Do external imbalances matter in explaining the cross-section of currency excess returns? *

Pedro Barroso, Frickson Kho, Florent Rouxelin, and Li Yang†

Abstract

Della Corte et al.(2016) have recently proposed countries' external imbalances as a theoretically motivated variable that explains the cross-section of currency excess returns. Their investigations are conducted at the portfolio level. Yet, the small number of tradable currencies available to form portfolios raises concerns about inference. Using individual currencies as test assets, we find limited evidence to support the relevance of the external imbalance once controlling for financial variables. Considering the possibility that both external imbalances and financial variables can be imperfect proxies of fundamental sources of risk, we also examine the effect of loadings (betas) of these variables on the cross-section of currency excess returns. The results from cross-sectional regressions as well as double-sorted portfolios suggest that characteristics dominate betas.

Keywords: External imbalances, Financial variables, Cross-section of currency excess returns.

JEL Classification: F31; F37; G12; G15.

*We thank Steven Ho as a discussant at the 2017 China International Conference in Finance for his helpful comments. We also thank Pasquale Della Corte, Paul Karehnke, Robert Tumarkin, Stefanie Schraeder, Goncalo Faria, Nick Nguyen, David Hunter and participants at the 2016 Australasian Finance and Banking Conference, the 2016 UNSW Business School Research Fair, and of the seminars at Católica Porto Business School, University of Queensland, and Massey University.

†University of New South Wales, UNSW Business School, Sydney, NSW 2052, Australia

1 Introduction

Exchange rates play a central role in facilitating global economic interactions, and extensive literature has examined how they are affected by macroeconomic variables. Despite the sound economic intuition, empirical studies typically find that macroeconomic variables have limited success in predicting exchange rates (Meese and Rogoff (1983) and Rossi (2013)). On the other hand, financial variables such as carry, momentum and value are found to be able to explain the cross-section of excess returns in currencies and other asset classes including bonds and equities (Asness, Moskowitz, and Pedersen (2013) and Koijen, Moskowitz, Pedersen, and Vrugt (2015)).

Engel and West (2005) offer a potential explanation for the disconnection between exchange rates and economic fundamentals, showing that exchange rates move ahead of fundamentals. Since current asset returns are driven by expectations about the future economic condition, using macroeconomic fundamentals subject to low frequency and delayed releases captures limited timely informational content. Recently, the challenge of relating exchange rates to economic fundamentals received an important development by Della Corte, Riddiough, and Sarno (2016). The authors show that the spread in countries' external imbalances is a theoretically motivated variable that can explain the cross-section of currency excess returns. Using portfolios as test assets, Della Corte et al. (2016) examine the explanatory power of external imbalances controlling for carry, and find significant and economically meaningful results.

On the other hand, Ang, Liu, and Schwarz (2016), Ecker (2013) and Novy-Marx (2015) show that aggregating stocks into portfolios shrinks the cross-sectional dispersion of the betas, causing estimates of factor risk premia to be less efficient when portfolios are created. This effect appears to be most prominent when there is a small and time-varying number of assets in the cross-section (Kan (2004) and Ang et al. (2016)). This development is relevant to the existing literature on the external imbalance for two reasons. First, the literature has focused on portfolios as opposed to individual currencies as test assets. Second, there is a limited number of tradable currencies that varies over time, with differing periods during when a currency becomes an eligible asset to trade, fixed exchange rate regimes and the introduction of the Euro.

These recent developments give rise to concerns regarding the use of portfolios by Della Corte et al.(2016) and whether their findings are sensitive to the choice of test assets. Thus, our paper contributes to the literature in two unique ways. First, we address the shortcomings of the portfolio approach by using individual currencies as test assets, and examine whether external imbalance can still explain the cross-section of currency excess returns. Second, since there is a possibility that external imbalance can be an imperfect proxy of the fundamental source of risk, we also test the impact of loadings on the respective variables on the cross-section of currency excess returns.

Using individual currencies as test assets, we find that in isolation a one standard deviation decrease in a country's net foreign asset position or liabilities denominated in domestic currency as a proxy for the external imbalance predicts a monthly excess return of 7 or 8 basis points (0.84% and 0.96% annualized) at the 5% significance level. This finding is consistent with the economic intuition developed by Della Corte et al. (2016). Investors perceive countries that cannot issue debt in their own currency more risky, and will experience a larger loss in currency value during periods of uncertainty. Hence, low external imbalance countries must compensate investors for bearing additional risk.

However, once controlling for carry, we find that external imbalance becomes insignificant, while carry is significant at the 1% level. This result has three main implications. First, Della Corte et al.(2016) results are sensitive to the choice of test assets (individual currencies versus portfolios). Second, the simultaneous significance of carry and external imbalance found using portfolios as test assets in Della Corte et al.(2016) may be driven by the fact that these two variables are highly correlated, leading to the incorrect inference that both variables matter, which is similar to the finding by Novy-Marx (2015) with earnings and price momentum. Third, a closer examination reveals that financial variables, most prominently the carry, can forecast the external imbalance. This shows that whilst the external imbalance does not matter in explaining the cross-section of currency returns, it provides a partial economic justification for the premia of the carry. Economically, countries that are net creditors (low external imbalances) need to attract capital with relatively higher interest rates, and this contributes to a higher interest rate differential captured by the carry.

Considering the possibility that external imbalance can be an imperfect proxy for the fundamental source of risk, we also test loadings on the respective variables in explaining the cross-section of currency excess returns, and the results from both cross sectional regressions and double-sorted portfolios suggest that characteristics dominate betas. To the best of our knowledge, no study has examined currency excess return variation with respect to factor loadings (betas), and variation with respect to characteristics jointly. This examination allows us to comprehensively test the external imbalance variable proposed by Della Corte et al. (2016), and extend the characteristics versus betas debate of Daniel and Titman (1997), Chordia, Goyal, and Shanken (2015) and others in equities to the context of currencies.

The remainder of this paper is organized as follows. Section 2 reviews existing empirical exchange rate literature and establishes the key motivation for this study. Section 3 describes the data collection process, variable construction and the structure of the data. Section 4 outlines the empirical framework. Section 5 discusses the main results. Section 6 presents additional tests for robustness and Section 7 concludes.

2 Related literature and motivation

Three key developments in empirical exchange rate literature motivate our study. First, despite sound economic intuition, macroeconomic variables have had limited success in explaining currency excess returns (Rossi, 2013). However, using portfolios as test assets, Della Corte et al. (2016) build on research by Gourinchas and Rey (2007) and Della Corte, Sarno, and Sestieri (2012) to show that a macroeconomic variable of external imbalances can explain the cross-section of currency returns, and is robust when controlling for a financial variable, carry. Second, a concurrent body of research by Ang et al. (2016), Ecker (2013) and Novy-Marx (2015) is developing in equities and suggests that using portfolios as opposed to individual assets can reduce information by shrinking the dispersion of the betas, leading to larger standard errors. Ang et al. (2016) show that these effects are most prominent when there is a small and time-varying number of assets in the cross-section. Third, financial variables such as carry, momentum and value (CMV) have been shown to explain differences in the cross-section of currency excess returns that cannot be fully explained by common risk factors (Menkhoff, Sarno, Schmeling, and Schrimpf (2012), Berge, Jorda, and Taylor (2011), Barroso and Santa-Carla (2015)). Based on their proven significance, we control for CMV while examining the explanatory power of external imbalances in the cross-section of currency returns.

2.1 Macroeconomic variables

A common macroeconomic problem in empirical exchange rate literature is the "Meese and Rogoff Puzzle". Despite sound theoretical intuition behind economic fundamentals, macroeconomic variables have largely failed to outperform the naive random walk model (Meese and Rogoff (1983), Engel, Mark, and West (2008), Rogoff and Stavrakeva (2008)). Recent literature has thus turned to previously unexamined macroeconomic variables to better explain the cross-section of currency returns.

The challenge of relating exchange rates to macroeconomic fundamentals received an important development with the model of international financial adjustment by Gourinchas and Rey (2007). Their model explores the implication of a country's external constraint on net foreign assets, returns and exchange rates. Gourinchas and Rey (2007) and Gabaix and Maggiori (2015) show that deteriorations in external accounts imply future trade surpluses through a trade channel or excess returns on the net foreign portfolio through a valuation channel. These stabilizing valuation effects allow a country's external constraint to predict net export growth and net portfolio returns that can be used to forecast exchange rates in-sample and out-of-sample. While these effects have always been present, the significance has grown in recent years with the rapid growth in the scale of cross-border interactions (Lane and Milesi-Ferretti (2007)).

Using a mean-variance framework to measure economic value, Della Corte et al. (2012) extend the model of international financial adjustment to bilateral exchange rates. With a narrow basket of currencies, the authors find that exchange rates are predictable using bilateral external imbalances. The model outperforms the random walk benchmark and is robust to transaction costs and real time considerations. Additionally, Della Corte et al. (2012) argue that if a country runs persistent and negative external imbalances, its currency depreciates more in periods of uncertainty and hence should compensate investors with premium for bearing additional risk.

Della Corte et al.(2016) extend this finding to a broader currency sample by focusing on a global imbalance factor that explains the cross-sectional variation in currency excess returns. Two distinct variables are used to construct the global imbalance factor. One is the traditional measure of imbalances capturing a country's net foreign asset position (NFA). The other is the proportion of liabilities denominated in domestic currency (LDC). The LDC variable is motivated by Lane and Shambaugh (2010) who find countries with the relatively balanced NFA can still experience substantial currency movements due to low LDC (reliance on net creditors). Using portfolio balance models of exchange rate determination, Della Corte et al. (2016) show that sorting currencies on NFA and LDC generates a large spread in returns.

2.2 Individual currencies as test assets

Concurrent to the developing body of literature supporting the role of external imbalances in explaining the cross-section of currency excess returns, new evidence in the equity market shows that tests performed using portfolios as test assets are not necessarily equivalent to tests with individual currencies. Ang et al. (2016) show that this effect is particularly prominent when there is a limited and time-varying number of assets in the cross-section. This development is highly relevant to the existing literature on external imbalances explaining the cross-section of currency returns for two reasons. First, the literature has focused on portfolios as opposed to individual currencies as test assets. Second, there is a limited number of tradable currencies that varies over time with fixed exchange rate regimes, the introduction of the Euro, and differing periods during when a currency becomes an eligible asset to trade.

The literature on empirical asset pricing has taken two different approaches in specifying the universe of base assets in cross-sectional factor tests. First, researchers have followed Black, Jensen, and Scholes (1972) and Fama and MacBeth (1973) to group stocks into portfolios and run cross-sectional regressions using portfolios as test assets. On the other hand, Litzenberger and Ramaswamy (1979), Lewellen (2015) and Novy-Marx (2015) among others estimate cross-sectional risk premia using the entire universe of stocks and treating individual stocks as test assets.

Blume (1970) argues that the original motivation for using portfolios is to reduce idiosyncratic volatility, allowing for more efficient estimates of factor loadings. Since betas are the explanatory variables in cross-sectional regressions, the more precise the estimates of factor loadings for portfolios, the more precise the estimates of factor risk premia. Recently however, new evidence has shown that the more precise estimates of factor loadings do not necessarily translate into more efficient estimates of factor risk premia (Ang et al. (2016) and Ecker (2013)). Rather, Ang, et al. (2016) empirically demonstrate that the more disperse the cross section of the betas, the more information the cross section contains to estimate risk premia. By aggregating stocks into portfolios, the cross-sectional dispersion of the betas shrinks causing estimates of factor risk premia to be less efficient. Furthermore, Ang, et al. (2016) build on the work of Kan (2004) to show that efficiency losses are larger when there is a limited and time-varying number of assets in the cross-section. Novy-Marx (2015) also shows that using portfolios can reduce individual variation and lead to the illusion of a relevant characteristic when in fact it is not. This effect is shown to be particularly susceptible in portfolios when the characteristics under examination are correlated with one another. Hence, in contrast to Della Corte et al. (2016) who use portfolios, recent developments motivate an examination to estimate cross-sectional risk premia using individual currencies as test assets. Lewellen (2015) finds that Fama-Macbeth regressions provide an effective way to combine many individual characteristics into a composite estimate of expected returns.

2.3 Financial variables

Whilst evidence on economic fundamentals and the choice of test assets is still developing, there is strong empirical evidence supporting financial variables such as carry, momentum, and value reversal as predictors of currency excess returns. Unlike macroeconomic variables that are released at a lower frequency and are subject to revision, financial variables convey real time information regarding present and future expectations. Berge et al. (2011), Burnside et al. (2011) and Menkhoff et al. (2012) have shown that trading strategies formed based on carry, momentum, and value reversal predict returns unexplained by traditional risk factors such as business cycle risk (Brunnermeier et al. (2009)), liquidity risk (Brunnermeier et al. (2009)) and foreign exchange volatility risk (Menhkoff et al. 2012).

The carry trade is a popular trading strategy that borrows in currencies with low interest rates and invests in currencies with high interest rates. According to uncovered interest parity, if investors are risk neutral and form their expectations rationally, exchange rate changes should eliminate any gain arising from the differential in interest rates across countries. However, Lothian and Wu (2011) find that the theoretically perfectly depreciating relationship of exchange rates and interest rates, stipulated by uncovered interest rate parity, does not hold well under the empirical microscope. Burnside et al. (2011), Lustig et al. (2011), and Menkhoff et al. (2011) all find that high interest rate currencies tend to appreciate, while low interest rate currencies tend to depreciate. This interest rate differential gives rise to the profitability of the carry trade, which still persists in the foreign exchange market today.

