School of Finance

University of St.Gallen

CURRENCY STRATEGIES AND SOVEREIGN RATINGS

NINA KARNAUKH

WORKING PAPERS ON FINANCE NO. 2016/20

SWISS INSTITUTE OF BANKING AND FINANCE (S/BF – HSG)

NOVEMBER 2016

Currency strategies and sovereign ratings*

Nina Karnaukh†

Fourth Draft, 28 June 2016

Abstract

This paper investigates a link between the most popular currency strategies (carry trade, momentum, value) and sovereign ratings. I document that the profitability of the momentum strategy is large and significant among higher credit risk currencies, but is nonexistent among lower credit risk currencies. The profitability of currency momentum disappears when currencies rated BBB- or worse (16% of currency months) are excluded from the sample. The country credit risk conditions do not apply to the carry trade and value, which are profitable among lower and higher credit risk currencies. Sovereign rating changes do not have a significant impact on the performance of the most popular currency strategies.

*I am eternally indebted to my advisor Paul Söderlind for all his support and advice. I also thank to John Cochrane, Angelo Ranaldo, and Nick Roussanov. This paper also benefited from the comments at Financial Economics Workshop in Lund, University of St. Gallen, and the Wharton School.

†I have two affiliations: (1) nina.karnaukh@student.unisg.ch, Swiss Institute of Banking and Finance, University of St. Gallen; Rosenbergstrasse 52, CH-9000 St. Gallen, Switzerland; (2) karnaukh@wharton.upenn.edu, The Wharton School, University of Pennsylvania; 2300 Steinberg-Dietrich Hall, 3620 Locust Walk, Philadelphia, PA 19104-6365, United States.

Introduction

In this paper, I study how the predictability of currency returns varies by the sovereign credit rating of the country.

A number of strategies have been found to predict returns to currency investing. Currencies display *carry*, *momentum* and *value* effects. Countries that have higher interest rates deliver higher average excess returns (Lustig, Roussanov, and Verdelhan 2011), as do countries whose interest rates are higher than usual (Fama 1984, Hansen and Hodrick 1980). Currency returns are positively related to past currency returns (Menkhoff, Sarno, Schmeling, and Schrimpf 2012b). Currencies with high real exchange rates deliver low subsequent returns (Asness, Moskowitz, and Pedersen 2013; Menkhoff, Sarno, Schmeling, and Schrimpf 2015).

In this paper, I study how these return predictors interact with sovereign credit ratings. I find that profitability of the momentum strategy is concentrated in the currencies of countries with the highest credit risk. The profitability of this currency strategy disappears when currencies rated BBB or worse are excluded from the sample. Carry trade and value currency strategies remain profitable both in higher and lower credit risk countries.

I perform a number of robustness checks. The results remain similar when I exclude the recession periods. The profitability of currency strategies does not strive from the periods of financial distress, as measured by the sovereign ratings downgrades.

The importance and awareness of sovereign credit risk has risen dramatically since the start of the financial crisis in 2008. Credit risk has played an important role for stock and fixed income instruments as well as to policy discussions over the last years. Avramov, Chordia, Jostova, and Philipov (2012) provide the evidence that world credit risk factor (computed as the difference between equity returns of high and low credit risk country portfolios sorted on sovereign credit ratings) is significantly priced in the cross-section of country equity returns.

Avramov, Chordia, Jostova, and Philipov (2013) find that the profitability of most stock market anomaly-based strategies is concentrated in the worst-rated stocks. Specifically, they show that the profitability of these strategies disappears when firms rated BB+ or below are excluded from the sample. The potential implications of countries sovereign ratings for the currency strategies have not yet been comprehensively explored.

There are several reasons sovereign credit risk might matter for exchange rates and currency

risk premia. First of all, high credit risk countries are more likely to default, especially in times of bad macroeconomic shocks (Borri and Verdelhan 2012). Additionally, Cochrane (2005) suggests that sum of sovereign debt and money can be viewed as corporate equity and the exchange rate is analogous to the stock price, suggesting that an increase in sovereign credit risk of a country should be accompanied by a depreciation of its currency. Finally, exchange rates might be viewed as the present value of future discounted macro fundamentals (Engel and West 2005), thus there is a role for credit risk to affect the exchange rate.

This paper focuses on sovereign credit rating as a proxy for credit conditions, as the rating provides us with a publicly available, non-model-specific, measure of credit-risk and financial distress. Specifically, I use country ratings data provided by three main sovereign ratings agencies, S&P, Moody's and Fitch. Della Corte, Sarno, Schmeling, and Wagner (2015) also study the relation between sovereign risk and currency returns, but *(a)* they use credit default spreads (CDS) as a proxy for sovereign risk, *(b)* their sample starts in 2003 and covers only 20 currencies, *(c)* they do not investigate the implications of sovereign risk for the profitability of momentum and value currency strategies.

I perform the analysis on a large cross-section (35 currencies) and over an extended period of time (22 years, 1993–2014) and find that profitability of the momentum strategy is concentrated in high credit risk currencies. The momentum profitability disappears when currencies rated BBB or worse (17% of the total number of currency-months) are excluded from the sample. The country credit risk conditions do not apply to the carry trade and value strategy, which is profitable among higher and higher credit risk currencies.

I also study the effects of sovereign rating upgrades and downgrades on currency returns. I find that higher credit risk currencies depreciate during a year ahead of sovereign rating downgrade and appreciate during the year before sovereign ratings upgrade. Currency returns are on average zero following a rating downgrade, not allowing the trader to profit from shorting the downgraded currency. Finally, the performance of carry trade, momentum, and value remains unchanged when I exclude the periods around the sovereign ratings changes.

The paper proceed as follows. Section 1 describes the data, section 2 discusses the methodology, section 3 and 4 presents the results for sovereign ratings levels and changes, section 5 discusses robustness changes and section 6 concludes.

1. Data

The data for spot exchange rates and one-month forward rates cover the sample period from December 1992 to December 2014, and are obtained from *Barclays Bank International* (BBI) and *WM/Reuters* (via Datastream). The start of the sample is based on the availability of the data on sovereign ratings and forward discounts for the sufficiently large cross-section of currencies.[1] Spot and forward rates are end-of-month data (last trading day in a given month). The total available number of countries is 35 (this dataset was used by Lustig, Roussanov, and Verdelhan 2011, but their analysis starts in 1976).

My sample consists of the following countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Euro Area, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Italy, Japan, Kuwait, Malaysia, Mexico, Netherlands, New Zealand, Norway, Philippines, Poland, Portugal, Singapore, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, United Arab Emirates, United Kingdom. My effective sample size varies over time as data for emerging countries become available or when currencies cease to exist, e.g. due to adoption of the Euro.

Since the purpose of this paper is to examine how momentum, value, and carry strategies interact with sovereign rating, I apply the same filters as the papers that document those strategies. Following Lustig, Roussanov, and Verdelhan 2014, I do not consider Turkey due to near-hyperinflation episodes as well as the currencies which have pegged their exchange rate partly or completely to the U.S. dollar over the course of the sample (Hong Kong, Saudi Arabia, and United Arab Emirates). I also exclude Indonesia from the end of December 2000 to the end of May 2007 and Malaysia from the end of August 1998 to the end of June 2005 due to large failures of covered interest rate parity.

Figure 1 plots the total number of currencies with the available spot/forward and sovereign ratings data for each month of my sample. The total number of currency-month observations is 5632. There are 13 currencies available at the start of the sample, and 28 currencies at the end of the sample.

For the purpose of computing the currency excess returns, I take the perspective of a U.S.

[1] More than half of the countries with the available forward discounts data have AAA ratings before December 1992, that disables sorting on credit rating into to groups.

