THE RELATIONSHIP BETWEEN RETURNS OF CARRY TRADE STRATEGIES AND EQUITY MARKETS: THE EVIDENCE FROM DEVELOPED ECONOMIES AND ASEAN-5 EMERGING MARKETS

ความสัมพันธ์ระหว่างผลตอบแทนของธุรกรรม CARRY TRADE และผลตอบแทนของตลาดตราสารทุน: ผลการทดสอบในกลุ่มประเทศพัฒนาและกลุ่มประเทศเกิดใหม่ 5 ประเทศอาเซียน

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Abstract

This paper investigates the Granger causality relationship between returns of carry trade strategies and equity markets in developed economies and ASEAN-5 emerging markets. The Granger causality test under the Vector Autoregressive (VAR) model is employed using daily data from August 2006 to March 2015. The empirical results show that carry trade portfolio returns of G10 currencies strongly Granger cause returns of equity markets in all developed economies and ASEAN-5 emerging markets. Higher carry trade portfolio returns significantly lead to greater returns in most stock markets regardless of the environments they operate in. The implication of this study is that the US dollar has been more popular in funding for carry trade strategies than the Japanese yen. Conversely the currencies of all ASEAN-5 emerging markets have been used for investment purposes. For the case that excess returns of individual currency pairs are proxies for carry trade returns, both directions of the Granger causality relationship exist in most equity markets. Moreover, the results indicate that the yen is no longer a funding currency for carry trades.

Keywords: Carry Trade, Uncovered Interest Rate Parity (UIP), Granger Causality test, Vector Autoregressive model (VAR)

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บทคัดย่อ

งานวิจัยฉบับนี้ทำการตรวจสอบความสัมพันธ์แบบ Granger causality ระหว่างผลตอบแทนของธุรกรรม carry trade และผลตอบแทนของตลาดตราสารทุนในกลุ่มประเทศที่พัฒนาและกลุ่มประเทศเกิดใหม่ 5 ประเทศอาเซียน การศึกษาอาศัยการทดสอบ Granger causality ภายใต้ตัวแบบ Vector Autoregressive (VAR) โดยใช้ข้อมูลรายวัน ตั้งแต่เดือนสิงหาคม 2549 ถึงเดือนมีนาคม 2558 ผลการทดสอบแสดงให้เห็นว่า ผลตอบแทนจากพอร์ตการลงทุน ธุรกรรม carry trade ที่ลงทุนในสกุลเงินของประเทศในกลุ่ม G10 ส่งผลกระทบต่อผลตอบแทนของตลาดตราสารทุน ทั้งหมดในประเทศที่พัฒนาและกลุ่มประเทศเกิดใหม่ 5 ประเทศอาเซียน ผลตอบแทนจากพอร์ตการลงทุนธุรกรรม carry trade ที่สูงขึ้นส่งผลให้ผลตอบแทนของตลาดตราสารทุนส่วนใหญ่สูงขึ้นด้วยไม่ว่าจะอยู่ในกลุ่มประเทศใด ผลการทดสอบนี้ให้ความหมายโดยนัยที่แสดงให้เห็นว่ามีความนิยมกู้ยืมเงินดอลลาร์สหรัฐฯ ในฐานะสกุลเงินที่มีอัตรา ดอกเบี้ยต่ำเพื่อทำธุรกรรม carry trade มากกว่าเงินเยน ในทางกลับกันสกุลเงินของกลุ่มประเทศเกิดใหม่ 5 ประเทศ อาเซียนทั้งหมดเป็นสกุลเงินที่ใช้สำหรับลงทุน สำหรับกรณีที่ใช้สกุลเงินคู่เดียวในการลงทุน เป็นตัวแทนการวัดผลตอบแทน ของธุรกรรม carry trade นั้น ความสัมพันธ์แบบ Granger causality ทั้ง 2 ทิศทางเกิดขึ้นในตลาดตราสารทุน ส่วนใหญ่ นอกจากนี้ผลการทดสอบได้ยืนยันว่าเงินเยนไม่ใช่สกุลเงินที่มีการกู้ยืมเพื่อทำธุรกรรม carry trade

