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International Seigniorage

The US Dollar and the American Trade Deficit



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PREFACE AND ACKNOWLEDGEMENT

I made this thesis to obtain the Master of Science degree in Economics and Business Economics, with a specialization in Financial Economics, from the Erasmus University Rotterdam. The research and writing took place between January 2016 and May 2017. Despite several setbacks, it has been a rewarding process. The results are both unique and important. They were very informative to me, I hope they are to others too.

The subject is the trade deficit of the United States. This might seem like a peculiar topic for a thesis on financial economics. However, as will be explained, the cause of the American trade deficit is thoroughly financial in nature. Monetary theory, portfolio choice, exchange rate risk, the required return on investment and the trade in financial assets cover the vast majority of the thesis. Only a small portion is dedicated to the actual trade deficit itself, which is an inevitable result of the financial processes involved.

I would like to thank my supervisor, dr. Lemmen, for his fast and valuable feedback.

Jeroen Louwerse

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ABSTRACT

The effect of the international transactional use of the dollar on the United States' balance of trade is investigated for the period 2003-2015, using accounting data and literary sources, and employing two least squares regressions. This effect turns out to be substantial, through a complicated mechanism. The transactional use of the dollar leads to a demand for dollar denominated assets as international reserves. These assets originate in the United States, due to a competitive advantage related to the production of dollar banknotes. The outflow of financial assets causes an inflow of goods and services, because of restrictions on the use of other compensations. Although the exact magnitude of the effect remains uncertain, even the most conservative estimate covers 51% of the trade deficit.

Keywords: International currency, Dollar denomination, Foreign exchange reserves, Financial account surplus, Trade deficit, Two-stage regression.

JEL Classification: F33, G11

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CHAPTER 1 Introduction

In this thesis, the origin of the United States' (US hereafter) trade deficit will be explained. A trade deficit denotes a negative value on the balance of trade. The balance of trade is defined as the net export of goods and services. When this is positive, exports exceed imports and the country produces more goods and services than it uses for consumption and investment. When this is negative, imports exceed exports and more is used than produced.

The US balance of trade is consistently negative. Since 1976, the US has run a trade deficit in every single year and in the last two decades its value has greatly increased (Bureau of Economic Analysis [BEA hereafter], 2016a). From 2003 to 2015 the deficit ranged between 384 and 762 billion dollars. The latter figure for 2006 exceeded the GDP of countries like Australia and the Netherlands (World Bank, 2016).

Figure 1: The size of the American trade deficit.



Source: BEA, 2016a

As the largest trade imbalance in the world (World Bank, 2016), this is an important economic phenomenon in itself. It has, moreover, been connected to a variety of developments and events. Deindustrialization and unemployment in parts of the US are blamed on the deficit (Buchanan, 1998; Bivens, 2015). Both the dot-com (Kraay & Ventura, 2005; Hunt & Rebucci, 2005) and subprime mortgage bubble (Bernanke, 2005; Wolf, 2014) have been related to this global imbalance. Even the invasion of Iraq would be caused by a desire to retain the inflow of foreign produce (Clark, 2005). The trade deficit has been widely discussed by the American media and was an important topic in the 2016 presidential election.¹ Economic research however, has remained remarkably lacking. To date, it has never been properly explained how this deficit is financed.