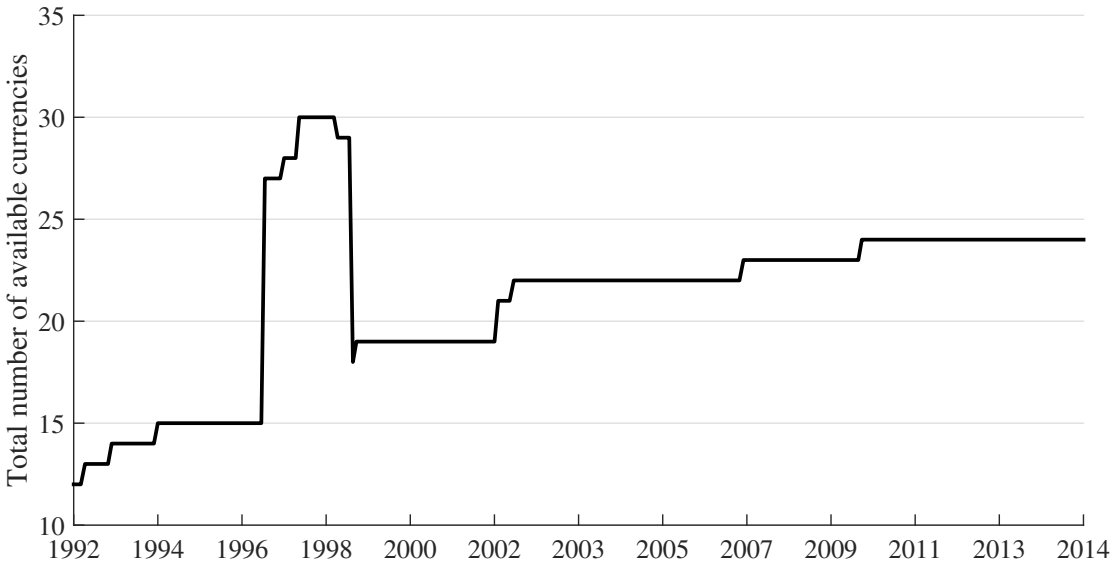

Figure 1: **Number of available currencies.** The figure plots the number of currencies with the available data on all three following series: forward discounts, sovereign ratings, and CPI. The full sample period is 264 months, December 1992–December 2014.

investor. Monthly excess returns to a U.S. investor for holding foreign currency k are given by

$$er_{t+1}^k = f_t^k - s_{t+1}^k, \tag{1}$$

where s and f denote the (log) spot and 1-month forward rate (foreign currency unit per USD), respectively. In my analysis, I focus on currency excess returns and do not study country bond returns.

The sovereign credit rating by three major credit rating agencies is provided by Bloomberg (via the CRPR function for each sovereign). For the main analysis, I rely on the foreign currency long-term Standard&Poor's (S&P) ratings.[2]. The S&P ratings of sovereigns are based on: (1) Institutional effectiveness and political risks, reflected in the political score; (2) Economic structure and growth prospects, reflected in the economic score; (3) External liquidity and international

[2]As defined by S&P, credit ratings are based, in varying degrees, on their analysis of the following considerations: (1) Likelihood of payment–capacity and willingness of the obligor to meet its financial commitment on an obligation in accordance with the terms of the obligation; (2) Nature of and provisions of the obligation and the promise we impute; (3) Protection afforded by, and relative position of, the obligation in the event of bankruptcy, reorganization, or other arrangement under the laws of bankruptcy and other laws affecting creditors' rights. Issue ratings are an assessment of default risk, but may incorporate an assessment of relative seniority or ultimate recovery in the event of default. More details at https://www.standardandpoors.com/en_EU/delegate/getPDF?articleId=1663724&type=COMMENTS&subType=REGULATORY.

investment position, reflected in the external score; (4) Fiscal performance and flexibility, as well as debt burden, reflected in the fiscal score; (5) Monetary flexibility, reflected in the monetary score.

The results using data from alternative credit rating agencies (Moody's or Fitch) are similar. Adding the data on Rating Watches and Rating Outlooks does not affect the results materially. The results from proxying sovereign risk with the country risk data provided by the International Country Risk Guide (ICRG) database from the Political Risk Services (PRS) group are similar.

					Excess Returns		Forward discounts		Sovereign Ratings					Number of entries	
	Country	Code	Start	End	Mean	Std	Mean	Std	Mean	Min	Max	N down	N up	C1	C2
1	Australia	AUD	Dec/1992	Dec/2014	4.40	1.20	1.74	0.06	1.8	1	3	0	2	188	77
2	Austria	ATS	Jan/1997	Dec/1998	-3.01	0.87	-2.13	0.00	1.0	1	1	0	0	23	0
3	Belgium	BEF	Jan/1997	Dec/1998	-3.06	0.87	-2.10	0.01	2.0	2	2	0	0	23	0
4	Canada	CAD	Dec/1992	Dec/2014	0.58	0.79	0.10	0.03	1.4	1	2	0	1	215	50
5	Czech Rep.	CZK	Jul/1997	Dec/2014	2.85	1.28	0.79	0.09	6.1	4	7	1	2	41	169
6	Denmark	DKK	Dec/1992	Dec/2014	0.32	1.00	0.26	0.09	1.4	1	2	0	1	215	50
7	Euro Area	EUR	Jan/1999	Dec/2014	0.10	1.04	-0.29	0.04	2.7	2	5	28	13	153	38
8	Finland	FIM	Jan/1997	Dec/1998	-4.22	0.90	-2.31	0.01	3.0	3	3	0	0	0	23
9	France	FRF	Dec/1992	Dec/1998	0.14	0.91	0.56	0.10	1.0	1	1	0	0	73	0
10	Germany	DEM	Dec/1992	Dec/1998	-1.08	0.92	-0.44	0.07	1.0	1	1	0	0	73	0
11	Greece	GRD	Jan/1997	Dec/1998	2.17	1.14	6.55	0.05	10.0	9	10	0	1	0	23
12	Hungary	HUF	Nov/1997	Dec/2014	4.33	1.43	5.98	0.10	8.9	7.0	12.0	5	3	0	206
13	India	INR	Nov/1997	Dec/2014	1.24	0.75	4.48	0.08	10.9	10	12	1	2	0	206
14	Indonesia	IDR	Jul/2007	Dec/2014	1.67	1.10	5.93	0.08	11.9	11	13	0	2	0	90
15	Ireland	IEP	Jan/1997	Dec/1998	-2.89	0.89	0.39	0.02	2.7	2	3	0	1	8	15
16	Italy	ITL	Dec/1992	Dec/1998	0.82	0.86	3.39	0.08	3.1	3	5	0	1	0	73
17	Japan	JPY	Dec/1992	Dec/2014	-2.63	1.09	-2.80	0.07	2.7	1	4	3	2	246	19
18	Kuwait	KWD	Jul/2002	Dec/2014	0.80	0.27	0.55	0.04	4.1	3	5	0	2	90	60
19	Malaysia	MYR	Jan/1997	Dec/2014	-7.07	1.04	3.33	0.10	6.7	5	8	3	0	0	78
20	Mexico	MXN	Jan/1997	Dec/2014	3.94	1.01	7.41	0.18	9.7	8	12	1	5	0	215
21	Netherlands	NLG	Dec/1992	Dec/1998	-1.17	0.92	-0.53	0.08	1.0	1	1	0	0	73	0
22	New Zealand	NZD	Dec/1992	Dec/2014	4.60	1.22	2.69	0.04	2.4	2	4	1	2	215	50
23	Norway	NOK	Dec/1992	Dec/2014	0.53	1.09	1.09	0.06	1.0	1	1	0	0	265	0
24	Philippines	PHP	Jan/1997	Dec/2014	1.35	0.88	4.30	0.11	11.7	9	13	2	4	0	215
25	Poland	PLN	Mar/2002	Dec/2014	4.20	1.50	2.80	0.06	7.4	7	8	0	1	0	154
26	Portugal	PTE	Jan/1997	Dec/1998	-2.60	0.84	-0.67	0.02	4.0	3	4	0	1	0	23
27	Singapore	SGD	Dec/1992	Dec/2014	-0.03	0.57	-0.98	0.05	1.1	1	2	0	1	238	27
28	South Africa	ZAR	Oct/1994	Dec/2014	1.45	1.55	7.27	0.09	9.4	8	12	2	4	0	243
29	South Korea	KRW	Mar/2002	Dec/2014	2.58	1.18	1.12	0.06	6.1	5	8	0	3	0	154
30	Spain	ESP	Jan/1997	Dec/1998	-1.83	0.85	-0.76	0.02	3.0	3	3	0	0	0	23
31	Sweden	SEK	Mar/1993	Dec/2014	0.38	1.11	0.35	0.06	1.5	1	2	0	1	215	47
32	Switzerland	CHF	Dec/1992	Dec/2014	-0.02	1.08	-1.70	0.05	1.0	1	1	0	0	265	0
33	Taiwan	TWD	Jan/1997	Dec/2014	-1.71	0.56	-0.92	0.10	3.4	2	4	2	0	213	2
34	Thailand	THB	Jan/1997	Dec/2014	1.15	1.16	2.46	0.16	8.6	6	10	3	2	0	215
35	UK	GBP	Dec/1992	Dec/2014	1.05	0.82	0.85	0.03	1.0	1	1	0	0	255	0

Table 1: **Descriptive statistics for individual currencies.** This table presents descriptive statistics for individual currencies. The start of the sample for each country denotes the month, when the data on all three following series becomes available: forward discounts, sovereign ratings, and CPI. Means and standard deviations for excess returns and forward discounts are annualized and in percent. Higher sovereign rating numeric score reflects higher credit risk (1 represents a AAA rating and 21 represents a C rating). The last two columns show the number of entries to rating group C1 (higher-rated) and C2 (lower-rated) for each currency. The full sample period is 264 months, December 1992–December 2014.