คำสำคัญ: ธุรกรรม Carry Trade ทฤษฎี Uncovered Interest Rate Parity (UIP) การทดสอบ Granger Causality ตัวแบบ Vector Autoregressive (VAR)

Introduction

Currency carry trades have been tempting strategies for foreign exchange (FX) traders and speculators over the last decade. For example the well-known international fund Deutsch Bank invested in carry trades, namely Power Shares DB G10 Currency Harvest Fund. Currency carry trade strategies proceed with borrowing low interest rate currencies (funding currencies) then converting these into currencies of countries that offer high-yielding assets to invest (investment currencies). The interest rate differential creates profits for carry trades. Additional carry trade profits are made when investment currencies rise against funding currencies. However, the returns on carry trades raise the puzzle of uncovered interest rate parity (UIP). This states that returns on interest rate differentials between countries should be offset by changes in their pairs of foreign exchange rates. Particularly, the funding currencies should be appreciating against the investment currencies to eliminate the attractive interest rate gap.

According to previous studies, there is a close relationship between foreign exchange rates and equity markets, but not much consistent evidence has emerge to confirm this. This paper proposes to study the Granger causality relationship between the daily returns of currency carry trade strategies and equity markets. Specifically, the paper analyses whether the previous values of carry trades improve the prediction of future changes in stock prices, or in the opposite direction. To extend the literature on the subject, this paper examines the Granger causality relationship in

different economies. It focuses on five major emerging markets in Southeast Asia (ASEAN-5), namely Indonesia, Malaysia, the Philippines, Singapore and Thailand, along with countries of G10 currencies. In addition, the excess returns of individual currency pairs are created to proxy for ASEAN-5 currency carry trades due to a small number of ASEAN-5 carry trade portfolios provided. Hence, this empirical examination using evidence from those markets and additional proxy of currencies will contribute to updating our knowledge of this subject.

The empirical results in this paper indicate that carry trade portfolio returns help to forecast equity markets returns regardless of environments. The additional proxy of individual currency pairs add up to both causality directions (i.e. the causality from carry trade returns to equity market returns and vise-versa). The results also imply that the Japanese yen is no longer a funding currency because the US dollar is now more popular in funding for carry trade strategies.

Literature Review

Carry trade profits violate uncovered interest rate parity (UIP) theory because the interest rate differential between countries is not equal to the change in corresponding foreign exchange rates. An excess return above what UIP predicts in equation 1 should not exist. (eq.1)

$$r = \Delta i - \Delta s$$

r represents an excess return from borrowing a low yielding currency and investing in a high yielding currency. Δi is the interest rate differential between countries, while Δs represents the change in spot exchange rate of funding currency against investment currency.

There is evidence explaining the UIP puzzle (e.g. Fama, 1984; Froot & Thaler, 1991; Burnside, Eichenbaum & Rebelo, 2007). These have explored carry trades performance associated with risks (see Plantin & Shin, 2008; Ichiue & Koyama, 2008; Brunnermeier, Nagel & Pedersen, 2009). Much research has revealed the relationship of excess FX returns to risk factors like stock and bond market returns by applying: firstly, an asset pricing approach; and secondly, nonlinear modeling to account for time-varying risk premium (e.g. Lustig, Roussanov & Verdelhan, 2011; Menkhoff et al., 2011; Christiansen, Ranaldo & Söderlind, 2011; Bakshi & Panayotov, 2013; Atanasov & Nitschka, 2014). Christiansen, Ranaldo & Söderlind (2011) found that carry trades were priced by stock returns and its exposure to stock factor was regime-dependent, which became greater during turbulent periods.

Capital flows from where returns are low to where they are high or from where capital is abundant to where it is scarce. In practice this means they from developed to developing countries. Emerging markets have made it possible for foreign investors to access domestic stock markets. Market valuations grow due to these examples of liberalization, which cause the cost of capital to fall (Eichengreen, Hausmann & Panizza, 2007).