Momentum strategies in currencies are derived from short term persistence in the currency performance. In the cross-section Okunev and White (2003) analyze a universe of eight currencies over 20 years. At the end of each month, the investor goes long of the currency with the best prior month's performance and shorts the currency with the worst prior month's performance. They find that this strategy can predict excess returns independent of the base currency. Menkhoff et al. (2012) also find a spread exceeding 10% between winning currencies (positive persistence) and losing currencies (negative persistence).

Value reversal strategies position towards long-term value reversion in currency markets. Froot and Ramadorai (2005) decompose currency returns into (permanent) intrinsic-value shocks and (transitory) expected-return shocks. Parallel to the research of Bondt and Thaler (1985) in equities, Froot and Ramadorai (2005) provide evidence for the overreaction hypothesis. They show that currency market shocks exhibit value reversal by driving an underreaction in the short term and an overreaction in the longer term currency excess returns. The developments in this field have resulted in carry, momentum and value reversal (CMV) being widely used as profitable foreign currency trading strategies. As the success of these strategies cannot be explained through standard risk factors (Berge et al. (2011), Burnside et al. (2011), and Menkhoff et al. (2012)), we control for CMV when examining external imbalances in explaining the cross-section of currency excess returns.

3 Data

This section describes the main data used in our analysis and the additional data for the extended foreign currency sample and robustness tests.

3.1 Main sample

The main sample consists of the 32 member countries within the Organization for Economic Cooperation and Development (OECD) and the Euro zone [1]. The data consists of exchange rate, short-term interest rate, inflation and external imbalances measured by net foreign assets or liabilities denominated in domestic currency. Some studies in recent literature use broader samples of countries, including emerging economies (Burnside et al. (2011) and Lustig et al. (2011)). However, to avoid issues with selection bias and discrepancies on when a currency becomes an eligible asset to trade and forecast, we follow Barroso and Santa-Carla (2015) and narrow our focus to the OECD countries [2].

Closing mid-spot and mid-forward exchange rates are sourced from Thomson Reuters Datastream from August 31, 1973 to August 31, 2015 [3]. The month of August, 1973 is chosen as the starting point to avoid periods of fixed exchange rate regimes. The standard date conventions are used when matching the forward rate with the appropriate spot rate (Bekaert and Hodrick (1993)). Quotations are in the form of U.S. dollar closing mid-price per foreign currency unit (FCU). To allow analysis to be independent of direct and indirect quotations, we take the natural logarithm of all exchange rates (Fama, 1984). The global shift in base currency from Great British Pounds (GBP) to United States Dollars (USD) requires transformations to be made to combine series with different base currencies to compile a more comprehensive and complete dataset.

Despite the availability of daily exchange rate data, the frequency in disclosure of macroeconomic external imbalances requires sampling end of month spot and forward exchange rates to construct monthly observations. The final sample period consists of 483 months starting from August, 1973 to December, 2012 for each currency. During the early part of the sample, a large portion of the currencies are omitted due to data availability issues and fixed exchange rate regimes. The number of currencies under examination will also vary as some currencies are subsumed by the Eurozone, whilst others experience political instability (e.g. Turkey and Malaysia), rendering it unsuitable for the purpose of analysis and hence is omitted from the sample [4]. Monthly short-term interest rate and CPI data is acquired from the OECD's Key Economic Indicators Database and available for the sample of 33

[1] Countries include Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States.

[2] We also consider a broader currency panel of Burnside et. al (2011) in section 6.2 to test for Robustness.

[3] This is an indication of the furthest date range available for the set of currencies and exchange rates.

[4] Turkey for the period around the 2001 devaluation, and Malaysia for the 1998-2005 period of capital controls. Specifically, we exclude a period from November 2000 to November 2001 for Turkey and a period from May 1998 to June 2005 for Malaysia.

countries with varying degrees of coverage over time. The data availability increases until January 2000 and January 1996, respectively, where data is available for the entire sample of countries. Monthly CPI data is indexed to 100 in 2010.

Annual data on net foreign assets and liabilities (NFA) is sourced from the updated and extended version of the dataset constructed by Lane and Milesi-Ferretti (2007) and updated by Lane and Milesi-Ferretti (2012) [5]. This comprehensive dataset compiles information from governmental data sources such as the International Monetary Fund's Balance of Payments Statistics (BOPS), International Financial Statistics (IFS), the World Bank's World Debt Tables, Global Development Finance (GDF), the OECD statistics on external indebtedness and the Bank for International Settlements' data on banks' assets and liabilities. Foreign (or external) assets are measured as the dollar value of assets that a country owns abroad, while foreign (or external) liabilities refer to the dollar value of domestic assets owned by foreigners. For each country, the net foreign asset position (NFA) captures the indebtedness of a country to foreigners relative to the size of the economy (GDP) [6].

Annual data on the proportion of external liabilities denominated in domestic currency (LDC) at the annual frequency is obtained from Benetrix, Lane, and Shambaugh (2015) who updated the data from Lane and Shambaugh (2010)[7]. Since there are considerable gaps in data for some countries, the construction of currency composition weights is not entirely mechanical. Lane and Shambaugh (2010) rely on recent advances in the modeling of the geographical distribution of international financial portfolios to generate predictions for asset holdings that allow missing observations to be filled in (Lane and Milesi-Ferretti (2008)).

The data for all countries included in this study is obtained until the end of 2012 and correspond to the period of examination used by Della Corte et al. (2016). These data are the most suitable dataset for the purpose of this study and cover a large sample of countries over a long span of time [8]. Furthermore, the Lane and Milesi-Ferretti (2007) and Lane and Shambaugh (2010) dataset is a widely used source of external imbalance positions in empirical exchange rate literature (Gourinchas and Rey (2007), Della Corte et al.(2012), and Della Corte et al.(2016)). Like Della Corte et al. (2016), we follow the standard procedure and construct monthly observations by keeping end of period data for NFA and LDC constant

[5]The full NFA dataset including information regarding variable construction and sources can be found at $http://www.philiplane.org/EWN.html$.

[6]The NFA data is constructed as the sum of net foreign equity, net foreign debt, net foreign direct investment and foreign exchange reserves, that is, NFA = [Equity Assets$_t$ - Equity Liabilities$_t$] + [Debt Assets$_t$ - Debt Liabilities$_t$] + [FDI Assets$_t$ - FDI Liabilities$_t$] + FX$_t$.

[7]The full LDC dataset including variable construction and data sources can be found at $http://www.philiplane.org/BLSJIE2015data.htm$.

[8]Accurately measuring the share of external liabilities in foreign currency is a hard task, especially due to difficulties in gathering data on derivatives that require inference procedures and modeling of the geographical distribution of international financial portfolios (Della Corte et al. (2016)).

until a new observation becomes available.

The limited data availability for spot and forward exchange rates and external imbalances towards the beginning of the sample presents a potential degrees of freedom problem for cross-sectional analysis. To address this problem, we set a minimum of 10 countries in each cross-sectional regression. To qualify for analysis in the regression, the number of currencies in the cross-section at any point in time must exceed this threshold.

3.2 Additional sample

To test the robustness of our findings in an extended currency panel, monthly spot exchange rates, forward rates, NFA and LDC are acquired for an additional 16 countries [9]. This brings the total panel of countries to 48 and is reflective of the sample employed by Menkhoff et al.(2012). Collection of the extended sample data follows the same process as the main dataset outlined above [10]. Additional countries include Brazil, Bulgaria, Croatia, Cyprus, Egypt, Hong Kong, India, Indonesia, Kuwait, Malaysia, Philippines, Russia, Saudi Arabia, Taiwan, Thailand and Ukraine.

Della Corte et al. (2016) filter the data for the extended foreign currency sample based on two criteria. First, episodes where CIP deviations are large (generally in excess of 25 percent) and likely not tradable. Second, periods characterized by extreme illiquidity and lack of tradability, of which prices are uninformative. We follow an identical approach and filter the data from the extended sample as follows: Egypt from November 2011 to August 2013; Indonesia from December 1997 to July 1998, and from February 2001 to May 2005; Malaysia from May 1998 to June 2005; Russia from December 2008 to January 2009.

3.3 Dependent variable construction

Currency Excess Return ($RX_{j,t+h}$) is defined as the return of a U.S. based investor who borrows at the U.S. interest rate, $i_{us,t}$, at the end-of-month t and uses the funds to invest in a foreign currency j over a period of h months at the foreign interest rate, $i_{j,t}$:

$$RX_{j,t+h} = i_{j,t} - i_{us,t} + \Delta S_{j,t+h}, \tag{1}$$

[9] The following countries do not have LDC data for the analysis period: Bulgaria, Cyprus, Kuwait, Saudi Arabia, and Taiwan. This is due to difficulties in forecasting derivative positions, data reliability and availability (Lane and Shambaugh (2010)).

[10] When forward data is not available for the additional currencies, we take the rates from the Non-Deliverable Forward (NDF) market. These contracts are commonly used by multinational corporations and traders for hedging in circumstances where emerging markets have capital restrictions for foreigners. Doukas and Zhang (2013) observe that covered interest rate differential between onshore and offshore interest rate differentials of 3.5% for NDF. However, they find that NDF and deliverable forwards share common risk factors and is hence appropriate for the purposes of this study where no forward data is available.

where $\Delta S_{i,t+h}$ is the change in the natural logarithm of the nominal exchange rate between currency j and the U.S. dollar over the h-month period, that is, $\Delta S_{j,t+h} = S_{j,t+h} - S_{j,t}$, where $S_{j,t+h}$ represents the natural logarithm of the nominal exchange rate at the end-of-month $t+h$ and $S_{j,t}$ is the the natural logarithm of the nominal exchange rate at the end-of-month t between foreign currency j and the U.S dollar. Exchange rates are expressed as the U.S. dollar closing mid-price per foreign currency. So, currency appreciation implies an increase in value of currency j represented in U.S. dollars over the last h months.

When covered interest rate parity holds, i.e., $i_{j,t} - i_{us,t} = S_{j,t} - F_{j,t}^{t+h}$, where $F_{i,t}^{t+h}$ is the natural logarithm of forward exchange rate between currency j and the U.S. dollar agreed at time t for delivery at time $t+h$, equation (1) becomes

$$\begin{aligned} RX_{j,t+h} &= S_{j,t} - F_{j,t}^{t+h} + \Delta S_{j,t+h} \\ &= S_{j,t+h} - F_{j,t}^{t+h}. \end{aligned} \tag{2}$$

This represents the payoff of the U.S. based investor who takes a long position in a forward contract on the foreign currency over the period of h months.

3.4 Independent variable construction

The independent variables are constructed and tested for statistical and economic significance when explaining movements in the cross-section of currency excess returns. Each variable we utilize is standardized in the cross-section. This standardization is conducted using the mean and standard deviation across all foreign currencies which have complete and available data for all variables at month t. Standardization is in the form:

$$x_{j,t} = (X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}},$$

where $x_{j,t}$ is the standardized variable, $X_{j,t}$ is the variable before standardization and $\mu_{X_{j,t}}$ and $\sigma_{X_{j,t}}$ represent the cross-sectional mean and standard deviation, respectively, at month t. This standardization process measures each variable of interest in standard deviations above or below the cross-sectional average. When dealing with exchange rate data, this process creates a zero mean in the cross-section and is neutral to the base currency.

1. **Carry Trade Variable ($Carry_{i,t}$)**: The carry trade has long been a profitable foreign currency strategy. In its simplest form, investors long high interest rate currencies and short low interest rate currencies. The profitability of this strategy is driven by the uncovered interest rate parity puzzle where theoretical parity conditions do not hold well empirically. We use the interest rate differentials between a foreign country j and

the U.S. as a financial variable that reflects the signal of constructing the carry trade strategy,

$$Carry_{j,t} = i_{j,t} - i_{us,t}.$$

This strategy can also be constructed using the forward discount rate under the condition that covered interest rate parity holds. Research such as Taylor (1987) and Akram, Rime and Sarno (2008) have confirmed that the covered interest rate parity conditions hold with empirical evidence. The monthly forward discount rate is defined as $FD_{j,t} = S_{j,t} - F_{j,t}^{t+1}$ [11]. Hence, monthly $Carry_{j,t} = i_{j,t} - i_{us,t} = FD_{j,t}$. Through the standardization, it becomes

$$Carry_{j,t} = (FD_{j,t} - \mu_{FD_{j,t}})/\sigma_{FD_{j,t}}.$$

This intuitively keeps the definition of the carry trade strategy consistent. A long position in a high interest rate country relative to the cross-sectional average is expected to drive positive excess return compared to low interest countries when employing a carry strategy.

