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Currency Bias of Sovereign Wealth Fund Investments*

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This study provides an alternative explanation for the poor performance of sovereign wealth fund (SWF) investments based on key currency bias. Using the international portfolio rebalancing model and the matched firm data of 18,704 and 8,267 cases of SWFs' cross-border investment during 1999–2017, evidence strongly supports the key currency bias hypothesis for the determination of SWFs' cross-border investments. In sharp contrast to the relationship between the exchange rate and international portfolio flows, the economic rationale for the currency bias is to provide hedging against the exchange risk of SWFs' cross-border investments by matching the denominated key currency of the SWF sources with the other denominated currency of foreign target assets. This study complements the existing finance literature by providing portfolio implications for analyzing cross-border investments by commercial institution investors and portfolio rebalancing of financial assets between different currency zones.

JEL Classification: F21, F31, G15
Keywords: Sovereign Wealth Fund (SWF), Foreign Bias, Currency Bias, Risk, Hedging

I. Introduction

Sovereign wealth funds (SWFs) are funds composed of the wealth owned and operated by governments. Commodity SWFs, located mainly in the Middle East,

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are SWFs predominantly funded by resource exports of oil and gas. Non-commodity SWFs in Asian countries (e.g., China, Singapore, and South Korea) are funds built from these countries' excess foreign exchange reserves generated from trade surpluses. Their investment goals are to hedge against the risk of price fluctuations in natural resources or foreign reserves and secure the engine of economic growth by diversifying the risks of natural resource- and export-dependent economies by using SWFs' cross-border investments (Boubakri et al., 2016). The total assets held by SWFs worldwide have increased sharply since the 2008 global financial crisis, increasing from US$4.2 trillion in 2008 to US$7.1 trillion in 2017. According to the SWF Institute (2017) data, SWFs from Asian countries and the Middle East account for 39% and 37% of total world SWF assets, respectively. Only a small portion of SWFs' world assets are operated by developed countries, such as the UK and the US. Notably, the target countries and target firms of SWF investments are concentrated in developed countries, even though SWFs are owned and operated by Middle Eastern and Asian countries.

SWFs invest in various financial instruments: foreign direct investment, derivatives, bonds, listed and unlisted equities, real estate, and other financial instruments. SWF investments are different from other government funds' investment activities. For instance, government pension funds and public insurance funds mainly invest in relatively less risky assets with stable returns. However, the operation and governance of SWFs are not transparent in the Middle East and Asia. Therefore, the detailed data of foreign investments by SWFs are difficult to obtain, except for the SWFs of a few developed countries (e.g., Norway and the Netherlands). Thus, few studies have focused on the foreign investment determinants of SWFs. Dewenter et al. (2010), Knill et al. (2012), Kotter and Lel (2011), and Bortolotti et al. (2010) analyzed the relationship between SWF investments and the stock price of target firms from a profit-seeking firm's perspective. From the macroeconomic perspective of the target countries, Megginson et al. (2013), Ciarlone and Miceli (2013), Knill et al. (2012), Chhaochharia and Laeven (2008), and Johan et al. (2012) found that foreign target countries attract more SWF investments when they have more transparent governance, better investor protection, more developed capital market, and similar culture to the SWFs' home country. Kotter and Lel (2011), Truman (2008), Megginson et al. (2013), Ciarlone and Miceli (2013), and Aizenman and Glick (2009) analyzed the characteristics and governance methods of SWFs from the governance perspective of SWFs' acquirer countries. However, previous studies have not provided consistent evidence on the determinants of SWFs' overseas investments, because such data are limited, and the range of foreign target firms and countries analyzed is not consistently specified.

One of the main stylized facts for the SWF investment is a foreign investment bias (hereinafter, foreign bias) toward holding foreign assets over total assets

invested, which is in sharp contrast to equity home bias by the profit-seeking financial institution investors[1] (Lau et al., 2010; Chhaochharia and Laeven, 2008). The ratio of SWF foreign investments to total assets held is 99% for Korea, 68% for China, and 86% for Singapore, on average. The foreign investment ratios of the SWFs in the United Arab Emirates and Qatar are 92% and 79%, whereas those in Norway and Canada are 100% and 84%, respectively (Chhaochharia and Laeven, 2008). Furthermore, SWF investments prefer to hold foreign assets denominated in terms of key currencies, such as the US dollar and the Euro. It is the *so-called* key currency bias. The key currencies are literally defined as the convertible currencies of international payment—US dollar, Euro, British pound, Japanese yen, and Canadian dollar. Indeed, the share of key currency-denominated foreign assets (6,446 cases) is 77% among all foreign target samples (8,287 cases) invested by SWF, and greater than that of other foreign local currency assets, as shown in Table A2.

In addition, evidence from SWFs' cross-border investments shows that SWFs invest in the equities of foreign target firms that are financially distressed and with poor performance. Caner and Grennes (2010), Johan et al. (2012), Knill et al. (2012), and Ahn et al. (2020) demonstrated that foreign investments of SWFs from Asia and the Middle East are less efficient and show poorer performance compared with the investment of commercial institution investors seeking profit maximization. The poor performance of SWFs' cross-border investments has been explained from three perspectives: development, political, and agency perspectives (Bernstein et al., 2009). From the development perspective, SWFs invest in long-term strategic projects to overcome domestic market failure and foster the engine of growth. The political perspective argues that politicians are self-interested to pursue their own goals and thus invest in inefficient but politically desirable projects (Johan et al., 2012; Knill et al., 2012). The agency perspective argues that SWFs invest foreign assets to maximize social welfare but generate corruption and misallocation, costing a weak managerial incentive (Boubakri et al., 2016). According to Fotak et al. (2008), the return performance of SWFs' foreign investment in the equities of target firms two years after investment was –41%, resulting in additional agency costs.

Our research question aims are to provide an alternative explanation for the poor performance of the SWFs' cross-border investment based on the key currency bias and examine a possibility that the role of key currency-denominated assets is different from the other foreign currency denomination of assets invested by SWFs. However this key currency denomination does not necessarily indicate that the SWF portfolios are inefficient. The key currency denomination might be related to the risk-hedging purpose of the SWFs, because the SWFs are also implicitly or

[1] A few studies have been conducted on the foreign bias of international portfolio investments because home bias is more common in international portfolio investment (Chan et al., 2005; Beugelsdijk and Frijns, 2010).

explicitly obligated to care of the underlying risk more than private sectors.

Our study focuses on the role of the key currency denominations of foreign target assets acquired by SWFs as a main driver of determining SWF investments. Here, the performance of SWF investments may depend on the use of key currency denominations, as well as foreign assets' returns and risks.[2] The economic rationale behind the key currency bias may not be flight-to-quality (safety) assets but its direct hedging against exchange risk of the SWFs' cross-border investment by matching the denominated key currencies of SWF sources with the local currencies of foreign assets invested by SWFs.

The key currency bias of SWF investment is similar to the concept of transaction cost or risk-hedging models by equity home bias in international portfolio investment (Coeurdacier and Rey, 2011; Forbes, 2010; Coeurdacier, 2009). Exchange risk is associated with the currency difference between the foreign target assets and the SWF sources, whereas transaction costs are caused by cultural and language differences between foreign target country and home in international portfolio investments (Portes and Rey, 2005). Higher transaction costs and information asymmetries lead to less SWF investment in foreign target countries or firms. In the literature, the equity home bias provides hedging against non-tradable labor income and real exchange rate risks. Optimal portfolio equilibrium shows a home bias under a separable utility case (Coeurdacier et al., 2010; Heathcote and Perri, 2007, 2013; Obstfeld and Rogoff, 2000; Coeurdacier, 2009; Pyun, 2016; Kim and Kim, 2021).[3]

Surprisingly, studies on the role of key currency bias in determining SWFs' foreign investments are scant. Instead, most studies focus on the effects of the exchange rate and its risks on the determinants of SWFs' cross-border investment. Knill et al. (2012) and Kotter and Lel (2011) examined the effects of oil price sensitivity, exchange rate sensitivity, and market return risk as explanatory variables in determining the returns of foreign target firms invested by SWFs. They found that oil price sensitivity and exchange rate risk do not significantly influence the returns of foreign target firms.