As capital flows to countries with high-yielding assets such as stocks (Fung, Tse & Zhao

(2013), some scholars studied the connections between the currencies and equity returns in terms of correlations and causality (e.g. Melvin & Taylor, 2009; Tse & Zhao, 2011) showed that causality from carry trades to the US stock market does not exist but there is a volatility spillover effect from US stocks to carry trades. Later, in 2013 they found the causality in returns from carry trades to stock markets in Japan, Australia, and India, and bi-directional volatility spillover effects between these markets. Kumar (2013) also reported the bi-directional volatility spillover in other emerging markets using multivariate GARCH.

These theoretical and literature reviews on UIP and efficient allocation of capital motivate this paper to investigate how funds flow and also to indirectly provide an answer to the UIP puzzle. The Granger causality test is used to describe relationships between carry trades and equity markets in developed and emerging countries.

Objective of the study

As funds transfer across international financial markets affecting exchange rate and stock price movements, previous studies reported a close relationship between currencies and stock markets. Empirical results revealed an inconsistent relationship in different environments. Thus, this study tries to examine the causal relation-ship between carry trade portfolio returns of G10 currencies and equity market returns in developed economies and emerging markets by employing the Granger causality test under

Vector Autoregressive (VAR) system. In other words, the research tests whether previous currencies values forecast future values of stock prices (and vice-versa) in those markets. Moreover, in the test, this research proposes to represent the excess returns of individual currency as another proxy for ASEAN-5 currency carry trades. It does this in order to more properly analyze the relationships between FX and stocks in ASEAN-5 emerging markets.

Methodology and Data

The methodology in this paper is established to determine the Granger causality relationship between the daily returns of currency carry trade strategies and equity markets. The Granger causality is estimated under the two-equation vector autoregressive (VAR) system with lag length p as follows:

(eq.2)

$$ET_t = \alpha_1 + \sum_{i=1}^{p} \beta_{1i} CT_{t-i} + \sum_{i=1}^{p} \gamma_{1i} ET_{t-i} + \delta_1 DM_t + \varepsilon_{1t}$$

(eq.3)

$$CT_t = \alpha_2 + \sum_{i=1}^{p} \beta_{2i} CT_{t-i} + \sum_{i=1}^{p} \gamma_{2i} ET_{t-i} + \delta_2 DM_t + \varepsilon_{2t}$$

where the daily log carry trade returns and the lagged values are denoted as CT_t and CT_{t-i}, while ET_t and ET_{t-i} are the daily log returns of an equity index in period t and its past values, respectively. A dummy variable for financial crisis (DM_t) is equal to 1 during a crisis period or 0 if otherwise. The terms ε_{1t} and ε_{2t} are respectively shocks in ET_t and CT_t. All variables

in the VAR model are stationary, and testing Granger causality uses the standard F-test under the following restrictions. These refer to the coefficients of the cross-market returns between equity and carry trades all equally set to zero.

1) H_o: $\beta_{1i} = 0$ ($\beta_{11} = \beta_{12} = ... = \beta_{1p} = 0$)
2) H_o: $\gamma_{2i} = 0$ ($\gamma_{21} = \gamma_{22} = ... = \gamma_{2p} = 0$)

The Granger causality measures past values of one variable that can aid in forecasting future values of another variable in the system. Thus, carry trades Granger cause equity when the first null hypothesis is rejected. It means that the past values of carry trades improve the prediction of future changes in stock prices. On the other hand, rejecting the second restriction implies that changes in currency prices can be predicted from the past values of stock prices.

Moreover, to explain the causality relation-ship between each other in terms of the economic impacts magnitude (Fung, Tse and Zhao (2013), the sum of all coefficients of cross-market returns between equity and carry trades ($\sum_{i=1}^{p} \beta_{1i}$ and $\sum_{i=1}^{p} \gamma_{2i}$) are also considered under the restriction tests:

3) H_o: $\sum_{i=1}^{p} \beta_{1i} = 0$
4) H_o: $\sum_{i=1}^{p} \gamma_{2i} = 0$

These rejected restrictions tell us that the total causality relationships across these 2 markets exist. In particular, the sum of all estimated coefficients ($\sum_{i=1}^{p} \hat{\beta}_{1i}$) indicates the magnitude of total causality from carry trade returns to equity market returns. The sum of all estimated coefficients ($\sum_{i=1}^{p} \hat{\gamma}_{2i}$) describes the magnitude from equity market returns to carry trade returns.