2. **Momentum Variable ($Mom_{j,t}$):** The momentum variable in essence is a proxy for the persistence of short-term trends in the market. This is driven by evidence that long positions in assets with recent high returns and short positions in assets with recent low returns is a profitable strategy in both equity and foreign exchange markets. We construct $Mom_{j,t}$ using the change in the natural logarithm of the spot exchange rates of each currency over the last k months:

$$\Delta S_{j,t} = S_{j,t} - S_{j,t-k},$$

where $S_{j,t-k}$ is the natural logarithm in the spot exchange rate at month $t-k$. Standardized in the cross-section:

$$Mom_{j,t} = (\Delta S_{j,t} - \mu_{\Delta S_{j,t}})/\sigma_{\Delta S_{j,t}}.$$

The literature has shown that three- and twelve- month changes in spot exchange rates are successful proxies for momentum (Menkhoff et al. (2012), Asness et al. (2013) and Barosso and Santa Clara (2015)). We use the 3-month changes to generate the main

[11] Note that in literature the monthly forward discount rate is typically expressed in the form $FD_{j,t} = F_{j,t}^{t+1} - S_{j,t}$.

results. For completeness, we also examine the 12-month changes.

3. **Value Variable (Value$_{i,t}$)**: Value is used to proxy for an observed long-term value reversion in currencies. This variable captures whether the spot exchange rate corrects for disequilibrium in the market. It is constructed using the change in **real** exchange rates over the last five year period.

$$\begin{aligned}\Delta q_{j,t} &= -(q_{j,t-12} - q_{j,t-60}) \\ &= -[(p_{us,t-12} - p_{j,t-12} - S_{j,t-12}) - (p_{us,t-60} - p_{j,t-60} - S_{j,t-60})],\end{aligned}$$

where $q_{j,t-60}$ and $q_{j,t-12}$ are the real exchange rates from 60 and 12 months prior to month t, respectively. The twelve-months is the chosen starting point for value to avoid an overlap with the momentum variable when k is set to be 12 months. The real exchange rate is defined as $q_{j,t} = p_{us,t} - p_{j,t} - S_{j,t}$ where $p_{us,t}$ is the CPI for the United States at month t, $p_{j,t}$ is the CPI for currency j at month t. Standardized in the cross-section:

$$Value_{j,t} = (\Delta q_{j,t} - \mu_{\Delta q_{j,t}})/\sigma_{\Delta q_{j,t}}.$$

The negative change in real exchange rates is used for interpretation purposes. By this definition, high changes in real exchange rates correspond to a stronger U.S. dollar relative to currency j. Therefore, in instances where there is a long-term negative change in real exchange rates one would expect to see a positive coefficient for excess returns and currency appreciation.

4. **Net Foreign Assets (NFA$_{j,t}$)**. Della Corte et al. (2016) propose a definition in the context of predictive informational content. The authors define NFA as the total net external position of a country measured as the sum of net debt position, net equity position, net FDI position and FX reserves relative to the size of economy proxied by gross domestic product (GDP). Economically, NFA captures the indebtedness of a country to foreigners accounting for size effects. GDP follows the economic definition as the total value of goods and services produced by a country in each year. Using the updated and extended version of the dataset constructed by Lane and Milesi-Ferretti (2007), NFA is given as

$$\begin{aligned}\text{NFA}_{j,t} &= [(EquityA_{j,t} - EquityL_{j,t}) + (DebtA_{j,t} - DebtL_{j,t})]/\text{GDP}_{j,t} \\ &+ [(\text{FDIA}_{j,t} - \text{FDIL}_{j,t}) + FXReserves_{j,t}]/\text{GDP}_{j,t}.\end{aligned}$$

This variable is then standardized in the cross-section: $(\mathrm{NFA}_{j,t} - \mu_{\mathrm{NFA}_{j,t}})/\sigma_{\mathrm{NFA}_{j,t}}$.

5. **Net Foreign Asset Ratio ($\mathbf{NFAR}_{j,t}$)** To capture a country's net foreign asset position relative to the global imbalances, we introduce an additional measure with a different economic meaning, denoted by $\mathrm{NFAR}_{j,t}$. To construct this variable, we use a country's $\mathrm{NFA}_{j,t}$ position outlined above and divide by the sum of the absolute value of $\mathrm{NFA}_{j,t}$ of all the countries in the sample at month t.

$$\mathrm{NFAR}_{j,t} = \frac{\mathrm{NFA}_{j,t}}{\sum_{j=1}^{n} |\mathrm{NFA}_{j,t}|}.$$

   This variable is then standardized in the cross-section: $(\mathrm{NFAR}_{j,t} - \mu_{\mathrm{NFAR}_{j,t}})/\sigma_{\mathrm{NFAR}_{j,t}}$. Economically, $\mathrm{NFAR}_{j,t}$ has a different meaning from $\mathrm{NFA}_{j,t}$ measure used by Della Corte et al. (2016). Whilst $\mathrm{NFA}_{j,t}$ captures a country's net foreign asset position relative to the size of its economy, $\mathrm{NFAR}_{j,t}$ considers a country's net foreign asset position relative to global imbalances. For a robustness check, we consider both measures.

6. **Proportion of liabilities denominated in domestic currency ($\mathbf{LDC}_{j,t}$)**. In addition to $\mathrm{NFA}_{j,t}$ and $\mathrm{NFAR}_{j,t}$, Lane and Shambaugh (2010) find that for developed countries with a relatively balanced $\mathrm{NFA}_{j,t}$, large gross international positions mean that the country may still experience substantial currency movements due to a low proportion of foreign liabilities denominated in domestic currency $\mathrm{NFA}_{j,t}$. As a result, they account for the currency composition of countries by breaking up liabilities denominated in domestic and foreign currencies to more accurately capture the aggregate currency exposures for net foreign asset positions. In our analysis, we use the updated and extended version of $\mathrm{LDC}_{j,t}$ dataset from Benetrix, Lane, and Shambaugh (2015). This variable is then standardized in the cross-section: $(\mathrm{LDC}_{j,t} - \mu_{\mathrm{LDC}_{j,t}})/\sigma_{\mathrm{LDC}_{j,t}}$.

3.5 Descriptive statistics

Table 1 reports the mean and standard deviation of monthly currency excess returns (RX1), carry, 3-month momentum, value, LDC, NFA and NFAR on a country level prior to standardization over the sample period. On average, the sample of all OECD countries exhibits positive monthly currency excess returns of 0.067% with a standard deviation of 3.241. The mean of carry, momentum and value variables across OECD countries is also positive. The average of LDC across all OECD countries is 69.4% and the average of NFA is 0.005, indicating a relatively balanced sample between creditors and debtors.

An examination of the outliers shows that Turkey has a positive monthly excess return of 0.85% compared to the sample average of 0.067%. The problems behind Turkey are clear when focusing on attention to the carry variable. In contrast to the sample average of 0.037, Turkey's carry reaches 2.872. A closer examination reveals that during the 2001 Turkish economic crisis, interest rates increased to levels up to 3,000% leading to a failure in the covered interest rate parity condition. As a result, we follow Lustig, Roussanov and Verdelhan (2011) and remove Turkey from the sample from November 2000 to November 2001. While countries such as Greece and Portugal also demonstrate large currency excess returns of -0.394% and -0.437%, respectively, we find no problem with data and thus include them in the sample.

[Insert Table 1 here]

4 Empirical Framework

Lewellen (2015) find that Fama-Macbeth (1973) cross-sectional regression approach provides an effective way to combine many individual stock characteristics into a composite estimate of expected returns. This approach is the standard method used in asset pricing and mitigates idiosyncratic drivers of currency pairs, providing a clearer representation of the drivers of currency excess return. Furthermore, it includes quantification of both economic and statistical value of the predictors, is less sensitive to time-varying volatility and exhibits greater robustness in comparison to time-series models (Mark and Sul (2001), Groen (2005) and Cerra and Saxena (2010)). In this paper, we follow Fama and Macbeth's (1973) approach. We run cross-sectional regressions and calculate the average and standard deviation of each set of coefficients over time and then test their significances using Fama-Macbeth's (1973) t-statistics. In its generalized form, each cross-sectional regression is given as follows:

$$RX_{j,t+1} = \alpha_t + \sum_{l=1}^{k} \gamma_{l,t} x_{l,j,t} + \epsilon_{j,t+1},$$

where α_t and $\epsilon_{j,t+1}$ represent the intercept and residuals at months t and t+1, respectively. $\gamma_{l,t}$ represents the coefficient of the l^{th} independent variable $x_{l,t,j}$ at month t including financial and macroeconomic variables discussed above.

Running the regression cross sectionally at each month t for T months generates a matrix of the order $T \times l$ of γ estimates, $\widehat{\gamma}_{l,t}$. We then take the average $\widehat{\gamma}_{l,t}$ and the standard deviation $s(\widehat{\gamma}_{l,t})$ over T months. The t-statistics is given as:

$$t(\bar{\widehat{\gamma}}_l) = \sqrt{T}\widehat{\gamma}_{l,t}/s(\widehat{\gamma}_{l,t}).$$

$\bar{\widehat{\gamma}}_l$ is important in determining the role of each of these variables in explaining the cross-section of currency excess returns. By construction, $\bar{\hat{\gamma}}_l$ represents the return of a long-short portfolio of currencies with a weight assigned to each currency, which equals to $x_{l,j,t}$ at each month t. This can be interpreted as a factor return (or the return of a characteristic-sorted portfolio). From this, inferences on the relative contribution of each variable to future currency excess returns can be made. The variable predicts positive currency excess returns at a horizon of one month when $\bar{\hat{\gamma}}_l$ is positive. This means that a long position in currency j, where country j has higher than the cross-sectional average of x_l, would obtain positive currency excess returns on average. A long position in currency j, where country j has lower relative to the cross-sectional average of x_l, would obtain negative monthly excess currency returns on average. In other words, it would be profitable for longing currencies with higher ranking of x_l while shorting currencies with lower ranking of x_l relative to the cross-section average of x_l.

5 Results and Discussion

This section presents the main empirical findings. Using individual currencies as test assets, we examine whether external imbalances can explain the cross-section of currency excess returns. The results are presented in the following subsections. In isolation, subsection 5.1 examines the financial variables and subsection 5.2 examines external imbalances (NFA, NFAR, and LDC) to establish individual significance. Subsection 5.3 shows the results of external imbalances controlling for financial variables. Subsection 5.4 tests the loadings on the respective variables as predictors of currency excess returns.

5.1 Financial variables

The financial variables under examination are proven to be successful signals in constructing profitable currency portfolios for investors. Our first test examines carry, momentum and value variables in various specifications for explaining the cross-section of currency excess returns. Empirically, the expectation is that each financial variable is positively significant in explaining currency excess returns. Instead of constructing portfolios, we use individual currencies as test assets and the Fama-Macbeth (1973) procedure to examine the statistical significance of these variables.

[Insert Table 2 here]

Table 2 summarizes the results for the financial variables being predictors of currency excess returns. Column (1) shows a positive and statistically significant coefficient for carry at the 1% level. A positive coefficient for carry implies that taking a long position in currencies with higher interest rates relative to the cross-sectional average predicts positive returns in the following period. Our results are consistent with the finding in the literature. As the variable is standardized in the cross-section, a one standard deviation increase in the carry predicts a monthly excess return of 25 basis points (3% annualized).

Column (2) presents the results for momentum, of which coefficient is positive and significant at the 5% level. For every one standard deviation increase in momentum, monthly excess returns increase by 16 basis points (1.92% annualized). This demonstrates that long positions in currencies with greater momentum characteristics than the cross-sectional average predict positive currency excess returns. For value, a positive and statistically significant coefficient at the 1% level is also observed. Column (3) shows that by following value reversal expectations of currencies that are higher than the cross-sectional average, positive currency excess returns are expected. It follows that a one standard deviation increase in value is associated with a monthly excess return of 13 basis points (1.56% annualized). Momentum and value are amongst the most studied capital market phenomena and our results are consistent with the broader literature (Okunev and White (2003), Menkhoff et al. (2012) and Barosso and Santa-Clara (2015)).

Columns (4), (5) and (6) demonstrate the predictive power of combining two of the financial variables. The combination of carry and momentum in Column (4) demonstrates higher levels of predictive power in the cross section of currency excess returns, with both variables significant at the 1% level. The combination of carry and value in Column (5) shows a similar increase in the predictive power. This indicates that combining financial variables has an enhancing informational effect that captures different components of currency excess returns. In Column 6, when momentum and value are combined, the magnitude and significance of both variables decrease marginally, indicating a potential interaction between these two variables. In each financial variable pair, the magnitude and economic significance of each coefficient remains similar to the individual counterparts.

Column (7) shows the improvement in predictive power when carry, momentum and value (CMV) are regressed together in the cross-section of currency excess returns. Economically, the results of regressions (4) to (7) demonstrate that on average the interest rate component is captured by carry, short-term fluctuations in the spot rate may be reflected through momentum, and mean reversion in trends may be captured by the value variable. Thus, all three variables are shown to hold economic and statistical significance in predicting currency excess returns, in isolation and in various combinations. This is consistent with Jorda and Taylor (2009) who identify carry, momentum and value as jointly important signals with augmented informational effects.

5.2 Macroeconomic variables

This section presents the results for NFA and LDC, and a relative measure of net foreign assets, NFAR. Each variable is standardized in the cross-section and examined on a stand alone basis. Using Lane and Milesi-Ferretti's dataset, Gourinchas and Rey (2007) show that deteriorations in external accounts imply future trade surpluses through trade channel or excess returns on the net foreign portfolio through valuation channel. These stabilizing valuation effects allow a country's external constraint to predict net export growth and net portfolio returns, which can be used to forecast exchange rates in sample and out of sample. Della Corte et al. (2016) build on this finding using an updated and extended version of Lane and Milesi-Ferretti's dataset. They show that a global imbalance risk factor explains the cross-sectional variation in currency excess returns. This mechanism is consistent with the exchange rate determination theory developed by Gabaix and Maggiori (2015) on capital flows in imperfect financial markets.