We deviate from previous studies by explicitly considering the role of key currency bias in determining SWFs' overseas investments. To do so, this study initially introduces a foreign bias model of the SWF investment in the frameworks of international portfolio rebalancing (Hau and Rey, 2004; Kim, 2011; Kim et al., 2015). We then identify a role of key currency empirically among the exchange rates

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[2] The SWFs of Middle Eastern countries may acquire the cross-border assets of target firms, which produce cross-price elastic products with their funding source of a commodity (oil).

[3] Home bias has been explained in three models: transaction cost model, gravity model, and risk-hedging model. In the transaction cost model, the transaction cost is interpreted as a barrier to international capital flows (Coeurdacier and Rey, 2011; Forbes, 2010; Portes and Rey, 2005; Coeurdacier, 2009; Heathcote and Perri, 2007).

of foreign local currencies of overseas assets invested by SWF. Specifically, we control firm- and country-specific fixed effect variables in the empirical panel model to examine the effects of these fixed variables on SWF investment. Using the empirical model of currency bias and rich matched firm-level data of 18,704 and 8,267 cases of SWF foreign investment during 1999–2017, this study provides evidence that strongly supports our key currency bias hypothesis. We have 18,704 observations of target firms, which in case numbers are remarkable, compared with 775 investment cases of SWFs and 279 matched firms in a firm-level study by Kotter and Lel (2011).

This study is the first attempt to identify the role of key currency bias in the cross-border portfolio investment of SWFs and provide an alternative explanation for the poor performance of SWFs' cross-border investment based on the key currency bias. The role of key currency-denominated assets invested by SWFs is different from that of the other foreign currency denomination of assets by providing risk-hedging instrument.

The remainder of this paper is structured as follows. Section 2 explores a currency bias model of SWFs' foreign investment in international portfolio rebalancing. Section 3 presents descriptive statistics of the explanatory variables for SWFs' cross-border investments and the regularity of the data. Section 4 presents the empirical results. Section 5 provides concluding remarks and implications.

II. Model Specification

1. Basic Model

Instead of re-illustrating the portfolio rebalancing model, we simply introduce a foreign bias model to explore a role of key currency bias in the SWFs' cross-border investment in the framework of international portfolio rebalancing. The foreign bias of SWFs depends on variance and covariance among differentials of equity returns and risks, and exchange rates between overseas target firms and the SWFs' home country. Market and equity risks play an important role in determining SWFs' cross-border investments when SWF investors are risk-averse. The optimal equity equilibrium by the SWFs is specified in the Appendix model.

The main intuition of the international portfolio rebalancing model is the asset portfolio rebalancing. Whenever foreign asset holdings outperform domestic holdings, home SWF investors are exposed to higher relative exchange risk exposure. They sell and repatriate some of the foreign assets invested to reduce the exchange rate risk. Doing so leads to foreign currency depreciation and reduces international portfolio investment of the home SWFs. The key currency denomination of foreign assets may reduce the extent of this portfolio rebalancing

by providing hedging against the exchange risk for the SWFs' cross-border investment. This role of key currency bias differs remarkably from the effects of exchange rate and its volatility as exchange risk exposure on the foreign investment of the SWFs.

Let A and A^* denote the domestic and overseas assets (equity) in a two-country international portfolio rebalancing model, respectively. Home SWF investor (h) invests in domestic (A^h) and overseas (A^{*h}) assets, whereas a foreign SWF investor (f) holds his or her own domestic asset (A^{*f}) and an overseas asset (A^f). The SWF investors choose their optimal portfolio balance to maximize their expected mean-variance utility function subject to an uncertain profit. The expected profit of the home SWF investor is a sum of expected returns of home and foreign assets. The returns of assets are assumed to be subject to equity price and dividend shocks. The foreign assets and their returns are expressed in terms of their local currency. Therefore, the home SWF investor is exposed to exchange risk when holding overseas assets. The optimal demands (A^h, A^{*h}) for assets by home SWF investor (h) are derived under the first-order condition to maximize his mean-variance utility, given an expected profit.

By normalizing total assets at home and abroad, we express the optimal asset demands in terms of home and foreign portfolio shares out of total assets; $A_t^h + A_t^f = 1$, and $SA_t^{*h} + SA_t^{*f} = 1$. Now, A^h and SA^{*h} are the home SWF investor's domestic portfolio holding weight at home and foreign portfolio weight, respectively. S is the exchange rate of SWF's home currency per unit of foreign currency.

Following a definition of traditional equity home bias in the literature (Lau et al., 2010; Chhaochharia and Laeven, 2008), a foreign bias is defined as domestic investors' foreign portfolio weight in the foreign target market relative to the foreign capital market's weight in the world market capitalization. That is, $SA^{*h} - m^{*c}$, where SA^{*h} is the domestic investors' foreign portfolio holding share in terms of domestic currency, and m^{*c} is the foreign target country's weight out of world market capitalization. The extent of this foreign bias asymmetrically varies depending on the size of the foreign target country's capital market (m^{*c}). For instance, it will become larger when investing in small emerging markets with the small m^{*c}. To correct this measurement problem of a foreign bias, we explore a new foreign bias (FB) standardized by foreign capital markets' weight in the world market capitalization in (1). The foreign bias (FB^*) in terms of foreign currency can be obtained by dividing FB by the exchange rate of SWF's home currency per unit of foreign currency in (2).

$$FB = (SA^{*h} - m^{*c}) - (A^h - m^c) - (m^c - m^{*c}) = (SA^{*h} - A^h), \tag{1}$$

$$FB^* = \frac{1}{S}(SA^{*h} - A^h), \tag{2}$$

where m^c and m^{*c} are respectively the home and foreign target country's capital market weights among the world market capitalization. The first term on the right-hand side of (1) is a foreign bias, and the second term represents the traditional home bias of portfolio investment. The last term represents the relative size of the home market weight of world capitalization to foreign ones. Now, a standardized foreign bias (FB^*) is independent of the foreign target country's capital market weight (m^{*c}) in world market capitalization, representing a ratio of foreign asset holding over domestic assets invested by the SWFs.

Substituting the optimal portfolio demands (A^h, A^{*h}) in Appendix model into (2), we can derive the new foreign bias (FB^*) of the home SWFs as a function of the differentials of returns, variance and covariance terms, market risks, and exchange rate. Without any loss of generality, assuming that $\Delta^* = \Delta$ at the initial market condition, FB^* can be decomposed into two parts: the differential of returns and the risk differential.

$$FB^* = \frac{1}{S}\{\Delta^*[E(R^*) - E(R)] + \Delta[\delta^* E(R^*) - \delta E(R)]\}, \tag{3}$$

where R_t^* and R_t are returns of foreign assets and domestic market. $E(\cdot)$ is an expectation operator. The first term on the right-hand side of (3) represents the traditional differential of returns between foreign assets and domestic market, $[E(R^*) - E(R)]$. The second term is the risk differential $[\delta^* E(R^*) - \delta E(R)]$ associated with overseas investments by home SWFs. (Kim, 2011; Kim et al., 2016). If the foreign return is greater than domestic (i.e., $[E(R^*) > E(R)]$), then FB^* will increase under a positive $\Delta^* = \Delta$ when the foreign market is more stable than the domestic market ($\delta^* > \delta$). Δ^* and Δ respectively represent the variance and covariance functions of returns, which are important channels for the transmission of shock effects to the returns of foreign assets and thus to FB^*. $\Delta^* = (\frac{1}{\sigma_{R^*}^2 - Cov(R,R^*)\delta})(\frac{1}{\rho})$, and $\Delta = (\frac{1}{\sigma_R^2 - Cov(R,R^*)\delta^*})(\frac{1}{\rho})$. σ_R^2 and $\sigma_{R^*}^2$ are the variance of equity returns. $\rho(\rho^*)$ is the degree of absolute risk aversion for home (foreign) SWF investors.

δ and δ^* are the correlation between home and foreign returns, respectively. They are increasing with covariance terms between the two returns but decreasing with the variance of return (i.e., $\delta = \frac{Cov(R,R^*)}{\sigma_R^2}$ and $\delta^* = \frac{Cov(R,R^*)}{\sigma_{R^*}^2}$). If the financial markets between the two countries are well-integrated with each other, then the returns of the two countries move together. In this case, δ and δ^* are positive

with positive covariance of returns. As δ^* and δ increase, the risk-adjusted differential of return becomes lower between home and abroad, and the demand for foreign assets is less.