In this paper, the sample of daily data spans from August 2006 to March 2015, covering 2,251 observations. Two sets of data are classified to examine the causality relationship in different economies. First, the set of developed economies enclose the most liquid and tradable currencies and stock markets (Japan, United States, United Kingdom, Australia, New Zealand, and European Union). Second, ASEAN-5 (Indonesia, Malaysia, the Philippines, Singapore[*], and Thailand) represent the emerging markets environment and the major stock markets in terms of market capitalization in Southeast Asia.

Portfolio Returns of Carry Trade

In the base line analysis, a proxy for the performance of carry trade portfolio is the daily log return created from the DB G10 Currency Future Harvest price Index, collected through Reuters DataStream. It is the index tracked changes by the PowerShares DB G10 Currency Harvest Fund of Deutsche Bank, providing for investors who want to conveniently invest in currency futures. The Index is composed of G10 currencies future contracts and constructed to seek profit in the way that high interest rate currencies tend to appreciate relative to low interest rate currencies.

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[*] The World Bank classifies Singapore as a high-income country, including Singapore here is to represent the result of developed country in ASEAN.
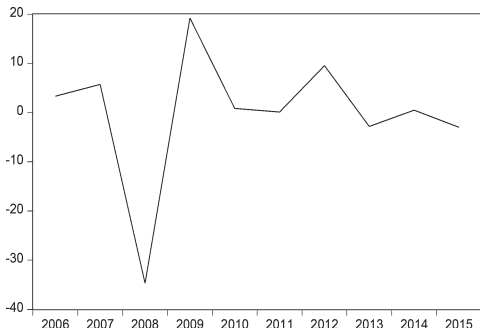
Figure 1 Annualized CT performance calculated based on DB G10 Currency Future Harvest Index

G10 currencies are most liquid and traded, including the Australian Dollar (AUD), Canadian Dollar (CAD), Swiss Franc (CHF), Euro (EUR), British Pound (GBP), Japanese Yen (JPY), Norwegian Krone (NOK), New Zealand Dollar (NZD), Swedish Krona (SEK), and US Dollar (USD). The DB G10 Currency Future Harvest Index works on making: firstly, long future contracts of the 3 highest interest rates currencies; and secondly, short future contracts of the 3 lowest interest rate currencies among the G10 countries. Each quarter, there is a performance evaluation and re-weighting 3 long positions of the highest interest rate currencies future and 3 short positions of the lowest interest rate currencies future.

Excess Returns of Individual Currency

Another proxy of carry trade returns is constructed for robustness. It is also due to the lack of carry trades performance that includes

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Some studies customize portfolios from Bloomberg Professional Services and the results have no relevance to equity to carry trades.

enough Asian currencies into the portfolio[*]. This proxy, the excess returns of each currency pair (funding and investment currencies) is calculated individually based on the interest rate differential in concurrence with UIP theory. Consequently the return calculated from eq. 4 below is an arbitrage profit or an excess return above what UIP predicts as documented in many studies (eg. Brunnermeier, Nagel & Pedersen, 2009; Christiansen, Ranaldo & Söderlind, 2011).

(Eq.4)
$$r_{jt}^k = \left(i_{t-1}^k - i_{t-1}^j\right) - \left(s_t^k - s_{t-1}^k\right)$$

where r_{jt}^k = individual currency pair excess return in period t which is calculated from borrowing currency j and investing in currency k
$i_{t-1}^k - i_{t-1}^j$ = 1-day lagged interest rate differential of country k and j
s_t^k = log spot exchange rate of currency k per 1 unit of j
s_{t-1}^k = log 1-day lagged spot exchange rate of currency k per 1 unit of j

Mid quotes daily data of spot exchange rates and interest rates are utilized. The most used interest rate is the 1-day interbank overnight money market rate, except for some countries where only the 1-day interbank T/N (tomorrow-next) money market rate is available.