Lane and Shambaugh (2010) also find that despite having a relatively balanced NFA, countries with large gross international positions can still experience substantial currency movements. Hence, the proportion of foreign liabilities denominated in domestic currency (LDC) is another measure of external imbalances that captures the effects of trade and valuation flows on currency movements. Lane and Shambaugh (2010) establish that countries with a lower LDC would expect to yield higher currency excess returns, since they are relatively more reliant and exposed to international volatility. As a result, these countries must offer additional compensation to investors for holding their currencies. The two measures of external imbalances (NFA and LDC) thus provide insight on the implications of fiscal policy and the relation between a country's composition of and tendency to issue external liabilities, and the subsequent impact on the cross-section of currency excess returns.

[Insert Table 3 here]

Table 3 shows the results for NFA. Column (1) shows that NFA has a negative and statistically significant coefficient at the 5% level. Because the variable is standardized in the cross-section, this means that a one standard deviation decrease in NFA explains a monthly excess return of 7 basis points (0.84% annualized). Consistent with the theoretical prediction developed by Della Corte et al. (2016), this result shows that taking a long position in currencies with lower NFA relative to the cross-sectional average will predict positive currency excess returns. Economically, this finding implies that net debtor countries must offer a currency risk premia to compensate investors for financing negative external imbalances, as their currencies depreciate relatively more during periods of instability. Furthermore, the effects should be particularly prominent for highly integrated countries (such as the OECD sample) where foreign exchange markets have been shown to react promptly to the release of new macroeconomic fundamentals (Andersen, Bollerslev, Diebold, and Vega (2003)). Due to difficulties in obtaining contemporaneous NFA data and the challenge associated with the staggered release of macroeconomic variables, the significantly predictive power of the 12-month lag of NFA given in Column (2) may suggest that NFA is persistent and has a long-term effect on exchange rate determination. In Columns (3)-(5) we regress the 12-month change in NFA against currency excess returns. No significant result for the change in NFA both in isolation and when combined with NFA and lagged NFA is found.

[Insert Table 4 here]

Whilst NFA captures the relative size of a country's imbalance to the size of its economy, we examine an alternate measure for NFA with an economically different meaning. The NFA ratio (NFAR) measures the imbalances of a country relative to the global imbalances of all countries in the OECD sample at a point in time. Intuitively, we expect that a country that requires more financing in the context of the world economy should command a higher premium. These results are shown in Table 4. It is found that the economic significances of the coefficients are identical to those presented in Table 3, with a marginal improvement in the significance of the estimators.

[Insert Table 5 here]

Table 5 examines the role of LDC in explaining the cross-section of currency excess returns. The results are similar to those of NFA and NFA Ratio in both economical and statistical significance. The LDC coefficient is negative and significant at the 5% level. Every one standard deviation decrease in LDC is associated with a positive monthly excess return of 8 basis points (0.96% annualized). This implies that taking a long position in currencies with a lower proportion of liabilities denominated in domestic currency relative to the cross-sectional average predicts positive currency excess returns. Economically, the lower the LDC, the greater the reliance on international creditors and greater the exposure to international uncertainty. Hence, investors should be compensated for the additional risk. Similar to NFA, our results remain unchanged using the 12-month lag of LDC [12].

[Insert Table 6 here]

Table 6 jointly examines LDC and NFA as predictors of currency excess returns. Column (1) shows that LDC and NFA are significant at the 5% and 10% level with a coefficient of

[12] Additional tests are also conducted to show the robustness of the results to 6-month and 18-month lagged LDC.

-0.07 and -0.06, respectively. The simultaneous significance of these variables shows that they capture different components of external imbalances. However, the similar magnitude of the coefficients indicates that they have a relatively balanced contribution to explain the cross-section of currency excess returns. The results are also consistent with those using the 12-month lagged values of NFA and LDC. Like the individual counterparts, simultaneously examining the change in LDC and NFA produces no significant results [13].

Each variable, NFA, NFAR, or LDC, represents an economically different measure of external imbalances and is a robust predictor in the cross-section of currency excess returns. Whilst using individual currencies as test assets, in isolation these measures of external imbalances are consistent with the findings of Della Corte et al. (2016) using portfolios.

5.3 External imbalances controlling for CMV

Following the findings of statistical significance on a stand alone basis, we examine the role of external imbalances in explaining the cross-section of currency excess returns once controlling for carry, momentum and value (CMV). Table 7 summaries the results. Panels A and B show the results for NFA and the 12-month lag of NFA controlling for CMV in various groupings.

[Insert Tables 7 & 8 here]

Columns (2) and (4) show that NFA is not significant when controlling for carry or value. However, the NFA coefficient increases from -0.07 to -0.08 with the 1% significance level when controlling for momentum. Columns (5)-(7) examine the role of NFA when controlling for two financial variables jointly. While NFA is not significant when controlling for momentum and carry in column (5), NFA retains the 5% significance level with a coefficient of -0.06 when controlling for momentum and value in column (7). Interestingly, when controlling for carry and value in column (6), the coefficient of NFA reverses in sign from -0.07 to 0.05 and is significant at the 10% level. The coefficients of carry and value also increase relative to their individual counterparts to 0.30 and 0.14, respectively. In column (8), we examine the role of NFA when controlling for carry, momentum and value jointly. It is found that carry and momentum retain their significance at the 1% and 5% levels, respectively, whilst value and NFA are significant at the 10% level. Apart from the coefficient of NFA switching sign from negative to positive, the economic significance of the carry, momentum and value coefficients are similar to those presented in subsection 5.1 where they are examined in isolation. Hence, NFA is not robust to the control variables used, in particular, the carry. Like subsection 5.2, the results for NFA Ratio closely follow NFA and are not discussed here.

[13] This might be due to the highly persistent nature of LDC and NFA (Lane and Milesi-Ferretti (2007)).

[Insert Table 9 here]

Table 9 summarizes the findings for LDC when controlling for CMV in various groupings. The results and interpretation closely follow NFA discussed above. In isolation, the coefficient of LDC is -0.08 and significant at the 5% level. Furthermore, when LDC is combined with carry, the coefficient of LDC switches sign to 0.02 and becomes insignificant. Like NFA, the interaction between LDC and carry shows that this measure of external imbalances is also subsumed by the carry [14]. While NFA and LDC are significant in isolation, once controlling for the carry, both measures of external imbalances become insignificant. Panel B of Tables 7, 8 and 9 follows an identical specification to their counterparts using a 12-month lag of NFA, NFAR and LDC, respectively. Across all three tables, the magnitude and sign of the coefficients remain largely unchanged.

To determine the cause of the changing sign of NFA and LDC coefficients, we compare the results presented in column (2) of Tables 7, 8, and 9. Here, when examining NFA and LDC whilst controlling for carry, the sign of the coefficients changes from negative to positive and becomes insignificant. By contrast, NFA and LDC retain a negative significant coefficient when combined with value and/or momentum. A similar interaction is observed in columns (5), (6) and (8) where the coefficients of NFA and LDC switch sign from negative to positive and lose significance. Across these specifications, carry is the only common control. Hence, the changing sign of NFA and LDC once controlling for carry leads to conclude that carry is subsuming the informational content in external imbalances.

This result is not consistent with Della Corte et al. (2016) who find that external imbalances is significant controlling for carry, when using portfolios as test assets. By contrast, using individual currencies as test assets, we find that there is little evidence to support the relevance of external imbalances once controlling for carry. Our results share some similarities with recent findings of Novy-Marx (2015) for momentum in equities. Novy-Marx (2015) examines two closely related characteristics, price momentum and earnings momentum. They show that when using Fama-Macbeth regressions at the individual stock level, earnings momentum subsumes price momentum. However, when using portfolios, the correlation between these characteristics leads to the false conclusion that both characteristics matter.

Novy-Marx (2015) shows that portfolios are particularly susceptible to this effect when the characteristics under examination are correlated with one another. Pairwise correlations show that NFA and LDC are closely related to carry with a correlation coefficient of -0.37 and -0.36, respectively. This contrasts with momentum or value for which the pairwise cor-

[14]We also test the joint significance of NFA and LDC controlling for CMV and find that the results are consistent.

relation does not exceed 0.08. Hence, the significance of both carry and external imbalances discovered by Della Corte et al. (2016) using portfolios can be driven by the correlation effects found by Novy-Marx (2015). Ang et al. (2016) provide further empirical grounding in the context of equities to explain why the results could be sensitive to the choice of test assets. The authors show that aggregating stocks into portfolios shrinks the cross-sectional dispersion of the betas, causing estimates of factor risk premia to be less efficient. Kan (2004) and Ang et al. (2016) also show that the loss of informational content in a portfolio setting is most prominent when there is a small, time-varying number of assets in the cross-section. Hence, currencies are particularly susceptible to this effect due to differing periods during when a currency becomes an eligible asset to trade, fixed exchange rate regimes and the introduction of the Euro. The sensitivity of Della Corte et al.'s (2016) findings to the choice of test asset (individual versus portfolios) can thus be explained by two empirical developments. First, the relatively high correlation between carry and external imbalances shares parallels with the correlation effects found by Novy-Marx (2015). Second, currencies are particularly susceptible to the loss of individual variation using portfolios by the nature of this asset class.

The interaction of carry with external imbalances (NFA and LDC) is, itself, an interesting result. It raises the question proposed by Engel and West (1994) regarding whether market prices lead to fundamentals. Upon closer examination, we find that financial variables, most prominently the carry, are able to forecast NFA and LDC. Economically, countries that need to attract capital (low external imbalances) have relatively higher interest rates. Hence, the external imbalances fundamental that partially explains the interest rate differential is subsumed by the carry. This confirms the findings of Sarno and Schmeling (2014) who argue that market prices contain information that helps predict fundamentals.

5.4 Characteristics versus Betas

If external imbalances and financial variables are a proxy of fundamental sources of risk in the global economy, then loadings on the respective factors should command a risk premium. As a result, we test the loadings (betas) on the factors as explanatory variables of currency excess returns. Despite considerable literature on this subject in equities (Fama and French (1993), Kent and Daniel (1997), Davis, Fama, and French (2000)), to the best of our knowledge, no examination has been conducted on the relative importance of characteristics versus betas in the context of currencies.

We examine the explanatory power of the loadings and characteristic when used in combination using cross-sectional regressions and double-sorted portfolios. Both cross-sectional regressions and double-sorted portfolios show that characteristics dominate betas in this exercise. This is consistent with Chordia, Goyal, and Shanken (2015) who find that relative to betas, firm characteristics consistently explain a much larger proportion of variation in returns. Hence, our analysis also contributes to the broader literature by extending Daniel and Titmans (1997) findings in equities to currencies.

Our analysis of characteristics versus betas is divided into two components. First, we examine characteristics and the loadings on the characteristics (betas) using the Fama-Macbeth (1973) regression to explain the cross sectional returns. Second, we use double-sorted portfolios on characteristics and betas as an additional robustness check. This examination is often performed in asset pricing literature in the context of equities (Fama and French (1992) and Lewellen (2015)). Firm characteristics such as size, book-to-market equity (B/M), past returns, and investment are correlated with a firm's subsequent stock returns. Hence, effects can show up both in the performance of characteristic sorted portfolios and in slopes of Fama-Macbeth (1973) cross-sectional regressions.

5.4.1 Characteristics versus Betas using the Fama-Macbeth Framework

To obtain the loading of each characteristic at a point in time, we sort each characteristic (NFA, LDC or carry) into quintiles and obtain the corresponding currency excess returns (e.g., Della Corte et al. (2016)). The average of excess returns in each quintile and the high-minus-low (HML) factor are then computed. Using a 24-month rolling window, we regress currency excess returns against the HML factor to obtain a unique beta for each country at a point in time. Using the Fama-Macbeth framework the loading of the respective factor (i.e. beta) is regressed in the cross-section of currency excess returns.

[Insert Table 10 here]

Table 10 shows the cross sectional regression results. In columns (1) to (3), the loadings on the respective factors (carry, NFA, and LDC) are examined in isolation. Here, β_{NFA} and β_{LDC} are insignificant whilst β_{Carry} is significant at the 10% level with a coefficient of 0.10, which is weaker than the corresponding characteristic coefficient of 0.25 (subsection 5.1). However, when jointly examining the characteristic and beta, the characteristic dominates in each case. Columns (4) and (5) show that whilst β_{NFA} and β_{LDC} are insignificant, their corresponding characteristics are both significant at the 5% level with a coefficient of -0.05. Column (6) shows that β_{Carry} is no longer significant at the 10% level once examined in combination with the carry characteristic, which has a coefficient of 0.31 with the 1% significance level. The statistical and economic significance of the characteristic coefficients are identical to our main results. This is a confirmation of recurrent findings by Daniel and Titman (1997), Brennan, Chordia, and Subrahmanyam (1998) and Chordia, Goyal, and Shanken (2015) who argue that characteristics dominate betas. However, while these findings are limited to equities, we provide evidence that characteristics also dominate betas in the cross-section of currency returns.