The exchange rate influences FB^* of the SWFs in (3) are changed through exchange risk and international portfolio rebalancing. A rise in the exchange rate will simply increase the values of foreign portfolios in terms of the domestic currency. Home SWF investors are exposed to higher exchange risk. They sell and repatriate some foreign assets invested to reduce the exchange rate risk in international portfolio rebalancing.[4] The relationship between exchange rate and FB^* is negative. However, this relationship will depend on the choice of key currency denomination for the foreign assets invested. The use of key currency denominations will reduce this exchange risk exposure and less portfolio rebalancing by providing hedging against the exchange rate risk. The exchange rate volatility will also increase the exchange risk for the foreign asset holdings and thus reduce SWF foreign investment of SWFs.

The literature has not shown consistent empirical results on the determinants of cross-border investment of SWFs due to lack of SWF data. Consequently, previous studies have used an *ad hoc* model of estimation rather than a theoretical framework to explain the foreign investment of SWFs. The following two hypotheses will be tested from (3):

H1. The relationship among exchange rates, risk-adjusted equity return differentials, and FB^* *of the SWFs is statistically significant.*
H2. The relationship among exchange rates, risk-adjusted equity return differentials, and FB^* *of the SWFs depends on the choice of the key currency denomination of foreign asset.*

2. Empirical Model of Currency Bias

We hypothesize that the extent of FB^* of SWFs in (3) will depend on the use of key currency denominations of the foreign asset invested. However, the foreign bias FB^* of (3) does not reveal a role of key currency in the SWF's investment theoretically. To identify the role of key currency bias among all the other foreign local currencies of overseas assets invested by SWF empirically, we use the interactive terms of a dummy for key currency and exchange rates, or the division of sampling cases into two foreign target country groups using key currency versus

[4] Norway has the world's largest sovereign wealth fund. It decided to reduce its share of portfolio investment in corporate and government bonds from emerging markets due to an increase in the currency risk of emerging markets (Reuters News, 2019). These emerging markets are Korea, Mexico, Malaysia, Russia, Poland, Check, Chile, Thailand, Israel, and Hungary. The high correlation between returns of emerging markets makes it difficult to diversify their portfolio investments.

non-major currency.

We build empirical FB^* model (4) to identify the role of key currency bias among all the other foreign local currencies of overseas assets invested by SWF.

$$FB_j^{*h} = \beta_{0j} + X_j\Phi_1 + \Omega_j\Phi_2 + \Omega_j\Gamma\Phi_3 + u_j^h, \quad (4)$$

where FB_j^{*h} is the foreign bias of the home SWFs (h) in terms of the local currency of the foreign target country (j). β_{0j} is the foreign target firm- or country- (j) specific fixed variables, matched with the SWF investment data (Megginson et al., 2013; Ciarlone and Miceli, 2013). X_j is a matrix of explanatory variables in (3), such as differentials of returns and risks, $[E(R_j^*)-E(R)]$ and $[\delta^*E(R_j^*)-\delta E(R)]$. Φ_1 denotes the coefficients of these explanatory variables, identifying H1 of FB^* (i.e., whether the relationship between the risk-adjusted equity return differentials and FB^* of the SWFs are statistically significant). Ω_j is a matrix of the exchange rate variables (S_j^h, $\sigma_{s_j}^2$), where S_j^h is the exchange rate of the SWF's home currency per unit of the foreign target country (j), and $\sigma_{s_j}^2$ is its volatility. Φ_2 is the parameters of Ω_j, identifying the effects of the exchange rate and its volatility on SWF foreign investment. Γ is a dummy variable for the key currency denomination, which takes 1 for a key currency, and 0 otherwise. $\Omega_j\Gamma$ is the interactive term of Ω_j and Γ. Φ_3 denotes the parameters of $\Omega_j\Gamma$, identifying H2 of the key currency bias (i.e., the role of the key currency denomination of foreign assets is different from that of the foreign local currencies of assets invested by the SWFs). u_j^h is the cross-sectional correlated disturbance associated with the foreign investment of the SWF investors.

The key currency denomination will attract more foreign investments of SWFs by reducing the exchange risk and transaction costs. In this case, the FB^* of the SWFs will be more sensitive to the change in the risk-adjusted equity returns and less responsive to the exchange rate when the foreign target assets are denominated in the key currency.

III. Data and Descriptive Statistics

Our data cover the foreign investment data of SWFs over the period of 1999–2017 from the SWF Transaction database. Our initial observation number of target firms invested by SWFs is 18,704. These firms have multiple investment cases; hence, we aggregate the investment amount per year for each firm and then match the annual investment amount with financial variables of each firm. We have a total of 8,287 observation cases of SWF foreign investment.

The return of a foreign target firm is its listed equity return, $[E(R_j^*)]$, whereas

the market return of an SWF home country represents its stock market return $[E(R)]$. The risk of the target firm's equity is defined by its deviation from the home market risk of SWFs. Market risks (δ and δ^*) are directly calculated from the covariance and variance terms of foreign equity and domestic market returns. We extract data of the firm-level variables from Compustat Global and North America from the WRDS. Then, we match them with data of SWF investment from the SWF institute database based on the information on the target firms' listed name and year. Before controlling outliers, the firm-level data of our sample are curtailed to match with investment cases of SWFs between 1999 and 2017, and sample cases of negative and missing values are removed. Finally, our sample consists of 7,214 firm-matched investment cases of SWFs in the sample period.

We use the GDP growth per capita as a proxy variable for the degree of economic development, and the stock market capitalization as a percentage of the country's GDP for a proxy for financial market development. These data are obtained from the World Bank database. The economic freedom index is also obtained from the World Bank. Data for home market return are derived from the central banks of each country. The extent of governance transparency and accountability of the SWFs is indexed in several studies (Borst, 2015; Paulson, 2009).

We use all 8,287 investment cases of SWFs across the years in the sample period. The annual average amount per investment case is US$259 million, and the annual average of total SWF amount is US$24,324 million. The SWF investments showed a steadily increasing trend since the world financial crisis in 2008, and they increased notably after 2012. The SWF investments between 2013 and 2017 explain more than 80% of all investment cases by SWFs during the sample period.[5] With a surge in the SWF investments since 2008, the distribution of SWFs' acquirers provides more detailed information on country- and commodity-specific SWFs.

Table A1 in the Appendix displays the distribution of all 19 SWF acquirers investing in the foreign target firms in the matched samples. The largest investment cases (3,409 cases) are made by Norges Bank Investment Management, followed by the California Public Employees' Retirement System of the US with 1,057 cases; the APG Asset Management in the Netherlands similarly has 1,043 cases of investment. The distribution of investment cases by all 19 SWF acquirers (Table A1) is surprising, compared with the fact that oil commodity SWFs from the Middle East countries (e.g., Saudi Arabia, Kuwait, and the United Arab Emirates) made the most frequent investment cases of SWFs before 2008. However, since 2008, a huge spike in SWF investment has been aggressively triggered by the SWFs from the developed countries (e.g., Norway, the Netherlands, US, and Canada).

Table A2 in Appendix shows the distribution of foreign target firms and countries

[5] Our sample observation is based on data of the matched target firms invested by the SWFs; hence, some difference exists between our samples and the reported SWF data.

invested by the SWFs. SWFs have widely invested in foreign target firms across 79 countries. The US is the largest recipient of the SWF investment, of which investment cases are 3,940 target firms invested, whereas the UK is the second-largest recipient, having its investment cases of 745 target firms. The UK was the most attractive target country of SWFs before 2010.[6] Japan and Canada also have 617 and 481 target firms invested by SWFs, respectively. The abovementioned four recipient countries explain 83% of the total investment cases of SWFs and show the tendency of SWF investment bias toward foreign target assets, mainly from the developed countries using the key currencies. In Table A2, the ratio of target countries (6,446 cases) using key currencies to all samples (8,287 cases) of target foreign countries invested by SWF is about 77%.