I transform the S&P ratings into numeric scores, where 1 represents a AAA rating and 21 represents a C rating. Hence, a higher numeric score stands for higher credit risk. A numeric rating of 10 or below (BBB- or better) are considered investment grade, and ratings of 11 or higher (BB+ or worse) are considered high-yield or non-investment grade. Since S&P does not provide

the ratings for the Eurozone, I construct it as the government gross debt-weighted average of the credit rating of eleven major Euro-area countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal, Spain.[3] Table 1 presents the detailed descriptive statistics for the excess returns, forwards discounts, and sovereign ratings data for each country.

Each month t, I sort all countries rated by S&P into two groups (median sort) based on their credit rating. I also manually adjust the sorting of countries with the same ratings around the median, so that these countries do not appear in different groups. The lower credit risk group, C1, has an average rating of 1.59 (or AA+). The higher credit risk group, C2, has an average rating of rating of 7.55 (or BBB+). The last two columns of Table 1 show number of entries to rating group C1 and C2 for each currency. 11 out of 35 currencies did not stay in the same rating group over my sample period.

Figure 2 shows the time series development of sovereign ratings and cumulative currency excess returns for the higher and lower credit risk groups. The top plot of Figure 2 depicts the average S&P sovereign credit rating for the two groups. Since upgrades and downgrades in the higher and lower credit risk groups is about equal in number (52 downgrades and 57 upgrades), the deteriorating average credit rating in higher credit risk group is driven mostly by the addition of new countries. For instance, the appearance of the data on 12 currencies in January 1997 worsened the average rating of higher credit risk currencies by more than two notches.

The bottom plot of Figure 2 depicts the cumulative average currency excess returns for the higher and lower credit risk groups. On average, the higher credit risk currencies enjoy higher excess returns than the lower credit risk ones ones. The cumulative average returns for both groups are quite flat in the 1990s, increase considerably after 2002, drop sharply after the start of financial crisis in 2008, recover in 2009, and stay relatively unchanged after 2010.

2. Methodology

My main analysis is based on portfolio sorts. I equal weight currencies within each portfolio. I perform the analysis across all rated currencies as well as within the two subsets based on credit ratings (C1: Lower credit risk, C2: Higher credit risk).

[3]For each country I average annual government gross debt data from IMF over 1999–2013 and divide it by the total debt for these countries to get the weights. Using simple average instead yields similar results.

My portfolio formation methodology is consistent across the strategies. Each month t, I sort currencies into three portfolios on the basis of the strategy-specific conditioning variable (currency characteristic). P1 (P3) denotes the portfolio containing currencies with the lowest (highest) value of the conditioning variable. Each anomaly-based trading strategy involves buying portfolio P3 and selling portfolio P1, and holding this position during the following month. Each portfolio return is calculated as the equally weighted average excess return of its constituent currencies. While this methodology applies to all strategies, strategies differ with respect to their conditioning variable, consistent with the literature on each strategy. I consider three following currency strategies: carry

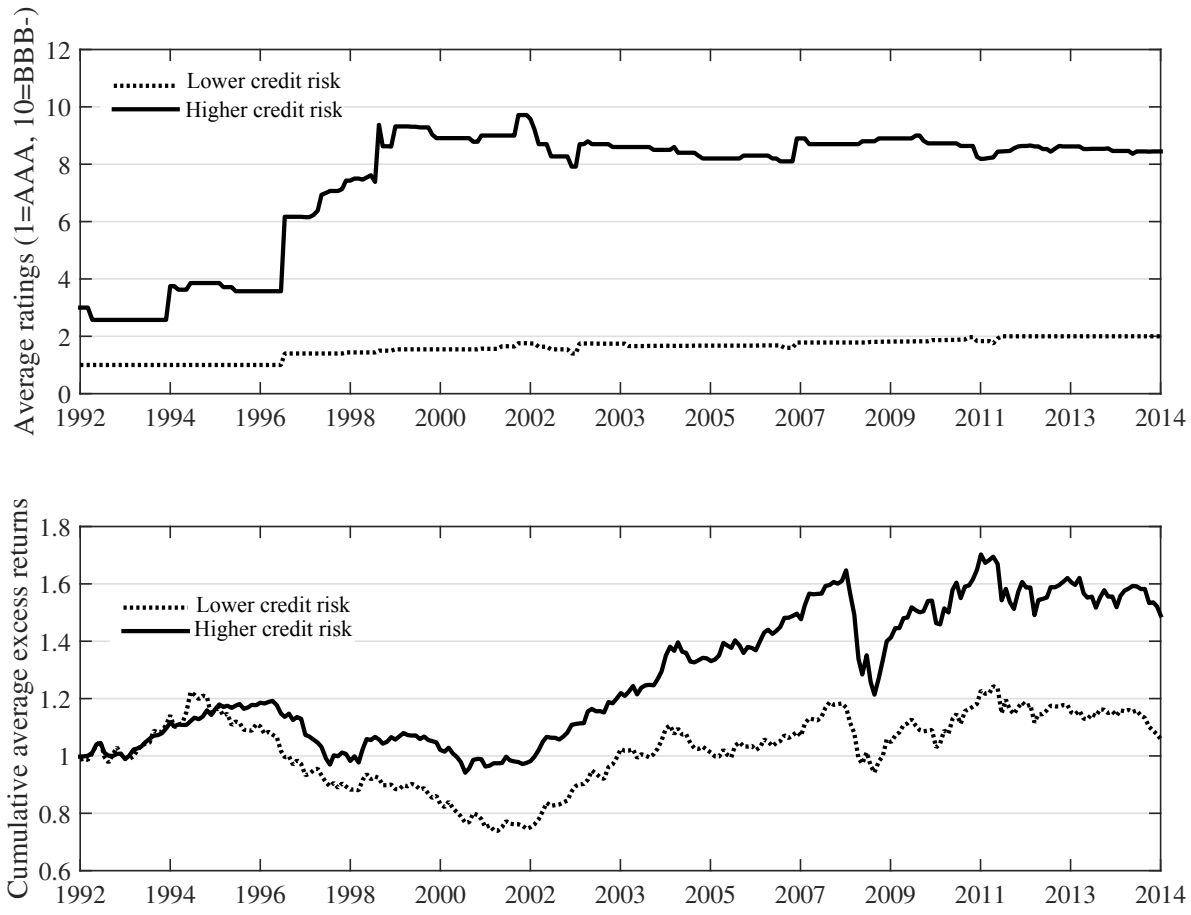

Figure 2: **Sovereign ratings and cumulative returns of the higher and lower credit risk currencies.** The top plot of the figure depicts the average S&P sovereign credit rating for the higher and lower credit risk group. The numeric rating is increasing in credit risk. The bottom plot of the figure depicts the cumulative average excess returns for the two groups. The sample is 264 months, December 1992–December 2014.

trade (Lustig, Roussanov, and Verdelhan 2011), momentum (Menkhoff, Sarno, Schmeling, and Schrimpf 2012b), and value (Asness, Moskowitz, and Pedersen 2013).