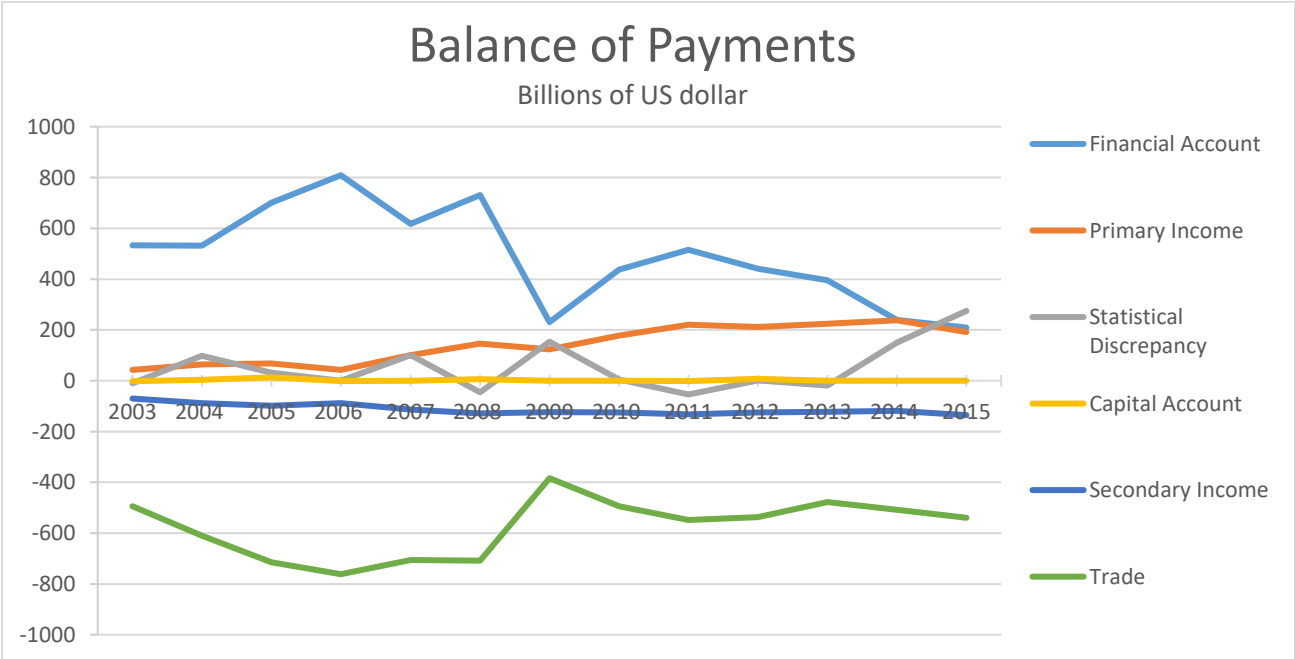
¹ Largely due to Republican candidate Donald Trump, who wanted a sharp reduction in the deficit with China (Trump, 2016a) and threatened to eliminate the deficit with Mexico if the Mexican government wouldn't finance a border wall (Trump, 2016b).

The proximate answer is given in the balance of payments. This is a record of every international transaction of a country, over a specified period. Apart from the balance of trade, it consists of the balance on primary income, the balance on secondary income, the capital account, the financial account and the statistical discrepancy. Primary income covers the compensation for employees and the provision of capital. Secondary income consists of current transfers without compensation. The capital account measures the change in the ownership of non-produced, non-financial assets and capital transfers, such as debt forgiveness. The financial account captures the net outflow of financial assets. Theoretically, these components should sum to zero. If an imported good isn't bartered for a service or another good, bought with compensation for the provision of capital or employees, given away for free or traded against a non-produced, non-financial asset, a financial asset must have been given in return. In practice the sum is not completely balanced due to accounting inaccuracies. The difference from zero is denoted as the statistical discrepancy (BEA, 2016b).

$$\text{Balance of Trade} + \text{Balance on Primary Income} + \text{Balance on Secondary Income} + \text{Capital Account} + \text{Financial Account} + \text{Statistical Discrepancy} = 0$$

The US trade deficit has a financial account surplus as its main counterpart. The excess of imported goods and services, is offset by an increase in liabilities. Paradoxically, the balance on primary income remains positive. Although the US is a net debtor with a rapidly deteriorating position, its returns on capital exceed its costs. The statistical discrepancy is positive as well. The value of the capital account is negligible and the balance on secondary income is slightly negative.

Figure 2: The composition of the US balance of payments.



Source: BEA, 2016a

The trade deficit is made possible by the simultaneous occurrence of a large financial account surplus and a surplus on primary income. This raises more questions than it answers. Why is the US able to get into ever further debt without paying a sufficient return on capital? Why is the world willing to accumulate American financial assets if it doesn't receive adequate compensation?

A myriad of explanations have been given, but none sufficiently convincing to remove discussion. In this thesis, I investigate the merit of one such explanation: the role of the US dollar (dollar hereafter) as an international means of payment. The US would be able to sustain trade deficits because of the foreign demand for assets denominated in its national currency. The following hypothesis is put to the test:

*The US trade deficit during the period 2003-2015,
is caused by the use of the dollar as an international means of payment.*

The period is chosen because it has the most detailed data. Conveniently, it also is the most recent and covers the largest trade deficits.