5.4.2 Double sorted portfolios

As an additional robustness test, we use double-sorted portfolios on characteristics first and then betas. Recently, Fama and French (2008) identified a key shortcoming of the Fama-Macbeth (1973) regressions. Specifically, as returns on individual test assets can be extreme, there is potential for influential observations to impact the results. Hence, double-sorted portfolios provide a cross-check. If there are contradictory findings, then outliers are likely present in the data.

[Insert Tables 11 here]

Panels A, B, and C of Table 11 show the results of the double-sorted portfolios on NFA, LDC and Carry, respectively. In each case, the characteristic dominates the beta. This result is consistent with our results using the Fama-Macbeth (1973) regression discussed above, providing further evidence on the characteristics versus betas debate. Panel A shows that the characteristic of NFA dominates the beta of NFA, with statistically significant difference in the mean of the equally weighted excess returns between High NFA and Low NFA, but insignificant difference in the mean of the equally weighted excess returns between High beta and Low beta. This is consistent with the idea that countries with low NFA should compensate investors with a higher currency risk premia and hence positive currency excess returns. Panel B shows a similar result where low LDC yields a higher positive and statistically significant return in comparison to high LDC. This result is also consistent with economic intuition, as a country with a lower proportion of liabilities denominated in domestic currency (LDC) is more exposed to international volatility. Hence, these countries should compensate investors with a higher currency risk premia. Again, the difference in the mean of the equally weighted excess returns between High beta and Low beta is insignificant for both High NFA and Low NFA. Panel C shows the double-sorted portfolio results for carry, where the high carry characteristic (trading on the interest rate differential) also dominates. Thus, in each case the nature of underlying economic processes with respect to the factors are best captured by the characteristic in the cross-section of currency excess returns.

6 Additional Tests for Robustness

This section provides the results of the additional tests that have been performed to evaluate the robustness of our findings. The purpose is to examine whether the results are sensitive to changes in monthly or yearly frequency and an extended currency panel of 48 countries.

6.1 Frequency - Monthly versus Yearly

Whilst a large body of empirical exchange rate literature focuses on analyzing currency excess returns over the monthly interval, macroeconomic data on NFA and LDC are released on an annual basis. As a result, we run additional tests to check the robustness of our findings over a twelve-month horizon. Table 12 shows the results of 12-month currency excess returns against CMV. Consistent with our main results, the financial variables in isolation and various combinations remain statistically significant.

[Insert Table 12 here]

Tables 13, 14, and 15 summarize the results for NFA, NFAR and LDC, respectively, controlling for CMV. In each table, regressions (1) through (8) show that on a standalone basis and in various specifications with CMV, both the statistical and economic significances are consistent with monthly currency excess returns. However, the magnitude of the coefficients increase, corresponding to the annual analysis interval. We also find that the coefficients of NFA and LDC switch sign once controlling for carry. Hence, carry subsumes external imbalances at the twelve-month analysis interval, and our results are robust to both monthly and annual frequencies.

[Insert Tables 13, 14, and 15 here]

6.2 Increased degrees of freedom

The limited number of tradable currencies is a key limitation of exchange rate analysis compared to other asset classes. It results in a low degrees of freedom issue that is a special concern between the early 1970's and the mid 1980's, where there is limited availability of foreign currency data. To evaluate the sensitivity of our results to potential degrees of freedom concerns, we increase the OECD sample to a panel of 48 countries, which is reflective of the sample employed by Menkhoff et al. (2012b), to assess the sensitivity of our findings.

With the extended dataset, there is a substantial increase in the number of currencies in each panel after the 1990's due to data availability from DataStream. Aside from NFA which is available for the main and extended sample across the entire analysis period, LDC and the financial variables benefit from increased degrees of freedom at differing points in time. In the extended currency sample, data for all variables is available by the mid 1990's. Any subsequent drops are due to currencies that have been omitted from the sample or currencies being subsumed by the Euro (see Section 3.2). To be included in the cross-sectional regression, there must be a minimum of 10 countries with complete data for the relevant regression at a point in time.

[Insert Table 16]

Table 16 summarizes the results. Controlling for CMV, the results of NFA and LDC are presented in various specifications on Panels A and B, respectively. While we observe a marginal increase in the magnitude and significance of the coefficients, the economic implications are consistent with our main results. It is found that NFA and LDC have a negative and statistically significant coefficient in isolation, and switches sign when controlling for carry. Hence, across both panels, the results using the extended foreign currency sample are still largely reflective of the results with the OECD sample.

6.3 Developed and developing nations

Since unique country characteristics influence currency dynamics, the classification between developed and developing countries is commonly considered in currency panel methodology. Adrian, Etula, and Shin (2011) find that predictors that are successful in advanced countries largely fail when examining emerging economies. Amongst other factors, developing countries are commonly characterized by greater political instability, less developed infrastructure and lower levels of investor confidence (Adrian et al. (2011)) that have implications for exchange rate dynamics. Hence, a distinction in the results is expected.

[Insert Tables 17 & 18 here]

Using the extended foreign currency sample, we categorize currencies into 28 developed and 20 developing nations based on the 2015 United Nations country classifications. Tables 17 & 18 summarize the results for monthly currency excess returns for NFA and LDC, respectively. In each table, Panel A shows the results for developed nations and Panel B shows the results for developing nations.

We find that for NFA and LDC, the results of developed nations are consistent with our earlier findings (see section 5.3) in both economic and statistical significance. This result is not surprising given the OECD sample is largely comprised of developed nations with more transparency, data availability and reliability. By contrast, in the developing sample the coefficients of NFA and LDC are largely insignificant, with a greater degree of variability in magnitude and sign changing relative to their developed counterparts. While the significance of carry remains in the developing sample, the results are not as clear as their developed counterparts, confirming the findings of Adrian et al. (2011).

7 Conclusion

Imbalances in trade and capital flows have been a central theme of discussion, especially in light of recent global events. Using individual currencies as test assets, our paper examines the theoretically motivated external imbalances variable to explain the cross-section of currency excess returns. Contrary to Della Corte et al. (2016), we find that there is little evidence to support the relevance of external imbalances, once controlling for carry. This result has three broad, but related implications.

First, Della Corte et al.s (2016) findings are sensitive to the choice of test asset. This confirms the findings by Ang et al. (2016) who show that tests performed using portfolios are not necessarily equivalent to tests with individual assets. Second, the simultaneous significance of carry and external imbalances found using portfolios shares parallels with the correlation effects found by Novy-Marx (2015). The relatively strong correlation between carry and external imbalances reduces the individual variation in a portfolio setting, creating the illusion that both characteristics matter. However, using Fama-Macbeth regressions at the individual currency level reveals that carry subsumes external imbalances. Third, the ability for carry to forecast external imbalances seems to provide a partial economic justification for its premium. Economically, countries that need to attract capital (low external imbalances) will have relatively higher interest rates. Hence, by using the carry trade strategy to borrow in low interest rate currencies and lend in high interest rate currencies, an investor should also capture the external imbalances risk premium.

Since external imbalances can be an imperfect proxy of the fundamental source of risk, we also examine the role of betas with respect to factors as predictors of currency excess returns. Both cross-sectional regressions and double sorted portfolios show that characteristics consistently explain a much larger proportion of variation in currency returns than factor loadings. To the best of our knowledge there has been no study on the comparison of characteristics versus betas performed in the currency market. This is a unique contribution that extends the findings of Daniel and Titman (1997) and Chordia et al. (2015) in equities to the context of currencies.

Overall, our results provide new insights into existing empirical exchange rate literature by using recent methodological developments in equities to motivate a reexamination of established variables in currency return predictability. While we find that external imbalances do not matter once controlling for carry, the sensitivity of external imbalances to the choice of test assets (individual currencies versus portfolios) serves to validate the recent methodological developments in equities to currencies. Since recent exchange rate literature has largely focused on using currency portfolios, to fully grasp the implications of recent methodological developments, further testing can be performed on other characteristics. Finally, since the effects of using portfolios are prominent in currencies due to the small and time-varying number of assets in the cross-section, future research should consider both the individual and portfolio levels to validate robustness.

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Table 1: Summary Statistics

This table shows the average (μ) and standard deviation (σ) of currency excess returns (RX1), financial variables of carry, 3-month momentum (3mth-Mom), 5-year value (Value), and macroeconomic variables of liabilities denominated in domestic currency (LDC), net foreign assets (NFA), and net foreign asset ratios (NFAR), all of which are standardized in the cross section. The sample covers the period from August 1973 to August 2015 at a monthly frequency for all variables except for LDC, NFA and NFAR, which are available at an annual frequency, and expressed as percentages. All exchange rates are quoted in terms of U.S. Dollars per unit of foreign currency. Averages given in the last row of the table represents the average of the corresponding variables across all the countries. Note that N/A indicates unavailable data.

	RX1		Carry		3mth-Mom		Value		*LDC*		NFA		NFA Ratio	
	μ	σ	μ	σ	μ	s	μ	s	μ	s	μ	s	μ	s
Australia	0.228	3.485	0.346	0.992	0.117	1.118	0.021	1.036	0.432	1.039	-0.714	0.339	-0.745	0.343
Austria	-0.047	3.407	-0.663	0.352	0.259	0.463	-0.175	0.556	0.858	0.181	0.173	0.161	0.157	0.161
Belgium	0.022	3.357	-0.158	0.541	0.204	0.436	0.174	0.837	0.192	0.044	0.594	0.315	0.584	0.32
Canada	0.037	2.028	-0.22	0.464	0.2	0.892	0.212	1.069	0.366	0.515	-0.39	0.512	-0.412	0.518
Chile	0.107	3.603	0.288	0.844	-0.006	1.211	0.016	0.947	0.389	0.523	0.089	0.263	0.073	0.27
Czech Republic	-0.138	4.096	-0.674	0.215	0.007	0.89	-0.558	1.062	0.647	0.066	-0.063	0.143	-0.083	0.148
Denmark	0.03	3.176	-0.206	0.555	0.096	0.485	0.04	0.538	0.722	0.584	-0.332	0.525	-0.354	0.532
Estonia	-0.039	3.07	-0.477	0.409	-0.049	0.516	-0.574	0.455	0.223	1.178	-0.65	0.471	-0.685	0.484
Euro	0.139	3.002	-0.587	0.196	-0.002	0.511	0.135	0.396	N/A	N/A	N/A	N/A	N/A	N/A
Finland	-0.186	2.012	-0.418	0.04	0.117	0.388	0.417	0.832	0.225	0.225	-0.753	0.002	-0.778	0.001
France	0.055	3.285	0.049	0.545	0.18	0.446	0.076	0.48	0.753	0.181	0.884	0.38	0.877	0.385
Germany	-0.097	3.405	-0.745	0.448	0.254	0.442	0.055	0.594	3.292	0.688	0.892	0.226	0.885	0.227
Greece	-0.394	3.127	0.054	0.15	-0.124	0.734	-0.251	0.542	0.634	0.07	0.046	0.153	0.027	0.157
Hungary	0.318	4.103	0.668	0.514	-0.025	0.967	-0.517	0.949	0.647	0.066	-1.018	0.396	-1.061	0.406
Iceland	0.084	4.456	1.333	0.667	-0.119	1.357	0.742	1.556	0.643	0.068	-2.349	1.251	-2.428	1.283
Ireland	0.148	3.158	0.163	0.575	0.2	0.487	0.16	0.728	0.501	0.043	-0.908	0.518	-0.937	0.525
Israel	0.159	2.527	-0.323	0.289	0.096	0.95	0.3	1.226	0.647	0.066	0.314	0.127	0.302	0.131
Italy	0.151	3.157	0.911	0.702	0.1	0.622	-0.045	0.717	0.453	0.688	0.305	0.122	0.291	0.123
Japan	-0.132	3.311	-1.119	0.464	0.082	1.25	-0.06	1.3	2.219	0.344	0.905	0.205	0.902	0.208
Korea	0.169	3.374	-0.191	0.414	0.083	0.947	0.147	0.948	N/A	N/A	0.161	0.093	0.145	0.097
Mexico	0.278	2.901	0.713	0.472	-0.055	1.186	0.105	1.479	0.523	0.194	-0.231	0.241	-0.256	0.245
Netherlands	-0.071	3.38	-0.645	0.368	0.245	0.436	0.155	0.624	0.442	0.205	1.015	0.265	1.01	0.267
New Zealand	0.453	3.629	0.53	1.101	0.135	1.167	0.212	1.066	0.647	0.066	-1.365	0.741	-1.405	0.749
Norway	0.05	3.131	0.019	0.502	0.098	0.657	0.111	0.368	0.642	0.066	0.382	0.823	0.373	0.837
Poland	0.362	3.894	0.534	1.1	0.084	1.015	-0.521	0.985	0.639	0.066	-0.264	0.175	-0.29	0.18
Portugal	-0.437	2.618	-0.293	0.056	0.116	0.371	0.252	0.517	0.552	0.028	-0.013	0.121	-0.028	0.122
Slovak Republic	-0.237	2.618	-0.293	0.056	0.114	0.389	0.296	0.502	N/A	N/A	0.007	0.118	-0.008	0.118
Slovenia	0.223	2.175	-0.243	0.148	-0.143	0.407	-0.355	0.216	0.632	0.062	0.201	0.009	0.184	0.01
Spain	0.179	3.105	1.038	0.811	0.151	0.598	-0.251	1.034	0.845	0.781	0.09	0.093	0.073	0.094
Sweden	-0.026	3.216	-0.011	0.599	0.067	0.705	0.372	0.6	0.931	0.892	-0.129	0.312	-0.149	0.317
Switzerland	-0.083	3.482	-0.996	0.399	0.167	0.76	0.167	0.669	0.316	0.337	2.978	0.712	3.006	0.716
Turkey	0.85	3.9	2.872	0.895	-0.664	1.586	-0.389	0.975	0.65	0.066	-0.21	0.187	-0.234	0.192
United Kingdom	0.08	2.993	-0.038	0.523	0.14	0.82	0.037	1.005	0.163	0.245	0.499	0.412	0.486	0.417
Average	0.067	3.241	0.037	0.497	0.064	0.764	0.015	0.812	0.694	0.979	0.005	0.325	-0.015	0.331