The Japanese yen (JPY) and US Dollar (USD) are mainly employed as funding currencies in this type of carry trade proxy. The Yen and Dollar are typically known as safe havens and have become the favorite currencies for trading. The US dollar was even more preferred to the Japanese yen since the subprime crisis and the

use of quantitative easing policy (Fung, Tse & Zhoa (2013). Following Fung, Tse & Zhao (2013), the investment currency used in this study is the Australian Dollar (AUD), the most selected as long position for carry trade strategies. This is due to its high interest rate. The currencies in emerging markets have been considered as well. The lower yielding currencies like JPY or USD are borrowed and then invested in higher yielding assets. 5 emerging Asian economies' currencies: Thai baht (THB), Indonesian rupiah (IDR), Philippine peso (PHP), Singapore Dollar, (SGD), and Malaysian ringgit (MYR) have been added to our investment scope.

Equity Market Returns

Daily data of stock indices of the above mentioned countries are derived from DataStream. Logarithmic return is applied. The sources for each country's stock indices are: S&P 500 composite (US); FTSE 100 (UK); Nikkei 225 Stock Average (Japan); S&P/ASX 200 (Australia); S&P/NZX 50 (New Zealand); FTSE World Europe (EU); Straits Times Index (Singapore); Bangkok S.E.T. (Thailand); FTSE Bursa Malaysia KLCI (Malaysia); IDX composite (Indonesia); and Psei (Philippines).

Empirical Results

The base line analysis is the Granger causality relationship between carry trade portfolio returns of G10 currencies and equity market returns. There are 2 directions in which causality can go: 1) carry trade returns cause equity market returns; and 2) equity market returns cause carry trade returns. The test results are summarized in Table 1. It reports p-values of test restrictions 1 to 4, and the sum of all estimated coefficients under restrictions 3 and 4 ($\sum_{i=1}^{p} \hat{\beta}_{1i}$, $\sum_{i=1}^{p} \hat{\gamma}_{2i}$). Significant p-values indicate that the Granger causality relationship exists, while the sum of all estimated coefficients describe how these 2 markets Granger cause each other.

From panel A, G10 carry trade portfolio returns strongly Granger cause returns of all equity markets in developed economies. Panel B also highlights the impact of carry trade returns on all ASEAN-5 emerging stock markets. Past currencies values assist in forecasting future values of prices in all stock markets. Positive values of the sum of all coefficients $\sum_{i=1}^{p} \hat{\beta}_{1i}$ explain that higher carry trade portfolio returns of G10 currencies significantly cause higher returns of all stock markets regardless of environments. The exception is the US which shows a negative coefficient.

To illustrate the implication of the estimated results, the violation of UIP theory is reviewed. UIP states that interest rate differentials should be offset by the appreciation of borrowing or funding currencies. Thus, positive returns of carry trades violate UIP. Profits from carry trades persuade more speculators and arbitrageurs to become involved in trading, which leads to more selling (depreciation) of funding currencies and more buying (appreciation) of high yielding or investment currencies. Consequently, funds flow out from (into) countries of funding (investment) currencies. Therefore carry trade

returns positively (negatively) relate to stock market returns in countries where currencies are invested (funded) (Fung, Tse & Zhoa, 2013). According to this explanation, the results from Table 1 mean that currencies of countries that have a positive sum of all estimated coefficients are investment currencies (like the AUD which is normally targeted as an investment currency) since the higher carry trade returns, the higher will be the equity market returns. In other words, carry trades help funds flow to where equity market returns are high. Thus their currencies are in demand for investment purposes.