The traditional *carry* trade strategy consists of borrowing low-interest-rate currencies and lending high interest-rate currencies. The uncovered interest rate parity condition states that such strategy would give a zero net payoff, however, historically carry trades have earned positive average returns. In normal conditions, the forward discount is equal to the interest rate differential. Thus, each month I sort the currencies on 1-month forward discounts (see, e.g. Lustig, Roussanov, and Verdelhan 2011). The strategy involves buying the portfolio with the currencies of the highest forward discount (P3), selling the portfolio with the currencies of the lowest forward discount (P1).

The *momentum* strategy goes long (short) in currencies for which long positions have yielded the highest (lowest) returns over the previous month. Menkhoff, Sarno, Schmeling, and Schrimpf (2012b) find that 1-month formation period and 1-month holding period results into the most profitable momentum returns.

The *value* strategy goes long in currencies that are undervalued (P1) and short in currencies that are overvalued (P3). I define the measure of currency "undervalue" as a 5-year real exchange rate change, measured as the average log spot exchange rate from 4.5 to 5.5 years ago minus log spot exchange rate today plus the log difference in the change in CPI in the foreign country relative to the U.S. over the same period, $s_{t-5y\to t} + (CPI^{foreign}_{t-5y\to t} - CPI^{US}_{t-5y\to t})$. Higher value measure indicates larger foreign currency depreciation (against the U.S. dollar) of currency in real terms. The value strategy goes long the currencies, that depreciated the most in real terms over the last 5 years (P1), and goes short the currencies, which appreciated the most in real terms over the last 5 years (P3).

3. Sovereign rating levels and currency strategies

3.1 Double-sorting

I look at the overall performance of four currency strategies and analyze their performance by double sorting. I do double sorting first by sovereign ratings, then by the conditioning variable: forward discount, prior month's return, and "undervalue" measure.

Table 2 shows the monthly (annualized) returns for the carry trade, momentum, value, and

		Carry Trade	Momentum	Value
All-rated	P1	-1.4	-0.7	-0.6
	P3	3.2	2.7	2.7
	P3-P1	4.6	3.4	3.3
		[3.2]	**[2.5]**	**[2.7]**
	SR	0.72	0.52	0.60
		[2.9]	**[2.5]**	**[2.6]**
Lower credit risk	P1	-1.3	-0.2	-1.3
	P3	2.7	1.0	1.7
	P3-P1	4.0	1.3	3.0
		[2.7]	[0.8]	**[2.2]**
	SR	0.61	0.19	0.48
		[2.5]	[0.9]	**[2.2]**
Higher credit risk	P1	0.2	-0.1	1.3
	P3	4.2	4.0	4.5
	P3-P1	4.0	4.2	3.3
		[2.7]	**[2.2]**	**[2.1]**
	SR	0.57	0.48	0.43
		[2.7]	**[2.2]**	**[2.0]**

Table 2: **Profits from currency strategies in rated countries.** This table shows the monthly (annualized) returns for the carry trade, momentum, and value strategies. In the end of each month, currencies are sorted into the lower credit risk and higher credit risk groups, based on prior sovereign credit rating. Within each subsample, I sort currencies into tercile portfolios based on the conditioning variable for each specific anomaly, as noted in the column heading. The carry trade strategy involves buying the portfolio with currencies of the highest forward discount (P3), selling the portfolio with the currencies of the lowest forward discount (P1). The momentum strategy involves buying the currencies with the highest return in the previous month (P3) and selling the currencies with the lowest return in the previous month (P1). The value strategy goes long currencies that are undervalued (P1) and short currencies that are overvalued (P3). The t-statistics for long minus short portfolios (P3-P1) and for Sharpe ratios (SR) are in brackets and are based on the standard errors, robust to conditional heteroscedasticity and serial correlation up to three lags as in Newey and West (1987). Bold t-statistics indicate significance at the 5% level. The full sample period is 264 months, December 1992–December 2014.

sovereign ratings strategies. Specifically, it presents for each strategy monthly returns for the extreme portfolios, P1 and P3, as well as P3-P1 (High-minus-Low) portfolios. The top part of Table 2 presents the results for the whole sample of currencies. The carry trade strategy is the most profitable, yielding the highest return of 4.6% return per month and 0.72 Sharpe ratio. The momentum delivers a 3.4% return and 0.52 Sharpe ratio. The value strategy performance is similar to momentum: 3.3% return and slightly higher 0.6 Sharpe ratio. All these strategies profits and Sharpe ratios are statistically significant.

Now, I examine the impact of sovereign risk on currency strategies. At the end of each month,

I partition the sample into the lower credit risk (C1) and higher credit risk (C2) currencies. Within each group, investor restricts herself to use currencies only from that group. Middle and bottom part of Table 2 shows the performance of currency strategies within each of the two groups of currencies.

The carry trade remains profitable both within a higher and lower credit risk group of currencies by yielding a 4% return. The performance of the value strategy is also similar within both groups: 3% within C1 and 3.3% within C2.

As opposed to the carry trade and value, high and significant momentum profits (4.2% per month) appear only within the higher credit risk group of currencies. Momentum profits are 1.3% and statistically insignificant in the group of lower credit risk currencies. The momentum's Sharpe ratio for the lower credit risk currencies is only 0.19, well below 0.61 and 0.48 for the carry trade and value strategies in the same group. As the strategy return, the 0.19 Sharpe Ratio is statistically insignificant (0.9 t-stat). Currency investor needs to include higher credit risk currencies to her investment set in order to earn sizeable profits from momentum investing.

To sum up, evidence in Table 2 suggests that momentum profits are concentrated within the higher credit risk currencies and are small and insignificant within the lower credit risk currencies. In other words, currency returns of higher credit risk countries are positively related to past currency returns, while currency returns of lower credit risk countries exhibit such property to a much smaller extent. The carry trade and value are profitable within both groups, thus exploiting the differences in countries interest rates and value measures remains profitable after controlling for sovereign risk.

3.2 Investment subsamples

Which segments of country sovereign ratings are driving the momentum profits? To answer this question, I consider the performance of currency strategies within different investment subsamples, built after controlling for sovereign ratings. Specifically, I compute the excess returns for various sovereign ratings subsamples as I sequentially exclude the worst-rated countries from the whole investment universe. I start with the whole set of countries rated from AAA to C, then restrict the sample to countries rated from AAA to BB, then AAA to BB+ and so on. The last subsample covers only the best-rated currencies (AAA).

Table 3 shows the profitability of high-minus-low currency strategies for different sovereign

ratings subsamples. It also provides the number and percentage of the total number of currencies included in each subsample (last two columns). The profits from using the full sample of currencies (AAA–C) are identical to those in *Panel A* of Table 2.

Carry trade profits stay between 4% and 5% for the full sample and for subsamples which exclude currencies with the ratings worse than AA-. When an investor uses the countries with the highest ratings (AAA and AA+ ratings or half of the sample), carry trade still exhibit high and significant profits – 3.7% with 2.5 t-stat. It is only when an investor is left with AAA currencies

Subsample	Carry trade	Momentum	Value	Number of currencies	% of currency-months
AAA–C	4.6	3.4	3.3	21.3	100.0
	[3.2]	**[2.5]**	**[2.7]**		
AAA–BB	4.4	3.2	3.1	20.9	98.4
	[2.9]	**[2.3]**	**[2.5]**		
AAA–BB+	4.2	2.8	3.1	20.1	94.8
	[2.8]	**[2.1]**	**[2.5]**		
AAA–BBB-	4.1	3.1	3.2	19.2	90.7
	[2.8]	**[2.3]**	**[2.5]**		
AAA–BBB	4.3	2.3	3.5	17.9	85.4
	[2.9]	[1.6]	**[2.7]**		
AAA–BBB+	4.8	2.7	3.5	17.3	82.7
	[3.4]	[1.9]	**[2.6]**		
AAA–A-	4.7	2.5	2.8	16.0	76.9
	[3.4]	[1.8]	**[2.2]**		
AAA–A	4.9	1.9	2.8	14.6	70.0
	[3.6]	[1.4]	**[2.0]**		
AAA–A+	4.4	1.9	3.2	13.9	66.3
	[3.0]	[1.3]	**[2.2]**		
AAA–AA-	4.7	1.7	3.4	13.5	64.2
	[3.1]	[1.1]	**[2.4]**		
AAA–AA	3.8	0.8	3.3	11.9	57.5
	[2.4]	[0.6]	**[2.2]**		
AAA–AA+	3.7	0.5	2.8	10.2	49.4
	[2.5]	[0.4]	**[2.1]**		
AAA	2.8	-1.3	3.2	7.4	35.1
	[1.9]	[-0.9]	**[2.3]**		

Table 3: **Profits from currency strategies in decreasing subsamples of rated currencies.** This table reports profits from currency trading strategies as in Table 2, as I sequentially eliminate the worst-rated currency-months. The first columns specifies the range of ratings included in the corresponding subsample. The t-statistics are in brackets and based on the standard errors, robust to conditional heteroscedasticity and serial correlation up to three lags as in Newey and West (1987). Bold t-statistics indicate significance at the 5% level. The fifth (sixth) column provides the average number (percentage) of currencies per month in each subsample. The full sample period is 264 months, December 1992–December 2014.