Table 1 describes the descriptive statistics for the key explanatory variables in determining the FB^* of the SWFs at the firm and country levels. The average ratio of FB^* over domestic assets out of total assets invested by SWF is 0.679, and its standard deviation is 0.535 at the country level. The average differentials of return and risk are –0.033 and –0.016, respectively, implying the poor performance of SWFs' foreign investments during 1999–2017. The exchange rates used in estimating SWF's FB^* are those rates of SWF's home currency per unit of the foreign target currency. The actual exchange rates used in the regression sample only have 21 observations among the 19 SWF acquirers and the 79 recipients of SWF investment in Tables A1 and A2. This finding is due to the fact that *Euro* is only a currency used by the 19 European countries, such as France, Germany, and the Netherlands, and some exchange rates of the SWF acquirers and recipients are overlapped or missing in the regression sample. The mean of the 21 exchange rates involved in the SWF foreign investment is 550.97, and its standard deviation is 311.41. The exchange rate volatility is obtained from annual standard deviations using the rolling-over deviation of the monthly exchange rate.

The statistics for the firm-level variables are associated with target firm's performance and financial activities. The total asset of a target firm represents the firm size (i.e., an average of US$366.9 billion), which is an important factor in determining SWF investments. Large-sized firms may have a better financial condition, a more comprehensive management system, and easier access to resources and opportunities, which can help enhance their productivity.[7] Tobin's Q,

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[6] Kotter and Lei (2011) reported that the UK had 49 investment cases of SWFs, which were the largest SWF investments by February 2009.

[7] Ferreira and Matos (2008) showed that institutional investors have a strong preference for large firms' common stocks, which is consistent with the findings of Gompers and Metrick (2001) on the US market and Dahlquist and Robertsson (2001) on the Swedish market. Aggarwal et al. (2005), Bradshaw et al. (2004), and Ferreira and Matos (2008) also found that institutional investors are attempting to minimize the transaction costs and information asymmetries in an international context by focusing on large firms.

[Table 1] Descriptive statistics of SWFs' foreign investment at firm- and country-level variables

Description	Obs.	Mean	Std. Dev.	Min	Max
Ratio of foreign investment at the country-level	7,212	0.679	0.535	−1.000	1.000
Exchange rate	21	550.97	311.41	0.2646	14682.5
Differential of return	6,258	−0.033	0.041	−0.097	0.065
Differential of risk	6,258	−0.016	0.027	−0.064	0.058
Firm specifics					
Stock return	6,261	−0.023	0.040	−.151	0.106
Total asset	7,214	366,914	3,626,207	10	142,000,000
Tobin's Q	7,178	1.700	1.836	0.166	12.886
Leverage ratio	7,214	0.866	1.574	−3.003	11.137
Cash ratio	7,214	0.110	0.114	0.000	0.603
Intangible asset ratio	7,129	0.174	0.197	0.000	0.761
Country characteristics					
GDP growth	6,106	0.022	0.015	−0.064	0.152
Market capital ratio	6,106	1.272	0.576	0.183	11.247
Economic Freedom index	6,261	7.738	0.273	6.190	8.980

Note: Unit is million USD, except for the exchange rates. Exchange rates are the rates of SWF acquirers' home currencies per unit of the USD, and the SWF acquirers are found in Table A1 of Appendix. The exchange rates of SWF home currencies of Brunei and Oman among the SWF acquirer countries are not found or the fixed exchange rate system. Stock return is defined as the yearly average monthly return for each firm. Capital stock is property, plant, and equipment (ppent). Tobin's Q is defined as the market value of equity (stock price × cshoi) and debt (dltt + dlc) over total asset (at). The leverage ratio is defined as the sum of current liabilities (dlc) and long-term liabilities divided by total assets ((dlc + dltt)/at). Cash ratio (ch/at) is the ratio of cash to total assets, and intangible asset is the ratio of the intangible asset to total assets (intan/at).

defined as the market value of a firm's debts over the market value of its assets, is a proxy for investment tendency and growing opportunity. The average value of Tobin's Q is 0.170, and these values range from 0.166 to 12.886. The leverage ratio, defined as a firm's total debts divided by its total market equity, represents the financial stress of a target firm. The cash ratio, defined as cash over total assets, indicates the financial constraint of a target firm; whereas the intangible asset ratio, defined as intangible assets divided by total assets, is a proxy for invisible know-how capacity (e.g., patents and copyrights). The average of the cash ratio and the intangible asset ratio is 0.110 and 0.174, respectively. A higher ratio of tangible assets indicates a lower risk to equity holders and represents a type of agency cost (Rajan and Zingalzes, 1995).

The descriptive statistics of three country-specific variables are also provided—GDP growth, financial market development, and economic freedom. The average GDP growth is 2.2% during the sample period. The market capital ratio to GDP as

a proxy for financial market development is 1.272. The foreign target countries with high economic growth, more economic freedom, and deeper financial markets attract more SWF investment (Megginson et al., 2013; Ciarlone and Miceli, 2013; Boubakri et al., 2016; Kim and Zhang, 2019).

IV. Empirical Results

Using the panel analysis methods with robust standard errors that are clustered at the firm- and at country-specific fixed variables, we test two hypotheses for the currency bias model of SWFs' cross-border investment from (4): (H1) whether Φ_1 is statistically significant; and (H2) whether the sign and magnitude of Φ_1 depends on the use of the key currency and Φ_3 is statistically significant. The effects of exchange rate and its volatility depend on the use of the key currency. The use of key currency denominations will attract more foreign investment of the SWFs by reducing the exchange risk and transaction costs.

1. Estimation Results of the FB^* of SWFs

Table 2 shows the empirical results of the FB^* model (4) of SWFs without considering the role of key currency denomination ($\Phi_3 = 0$), but controlling the firm- and country-specific fixed variables. The dependent variable is the extent of FB^*. Model (i) in the first column of Table 2 explains the estimation results for the effects of differentials of return and risk on SWFs' overseas investments in the firm-specific level analysis. Model (ii) adds country-specific variables as controllers of Model (i). Model (iii) analyzes the effect of exchange rate on the SWF foreign investments, and Model (iv) includes the effect of exchange rate volatility. Model (v) uses the effects of the exchange rate and its volatility as explanatory variables for the foreign investment of SWFs.

The empirical results for H1 show that the effects of differentials of the target form's return and home market return on the FB^* of SWFs are negative in sign and statistically significant for all models. Thus, *the equity returns of foreign target firms invested by SWFs are poor and considerably less than the domestic market return of SWF*. This result sharply contrasts with previous studies on the determination of SWFs (Kim and Zhang, 2019). The negative Φ_1 also implies that Δ^* and Δ of Φ_1 are negative in the FB^* of SWFs. In the negative Δ^* and Δ, *the SWFs' domestic markets seem riskier than the overseas target country*. Conversely, the effect of the risk differential on the FB^* of the SWFs is significantly positive and robust to all models with firm- and country-specific variables. This result shows that the equity risk of foreign target firms is important in deciding SWFs' overseas investment. It also increases their foreign investment, as the domestic financial

market becomes volatile and the foreign target market becomes more stable.

[Table 2] Estimation results of the foreign bias of SWFs with firm- and country-specific variables

Dependent variable: Extent of foreign investment of SWFs	Models				
	(i)	(ii)	(iii)	(iv)	(v)
Differential return	−2.567***	−2.334***	−2.935***	−1.149***	−1.180***
	(0.174)	(0.186)	(0.198)	(0.152)	(0.162)
Differential risk	8.052***	8.248***	8.438***	2.826***	2.840***
	(0.236)	(0.241)	(0.236)	(0.341)	(0.342)
Exchange rate			0.0002***		0.0000
			(0.00001)		(0.0000)
Exchange rate volatility				−1.976***	−1.914***
				(0.594)	(0.605)
Total assets	0.003***	0.002	0.018***	0.006***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Tobin's Q	0.003*	0.002	0.001	−0.001	−0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Leverage ratio	0.001	0.001	0.001	−0.001	−0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Cash ratio	0.072**	0.065**	0.050**	0.006	0.006
	(0.025)	(0.026)	(0.025)	(0.020)	(0.021)
Intangible assets ratio	−0.002	−0.004	−0.015	−0.009	−0.009
	(0.014)	(0.014)	(0.013)	(0.009)	(0.009)
GDP growth		0.088	−0.247	1.849***	1.829***
		(0.639)	(0.659)	(0.500)	(0.507)
Market capital ratio		0.013	0.021	0.009	0.009
		(0.019)	(0.020)	(0.013)	(0.013)
Economic freedom		−0.146	0.110	0.139	0.143
		(0.246)	(0.249)	(0.223)	(0.225)
Constant	0.167	0.459	−0.609	−0.687	−0.718
	(0.034)	(1.755)	(1.777)	(1.597)	(1.605)
Number of observations	6,162	6,017	6,017	4,924	4,924
R-squared	0.552	0.558	0.579	0.401	0.401

Note: ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. All models include yearly dummies.