This study reexamines the work of Fung, Tse & Zhao (2013) who found a positive value of coefficients for Japan. They argued that the Japanese yen was no longer a funding currency. This paper contributes to the extension of their study by stating that the US dollar plays the leading role in funding currencies instead of the Japanese yen. The evidence discloses the negative value of -0.4699 for the US, and the positive value of 1.2403 for Japan (Table 1, column restriction 3). This outcome is well supported by the evidence that higher carry trade profits lead to smaller US stock market returns, indicating that capital flows out from the US equity market to where assets produce higher yields. Conversely, in Japan the higher carry trade profits, the higher will be the equity returns. Thus, from this point the yen becomes an investment currency. The ASEAN-5 stock markets will perform better due to higher carry trade returns. Positive sum of all estimated coefficients implies that ASEAN-5 currencies and equities tend to be invested. Another feature of the Granger causality relationship - equity returns cause carry trade returns - is only found in some equity markets (US, Australia, New Zealand).

For a robustness check, Tables 2 and 3 contain the Granger causality results for the case of excess returns of individual currency pairs and related equity market returns. This refers, for example, to a relationship between excess returns of borrowing JPY to invest in AUD, and equity markets of Japan and Australia. In this analysis the JPY and USD are used as funding currencies, while the AUD and 5 Asian currencies (THB, IDR, PHP, SGD, and MYR) are selected as investment assets.

Overall, the results from borrowing JPY as shown in Table 2 and borrowing USD in Table 3 illustrate both directions of the Granger causality relationship. The exception involves Thailand and Malaysia, where carry trade returns do not help to forecast changes in their stock indices. Conversely, carry trade returns are not predictable from the changes in stock index of Singapore. Positive sum of all estimated coefficients in Table 2 insists that yen is no longer a funding currency.

Table 1 Granger Causality Relationship between Carry Trade Portfolio Returns and Equity Market Return

Equity Markets	lag	Carry Trades cause Equity				Equity cause Carry Trade			
		restriction 1	restriction 3			restriction 2	restriction 4		
		P-values	P-values	Sum Coeff		P-values	P-values	Sum Coeff	
Panel A: Developed Economies									
Japan	8	0.0000	0.0000	1.2403	***	0.0004	0.7540	-0.0144	
US	12	0.0001	0.0115	-0.4699	**	0.0055	0.0621	0.1533	*
Europe	6	0.0000	0.0000	1.7265	***	0.0545	0.2601	0.0464	
UK	6	0.0000	0.0328	0.2314	**	0.1032	0.3409	0.0511	
Australia	6	0.0000	0.0000	0.7687	***	0.0335	0.0157	0.1269	**
New Zealand	11	0.0000	0.0000	0.3415	***	0.0005	0.0446	0.1864	**
Panel B: ASEAN Emerging Markets									
Indonesia	8	0.0000	0.0000	1.0861	***	0.0006	0.2786	-0.0481	
Malaysia	6	0.0000	0.0000	0.3668	***	0.0860	0.9432	-0.0042	
Philippines	6	0.0000	0.0000	0.9041	***	0.2353	0.0928	-0.0649	
Singapore	7	0.0000	0.0000	0.5651	***	0.0159	0.1265	0.0818	
Thailand	6	0.0000	0.0000	0.6908	***	0.1454	0.0743	-0.0683	

*** Significant at 1% level   ** Significant at 5% level   * Significant at 10% level

Table 2 Granger Causality for Individual Currency Excess Returns (funding JPY) and Equity Market Returns

Equity Markets	lag	Carry Trade to Equity			Equity to Carry Trade		
		restriction 1	restriction 3		restriction 2	restriction 4	
		P-values	P-values	Sum Coeff	P-values	P-values	Sum Coeff
Pair 1: JPY to AUD							
Japan	2	0.0000	0.0111	0.1447 **	0.0002	0.0000	0.1221 ***
Australia	5	0.0814	0.8210	0.0137	0.0089	0.0078	0.1589 ***
Pair 2: JPY to IDR							
Japan	7	0.0000	0.0000	0.7450 ***	0.0000	0.1475	0.0674
Indonesia	8	0.0000	0.0000	0.7042 ***	0.0094	0.9051	-0.0056
Pair 3: JPY to MYR							
Japan	3	0.0002	0.0028	0.3014 ***	0.0000	0.0068	0.0662 ***
Malaysia	2	0.1556	0.6703	-0.0140	0.0006	0.0019	0.0987 ***
Pair 4: JPY to SGD							
Japan	5	0.0000	0.0000	1.8510 ***	0.0359	0.0276	-0.0691 **
Singapore	2	0.0000	0.0000	0.5531 ***	0.7787	0.4999	0.0135
Pair 5: JPY to THB							
Japan	2	0.0000	0.0143	0.2193 **	0.0013	0.0003	0.0568 ***
Thailand	6	0.0379	0.1213	0.1836	0.0000	0.0138	0.0661 **
Pair 6: JPY to PHP							
Japan	5	0.0002	0.5728	0.0724	0.0000	0.0000	0.2227 ***
Philippines	5	0.2714	0.5310	0.0567	0.0000	0.0000	0.1414 ***