(35% of the sample) that the carry trade profits are 2.8% and significant only at 10% level (1.9 t-stat). The profitability of the value strategy is robust across various subsamples and delivers statistically significant returns between 2.9% and 3.3%.

The momentum profits stay significant around 3% as the worst-rated currencies are removed (C, BB and BB+-rated, less than 10% of the whole sample). However, as I remove additional 6% of currency-months with the ratings below BBB-, momentum returns diminish to a statistically insignificant 2.3% (1.6 t-stat). Further excluding of the worse-rated currencies from the investment universe reduces the profits from momentum investing. Momentum profits turn negative (-1.3%), when I consider only the AAA-rated currency-periods.

Thus, the momentum profits are derived from a subsample of currency-months with the ratings worse than BBB, that account for less than 16% of the whole sample. Momentum strategy for all currencies is profitable because extreme winner and loser currency portfolios are comprised mainly of countries with high sovereign risk. The returns of these higher credit risk currencies are positively related to the past returns and thus help momentum strategy to display sizeable returns. At the same time, currency returns of the winners and losers in the lowest credit risk group of countries are not positively related to the previous-month returns, making the momentum strategy based on these well-rated currencies unprofitable.

To sum up, Table 2 and 3 show that *(a)* the profits of carry trade and value are robust across the various credit rating groups, *(b)* momentum strategy profits are concentrated within the worst-rated currencies and reduce substantially as we remove the high credit risk currencies from the investment universe. This evidence suggests that sovereign credit risk plays an important role in explaining the source of currency momentum profitability.

3.3 Regression analysis

I study the relation between the currency returns and sovereign ratings more formally by running the cross-sectional regressions of currency excess returns on currency characteristics. In particular, each month I run the following cross-sectional regressions:

$$er_{i,t} = a + bX_{i,t-1} + e_{i,t}, \tag{2}$$

where $er_{i,t}$ is the excess return on currency i in month t and $X_{i,t-1}$ is the value of the conditioning variable (forward discount, prior month's return, currency "undervalue" measure, or credit ratings) for currency i in the previous month.

		Carry Trade	Momentum	Value
Panel A. $er_{i,t} = a + bX_{i,t-1} + e_{i,t}$				
All-rated	b	0.70	0.09	0.55
		[4.70]	**[2.46]**	**[2.61]**
Lower Credit Risk	b	1.19	0.05	0.89
		[4.59]	[1.26]	[1.56]
Higher Credit Risk	b	0.53	0.09	0.46
		[2.95]	**[2.53]**	**[1.96]**
Panel B. $er_{i,t} = a + bX_{i,t-1} + cX_{i,t-1} \cdot D_{i,t-1}^{Lower} + e_{i,t}$				
	b	0.58	0.07	0.00
		[3.08]	**[2.58]**	**[2.31]**
	c	0.74	-0.04	0.00
		[2.12]	[-1.18]	[0.40]
Panel C. $er_{i,t} = a + bX_{i,t-1} + cCR_{i,t-1} + e_{i,t}$				
	b	0.90	0.05	0.39
		[4.85]	**[2.72]**	**[2.57]**
	c	-0.02	0.02	-0.03
		[-1.95]	[1.65]	[-0.02]

Table 4: **Cross-sectional regressions of currency returns on anomaly variables.** Each month t, I run cross-sectional regressions of monthly currency returns on a lagged currency characteristic based on each of the strategies. Carry trade uses forward discounts as of the end of previous month as the independent variable. Momentum uses the past month's return. Value uses the "undervalue" measure (5-year change in the purchasing power parity) from the previous month. Sovereign ratings strategy uses the sovereign ratings level as of the end of past month. Each column of *Panel A* reports the results from a separate univariate regression and shows the time-series average of these cross-sectional regression coefficients with their associated t-statistics in brackets. *Panel B* reports the results from bivariate regressions on the lagged currency characteristic and dummy which takes one if country i has lower (than median) credit risk in month $t-1$. *Panel C* reports the results from bivariate regressions on the lagged currency characteristic and sovereign ratings. The t-statistics are in brackets and are based on the standard errors, robust to conditional heteroscedasticity and serial correlation up to three lags as in Newey and West (1987). Bold t-statistics indicate significance at the 5% level. The full sample period is 264 months, December 1992–December 2014.

Each column in *Panel A* of Table 4 reports average coefficient estimates and t-statistics from a separate univariate regressions of currency excess returns on past strategy characteristics. For the all-rated currencies, forward discounts, prior month's returns and "undervalue" measure significantly predict currency returns. This result reiterates the portfolio-based evidence in Table 2.

Turning to the two credit risk groups, *(a)* forward discounts positively predict currency returns

in the both groups, *(b)* predictive effect of forward discounts is larger twice larger for the lower credit risk countries than for the higher credit risk countries (1.19 coefficient versus 0.53), *(c)* prior month's return is a significant predictor of next month's return within a higher credit risk group, but does a poor job within a lower credit risk subgroup. These results are in line with the earlier evidence for double-sorts in Table 2. The "undervalue" measure is insignificant predictor of currency returns within the lower credit risk group, though its coefficient (0.89) is higher than within the higher credit risk group (0.46).

Next, I add the interaction of currency characteristic with the dummy for lower credit risk currencies:

$$er_{i,t} = a_t + bX_{i,t-1} + cX_{i,t-1} \cdot D_{i,t-1}^{Lower} + e_{i,t}, \tag{3}$$

where $D_{i,t-1}^{Lower}$ is the dummy which takes one if country i has lower (than median) credit risk in month $t-1$.

Panel B of Table 4 reports the results for these bivariate regressions for all-rated currencies. Positively significant coefficient c in the first column (2.1 t-stat) indicates that the forward discounts have an extra predictive ability for the future currency excess returns of lower credit risk countries. There are no similar effects for momentum and value.

Finally, I analyze the linear predictive effects of lower credit risk for future excess returns on top of the currency characteristics:

$$er_{i,t} = a_t + bX_{i,t-1} + cCR_{i,t-1} + e_{i,t}, \tag{4}$$

where $CR_{i,t-1}$ is the level of the sovereign credit risk of country i in month $t-1$.

The evidence in *Panel C* of Table 4 suggests: *(a)* higher sovereign risk is negatively associated with currency returns after controlling for forward discounts, *(b)* higher sovereign risk is positively associated with currency returns after controlling for past month's return, *(c)* sovereign risk effects are insignificant after controlling for the "undervalue" measure. The effects in *(a)* and *(b)* are statistically significant only at 10% level (-1.95 and 1.65 t-stat).

To sum up, even though the level of credit ratings plays an important role when analyzing currency strategies with double sorting and over various investment subsamples, its role is less visible in the predictive regressions context.

4. Sovereign rating changes and currency strategies

In this section, I study how sovereign rating changes impact the profitability of currency strategies.

The impact of sovereign rating changes (especially, downgrades) on equity and stock prices has been well documented in the literature. For instance, Avramov, Chordia, Jostova, and Philipov (2012), document that equity prices drop sharply around sovereign rating downgrades in both higher and lower credit risk countries. They also find that worst-rated countries outperform the best-rated countries even more during stable or improving credit conditions. When looking at the individual stock returns, Avramov, Chordia, Jostova, and Philipov (2013) find that the profitability of most stock market anomaly-based strategies disappears when periods around credit rating downgrades are excluded from the sample. The potential implications of countries sovereign ratings for the currency strategies have not yet been comprehensively explored.