The empirical results of the foreign investment of SWFs with exchange rate and its volatility are displayed in Models (iii)–(v) in Table 2. The coefficient of the exchange rate in Model (iii) of Table 2 is positive and statistically significant, suggesting that the SWFs prefer to invest in the equities of foreign target firms when the value of the domestic currency of the home SWF depreciates. This result is opposite to the expected negative effect of the exchange rate on the FB^* of the

SWFs theoretically in (3). A reason behind this opposite result lies in the fact that empirical Model (4) includes the effects of the exchange rate and its volatility, and that the effect of exchange risk overweighs the effect of exchange rate on the FB^* of the SWFs.

In the empirical results of FB^* (4), the overseas investment amount of SWFs will increase as the SWF's home currency exchange rate depreciates. However, the domestic SWF investors feel more exposed to exchange risk at a higher level of the exchange rate; hence, they rebalance their foreign portfolios toward the investment of the domestic assets (Hau and Rey, 2004; Kim, 2011). This portfolio rebalancing behavior is reflected in the negative effect of the exchange rate volatility. Indeed, the coefficient for the volatility of exchange rate is significantly negative for Models (iv) and (v). This finding suggests that the SWFs' foreign investment will decrease as the exchange rate is more volatile. In Model (v), the coefficient of the exchange rate is positive but marginally insignificant, whereas the coefficient of its volatility is significantly negative at the conventional level.

In sum, the evidence provides strong support for H1, that is, Φ_1 in (4) is statistically significant; the relationship between the risk-adjusted equity return differentials, exchange rates, and FB^* of the SWFs are statistically significant. A rise in the exchange rate will increase the portfolio values of foreign assets in terms of domestic currency. The domestic SWF investors are exposed to higher exchange risk. The relationship between exchange rate volatility and FB^* is negative. This relationship will depend on the choice of key currency denomination for the foreign assets invested. The use of key currency denominations will reduce this exchange risk exposure and less portfolio rebalancing by providing risk hedging against the exchange risk of foreign target assets invested.

2. Estimation Results of the Currency Bias of SWFs

The key currency bias of the SWFs implies that the FB^* of the SWFs depends on the key currency denomination of the foreign assets invested. The effect of key currency bias in (4) can be captured by the effect of the dummy (Γ) for key currency denomination or by subsampling two currency groups—key currency versus non-major currency countries.[8] Models (i)–(iii) in Table 3 represent the estimation results for the interactive terms of key currency denomination, exchange rate, and its volatility, respectively. They show that the exchange rates in the key currency and non-major currency groups are positive and significant at a conventional significance level. This result is consistent with the estimation results from Table 2. Interestingly, the coefficient of the interactive term of a dummy for

[8] In our sample, the EU countries include France, Germany, Ireland, Netherlands, Norway, Spain, Sweden, and Switzerland.

[Table 3] Estimation results of the currency bias of SWFs with firm- and country-specific variables

Dependent variable: Extent of foreign investment of SWFs with currency bias	Interactive terms of key currency dummy			Subsampling of key currency	
	(i)	(ii)	(iii)	Major currency	Non-major currency
Differential return	−2.529***	−0.907***	−0.335*	−0.561***	0.707
	(0.194)	(0.161)	(0.174)	(0.101)	(0.478)
Differential risk	7.878***	2.574***	1.180***	0.975***	−0.673
	(0.225)	(0.349)	(0.236)	(0.203)	(0.923)
Exchange rate				0.054***	0.00004**
				(0.002)	(0.00001)
Exchange rate*major currency	0.042***		0.029***		
	(0.002)		(0.002)		
Exchange rate*non-major currency	0.0002***		0.0001***		
	(0.00001)		(0.00001)		
Exchange rate volatility				−9.429***	12.598***
				(0.528)	(3.567)
Exchange rate volatility*major currency		−2.864***	−6.934***		
		(0.623)	(0.632)		
Exchange rate volatility*non-major currency		10.261***	6.325***		
		(2.502)	(2.641)		
Total asset	0.027***	0.007***	0.010***	0.002**	0.007
	(0.002)	(0.002)	(0.002)	(0.001)	(0.005)
Tobin's Q	0.005*	−0.001	0.002	0.001**	−0.003
	(0.001)	(0.001)	(0.001)	(0.001)	(0.004)
Leverage ratio	0.001	−0.001	−0.001	−0.002**	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Cash ratio	0.067**	0.006	0.014	0.007	−0.012
	(0.023)	(0.021)	(0.019)	(0.012)	(0.064)
Intangible assets ratio	−0.007	−0.006	−0.005	−0.012*	0.017
	(0.011)	(0.009)	(0.008)	(0.007)	(0.020)
GDP growth	0.360	2.146***	1.917***	1.636***	2.534*
	(0.667)	(0.496)	(0.511)	(0.254)	(1.380)
Market capital ratio	0.022	0.006	0.011	0.007*	0.119
	(0.020)	(0.013)	(0.013)	(0.004)	(0.036)
Economic freedom	0.076	0.158	0.043	0.188**	0.260
	(0.253)	(0.219)	(0.229)	(0.084)	(0.380)
Constant	0.624	−0.862	−0.063	1.241	−1.527
	(1.804)	(1.567)	(0.272)	(0.578)	(2.667)
Number of observations	6,162	4,924	4,924	3,735	1,189
R-squared	0.629	0.408	0.475	0.701	0.575

Note: ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively. All models include yearly dummies.

key currency and the exchange rate is significantly positive and its magnitude is considerably larger than that of the non-major currency dummy. Thus, the role of key currency denomination tends to enhance the effect of the exchange rate on the overseas investment of the SWFs. SWF investors have a greater tendency to rebalance their international portfolio toward foreign target firms as the exchange rate depreciates when the foreign assets are denominated in the key currency.

In Models (i)–(iii) in Table 3, the coefficients of exchange rate volatility are statistically significant and negative for the key currency group (–2.864 and –6.934) at the 1% significance level. Thus, the key currency denomination tends to significantly reduce the effect of exchange risk on the overseas investment of the SWFs. This result provides a strong support for H2 about the role of key currency bias as providing risk hedging against the exchange rates of foreign assets invested by the SWFs.

The empirical results using the subsamples appear in the last two columns of Table 3. The results are similar to the previous results from Models (i)–(iii) in Table 3. The coefficients of the exchange rate for major and non-major currency countries are significant and positive (0.054 and 0.00004) at the 1% level. The key currency denomination further enhances the effect of the exchange rate on the overseas investment of SWFs. The coefficients of exchange volatility for the key currency country are significantly negative at the 1% significance level, indicating that exchange rate volatility tends to reduce SWFs' overseas investment in target firms denominated in the key currency but not in non-major currency countries. This evidence supports H2 that the role of key currency denomination, as risk hedging instrument, is different from that of the foreign local currency denomination of assets invested by the SWFs. The non-major currency countries might involve the home country and its investment of the SWFs. The SWFs prefer to invest more in the domestic target firms than in overseas investment when the exchange rate becomes more volatile.