*** Significant at 1% level   ** Significant at 5% level   * Significant at 10% level

Table 3 Granger Causality for Individual Currency Excess Returns (funding USD) and Equity Market Returns

Equity Markets	lag	Carry Trade to Equity			Equity to Carry Trade		
		restriction 1	restriction 3		restriction 2	restriction 4	
		P-values	P-values	Sum Coeff	P-values	P-values	Sum Coeff
Pair 1: USD to AUD							
USD	10	0.0328	0.7092	-0.0493	0.0094	0.1774	-0.1017
Australia	7	0.0000	0.0000	0.5199 ***	0.2463	0.7954	-0.0151
Pair 2: USD to IDR							
USD	2	0.8185	0.6806	-0.0281	0.0000	0.0007	0.0564 ***
Indonesia	2	0.0000	0.0000	0.8133 ***	0.0000	0.0000	0.0693 ***
Pair 3: USD to MYR							
USD	2	0.5442	0.4076	0.0839	0.0000	0.0000	0.1198 ***
Malaysia	1	0.7407	0.7407	0.0140	0.0025	0.0025	0.0364 ***
Pair 4: USD to SGD							
USD	12	0.0001	0.0227	0.6927 **	0.0038	0.0051	-0.0755 ***
Singapore	2	0.0000	0.0000	0.9567 ***	0.5665	0.3945	-0.0079
Pair 5: USD to THB							
USD	5	0.0108	0.5578	0.1215	0.0000	0.0005	0.0419 ***
Thailand	6	0.5429	0.2642	0.2704	0.0000	0.0000	0.0543 ***
Pair 6: USD to PHP							
USD	2	0.9595	0.9900	-0.0014	0.0000	0.0000	0.1350 ***
Philippines	5	0.0152	0.0343	0.3765 **	0.0000	0.0000	0.0879 ***

*** Significant at 1% level   ** Significant at 5% level   * Significant at 10% level

Conclusion

Currency carry trade has been reviewed in detail, particularly its strong correlation to the world's stock markets when capital flows from/ to financial markets. This paper attempts to build on existing studies concerning this Granger causality relationship in returns between carry trade strategies and equity markets by controlling for economies factor. Carry trade returns are represented by portfolio returns as the analysis base line, and individual currency pair excess returns for a robustness check. Stock markets in developed economies and ASEAN-5 emerging markets are selected. Daily data used for carry trade proxies and equity market returns are from August 2006 to March 2015, covering 2,251 observations.

The empirical results show that carry trade portfolio returns of G10 currencies strongly Granger cause returns of all equity markets in both developed economies and emerging markets. Higher carry trade portfolio returns lead to significantly higher stock market returns in most developed markets and all the emerging markets. The implication made here is that the US dollar has been used as the funding currency instead of the Japanese yen.

For the case of excess returns of individual currency pairs, results show the directions which the Granger causality relationship can go, exist in most equity markets. In particular, carry trade returns causing equity market returns are found in most stock markets except for Thailand and Malaysia. In contrast, equity market returns do not cause carry trade returns in Singapore. The causality from equity market returns to carry trade returns is explicitly revealed when a carry trade proxy consists of individual currency pairs' excess returns rather than using carry trade portfolio returns.

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