Table 2: Financial variables as predictors of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of monthly currency excess returns by financial variables of carry, 3-month momentum, and value. Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. 3-month momentum is defined as the change in the natural logarithm of the nominal spot exchange rates over the last three months, $S_{j,t} - S_{j,t-3}$. Value is defined as the five-year change in the natural logarithm of the real exchange rates $-(q_{j,t-12} - q_{j,t-60})$, which in this form means that higher value indicates a weaker foreign currency. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ across the countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in cross-sectional regressions over the sample period. The cross-sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. The t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Carry	0.25***			0.29***	0.27***		0.30***
	(5.57)			(6.39)	(6.22)		(6.68)
3mth-Mom		0.16**		0.20***		0.12*	0.16**
		(2.35)		(2.88)		(1.68)	(2.18)
Value			0.13***		0.14***	0.10**	0.08*
			(2.84)		(3.01)	(2.01)	(1.77)
Constant	0.12	0.08	0.08	0.07	0.08	0.04	0.03
	(1.04)	(0.70)	(0.67)	(0.62)	(0.60)	(0.34)	(0.25)
Observations	8,256	8,256	7,583	8,256	7,583	7,583	7,583
Adjusted R^2	0.2	0.17	0.14	0.36	0.33	0.29	0.43
Number of months	475	475	441	475	441	441	441

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

Table 3: NFA as a predictor of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of monthly currency excess returns by NFA, which captures the total net external position of a country relative to GDP. It is defined as $\text{NFA}_{j,t}$=([Equity $\text{Assets}_{j,t}$ - Equity $\text{Liabilities}_{j,t}$]+[Debt $\text{Assets}_{j,t}$ - Debt $\text{Liabilities}_{j,t}$] + [FDI $\text{Assets}_{j,t}$ - FDI $\text{Liabilities}_{j,t}$]+ $\text{FX}_{j,t}$) /$\text{GDP}_{j,t}$. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for the countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in the cross sectional regressions over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns				
	(1)	(2)	(3)	(4)	(5)
NFA	-0.07**			-0.06	
	(-1.97)			(-0.93)	
12mth lagged NFA		-0.08**			-0.08
		(-2.35)			(-1.26)
ΔNFA			0.01	-0.05	-0.06
			(-0.29)	(-0.72)	(-1.08)
Constant	0.19	0.18	0.18	0.19	0.19
	(-1.55)	(-1.53)	(-1.44)	(-1.51)	(-1.51)
Observations	7,456	7,672	7,456	7,456	7,456
Adjusted R^2	0.12	0.12	0.07	0.19	0.19
Number of months	443	455	443	443	443

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

Table 4: NFA Ratio as a predictor of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of monthly currency excess returns by NFA ratio. NFA Ratio is defined as $\text{NFA}_{j,t}$ relative to the sum of the absolute value of sum of $\text{NFA}_{j,t}$ of the countries available in the sample at time t. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for the countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in the cross sectional regressions over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns				
	(1)	(2)	(3)	(4)	(5)
NFAR	-0.07**			-0.07*	
	(-2.02)			(-1.92)	
12-mth lagged NFAR		-0.08**			-0.07*
		(-2.39)			(-1.83)
ΔNFAR			-0.01	0.01	-0.01
			(-0.08)	(0.26)	(-0.20)
Constant	0.19	0.18	0.17	0.18	0.18
	(1.49)	(1.47)	(1.37)	(1.45)	(1.45)
Observations	7,648	7,876	7,648	7,648	7,648
Adjusted R^2	0.12	0.12	0.07	0.19	0.19
Number of months	443	455	443	443	443

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

Table 5: LDC as a predictor of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of monthly currency excess returns by LDC, which captures the proportion of a country's liabilities denominated in domestic currency. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for the countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in the cross sectional regressions over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns				
	(1)	(2)	(3)	(4)	(5)
LDC	-0.08**			-0.09	
	(-2.53)			(-1.49)	
12-mth lagged LDC		-0.08**			-0.09*
		(-2.22)			(-1.79)
ΔIdc			0.03	0.03	0.00
			(0.97)	(0.62)	(0.03)
Constant	0.25*	0.29**	0.15	0.16	0.16
	(1.87)	(2.18)	(0.97)	(1.05)	(1.05)
Observations	6,611	6,431	4,859	4,859	4,859
Adjusted R^2	0.09	0.09	0.06	0.15	0.15
Number of months	380	368	276	276	276

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

Table 6: LDC and NFA as predictors of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of monthly currency excess returns by LDC and NFA, which capture the proportion of a country's liabilities denominated in domestic currency and the total net external position of a country relative to GDP, respectively. NFA is defined as NFA$_{j,t}$=([Equity Assets$_{j,t}$ - Equity Liabilities$_{j,t}$]+[Debt Assets$_{j,t}$ - Debt Liabilities$_{j,t}$] + [FDI Assets$_{j,t}$ - FDI Liabilities$_{j,t}$] + FX$_{j,t}$) /GDP$_{j,t}$. All variables are standardized in the cross-section in the form $(X_{j,t}-\mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for the countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in the cross sectional regressions over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns				
	(1)	(2)	(3)	(4)	(5)
LDC	-0.07**			-0.09	
	(-2.20)			(-1.58)	
NFA	-0.06*			-0.12	
	(-1.72)			(-1.35)	
12-mth lagged LDC		-0.06*			-0.09*
		(-1.93)			(-1.88)
12-mth lagged NFA		-0.07*			-0.13
		(-1.92)			(-1.52)
ΔLDC			0.02	0.01	-0.03
			(0.46)	(0.13)	(-0.65)
ΔNFA			-0.01	-0.01	-0.04
			(-0.15)	(-0.14)	(-0.50)
Constant	0.33**	0.36***	0.20	0.22	0.22
	(2.36)	(2.63)	(1.25)	(1.39)	(1.39)
Observations	6,035	6,071	4,427	4,427	4,427
Adjusted R^2	0.18	0.18	0.13	0.31	0.31
Number of months	348	348	252	252	252

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

Table 7: NFA controlling for financial variables as predictors of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of monthly currency excess returns by NFA controlling for carry, momentum, and value (CMV). Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. Momentum is defined as the three-month change in the natural logarithm of the nominal spot exchange rate $S_{j,t} - S_{j,t-3}$. Value is defined as the five-year change in the natural logarithm of the real exchange rate $-(q_{j,t-12} - q_{j,t-60})$, which in this form means that higher value indicates a weaker foreign currency. NFA captures the total net external position of a country relative to GDP. NFA is defined as $\text{NFA}_{j,t}$=([Equity $\text{Assets}_{j,t}$ - Equity $\text{Liabilities}_{j,t}$]+[Debt $\text{Assets}_{j,t}$ - Debt $\text{Liabilities}_{j,t}$] + [FDI $\text{Assets}_{j,t}$ - FDI $\text{Liabilities}_{j,t}$] + $\text{FX}_{j,t}$) /$\text{GDP}_{j,t}$. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for the countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in the cross sectional regressions over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns															
	Panel A: NFA								Panel B: NFA (12mth lag)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carry		0.28***			0.31***	0.30***		0.33***		0.26***			0.30***	0.28***		0.31***
		(5.93)			(6.54)	(6.57)		(6.94)		(5.54)			(6.18)	(6.09)		(6.49)
3-mth Mom			0.16**		0.22***		0.12	0.16**			0.16**		0.21***		0.12	0.17**
			(2.31)		(2.94)		(1.58)	(2.07)			(2.32)		(2.93)		(1.62)	(2.13)
Value				0.12**		0.14***	0.09*	0.09*				0.13***		0.15***	0.09*	0.09*
				(2.45)		(2.94)	(1.80)	(1.80)				(2.65)		(3.06)	(1.91)	(1.80)
NFA	-0.07**	0.04	-0.08***	-0.05	0.04	0.05*	-0.06**	0.05*								
	(-1.97)	(1.46)	(-2.86)	(-1.38)	(1.33)	(1.65)	(-2.09)	(1.87)								
NFA(12-mth lag)									-0.08**	0.02	-0.09***	-0.06*	0.02	0.02	-0.07**	0.03
									(-2.35)	(0.81)	(-3.04)	(-1.85)	(0.84)	(0.83)	(-2.49)	(1.05)
Constant	0.19	0.16	0.14	0.14	0.11	0.12	0.09	0.07	0.18	0.16	0.13	0.14	0.11	0.12	0.09	0.06
	(1.55)	(1.34)	(1.16)	(1.12)	(0.87)	(0.93)	(0.73)	(0.49)	(1.53)	(1.32)	(1.15)	(1.10)	(0.86)	(0.92)	(0.72)	(0.49)
Observations	7,456	7,456	7,456	6,834	7,456	6,834	6,834	6,834	7,672	7,672	7,672	7,050	7,672	7,050	7,050	7,050
Adjusted R^2	0.12	0.28	0.27	0.24	0.41	0.38	0.37	0.49	0.12	0.28	0.26	0.24	0.40	0.37	0.37	0.49
Number of months	443	443	443	409	443	409	409	409	455	455	455	421	455	421	421	421

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

Table 8: NFA ratio controlling for financial variables as predictors of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of monthly currency excess returns by NFA ratio controlling for carry, momentum, and value (CMV). Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. Momentum is defined as the three-month change in the natural logarithm of the nominal spot exchange rate $S_{j,t} - S_{j,t-3}$. Value is defined as the five-year change in the natural logarithm of the real exchange rate $-(q_{j,t-12} - q_{j,t-60})$, which in this form means that higher value indicates a weaker foreign currency. NFA captures the total net external position of a country relative to GDP. NFA is defined as $\text{NFA}_{j,t}$=([Equity $\text{Assets}_{j,t}$ - Equity $\text{Liabilities}_{j,t}$]+[Debt $\text{Assets}_{j,t}$ - Debt $\text{Liabilities}_{j,t}$] + [FDI $\text{Assets}_{j,t}$ - FDI $\text{Liabilities}_{j,t}$] + $\text{FX}_{j,t}$) /$\text{GDP}_{j,t}$. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for the countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in the cross sectional regressions over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns															
	Panel A: NFA Ratio								Panel B: NFA Ratio (12mth lag)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carry		0.28***			0.31***	0.30***		0.33***		0.26***			0.30***	0.28***		0.31***
		(5.97)			(6.58)	(6.61)		(6.97)		(5.58)			(6.22)	(6.11)		(6.51)
3-mth Mom			0.16**		0.22***		0.12	0.16**			0.16**		0.21***		0.12	0.17**
			(2.35)		(2.99)		(1.61)	(2.1)			(2.35)		(2.98)		(1.64)	(2.16)
Value				0.12**		0.14***	0.09*	0.09*				0.13***		0.15***	0.09*	0.09*
				(2.45)		(2.95)	(1.78)	(1.79)				(2.65)		(3.07)	(1.89)	(1.8)
NFAR	-0.07**	0.04	-0.08***	-0.05	0.04	0.05*	-0.06**	0.05*								
	(-2.02)	(1.46)	(-2.91)	(-1.44)	(1.34)	(1.66)	(-2.15)	(1.89)								
NFAR (12-mth lag)									-0.08**	0.02	-0.09***	-0.06*	0.02	0.02	-0.07**	0.03
									(-2.39)	(0.81)	(-3.09)	(-1.89)	(0.84)	(0.84)	(-2.54)	(1.06)
Constant	0.19	0.16	0.14	0.14	0.11	0.12	0.09	0.07	0.18	0.16	0.13	0.14	0.11	0.12	0.09	0.06
	(1.49)	(1.32)	(1.11)	(1.09)	(0.87)	(0.92)	(0.71)	(0.5)	(1.47)	(1.3)	(1.1)	(1.08)	(0.85)	(0.91)	(0.7)	(0.5)
Observations	7,648	7,648	7,648	6,975	7,648	6,975	6,975	6,975	7,876	7,876	7,876	7,203	7,876	7,203	7,203	7,203
Adjusted R^2	0.12	0.28	0.27	0.24	0.41	0.38	0.37	0.49	0.12	0.28	0.26	0.24	0.4	0.37	0.37	0.49
Number of months	443	443	443	409	443	409	409	409	455	455	455	421	455	421	421	421