3. Effects of Firm- and Country-specific Variables

By using panel analysis methods with robust standard errors clustered at the firm-level, we extend our estimation to examine the effects of foreign target firm-specific variables on the currency bias of SWF investment by controlling the target firm's performance and financial variables (i.e., total assets, Tobin's Q, leverage ratio, cash ratio, and intangible assets ratio). We also examine the target country-specific fixed effects in (4) by controlling the target country's GDP growth for economic development, market capital ratio to GDP for financial market development, and economic freedom. The evidence in Tables 2 and 3 indicates that the effects of firm size and Tobin's Q are positive and statistically significant in determining the overseas investment of SWFs. Hence, SWFs tend to invest in large-

sized and growing firms among foreign target firms in the key currency countries. This result is consistent with the findings of Bortolotti et al. (2010), Fernandes (2014), Kotter and Lel (2011), Grira et al. (2018), and Gangi et al. (2019). It is also consistent with studies on the investment activity of public pension funds (Smith,1996; Gompers and Metrick, 2001) and commercial institution investors (Dahlquist and Robertsson, 2001; Ferreira and Matos, 2008; Aggarwal et al., 2005, Bradshaw et al., 2004). However, the effects of firm size and Tobin's Q are not statistically significant for non-major currency countries, indicating that the stylized facts of the overseas investments of SWFs are true only for foreign target firms from the developed countries using the key currencies.

The empirical results also indicate that the SWFs prefer to invest in foreign target firms with higher cash asset ratio because the coefficient of *Cash ratio* (from Columns 1 to 3 in Tables 2 and 3) is positive and statistically significant. This result contrasts with the findings of Kotter and Lel (2011), that SWFs prefer to invest in cash-constrained firms. The leverage ratio and intangible asset ratio are not statistically significant in Tables 2 and 3, indicating that the two variables are unimportant determinants of SWF investments.

The effects of the GDP growth and the financial market development are positive and significant at the 1% level. Thus, the SWFs tend to invest in foreign target firms located in a developed country with higher economic growth and deeper financial markets. This finding deviates from the widely spread perception that SWFs are institutional finance players looking for growth opportunities and wealth creation through investments in small emerging markets (Miracky et al., 2008). This result is consistent with those reported in previous studies on SWFs (Boubakri et al., 2016; Megginson et al., 2013; Ciarlone and Miceli, 2013; Kim and Zhang, 2019). However, economic freedom plays little role in the foreign investment decisions of SWFs.

Recent portfolio models with portfolio constraints can endogenously result in a bias toward key currency-denominated assets in the derived portfolio (Pavlova and Rigobon, 2008). The model of portfolio constraint examines the relationship among stock prices, exchange rates, and portfolio holdings with portfolio constraints, such as VaR, margin constraint, and collateral portfolio concentration. The portfolio constraints, then, amplify this relationship through channels of terms of trade and common discount factor under certain assumptions—home bias for domestic goods and assets in three-country model (a center and two peripheries). The model generates predictions consistent with other important empirical results, such as amplification and flight-to-quality effects of equity home bias. However, the portfolio model with portfolio constraints does not fit well with the purpose of our study, which focuses on the role of key currency denomination in the foreign bias of the SWF investment. The currency bias of the SWF investment also differs from the investment on the foreign currency sovereign bond, of which foreign local currency

may or may not coincidently be the same with the key currency.

V. Conclusion and Implication

This study provides an alternative hypothesis explaining the poor performance of foreign investment of SWFs based on the key currency bias. The key currency bias is defined as the investment bias toward foreign assets denominated in the key currency held over the total assets invested by SWF investors. The economic rationale behind the key currency bias may not be a flight-to-quality (safety) asset but provide direct hedging against the exchange risk of the SWFs' cross-border investment by matching the denominated key currencies of SWF sources with the local currencies of foreign assets invested by the SWFs. Thus, the poor performance of foreign assets invested by the SWFs depends on the use of key currency denomination of foreign assets invested for the risk-hedging incentive of SWFs' foreign investment.

This study is the first attempt to identify the role of key currency bias of SWFs empirically. We examine (1) whether the relationship among asset return, market risk, and the foreign investment of SWF is statistically significant; (2) whether this relationship depends on the key currency bias of SWF investments, and whether the role of key currency denomination as risk hedging instrument is different from that of the foreign local currency denomination of assets invested by the SWFs. Using matched firm-level data of 18,704 and 8,267 cases of SWF foreign investments during 1999–2017, our study provides evidence that strongly supports our hypothesis about the key currency bias. These empirical results are robust to the inclusion of firm- and country-specific fixed variables. The SWF investments show a strong currency bias toward investing in the foreign assets denominated in the key currencies of the developed countries. Furthermore, SWFs prefer to invest in foreign target firms, as the value of the domestic currency of the home SWF depreciates. The coefficient for exchange volatility is significantly negative, suggesting that exchange volatility reduces the overseas investments of SWFs in foreign target firms denominated in the key currency but not in the non-major currency countries. The evidence also indicates that SWFs prefer to invest in foreign target firms of a larger size, with a greater investment tendency and a larger cash ratio in developed countries, although the return of foreign target firms by SWF investment is poor. The puzzling currency bias patterns of SWF investments are likely to emerge as a hedging instrument against exchange rate risk since the 2008 global financial crisis.

This study contributes to the financial economics literature by providing an alternative explanation of currency bias for the poor performance of SWF investments. This study also complements the existing literature by providing

financial implication for the analysis of the cross-border investment of commercial institution investors and for the regional portfolio rebalancing of financial assets between different currency zones.

However, this study has its own limitation to the available data of listed equity used to test the foreign bias of the SWFs. We must also extend our analysis to examine whether the hypothesis of key currency bias can be applied to the broader range of foreign assets (e.g., foreign currency sovereign bonds). For instance, some emerging economies still issue sizable foreign currency (mostly the US dollar or the Euro) sovereign bonds. Therefore, how differently the SWF investors treat portfolios of those foreign currency sovereign bonds from key currency bonds would be meaningful to examine.

Appendix Model

Let home SWF investor (h) invest in domestic (A^h) and overseas (A^{*h}) assets, whereas foreign SWF investor (f) holds his or her own domestic asset (A^{*f}) and an overseas asset (A^f). The SWF investors choose their optimal portfolio to maximize their expected utility subject to uncertain returns. The utility function is assumed to be the mean-variance function of the expected profit.

$$\max_{A^h A^{*h}} \sum_{t=0}^{\infty} \beta^t E_0 \left[\Pi_t - \frac{1}{2} \rho \sigma_{\Pi}^2 \right], \tag{A1}$$

where β is the discount factor for home, and E_0 is the current expectation operator. $\rho(\rho^*)$ is the degree of absolute risk aversion for home (foreign) SWF investors. Π_t is the profit of the home SWF investor, and σ_{Π}^2 is the variance of profit.

$$\Pi_t = A_t^h dR_t + S_t A_t^{*h} dR_t^* \tag{A2}$$

In (A2), dR_t and dR_t^* are returns of home and foreign assets, respectively. S_t is the exchange rate of domestic currency per unit of a foreign currency. The foreign assets and their returns are expressed in terms of the domestic currency, and the home SWF investor is exposed to currency risk when holding overseas assets. The optimal demand for assets by home SWF can be obtained under the first-order condition to maximize its utility given the expected profit.

$$A^h = \left(\frac{1}{\sigma_R^2 - Cov(R, R^*)\delta^*} \right) \left(\frac{1}{\rho} \right) [E(R) - \delta^* E(R^*)], \tag{A3}$$

$$A^{*h} = \frac{1}{S} \left(\frac{1}{\sigma_{R^*}^2 - Cov(R, R^*)\delta} \right) \left(\frac{1}{\rho} \right) [E(R^*) - \delta E(R)], \tag{A4}$$

where σ_R^2 and $\sigma_{R^*}^2$ are the variance of returns. δ and δ^* are respectively the correlation between home and foreign returns (i.e., $\delta = \frac{Cov(R,R^*)}{\sigma_{R^*}^2}$ and $\delta^* = \frac{Cov(R,R^*)}{\sigma_{R^*}^2}$).