An increase (decrease) in sovereign credit risk might be accompanied with currency depreciation (appreciation) and thus might drive the profitability of currency strategies. I investigate whether currency strategies derive their profitability from the periods of worsening or improving credit conditions, as measured by the sovereign rating downgrades and downgrades.[4] In the spirit of Avramov, Chordia, Jostova, and Philipov (2012) and Avramov, Chordia, Jostova, and Philipov (2013), I look at the performance of the strategies as I exclude the periods around sovereign ratings rating changes from the sample.

Table 5 shows the total number of rating downgrades and upgrades, as well as returns around the events for the sovereign credit rating-sorted groups. Figure 3 plots the cumulative number of downgrades and upgrades for lower and higher credit risk group of currencies. Downgrades and upgrades are more frequent among higher credit risk currencies. The number of downgrades (upgrades) in lower credit risk group is 23 (20), while the corresponding number for the higher credit risk group is 29 (37). When I exclude EUR, the number of downgrades (upgrades) in the lower credit risk group decreases to 3 (12), and in higher credit risk – to 21 (32). The size of downgrades and upgrades is most of the times 1 notch, with a few exceptions.[5]

[4]For instance, Avramov, Chordia, Jostova, and Philipov (2013) find that worsening credit conditions causes equity anomalies' conditioning variables for the low-rated stocks to take extreme values, which in turn puts these distressed low-rated stocks on the short side of the trading strategies. These distressed stocks subsequently realize extremely low returns, producing the anomalous profits for the short leg of the trading strategy.

[5]Once the size of a downgrade is two notches: Thailand from A- to BBB on 24 October 1997. Twice the size of a downgrade is three notches: Indonesia from BB to B on 27 January 1998, Japan from AAA to AA- on 22 February 2001. Once the size of downgrade was five notches: Indonesia from CCC+ to SD (selective default) on 27 April 2000.

	All currencies			Excluding the Euro		
	All rated	Lower credit risk	Higher credit risk	All rated	Lower credit risk	Higher credit risk
Panel A. Downgrades						
N of downgrades	52	23	29	24	3	21
er_{t-1}	-5	13	-19	-21	-2	-23
er_t	-18	-16	-20	-31	-48	-28
er_{t+1}	8	8	8	16	28	14
$er_{t-6:t-1}$	-9	1	-14	-12	13	-16
$er_{t+1:t+6}$	3	2	2	3	9	2
$er_{t-12:t-1}$	4	4	-6	9	9	-7
$er_{t+1:t+12}$	3	4	3	4	7	3
Panel B. Upgrades						
N of upgrades	57	20	37	44	12	32
er_{t-1}	7	4	9	10	6	11
er_t	2	-6	6	8	0	11
er_{t+1}	-1	-17	9	1	-20	9
$er_{t-6:t-1}$	7	5	7	7	5	8
$er_{t+1:t+6}$	3	-1	5	4	0	6
$er_{t-12:t-1}$	3	3	7	2	2	8
$er_{t+1:t+12}$	2	1	2	2	2	2

Table 5: **Sovereign rating changes and currency excess returns by rating groups** This table focuses on the currencies with at least one downgrade/upgrade. The table reports the average excess returns around the downgrade (*Panel A*) and upgrade *(Panel B*) events, occurred at time t, over the whole sample period. The first three columns refer to all 35 currencies, while the last three columns exclude the EUR. The full sample period is 264 months, December 1992–December 2014.

Higher credit risk currencies experience considerably larger drops in excess returns around downgrades, when compared with lower credit risk ones. The monthly annualized excess return in the months of downgrade averages -16% (-20%) for the lower (higher) credit risk currencies. When excluding the Euro, these numbers are -48% (-28%).[6] In the six-month period before and after the downgrade, the higher credit risk currencies deliver average returns of -14% and 2%. This

Twice the size of upgrade is two notches: Italy from A+ to AA- on 1 March 1993, Chezh Republic from A to AA- on 24 August 2011. Once the size of upgrade was six notches: Indonesia from SD to B- on 2 October 2000. Since changes in the sovereign ratings for the Euro reflect the data on eleven main countries in the Eurozone and thus are much more frequent than for the other currencies, I included the statistics on the downgrades and upgrades for all currencies, excluding the Euro.

[6]The dramatic -48% monthly annualized return during the month of downgrade for the three lower credit risk currencies among is fully driven by a sharp depreciation of the New Zealand dollar from 1.17 NZD/USD as of end-August 2011 to 1.31 NZD/USD as of end-September 2011, which translated into -130% monthly annualized return. (S&P downgraded New Zealand from AA+ to AA on 29 September).

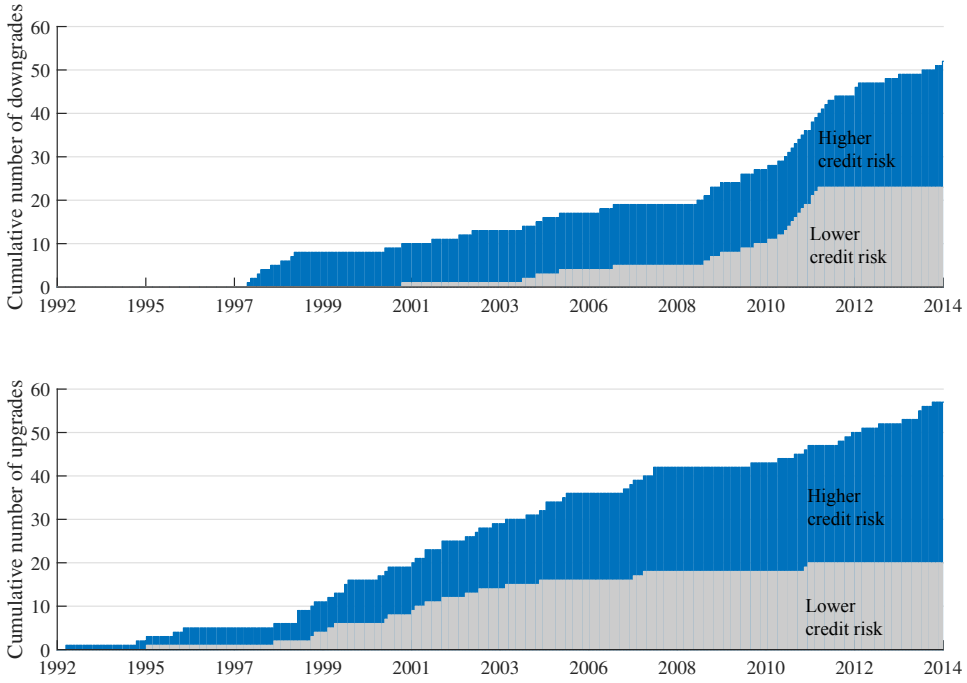

Figure 3: **Cumulative number of downgrades and upgrades for rated currencies.** The figure shows the cumulative number of downgrades (top plot) and upgrades (bottom plot) for the lower credit risk and higher credit risk group of currencies. The sample is from December 1992–December 2014.

is a preliminary evidence of currency depreciation ahead of the downgrade and no potential profit from going short the currency after the downgrade occured. The corresponding pre- and post-6 month returns for the lower credit risk currencies are 1% and 2%. Similarly, an investor is not awarded by buying a currency after an upgrade in country ratings.

The differences in responses are further illustrated in Figure 4. Top (bottom) plots of the Figure depict cumulative average excess returns for the lower and higher credit risk groups of currencies 24 months before and after the downgrade (upgrade). The dashed lines indicate 95% confidence band around average cumulative returns. The lower credit risk currencies are not affected neither by downgrades, nor by upgrades. The excess returns on higher credit risk currencies currencies drop during the six months before the downgrade, but remain flat in the months after the downgrade. Thus, there is some evidence that currency markets on average incorporate the information on the worsening credit conditions before the rating downgrade occurs. A potentially sluggish reaction of sovereign rating agencies to the worsening credit conditions does not allow a currency

investor to profit from shorting the currency right after the downgrade.