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

Table 9: LDC controlling for financial variables as predictors of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of monthly currency excess returns by LDC controlling for carry, momentum, and value (CMV). Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. Momentum is defined as the three-month change in the natural logarithm of the nominal spot exchange rate $S_{j,t} - S_{j,t-3}$. Value is defined as the five-year change in the natural logarithm of the real exchange rate $-(q_{j,t-12} - q_{j,t-60})$, which in this form means that higher value indicates a weaker foreign currency. LDC captures the proportion of a country's liabilities denominated in domestic currency. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for all countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in each cross sectional regression over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns															
	Panel A: LDC								Panel B: LDC (12mth lag)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carry		0.25***			0.28***	0.26***		0.28***		0.25***			0.27***	0.26***		0.27***
		(4.95)			(5.37)	(5.15)		(5.50)		(4.79)			(5.20)	(5.03)		(5.34)
3mth-Mom			0.10*		0.11		0.06	0.07			0.09*		0.1		0.05	0.07
			(1.73)		(1.39)		(0.82)	(0.97)			(1.67)		(1.42)		(0.65)	(0.95)
Value				0.18***		0.18***	0.15***	0.13**				0.18***		0.18***	0.15**	0.12**
				(3.23)		(3.27)	(2.62)	(2.25)				(3.12)		(3.22)	(2.44)	(2.10)
LDC	-0.08**	0.02	-0.08***	-0.08***	0.02	0.01	-0.08***	0.01								
	(-2.53)	(0.66)	(-2.82)	(-2.68)	(0.65)	(0.17)	(-2.74)	(0.14)								
LDC (12mth lag)									-0.08**	0.02	-0.07**	-0.08**	0.02	0.00	-0.07**	0.01
									(-2.22)	(0.79)	(-2.39)	(-2.38)	(0.78)	(0.06)	(-2.30)	(0.21)
Constant	0.25*	0.21	0.21	0.23*	0.18	0.20	0.19	0.17	0.29**	0.26*	0.25*	0.28**	0.23*	0.25*	0.24*	0.22
	(1.87)	(1.61)	(1.53)	(1.76)	(1.33)	(1.55)	(1.43)	(1.27)	(2.18)	(1.94)	(1.89)	(2.06)	(1.70)	(1.87)	(1.78)	(1.63)
Observations	6,611	6,611	6,611	6,488	6,611	6,488	6,488	6,488	6,431	6,431	6,431	6,308	6,431	6,308	6,308	6,308
Adjusted R	0.09	0.25	0.24	0.21	0.37	0.36	0.35	0.47	0.09	0.25	0.24	0.21	0.37	0.36	0.35	0.46
Number of months	380	380	380	380	380	380	380	380	368	368	368	368	368	368	368	368

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

Table 10: Characteristics versus Betas as predictors of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of one month currency excess returns by Carry, NFA and LDC on characteristics versus betas. Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. NFA captures the total net external position of a country relative to GDP. It is defined as NFA$_{j,t}$=([Equity Assets$_{j,t}$ - Equity Liabilities$_{j,t}$]+[Debt Assets$_{j,t}$ - Debt Liabilities$_{j,t}$] + [FDI Assets$_{j,t}$ - FDI Liabilities$_{j,t}$] + FX$_{j,t}$) /GDP$_{j,t}$. LDC captures the proportion of a country's liabilities denominated in domestic currency. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for the countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in the cross sectional regressions over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
β_{Carry}			0.10*			0.05	
			(1.78)			(0.81)	
β_{NFA}		-0.06		-0.04			-0.26
		(-0.61)		(-0.53)			(-1.13)
β_{LDC}	-0.05				-0.02		0.26
	(-0.69)				(-0.32)		(1.17)
Carry						0.31***	
						(4.36)	
NFA				-0.05**			-0.07**
				(-2.05)			(-2.34)
LDC					-0.05**		-0.07***
					(-2.10)		(-2.69)
Constant	0.21	0.18	0.1	0.16	0.22	0.12	0.32**
	(1.5)	(1.32)	(0.77)	(1.23)	(1.59)	(0.96)	(2.14)
Observations	6,238	6,415	7,634	6,825	5,898	7,634	5,322
Adjusted R^2	0.28	0.31	0.26	0.34	0.32	0.36	0.51
Number of months	357	420	452	420	357	452	325

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

Table 11: Double sorted portfolio - Characteristics versus Betas

This table reports the mean excess return and t-statistics for double sorted portfolios by characteristics and loadings. The characteristics are NFA (Panel A), LDC (Panel B), and Carry (Panel C). For each characteristic we build a high-minus-low factor portfolio and estimate currency betas on those factors with 24-month rolling window regressions. We first split the sample of currencies at each month t in two halves (High and Low) with respect to characteristics (NFA, LDC, or Carry), and within each of these into two halves (High and Low) with respect to loadings. The first two rows in each panel represent the mean of the equally weighted excess returns for countries with High and Low characteristics, respectively, over time, and the third row in each panel represents the difference in the mean of the equally weighted excess returns between the two groups. Similarly, the first two columns in each panel represent the mean of the equally weighted excess returns for countries with High and Low betas, respectively, over time and the third column in each panel represents the difference in the mean of the equally weighted excess returns between the two groups.

Panel A:	Double-sorted portfolios on NFA			
		Betas		
		High β_{NFA}	Low β_{NFA}	HML β_{NFA}
	High NFA	0.035	0.065	-0.029
		(0.298)	(0.680)	(-0.319)
Characteristics	Low NFA	0.190*	0.198**	-0.008
		(1.851)	(1.957)	(-0.363)
	HML NFA	-0.155*	-0.134*	
		(-1.862)	(-1.907)	
Panel B:	**Double-sorted portfolios on LDC**			
		Betas		
		High β_{LDC}	Low β_{LDC}	HML β_{LDC}
	High LDC	0.009	0.019	-0.010
		(0.048)	(0.035)	(-0.814)
Characteristics	Low LDC	0.056*	0.058*	-0.002
		(1.706)	(1.778)	(-0.044)
	HML LDC	-0.047*	-0.039*	
		(-1.671)	(-1.654)	
Panel C:	**Double-sorted portfolios on Carry**			
		Betas		
		High	Low	HML
	High Carry	0.355**	0.166*	0.189
		(2.191)	(1.749)	(1.244)
Characteristics	Low Carry	0.066	0.032	0.034
		(1.216)	(0.227)	(1.332)
	HML Carry	0.289**	0.134*	
		(1.992)	(1.678)	

Table 12: Financial variables as predictors of 12-month currency excess returns

This table reports the Fama-Macbeth estimates for predictability of twelve month currency excess returns by financial variables: carry, momentum, and value. Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. Momentum is defined as the three month logarithm change in nominal spot exchange rate $S_{j,t} - S_{j,t-3}$. Value is defined as the five year logarithm change in real exchange rate $-(q_{j,t-12} - q_{j,t-60})$ which in this form means that higher value indicates a weaker foreign currency. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for all countries available in month t. Observations represent the total number of currencies included in the regressions over the sampler period. Adjusted R^2 is the average of the adjusted R^2 in each cross sectional regression over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Annual Currency Excess Returns						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Carry	2.32**			3.46***	1.84**		2.93***
	(1.97)			(3.42)	(2.01)		(2.91)
3-mth Mom		2.68***		3.64***		2.41***	3.78***
		(3.69)		(6.9)		(4.97)	(6.09)
Value			3.29***		1.71***	2.29***	1.94**
			(3.01)		(3.46)	(4.22)	(4.31)
Constant	1.43	2.3	3.97	1.48	1.33	3.49	1.38
	(0.82)	(0.57)	(1.28)	(0.84)	(0.76)	(1.22)	(0.79)
Observations	3,858	4,146	3994	3,858	3,706	3,994	3,706
Adjusted R^2	0.33	0.54	0.52	0.51	0.46	0.64	0.61
Number of months	213	357	357	213	213	357	213

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

Table 13: NFA controlling for financial variables as predictors of 12 month currency excess returns

This table reports the Fama-Macbeth estimates for predictability of twelve month currency excess returns by NFA controlling for financial variables: carry, momentum, and value. Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. Momentum is defined as the three month logarithm change in nominal spot exchange rate $S_{j,t} - S_{j,t-3}$. Value is defined as the five year logarithm change in real exchange rate $-(q_{j,t-12} - q_{j,t-60})$ which in this form means that higher value indicates a weaker foreign currency. NFA captures the total net external position of a country relative to GDP. It is defined as $\text{NFA}_{j,t}$=([Equity $\text{Assets}_{j,t}$ - Equity $\text{Liabilities}_{j,t}$]+[Debt $\text{Assets}_{j,t}$ - Debt $\text{Liabilities}_{j,t}$] + [FDI $\text{Assets}_{j,t}$ - FDI $\text{Liabilities}_{j,t}$] + $\text{FX}_{j,t}$) /$\text{GDP}_{j,t}$, where $\text{NFA}_{j,t}$ is given by the sum of the net debt position, the net equity position and the net FDI stock position. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for all countries available in month t. Observations represent the total number of currencies included in the regressions over the sampler period. Adjusted R^2 is the average of the adjusted R^2 in each cross sectional regression over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Annual Currency Excess Returns															
	Panel A: NFA								Panel B: NFA (12mth lag)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carry		2.53**			3.85***	2.09*		3.40***		2.51**			3.69***	2.01*		3.24***
		(1.97)			(3.21)	(1.62)		(2.71)		(1.96)			(3.26)	(1.61)		(2.76)
3mth-Mom			2.44***		3.72***		1.95***	3.89***			2.44***		3.76***		2.05***	3.91***
			(4.82)		(5.81)		(3.95)	(5.19)			(5.46)		(6.37)		(4.31)	(5.62)
Value				1.99***		1.86***	1.99***	2.04***				1.90**		1.75***	1.87***	1.95***
				(2.85)		(3.23)	(3.48)	(3.92)				(2.53)		(2.97)	(3.19)	(3.70)
NFA	-4.17**	0.18	-1.22**	-0.65	0.17	0.33	-0.66*	0.29								
	(-2.01)	(0.33)	(-2.10)	(-1.20)	(0.34)	(0.53)	(-1.71)	(0.53)								
NFA (12mth lag)									-2.25*	0.02	-1.34**	-0.68	0.01	0.15	-0.63*	0.13
									(-1.68)	(0.04)	(-2.09)	(-1.35)	(0.03)	(0.26)	(-1.78)	(0.27)
Constant	0.10	2.47	2.83*	2.84*	2.51	2.31	3.17**	2.34	2.02	2.37	3.00**	2.84*	2.4	2.22	3.21**	2.25
	(0.05)	(1.29)	(1.91)	(1.75)	(1.32)	(1.21)	(2.00)	(1.24)	(1.00)	(1.32)	(2.10)	(1.78)	(1.34)	(1.25)	(2.12)	(1.27)
Observations	3,357	3,069	3,357	3,245	3,069	2,957	3,245	2,957	3,573	3,285	3,573	3,461	3,285	3,173	3,461	3,173
Adjusted R^2	0.49	0.42	0.61	0.59	0.59	0.52	0.7	0.67	0.48	0.41	0.6	0.57	0.57	0.51	0.68	0.65
Number of months	325	181	325	325	181	181	325	181	337	193	337	337	193	193	337	193

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

Table 14: NFA ratio controlling for financial variables as predictors of 12 month currency excess returns

This table reports the Fama-Macbeth estimates for predictability of twelve month currency excess returns by NFA ratio controlling for financial variables: carry, momentum, and value. Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. Momentum is defined as the three-month change in the natural logarithm of the nominal spot exchange rate $S_{j,t} - S_{j,t-3}$. Value is defined as the five-year change in the natural logarithm of the real exchange rate $-(q_{j,t-12} - q_{j,t-60})$ which in this form means that higher value indicates a weaker foreign currency. NFA captures the total net external position of a country relative to GDP. It is defined as $\text{NFA}_{j,t}$=([Equity $\text{Assets}_{j,t}$ - Equity $\text{Liabilities}_{j,t}$]+[Debt $\text{Assets}_{j,t}$ - Debt $\text{Liabilities}_{j,t}$] + [FDI $\text{Assets}_{j,t}$ - FDI $\text{Liabilities}_{j,t}$] + $\text{FX}_{j,t}$) /$\text{GDP}_{j,t}$. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for all countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in each cross sectional regression over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Annual Currency Excess Returns															
	Panel A: NFA Ratio								Panel B: NFA Ratio (12mth lag)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carry		2.56*			3.89***	2.08*		3.42***		2.43*			3.72***	2.04		3.25***
		(1.76)			(3.25)	(1.65)		(2.74)		(1.79)			(3.28)	(1.46)		(2.77)
3mth-Mom			2.46***		3.76***		1.96***	3.90***			2.40***		3.78***		2.06***	3.92***
			(4.87)		(5.90)		(3.96)	(5.23)			(5.53)		(6.45)		(4.32)	(5.66)
Value				1.99***		1.85***	2.00***	2.04***				1.89**		1.73***	1.88***	1.95***
				(2.84)		(3.20)	(3.49)	(3.91)				(2.52)		(2.93)	(3.20)	(3.68)
NFAR	-4.15**	0.17	-1.22**	-0.67	0.17	0.31	-0.68*	0.27								
	(-2.02)	(0.32)	(-2.12)	(-1.25)	(0.35)	(0.51)	(-1.77)	(0.51)								
NFAR(12mth lag)									-2.32*	0.01	-1.39**	-0.7	0.01	0.14	-0.64*	0.11
									(-1.69)	(0.02)	(-2.16)	(-1.40)	(0.02)	(0.25)	(-1.84)	(0.24)
Constant	-0.05	2.41	2.73*	2.82*	2.47	2.29	3.13**	2.33	1.91	2.32	2.93**	2.81*	2.37	2.22	3.18**	2.25
	(-0.02)	(1.26)	(1.84)	(1.73)	(1.30)	(1.21)	(1.98)	(1.24)	(0.94)	(1.30)	(2.06)	(1.77)	(1.33)	(1.25)	(2.10)	(1.27)
Observations	3,538	3,250	3,538	3,386	3,250	3,098	3,386	3,098	3,766	3,478	3,766	3,614	3,478	3,326	3,614	3,326
Adjusted R^2	0.49	0.42	0.61	0.59	0.59	0.53	0.7	0.67	0.48	0.41	0.6	0.57	0.58	0.51	0.68	0.66
Number of months	325	181	325	325	181	181	325	181	337	193	337	337	193	193	337	193