[Appendix Table A1] Distribution of SWF acquirer countries

SWF	Country	All firms	Regression sample
APG Asset Management	Netherlands	1,043	812
Aabar Investments PJSC	United Arab Emirates	4	2
Abu Dhabi Investment Authority	United Arab Emirates	83	52
Alaska Permanent Fund Corporation	US	1	1
Alberta Investment Management Corporation	Canada	138	122
Aranda Investments	Singapore	2	
Arran Investment Private Ltd	Singapore	1	
Baytree Investments (Mauritius) Pte	Singapore	1	
Brunei Investment Agency	Brunei	1	
California Public Employees' Retirement System	US	1,057	898
Canada Pension Plan Investment Board	Canada	651	473
Cavendish Industries Ltd	United Arab Emirates	1	
Central Huijin Investment	China	2	1
China Investment Corporation	China	57	49
Ellington Investments Pte Ltd	Singapore	1	1
France Strategic Investment Fund	France	2	
Fullbloom Investment Corporation	China	2	2
Future Fund Board of Guardians	Australia	1	
GIC Private Limited	Singapore	308	182
Havelock Fund Investments Pte Ltd	Singapore	1	1
Integrated Healthcare Holdings Ltd	Malaysia	1	1
Invest AD	United Arab Emirates	14	10
Investment Corporation of Dubai	United Arab Emirates	1	
Istithmar PJSC	United Arab Emirates	1	1
Ivanhoe Cambridge	Canada	1	1
Khazanah Nasional	Malaysia	4	2
Khazanah Nasional Berhad	Malaysia	1	1
Korea Investment Corporation	Korea	690	635
Kuwait Investment Authority	Kuwait	120	84
MediaCorp Pte Ltd	Singapore	1	
Merlion India Fund Ltd	Singapore	1	
Mubadala Development Co	United Arab Emirates	1	1
National Council for Social Security Fund	China	31	27
National Pensions Reserve Fund	Ireland	3	
National Social Security Fund	China	23	19
National Welfare Fund	Russia	2	
New Zealand Superannuation Fund	New Zealand	1	
Norges Bank Investment Management	Norway	3,409	2,365
Oman Investment Fund	Oman	1	
Ontario Teachers' Pension Plan	Canada	128	115
Qatar Holding	Qatar	9	7
Qatari Diar	Qatar	1	1
Reco Ambrosia Pte Ltd	Singapore	1	

Ridgewood Investments (Mauritius) Pte., Ltd.	Singapore	1	
Russian Direct Investment Fund	Russia	1	
SAFE Investment Company	China	22	10
STT Ventures Ltd	Singapore	1	
Saudi Arabian Monetary Agency	Saudi Arabia	26	23
Seletar Invest Pte Ltd	Singapore	2	2
Tasameem	United Arab Emirates	1	1
Temasek Holdings	Singapore	190	145
Texas Permanent School Fund	US	239	211
Twickenham Investment Private Limited	Singapore	1	
West Coast Hitech G.P., Ltd.	United Arab Emirates	1	
Total		8,287	6,258

Sources: SWF Institute (2017). The 16 exchange rates of the SWF acquirer's home currency among the 19 SWF acquirer countries are used in the estimation due to missing or overlapped data.

[Appendix Table A2] Distribution of SWF target firms and target countries

Country	All firms	Regression sample	Country	All firms	Regression sample
Argentina	1	-	Lebanon	1	-
Australia	134	-	Liechtenstein	1	-
Austria	18	-	Lithuania	1	-
Barbados	1	-	Luxembourg	18	-
Belgium	32	-	Malaysia	75	58
Bermuda	104	-	Malta	3	-
Brazil	63	54	Marshall Islands	22	-
British Virgin Islands	14	-	Mauritius	1	-
Canada	481	427	Mexico	18	-
Cayman Islands	82	-	Morocco	4	-
Chile	27	21	Netherlands	67	58
China	111	92	New Zealand	11	-
Colombia	10	-	Nigeria	1	-
Croatia	4	-	Norway	11	7
Cyprus	2	-	Oman	3	1
Czech Republic	2	-	Pakistan	1	-
Denmark	26	-	Panama	9	-
Egypt	7	-	Papua New Guinea	2	-
Faroe Islands	2	-	Peru	2	-
Finland	49	-	Philippines	18	-
France	124	96	Philippines	2	-
Germany	132	95	Poland	43	-
Gibraltar	1	-	Portugal	12	-
Greece	6	-	Puerto Rico	6	-
Guernsey	6	-	Qatar	8	4
Hong Kong	30	18	Romania	2	-
Hungary	3	-	Russia	31	-

India	181	-	Singapore	55	38
Indonesia	16	7	South Africa	65	-
Ireland	59	54	Spain	42	33
Isle of Man	3	-	Sweden	109	88
Israel	39	-	Switzerland	85	62
Italy	81	-	Taiwan	162	155
Japan	617	542	Thailand	52	-
Jersey	35	-	Turkey	7	-
Jordan	3	-	United Arab Emirates	8	5
Kazakhstan	2	-	UK	745	583
Kenya	7	-	US	3,940	3,643
Korea	120	115	Vietnam	5	-
Kuwait	4	2	Total	8,287	6,258

Sources: SWF Institute (2017). The sample data of 23 SWF recipients among the 79 recipient countries of the SWF investment are used in the regression sample.

References

Aggarwal, R., L. F. Klapper and P. D. Wysocki (2005), "Portfolio Preferences of Foreign Institutional Investors," *Journal of Banking and Finance*, 29(12), pp. 2919–2946.

Ahn, G, F. Oh, and J. Park, J. (2020), "The Efficiency of Financial Holding Companies in Korea," *Korean Economic Review*, 36(1), pp. 29–58.

Aizenman, J. and R. Glick (2009), "Sovereign Wealth Funds: Stylized Facts about Their Determinants and Governance," *International Finance*, 12(3), pp. 351–386.

Anselin, L. (1988), "Spatial Econometrics: Methods and Models," Kluwer Academic Publishers, Dordrecht.

Bernstein, S., J. Lerner and A. Schoar (2013), "The Investment Strategies of Sovereign Wealth Funds," *NBER Working Papers* Number 14861, *Journal of Economic Perspectives*, 27(2), pp. 219–238.

Beugelsdijk, S. and B. Frijns (2010), "A Cultural Explanation of the Foreign Bias in International Asset Allocation," *Journal of Banking and Finance*, 34(9), pp. 2121–2131.

Borst, N. (2015), "The Rise of Asian Sovereign Wealth Funds," *Asia in Focus*, Federal Reserve Bank of San Francisco, March.

Bortolotti, B., V. Fotak, W. Miracky and W. L. Megginson (2010), "Sovereign Wealth Fund Investment Patterns and Performance," Feem Working Paper, *SSRN Electronic Journal*.

Boubakri, N., J. Cosset and J. Grira (2016), "Sovereign Wealth Funds Targets Selection: A Comparison with Pension Funds," *Journal of International Financial Markets, Institutions and Money*, 42, pp. 60–76.

Bradshaw, M. T., B. J. Bushee and G. S. Miller (2004), "Accounting Choice, Home Bias, and US Investment in Non-US Firms," *Journal of Accounting Research*, 42(5), pp. 795–841.

Caner, M. and T. Grennes (2010), "Sovereign Wealth Funds: The Norwegian Experience," *World Economy*, 33(4), pp. 597–614.

Chan, K., V. Covrig and L. Ng (2005), "What Determines the Domestic Bias and Foreign Bias? Evidence from Mutual Fund Equity Allocations Worldwide," *Journal of Finance*, 60(3), pp. 1495–1534.

Chhaochharia, V. and L. Laeven (2008), "Sovereign Wealth Fund: Their Investment Strategies and Performance," Working Paper, University of Miami and International Monetary Fund.

Ciarlone, A. and V. Miceli (2013), "Escaping Financial Crises? Macro Evidence Based on SWFs' Investment Behavior," Available at http://www.cass.city.ac.uk/data/assets/pdf file/0008/219977/97.-Miceli-v2.pdf.

Coeurdacier, N. (2009), "Do Trade Costs in Goods Market Lead to Home Bias in Equities?" *Journal of International Economics*, 77(1), pp. 86–100.

Coeurdacier, N. and H. Rey (2013), "Home Bias in Open Economy Financial Macroeconomics," National Bureau of Economic Research Working Paper 17691, *Journal of Economic Literature*, 51(1), pp. 63–115.

Coeurdacier, N., R. Kollmann and P. Martin (2010), "International Portfolios, Capital

Accumulation and Foreign Assets Dynamics," *Journal of International Economics*, 80(1), pp. 100–112.

