The first is that across regions, currency risk—and specifically risk associated with dollar exposure—is highly heterogeneous. Whereas dollar exposure for firms in some countries or regions lead to underperformance in returns, that same exposure can translate into outperformance in other places. It is therefore necessary, if studying currency effects within a broad international setting, to understand what it is that fundamentally drives currency variation.

In this section, I showed that a significant part of firm currency variation can be explained by the financial characteristics of the firm, such as its size, cash flow, or leverage. The importance of these characteristics increase, the greater degree of currency sensitivity. Further, and despite the varying returns attributable to currency exposure, this finding of firm specific determinants remains robust across countries.

By finding that many of the firm characteristics that influence currency exposure are also characteristics that can proxy for distress, I extend the findings of Kolari et al. (2008) and Wei and Starks (2013) to a broader sample. However, I also demonstrate that those characteristics that can coincide with differential currency exposure, can also lead to further systematic differences in returns among firms with the same level of exposure.

Currency risk is therefore multi-faceted. This is interesting, because it does not entirely align with certain average effects found in Section 2. However the use of different methodologies, as well as the focus on more regional specific effects here in Section 3, should serve more to illustrate the difficulties of how currency risk and any associated premia should be measured. In this way, the results are consistent with the decidedly mixed results in the literature thus far.

However, one of the key identifiable differences in this study here is the treatment of currency risk from the perspective of U.S. dollar risk. To find that dollar risk is somehow globally systematic, and yet subject to significant regional variation, is an intriguing insight. U.S. dollar exposure is consistent with the findings of pervasive dollar risk in Lustig et al. (2011). And yet, by finding significant regional differences in the compensation to that exposure in this paper, many questions arise about why there should be such global heterogeneity. Such contrasts open new doors for future research.

4. CONCLUSIONS

This research followed two broad themes. The first was to identify the existence of, and sources driving, predictability in stock returns as a result of stock-specific levels of currency exposure. The second was to understand to what degree this exposure was globally systematic, as well as why this exposure might occur.

In particular, the focus was on predictability and risk compensation as a result of firm equity exposure of their locally denominated currency against that of the US dollar. The assumption, motivated by Lustig et al. (2011), is that U.S. dollar volatility is a pervasive component to the stochastic discount factor of any investor—be they in Japan, Italy, the Middle East, and so on.

The question of currency risk is important, because much debate still lingers about its existence, direction, and magnitude (e.g., Dominguez et al., 2006; Guo et al, 2008). More sophisticated theories have come into play that have either had a macroeconomic focus (e.g., Lustig et al. 2014), or a more firm fundamental one (e.g., Kolari et al, 2008; Wei and Starks, 2013). I attempt to enrich this area of the literature by taking both perspectives, but also by broadening the techniques for study as well as the sample size used.

The first endeavor—predictability—takes a multitude of approaches. These approaches vary in empirical design, as well as in the particular questions asked. In the first section, I ask whether information in the forward rates, both in terms of their recent movements and their forecasted movements, can be used to directionally predict the returns to stocks that have been historically more predisposed to co-vary with local/U.S. dollar exchange rates. I find that this is true: forward rate structures are not just indicative about the future price path of interest rates and currencies, but that they can be used for stock selection too.

In the second section I take a more fundamental approach, and attempt to understand the drivers behind currency exposure. By exploiting differences in variation among these drivers between firms with similar levels of currency exposure, I find here too that stock returns can be predictable.

The second theme aims to quantify currency exposure as a systematic risk. It attempts to identify to what degree currency exposure exists both within and across countries. My results show that while currency risk is not systematically priced within the entire cross-section of global equities, important pockets remain. Some countries or regions exhibit positive risk adjusted returns to portfolios formed on currency exposure. Others show no such effect—or, in some cases, even a negative one. Thus, while dollar risk may be an important factor worldwide, a la Lustig et a. (2011), the quantification of that risk remains highly heterogeneous across countries, regions, and time.

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