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

Table 15: LDC controlling for CMV as predictors of 12 month currency excess returns

This table reports the Fama-Macbeth estimates for predictability of twelve month currency excess returns by LDC controlling for financial variables: carry, momentum, and value. Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. Momentum is defined as the three-month change in the natural logarithm of the nominal spot exchange rate $S_{j,t} - S_{j,t-3}$. Value is defined as the five-year change in the natural logarithm of the real exchange rate $-(q_{j,t-12} - q_{j,t-60})$ which in this form means that higher value indicates a weaker foreign currency. LDC captures the proportion of a country's liabilities denominated in domestic currency. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for all countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in each cross sectional regression over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Annual Currency Excess Returns															
	Panel A: LDC								Panel B: LDC (12mth lag)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carry		1.85***			2.97***	1.60*		2.76**		1.90***			3.01***	1.64*		2.78***
		(2.57)			*(2.61)	(1.73)		(2.58)		(2.56)			(2.66)	(1.66)		(2.62)
3mth-Mom			3.59***		3.45***		2.36***	3.65***			3.59**		3.44***		2.35***	3.63***
			(3.90)		(7.44)		(4.97)	(6.50)			(2.26)		(7.40)		(4.95)	(6.45)
Value				3.57***		1.74***	2.43***	2.03***				3.56***		1.74***	2.43***	2.04***
				(2.76)		(3.70)	(4.20)	(-4.51)				(2.75)		(3.61)	(4.20)	(-4.41)
LDC	-0.66**	-0.53	-0.72**	-0.2	-0.41	-0.12	-0.25	0.09								
	(-2.06)	(-0.94)	(-1.98)	(-0.67)	(-0.95)	(-0.21)	(-0.99)	(0.23)								
LDC (12mth lag)									-0.61*	-0.42	-0.70**	-0.16	-0.34	0.02	-0.23	0.15
									(-1.89)	(-0.76)	(-1.96)	(-0.53)	(-0.78)	(0.03)	(-0.90)	(0.38)
Constant	3.52**	1.65	-4.33	3.85**	1.63	1.43	3.43**	1.36	3.53**	1.63	-4.32	3.85**	1.63	1.41	3.43**	1.35
	(2.53)	(0.93)	(-0.48)	(2.32)	(0.93)	(0.83)	(2.27)	(0.80)	(2.53)	(0.93)	(-0.48)	(2.32)	(0.93)	(0.82)	(2.27)	(0.80)
Observations	3,908	3,620	3,908	3,796	3,620	3,508	3,796	3,508	3,908	3,620	3,908	3,796	3,620	3,508	3,796	3,508
Adjusted R^2	0.06	0.39	0.58	0.57	0.55	0.51	0.67	0.64	0.06	0.4	0.58	0.57	0.55	0.51	0.67	0.64
Number of months	357	213	357	357	213	213	357	213	357	213	357	357	213	213	357	213

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

Table 16: Extended Foreign Currency Sample: NFA and LDC controlling for CMV as predictors of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of monthly currency excess returns by NFA and LDC controlling for financial variables: carry, momentum, and value using an extended foreign currency sample. Panels A and B show the results for NFA and LDC, respectively. Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. Momentum is defined as the three-month change in the natural logarithm of the nominal spot exchange rate $S_{j,t} - S_{j,t-3}$. Value is defined as the five-year change in the natural logarithm of the real exchange rate $-(q_{j,t-12} - q_{j,t-60})$ which in this form means that higher value indicates a weaker foreign currency. LDC captures the proportion of a country's liabilities denominated in domestic currency. NFA captures the total net external position of a country relative to GDP. It is defined as $\text{NFA}_{j,t}$=([Equity $\text{Assets}_{j,t}$ - Equity $\text{Liabilities}_{j,t}$]+[Debt $\text{Assets}_{j,t}$ - Debt $\text{Liabilities}_{j,t}$] + [FDI $\text{Assets}_{j,t}$ - FDI $\text{Liabilities}_{j,t}$] + $\text{FX}_{j,t}$) /$\text{GDP}_{j,t}$. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for the countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in the cross sectional regressions over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns															
	Panel A: NFA								Panel B: LDC							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carry		0.39***			0.42***	0.41***		0.46***		0.38***			0.43***	0.42***		0.43***
		(8.61)			(10.17)	(9.78)		(10.98)		(8.01)			(9.13)	(5.92)		(8.66)
3mth-Mom			0.28***		0.30**		0.12*	0.27**			0.29**		0.24*		0.19	0.21
			(3.10)		(2.11)		(1.66)	(1.97)			(2.14)		(1.68)		(1.49)	(1.41)
Value				0.17*		0.16**	0.13*	0.13				0.21*		0.23**	0.33**	0.16*
				(1.86)		(2.18)	(1.63)	(1.46)				(1.79)		(2.32)	(2.41)	(1.68)
NFA	-0.12**	0.08	-0.11***	-0.09*	0.06	0.07	-0.11***	0.07*								
	(-2.12)	(1.48)	(-3.31)	(-1.81)	(1.01)	(1.46)	(-2.05)	(1.69)								
LDC									-0.13***	0.04	-0.13**	-0. 10**	0.04	0.07	-0.11**	0.04
									(-3.57)	(1.49)	(-2.43)	(-2.13)	(1.28)	(1.51)	(-1.99)	(1.16)
Constant	0.16	0.42	0.24	0.01	0.44	0.04	0.10	0.37	0.13	0.47	0.19	0.32*	0.44*	0.31	0.28	0.31
	(1.19)	(1.21)	(1.44)	(0.08)	(1.36)	(1.03)	(0.71)	(1.26)	(1.45)	(0.19)	(0.84)	(1.89)	(1.72)	(1.04)	(1.43)	(1.11)
Observations	8,710	8,710	8,710	7,514	8,710	7,514	7,514	7,514	7,282	7,282	7,282	6,810	7,282	6,810	6,810	6,810
Adjusted R^2	0.11	0.25	0.22	0.27	0.4	0.35	0.36	0.44	0.07	0.29	0.18	0.17	0.33	0.34	0.31	0.41
Number of months	443	443	443	409	443	409	409	409	380	380	380	380	380	380	380	380

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

Table 17: Developed versus Developing Countries: NFA controlling for CMV as predictors of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of one month currency excess returns by NFA controlling for financial variables: carry, momentum, and value using an extended foreign currency sample. Panels A and B show the results for developed and developing nations, respectively. Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. Momentum is defined as the three-month change in the natural logarithm of the nominal spot exchange rate $S_{j,t} - S_{j,t-3}$. Value is defined as the five-year change in the natural logarithm of the real exchange rate $-(q_{j,t-12} - q_{j,t-60})$ which in this form means that higher value indicates a weaker foreign currency. NFA captures the total net external position of a country relative to GDP. It is defined as $\text{NFA}_{j,t}$=([Equity $\text{Assets}_{j,t}$ - Equity $\text{Liabilities}_{j,t}$]+[Debt $\text{Assets}_{j,t}$ - Debt $\text{Liabilities}_{j,t}$] + [FDI $\text{Assets}_{j,t}$ - FDI $\text{Liabilities}_{j,t}$] + $\text{FX}_{j,t}$) /$\text{GDP}_{j,t}$. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for the countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in the cross sectional regressions over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns															
	Panel A: Developed Nations								Panel B: Developing Nations							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carry		0.18***			0.23***		0.21***	0.28**		0.43**			0.41***		0.36***	0.44***
		(3.27)			(4.69)		(3.82)	(4.98)		(6.57)			(8.91)		(6.66)	(9.88)
3mth-Momentum			0.09*		0.11**	0.14		0.11*			0.19*		0.10	0.06		0.15*
			(1.69)		(2.17)	(1.34)		(1.61)			(1.87)		(1.17)	(1.34)		(1.81)
Value				0.05**		0.13**	0.07*	0.08*				0.05		0.24	0.21	0.13
				(1.96)		(1.73)	(1.61)	(1.67)				(0.76)		(0.19)	(1.13)	(1.12)
NFA	-0.05**	0.03	-0.06**	-0.03	0.03	-0.05*	0.04*	0.04*	-0.12**	0.04	-0.04*	-0.19	-0.11	-0.01	0.01*	-0.13
	(-2.02)	(1.23)	(-2.19)	(-0.93)	(1.07)	(-1.86)	(1.73)	(1.63)	(-2.41)	(0.21)	(-1.79)	(-0.34)	(-1.17)	(-0.23)	(1.73)	(-1.23)
Constant	0.13	0.11	0.13	0.13	0.08	0.11	0.08	0.08	0.41	0.61	0.44*	0.33*	0.27	0.46*	0.18*	0.27*
	(1.09)	(1.19)	(1.01)	(1.76)	(0.56)	(0.53)	(0.91)	(0.26)	(1.49)	(1.31)	(1.64)	(1.76)	(1.51)	(1.76)	(1.91)	(1.77)
Observations	7,937	6,990	6,990	6,184	6,990	6,184	6,184	6,184	2,904	1,194	1,870	1,870	1,194	1,870	1,870	1,194
Adjusted R^2	0.09	0.24	0.23	0.22	0.42	0.39	0.31	0.42	0.07	0.81	0.24	0.07	0.79	0.44	0.77	0.80
Number of months	475	443	443	409	443	409	409	409	224	138	192	192	138	192	192	138

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

Table 18: Developed versus Developing Countries: LDC controlling for CMV as predictors of currency excess returns

This table reports the Fama-Macbeth estimates for predictability of monthly currency excess returns by LDC controlling for financial variables: carry, momentum, and value. Panels A and B show the results for developed and developing nations, respectively. Carry is defined as the forward discount $S_{j,t} - F_{j,t}$. Momentum is defined as the three-month change in the natural logarithm of the nominal spot exchange rate $S_{j,t} - S_{j,t-3}$. Value is defined as the five-year change in the natrual logarithm of the real exchange rate $-(q_{j,t-12} - q_{j,t-60})$ which in this form means that higher value indicates a weaker foreign currency. LDC captures the proportion of a country's liabilities denominated in domestic currency. All variables are standardized in the cross-section in the form $(X_{j,t} - \mu_{X_{j,t}})/\sigma_{X_{j,t}}$, where $\mu_{X_{j,t}}$ is the average and $\sigma_{X_{j,t}}$ is the standard deviation of $X_{j,t}$ for all countries available in month t. Observations represent the total number of currencies included in the regressions over the sample period. Adjusted R^2 is the average of the adjusted R^2 in each cross sectional regression over the sample period. The cross sectional regressions are conducted only where there are at least 10 country's data available in the month. Number of months represents the total cross-sectional panels (months) that are used to compute the estimators. t-statistics are reported in parentheses and are based on Newey and West (1987) standard errors with one lag.

	Monthly Currency Excess Returns															
	Panel A: Developed Nations								Panel B: Developing Nations							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Carry		0.19***			0.21**		0.22***	0.23***		0.41**			0.37***		0.33***	0.42***
		(3.87)			(2.46)		(2.59)	(3.16)		(7.26)			(7.11)		(5.63)	(6.18)
3mth-Momentum			0.07*		0.03	0.02		0.04			0.16**		0.09	0.04*		0.10
			(1.61)		(1.07)	(0.93)		(0.93)			(2.17)		(0.16)	(1.67)		(0.66)
Value				0.13**		0.12**	0.11**	0.09*				0.05		0.13	0.01	0.04
				(2.11)		(1.99)	(2.11)	(1.93)				(0.13)		(1.00)	(0.16)	(0.02)
LDC	-0.04**	0.01	-0.05**	-0.04*	0.01	-0.04**	0.00	0.02	-0.02	0.00	0.14	-0.11	0.08	-0.21	-0.04	0.17
	(-2.03)	(0.47)	(-2.11)	(-1.75)	(0.40)	(-1.98)	(1.03)	(0.13)	(-1.10)	(0.13)	(1.06)	(-0.86)	(1.44)	(-1.13)	(-0.88)	(1.11)
Constant	0.21	0.18	0.17	0.22	0.17	0.20	0.18	0.16	0.38***	0.55*	0.42**	0.68*	0.55	0.91**	0.10	0.41
	(1.59)	(1.14)	(1.28)	(1.33)	(1.27)	(1.11)	(1.43)	(1.23)	(3.58)	(1.81)	(2.04)	(1.83)	(1.55)	(1.99)	(0.56)	(1.51)
Observations	5,862	5,862	5,862	5,729	5,862	5,729	5,729	5,729	1,033	761	1,042	912	761	912	761	761
Adjusted R^2	0.08	0.22	0.21	0.22	0.38	0.34	0.34	0.42	0.02	0.58	0.09	0.01	0.46	0.07	0.53	0.55
Number of months	380	380	380	380	380	380	380	380	139	107	139	139	107	139	107	107

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