A two-stage least squares regression (2SLS hereafter) is performed, to prove that the use of the dollar as an international means of payment causes the holding of dollar denominated assets as international reserves. Using accounting data, this is demonstrated to have increased the accumulation of dollar denominated assets, and these assets are subsequently shown to have originated in the US, contributing to the financial account surplus. Although not strictly required to prove the hypothesis, the processes involved will be fully explained, using relevant sources. Among other things, the origin of the dollar's role as an international currency, the motivations of the countries that accumulate international reserves, and the competitive advantage of the US in producing dollar denominated assets will be addressed. The holding of dollar denominated assets as international reserves also affected the balance on primary income, due to a deterioration of the net international investment position and a possible decrease in the required return on US liabilities. The former effect is estimated with accounting data, the latter with a second regression, which unfortunately fails to provide a definitive answer. Finally, the limitations on the deficits for the other components of the balance of payments and the specifics of the trade deficit are shortly discussed.

The hypothesis can be strongly confirmed. It is not only theoretically tenable, it provides a better explanation for the trade deficit than any previous attempt. The international transactional role of the dollar creates a financial account surplus, to which the balance of trade has to adjust. The effect on the balance on primary income is less clear. However, even in the most conservative estimate, the international use of the dollar is responsible for 51% of the trade deficit. This important result leads to an improved understanding of worldwide financial and trade flows and has many opportunities for further research.

CHAPTER 2 Literature Review

The literature on both the US trade deficit and the international role of the dollar is extensive. Their connection has also been often described, but not in detail and without empirical validation. First, incorrect explanations for the trade deficit will be discussed, subsequently the connection between the dollar and the deficit, the role of the dollar as an international currency and the theory on currency denomination. More literature will be reviewed in chapter 5 to explain everything at its proper place.

2.1 Incorrect Explanations of the Trade Deficit

Current explanations for the trade deficit are varied but, for the most part, confused or unrealistic. The most prevalent ones are discussed briefly.

It is sometimes claimed the trade deficit is caused by a loss in the competitiveness of American industries (Cuomo Commission on Competitiveness, 1993; Utley, 2016). Supposedly, foreign products are less costly to produce or of higher quality. This would induce more domestic demand for foreign products and less foreign demand for domestic products. Imports are raised and exports reduced, resulting in a trade deficit. This explanation is unsound. There is no reason to export without compensation. Diminished demand for US products would lead to an equivalent diminished supply of foreign products. Exports would decline but imports would decrease just as much. There are lots of countries of which the economic capabilities are inferior to the US, and yet these are not able to consistently run large trade deficits. If Burundi, Honduras and Afghanistan could increase their consumption without raising production, they would have done so already. The excess imports need to be financed. The willingness of the US to consume foreign goods and services is no mystery. The relevant question is why the world is willing to give up this production.

Engel and Rogers (2006), Chen et al. (2009), Ferrero (2010) and Gourinchas and Rey (2013) ascribe the deficit to a superior return on investment. The US would be unique in its demographic structure and efficient distribution of capital. The resulting superior return on investment would lead to an inflow of foreign funds. This explanation does not correspond to reality. Most of the exported liabilities are issued by the US Treasury and federally sponsored agencies (see section 5.3.4). Both institutions use the proceeds mainly to subsidize current consumption. This shouldn't be expected to provide a normal return, let alone be among the world's most profitable investment opportunities. The obtained funds are spent on consumer goods and petroleum (see section 5.4.5), products that can't be used for durable investment. Moreover, the US itself has a very low savings rate (World Bank, 2016), which would be hard to explain if investment opportunities were abounding. Most importantly, US financial assets have historically had significantly inferior returns. Despite their massive debt, the US has retained a positive return on its financial position (see section 5.4.2). There is something desirable about US liabilities which leads to both increased investment and a lower required return.