Similarly, currency returns appreciate during the months ahead of the upgrade but are on average flat in the months following the upgrade. Thus, betting on currency rise after the sovereign ratings upgrade is not bringing profits in the subsequent two years. Overall, it looks like sovereign

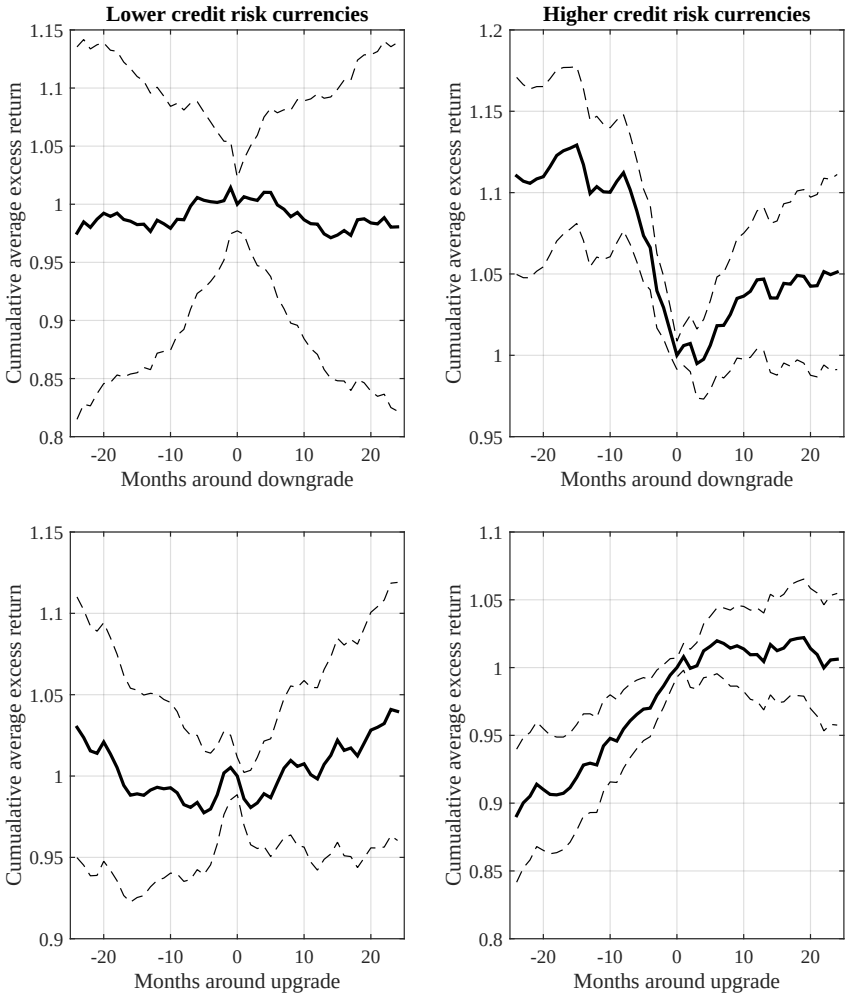

Figure 4: **Cumulative average excess returns around downgrades and upgrades.** The figure shows the cumulative average currency excess returns around downgrades (top plots) and upgrades (bottom plots) for the lower and higher credit risk group of currencies. Dashed lines indicate pointwise 95% confidence bands around average cumulative returns. I use average standard deviation of daily returns to compute the standard errors and divide them by the square root of rating changes within each credit group. Zero denotes the month of rating change. I cumulate average returns from zero on the left (right) until 24 months before (after) the rating change. The full sample period is 264 months, December 1992–December 2014.

ratings upgrade is rather a reaction to improving economic conditions than a trigger for high subsequent currency returns.

Figure 4 provided some evidence of currency depreciation (appreciation) ahead of sovereign ratings downgrades (upgrades) for the higher credit risk currencies. In the next exercise, I investigate whether the periods before and after sovereign rating changes drive the profitability of currency strategies.

		Carry Trade	Momentum	Value
All-rated	P1	-1.0	-0.4	-0.3
	P3	3.8	3.0	3.2
	P3-P1	4.8	3.4	3.5
		[3.4]	**[2.7]**	**[2.9]**
	SR	0.77	0.53	0.64
		[3.1]	**[2.7]**	**[2.8]**
Lower credit risk	P1	-1.0	0.2	-0.7
	P3	2.7	0.9	1.8
	P3-P1	3.7	0.8	2.6
		[2.4]	[0.5]	[1.9]
	SR	0.56	0.12	0.42
		[2.3]	[0.5]	[1.9]
Higher credit risk	P1	0.7	-0.1	2.1
	P3	5.5	4.3	5.2
	P3-P1	4.8	4.4	3.1
		[3.3]	**[2.5]**	**[2.0]**
	SR	0.68	0.51	0.42
		[3.0]	**[2.5]**	[1.9]

Table 6: **Profits from currency strategies over stable or improving credit periods.** This table shows the monthly (annualized) returns for the carry trade, momentum, and value strategies for the whole period excluding six month prior to six months after the downgrade. See caption to Table 2 for the details on how the portfolios for each strategy are constructed. The t-statistics for long minus short portfolios (P3-P1) and for Sharpe ratios (SR) are in brackets and are based on the standard errors, robust to conditional heteroscedasticity and serial correlation up to three lags as in Newey and West (1987). Bold t-statistics indicate significance at the 5% level. The full sample period is 264 months, December 1992–December 2014.

Table 6 repeats the analysis from *Panel A* in Table 2 but focuses on the periods of stable or improving sovereign credit conditions. Specifically, for each downgraded currency, I exclude observations from six months before to six months after a downgrade (accounts for 12% of total number of currency-months). The evidence in the Table 6 suggests that the returns on all currency strategies remain similar during the period of stable or improving credit conditions as they are

when considering the full sample period. Specifically, carry trade, momentum, and value deliver 4.8%, 3.4%, and 3.5% returns, very close to 4.6%, 3.4%, 3.3% in Table 2. The results for excluding the periods around rating upgrades are similar. Excluding the observations from one year before to one year after the downgrade also yields similar results.

To sum up, this section studied the effect of sovereign rating changes on currency strategies. Currencies of higher credit risk countries depreciate (appreciate) ahead of sovereign ratings downgrades (upgrades) and are close to zero after the rating change occured. The periods both before and after the sovereign rating changes are not important for the formation of profits on most popular currency strategies. The returns on carry trade, momentum and value remain similar when I exclude several months around the rating change from the sample.

5. Robustness checks

I do several robustness checks. First, I look at the performance of the strategies net of transaction costs. Figure 5 shows the time series of gross and net (adjusted for transaction costs) cumulative returns on the four currency strategies.

Carry trade and value exhibit very similar dynamics over time, both exhibit losses during the recent financial crisis in 2008. Momentum strategy returns went up in the end of 2008, the profits came from being short the looser currencies which kept on depreciating for a few months.

Table 7 breaks down the strategy profits by the credit groups. The performance of carry trade and value is similar, although value is statistically significant only at the 10% (1.9 t-stat) within the higher credit risk group. Momentum strategy requires frequent rebalancing, making momentum profits insignificant neither for the all-rated countries, nor within any of the credit ratings groups. It is worth noting that the size of currency transaction costs, as reported by *WM/Reuters*, is three to five times higher than the effective cost (see Mancini, Ranaldo, and Wrampelmeyer 2013), which large investment banks effectively pay for the currency transactions. Though unavailable for the large cross-section of currencies and over long time-period, a rough estimate of the momentum profits adjusted for the actual effective cost is 2.8%, statistically significant at 5% level. To sum up, even though transaction costs seemed to play a role in the profitability of currency strategies, their real impact is much more difficult to estimate. It might be the case that momentum profits are statistically insignificant also within a higher credit risk group, since the transaction costs are