Dahlquist, M. and G. Robertsson (2001), "Direct Foreign Ownership, Institutional Investors, and Firm Characteristics," *Journal of Financial Economics*, 59(3), pp. 413–440.

Danis, H., E. Demir and M. H. Bilgin (2015), "Conditional Jump Dynamics in Stock Returns: Evidence from MIST Stock Exchanges," *Singapore Economic Review*, 60(1), pp. 1–17.

Dewenter, K. L., X. Han and P. H. Malatesta (2010), "Firm Values and Sovereign Wealth Fund Investments," *Journal of Financial Economics*, 98(2), pp. 256–278.

Fernandes, N. (2014), "The Impact of Sovereign Wealth Funds on Corporate Value and Performance," *Journal of Applied Corporate Finance*, 26(1), pp. 76–84.

Ferreira, M. A. and P. Matos (2008), "The Colors of Investors' Money: The Role of Institutional Investors around the World," *Journal of Financial Economics*, 88(3), pp. 499–533.

Forbes, K. J. (2010). Why Do Foreigners Invest in the United States? *Journal of International Economics*, 80(1). pp. 3–21.

Fotak, V., B. Bortolotti and W. Megginson (2008), "The Financial Impact of Sovereign Wealth Fund Investments in Listed Companies," The University of Oklahoma Working Paper.

Gangi, F., A. Meles, M. Mustilli, D. Graziano and N. Varrone (2019), "Do Investment Determinants and Effects Vary across Sovereign Wealth Fund Categories? A Firm-Level Analysis," *Emerging Markets Review*, 38, pp. 438–457.

Gompers, P. A. and A. Metrick (2001), "Institutional Investors and Equity Prices," *Quarterly Journal of Economics*, 116(1), pp. 229–259.

Grira, J., C. Labidi and W. Rouatbi (2018), "Does Political Risk Matter for Sovereign Wealth Funds? International Evidence," *International Review of Financial Analysis*.

Hau, H. and H. Rey (2004), "Can Portfolio Rebalancing Explain the Dynamics of Equity Returns, Equity Flows, and Exchange Rates?" *American Economic Review*, Portfolio, Can, 94(2), pp. 126–133.

Heathcote, J. and F. Perri (2007), "The International Diversification Puzzle Is Not as Bad as You Think," CEPR Minnesota Economic Research Paper. pp. 2007–2003.

Heathcote, J. and F. Perri (2013), "The International Diversification Puzzle Is Not as Bad as You Think," *Journal of Political Economy*, 121(6), pp. 1108–1159.

Hofstede Center for Cultural Distance (2015), Available at http://geert-hofstede.com/.

Johan, S., A., Knill and N. Mauck (2012), "Determinants of Sovereign Wealth Fund Investment in Private Equity versus Public Equity," TILEC Discussion Paper. Tilburg University.

Kaufmann, D. and A. Kraay (2008), "Governance Indicators: Where Are We, Where Should We Be Going?" *The World Bank Research Observer*, 23(1), pp. 1–30.

Kim, H. (2011), "The Risk Adjusted Uncovered Equity Parity," *Journal of International Money and Finance*, 30(7), pp. 1491–1505.

Kim, H., S. Cho and Y. Kim (2015), "Home Bias, Risk Differential, and Cultural Spatial Spillover Effects," *Journal of International Money and Finance*, 51, pp. 114–136.

Kim, K. and S. H. Kim (2021), "Explaining Equity Home Bias Using Hedging Motives against Real Exchange Rate and Wage Risks," *International Review of Economics and Finance*, 73, pp. 30–43.

Knill, A. M., B. S. Lee and N. Mauck (2012), "Sovereign Wealth Fund Investment and the Return-To Risk Performance of Target Firms," *Journal of Financial Intermediation*, 21(2), pp. 315–340.

Kotter, J. and U. Lel (2011), "Friends or Foes? Target Selection Decisions of Sovereign Wealth Funds and Their Consequences," *Journal of Financial Economics*, 101(2), pp. 360–381.

Lau, S. T., L. Ng and B. Zhang (2010), "The World Price of Home Bias," *Journal of Financial Economics*, 97(2), pp. 191–217.

Le, C. H. A. (2016), "Macro-Financial Linkages and Bank Behaviour: Evidence from the Second-Round Effects of the Global Financial Crisis on East Asia," *Eurasian Economic Review*, 6(3), pp. 365–387.

Megginson, W. L., M. You and L. Han (2013), "Determinants of Sovereign Wealth Fund Cross-Border Investments," *Financial Review*, 48(4), pp. 539–572.

Miracky, W. F., D. Dyer, D. Fisher, V. Barbary and E. Chen (2008), "Assessing the Risks: The Behaviors of Sovereign Wealth Funds in the Global Economy," Monitor Group, Cambridge, MA.

Obstfeld, M. and K. Rogoff (2000), "The Six Major Puzzles in International Macroeconomics: Is There a Common Cause?" *NBER Macroeconomics Annual*, 15, pp. 339–390.

Paulson, A. (2009), "Raising Capital: The Role of Sovereign Wealth Funds," *Chicago Fed Letter*. FRB, Chicago, 258.

Pavlova, A. and R. Rigobon (2008), "The Role of Portfolio Constraints in the International Propagation of Shocks," *Review of Economic Studies*, 75(4, October), p. 1215–1256.

Portes, R. and H. Rey (2005), "The Determinants of Cross-Border Equity Flows," *Journal of International Economics*, 65(2), pp. 269–296.

Pyun, J. H. (2018), "(Asymmetric) Trade Costs, Real Exchange Rate Hedging, and Equity Home Bias in a Multicountry Model," *Review of International Economics*, 26(2), pp. 357–377.

Rajan, R. G. and L. Zingales (1995), "What Do We Know about Capital Structure? Some Evidence from International Data," *Journal of Finance*, 50(5), pp. 1421–1460.

Smith, M. P. (1996), "Shareholder Activism by Institutional Investors: Evidence from CalPERS," *Journal of Finance*, 51(1), pp. 227–252.

Sovereign Wealth Fund Transaction. Database (2017), Available at http://www.swftransaction.com/.

Stulz, R. M. (2005), "The Limits of Financial Globalization," *Journal of Finance*, 60(4), pp. 1595–1638.

The Frazer Institute (2015), "Economic Freedom Forum," Available at http://www.freetheworld.com/.

Truman, E. (2008), "A Blueprint for Sovereign Wealth Fund Best Practices," Peterson Institute for International Economics Policy Brief, Number PB08-3.

World Bank (2017), *World Development Indicators*. Available at http://data.worldbank.org/data-catalog/world-development-indicator.

Zhang, H. and H. Kim (2019), "Foreign Bias of Sovereign Wealth Fund and Spatial Spillover Effects," *Singapore Economic Review*, 64(2), pp. 377–397.

국부펀드 해외투자의 통화편향 현상*

김 희 호** · 권 상 욱*** · 설 윤****

초 록 본 연구는 국부펀드(Sovereign wealth fund) 해외투자의 낮은 수익률 성과를 설명하는 원인으로서 기축통화편향(key currency bias)현상을 제시하고자 한다. 1999년-2017년 국부펀드의 해외투자 사례 8,267건과 그 투자와 매칭된 18,704건의 기업 자료를 사용한 실증결과는 국부펀드 해외투자의 기축통화편향 현상을 강하게 지지하고 있다. 환율과 해외투자의 관계를 분석하고 있는 기존연구는 환율변동이 환 위험을 통해 해외투자에 미치는 효과를 분석하고 있지만, 본 연구는 환 위험을 회피하기 위한 헤징수단으로서 통화편향현상이 나타나고 있다는 점을 보여주고 있다. 본 연구의 의미는 국부펀드뿐 아니라 상업적 기관투자자의 해외투자와 상이한 통화지역간 해외투자에서도 통화편향 현상이 나타날 수 있어서, 해외투자의 연구에 새로운 가설을 제시하고 있다는 점이다.

핵심 주제어: 국부펀드, 해외투자편향, 기축통화편향, 투자위험, 헤징

경제학문헌목록 주제분류: F21, F31, G15

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