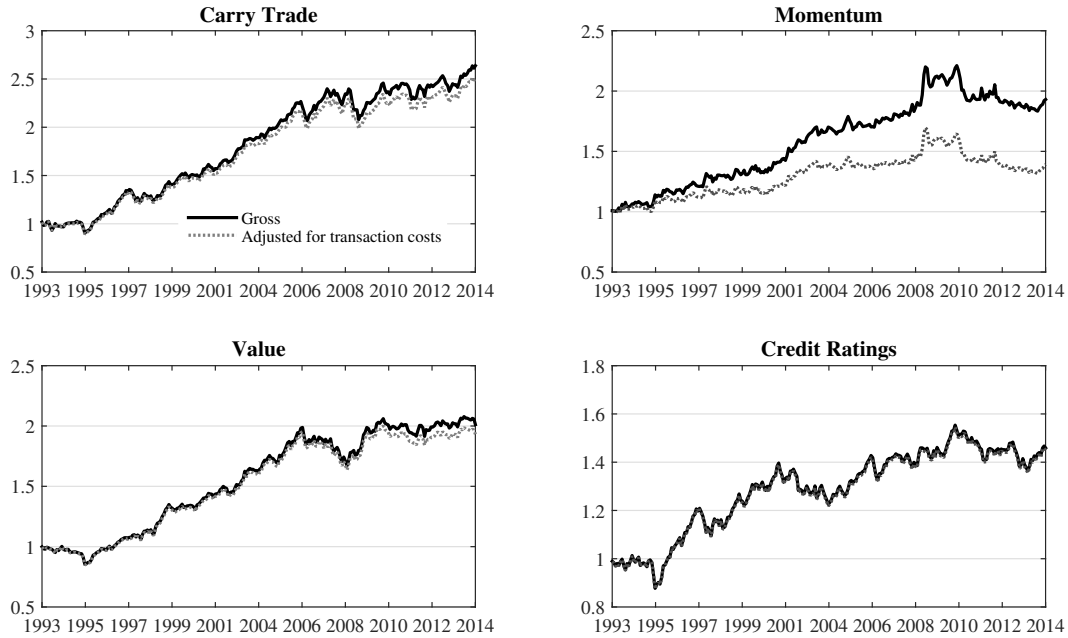

Figure 5: **Cumulative returns on the currency strategies.** The figure plots the cumulative gross and net (adjusted for the bid-ask spreads) returns on the four currency strategies. The full sample period is 264 months, December 1992–December 2014.

usually much larger for these, mostly, emerging currencies.

Second, I try alternative measures of sovereign risk to construct conditioning variable. One measure accommodates the S&P data on Rating Watches and Rating Outlooks into the ratings. The second measure takes average across sovereign ratings as provided by S&P, Moody's, and Fitch. The third measure proxies sovereign risk with the monthly country risk series provided by the International Country Risk Guide (ICRG) database from the Political Risk Services (PRS) group. Using any of these alternative measures produces very similar results to the ones reported in Table 2.

Third, I examine alternative approaches to form portfolios for each currency strategy. One approach constructs long-short portfolio from sorting currencies into five portfolios, instead of terciles (see Menkhoff, Sarno, Schmeling, and Schrimpf 2012a). Another approach weights currencies in proportion to their cross-sectional rank based on the signal minus the average rank of that signal (see Asness, Moskowitz, and Pedersen 2013). Any of the approaches yield similar results.

Fourth, I check whether the sovereign risk factor (portfolio long high credit risk currencies and

		Carry Trade	Momentum	Value
All-rated	P1	-1.4	0.2	-0.4
	P3	3.0	2.0	2.7
	P3-P1	4.4	1.7	3.1
		[3.0]	[1.3]	**[2.6]**
	SR	0.69	0.27	0.57
		[2.8]	[1.3]	**[2.5]**
Lower credit risk	P1	-1.1	0.4	-1.2
	P3	2.6	0.5	1.6
	P3-P1	3.6	0.1	2.8
		[2.4]	[0.1]	**[2.1]**
	SR	0.56	0.02	0.46
		[2.3]	[0.1]	**[2.1]**
Higher credit risk	P1	0.4	1.4	1.5
	P3	4.3	2.9	4.4
	P3-P1	4.0	1.5	3.0
		[2.7]	[0.8]	[1.9]
	SR	0.56	0.16	0.41
		[2.6]	[0.8]	[1.9]

Table 7: **Profits from currency strategies in rated countries, adjusted for transaction costs.** This table shows the monthly (annualized) returns for the carry trade, momentum, and value strategies. All the strategies are adjusted for transaction costs. See caption to Table 2 for the details on how the portfolios are constructed. The t-statistics for long minus short portfolios (P3-P1) and for Sharpe ratios (SR) are in brackets and are based on the standard errors, robust to conditional heteroscedasticity and serial correlation up to three lags as in Newey and West (1987). Bold t-statistics indicate significance at the 5% level. The full sample period is 264 months, December 1992–December 2014.

short low credit risk currencies) is priced in the cross-section of currency returns or carry trade portfolios (Lustig, Roussanov, and Verdelhan 2011). I find that this sovereign risk factor does not help to explain the cross-sectional differences in either FX returns or carry trade portfolios on top of the currency asset pricing factors already existing in the literature (*DOL* and *HML* factors).

Conclusion

In this paper, I study how the predictability of currency returns and strategies (carry trade, momentum, and value) varies by the sovereign credit rating of the country. I document that the profitability of currency momentum strategy is concentrated in the higher credit risk currencies. The momentum profitability disappears when I exclude currencies rated BBB or worse (15% of

the total number of currency-months) from the sample. Carry trade and value strategies remain profitable among various credit ratings groups.

I also study the effects of sovereign rating upgrades and downgrades on currency returns. I find some evidence that higher credit risk currencies tend to depreciate (appreciate) ahead of sovereign rating downgrade (upgrade). Currency returns are on average zero following the rating downgrade, not allowing the trader to profit from shorting the downgraded currency. The performance of carry trade, momentum, and value remains unchanged when I exclude the periods around the sovereign ratings downgrades. Overall, the periods of changing credit conditions as measured by sovereign ratings downgrades and upgrades do not play an important role in the overall performance of the three main currency investment styles.

References

Asness, C. S., T. J. Moskowitz, and L. H. Pedersen, 2013, "Value and momentum everywhere," *Journal of Finance*, 68, 929–985.

Avramov, D., T. Chordia, G. Jostova, and A. Philipov, 2012, "The world price of credit risk," *Review of Asset Pricing Studies*, 2, 112–152.

Avramov, D., T. Chordia, G. Jostova, and A. Philipov, 2013, "Anomalies and financial distress," *Journal of Financial Economics*, 108, 139–159.

Borri, N., and A. Verdelhan, 2012, "Sovereign risk premia," Working paper.

Cochrane, J. H., 2005, "Money as stock," *Journal of Monetary Economics*, 52, 501–528.

Della Corte, P., L. Sarno, M. Schmeling, and C. Wagner, 2015, "Sovereign risk and currency returns," Discussion paper, SSRN 2354935.

Engel, C., and K. D. West, 2005, "Exchange Rates and Fundamentals," *Journal of Political Economy*, 113, 485–517.

Fama, E. F., 1984, "Forward and spot exchange rates," *Journal of Monetary Economics*, 14, 319 – 338.

Hansen, L., and R. Hodrick, 1980, "Forward Exchange Rates as Optimal Predictors of Future Spot Rates: An Econometric Analysis," *Journal of Political Economy*, 88, 829–53.

Lustig, H., N. Roussanov, and A. Verdelhan, 2014, "Countercyclical currency risk premia," *Journal of Financial Economics*, 111, 527 – 553.

Lustig, H. N., N. Roussanov, and A. Verdelhan, 2011, "Common risk factors in currency markets," *Review of Financial Studies*, 24, 3731–3777.

Mancini, L., A. Ranaldo, and J. Wrampelmeyer, 2013, "Liquidity in the foreign exchange market: measurement, commonality, and risk premiums," *Journal of Finance*, 68, 1805–1841.

Menkhoff, L., L. Sarno, M. Schmeling, and A. Schrimpf, 2012a, "Carry trades and global foreign exchange volatility," *Journal of Finance*, 67, 681–718.

Menkhoff, L., L. Sarno, M. Schmeling, and A. Schrimpf, 2012b, "Currency momentum strategies," *Journal of Financial Economics*, 106, 660–684.

Menkhoff, L., L. Sarno, M. Schmeling, and A. Schrimpf, 2015, "Currency value," Discussion paper, SSRN 2492082.

Newey, W. K., and K. D. West, 1987, "A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix," *Econometrica*, 55, 703–708.