This brings us to a third explanation: US liabilities would be less subject to risk than those of other countries (Gourinchas et al., 2010). The US economy would be unparalleled in its ability to withstand global crises, due to its relative isolation and flexible financial system. This would enable the US to take on the role of global insurer. During normal times US liabilities are accumulated by the rest of the world and allowed to underperform, resulting in a trade deficit. During a global emergency these liabilities retain their value and are resold to the US, creating an American trade surplus. There remains a significant caveat: this insurer has never paid out. Even during the financial crisis of 2007-2008 and the resulting global recession, the balance of trade continued to be in deficit. Granted, in such a situation of inadequate demand, flooding your country with American imports would worsen the problem. To retain that the world is insuring itself for a global war or natural disaster, without any precedent, remains highly speculative. When such a catastrophe occurs, the US is likely to be involved and has a powerful incentive to default.

Hausmann & Sturzenegger (2007) deny the existence of a trade deficit and claim the primary income surplus and the financial account surplus should be explained by erroneous accounting. They show there is a significant difference between the value of liabilities on the financial account and their value as imputed from return on investment. They conclude the latter measure is the correct one. When thus considered, the US debt vanishes and the historical trade deficits disappear with it. The difference between the value the US gets paid and the value it has to pay in return is ascribed to a mysterious dark matter. This might be an important insight but, without a description of the nature and origin of this dark matter, it isn't an explanation.

Most current explanations for the trade deficit are woefully inadequate. A lack of competitiveness can be dismissed out of hand. Traditional theory of asset valuation would assume either superior returns or extraordinary safety. Neither is fitting for the US. To explain the anomalous balance of payments, another framework is required.

2.2 An Alternative Explanation

Funding the consumption of American citizens, who work themselves into ever increasing debt without paying a sufficient return on capital, seems to be among the worst possible investments imaginable. Yet it has been done over a long period and at a large scale. A still other theory provides an explanation for this puzzling phenomenon. Though more complicated, it is also much more plausible than any of the aforementioned propositions.

This theory finds the origin in the international use of the dollar. The US trade deficit would consist of compensation from the rest of the world for the provision of an international currency. Currency is a useful good, that is worth paying other goods and services for. When currency still consisted of gold and silver, expensive mining projects were able to be profitable with the proceeds of selling money (Lewis & Jones,

1970; Burton 2001). Likewise the issuance of a national currency allows central banks to obtain great profits, known as seigniorage (Groeneveld & Visser, 1997). As the US has control over an international currency, it should receive an international seigniorage. This process would affect the balance of payments by a financial account surplus, the outflow of currency in the form of financial assets, and a trade deficit, the inflow of goods and services as seigniorage.

This theory provides an explanation for the existence of dark matter. Its origin would be dollar denomination. The valuation of liabilities as measured by their market price, is correct from the point of view of the foreign financiers. The value imputed from the return on capital is the cost to the US. The difference between the cost to the US and the benefit for the rest of the world, can be ascribed to the value of dollar denomination. Alternatively, US liabilities could be considered less volatile because exchange rate risk is eliminated for international transactions. US assets would be more safe, although this has nothing to do with the risk of the underlying investment opportunities.

This line of thought dates back to Triffin (1961), who described how the world could only increase its international reserves by running financial account deficits, and accompanied trade surpluses, with the US. During the 1960s, this mechanism was studied by economists (Vasey, 1968; Mundell, 1971) and recognized by politicians (Rueff & Hirsch, 1965). In later periods it has received much less attention, although, as this thesis will show, nothing fundamental to the process has changed.

More recently, the large increase in trade deficits have reinitiated interest in this theory. A favorite in anti-American circles, it has been described by Clark (2005), Zemmour (2014), at the Anti-Zensur Konferenz (Elsässer, 2014) and by the Islamic State (Al-Hayat Media Center, 2015). Many of their claims are easily falsified. The trade deficit never exceeded 5.5% of US GDP (World Bank, 2016), so the dollar is not the sole cause of American economic dominance and the US has not stopped producing. The profits from exporting banknotes, on which much of the attention is focused, are relatively small (see section 5.3.2). Despite this, the mechanism can't be dismissed out of hand. More mainstream economists have alluded to similar processes, although they failed to describe them in detail (Dooley et al., 2003; McKinnon, 2005; Eichengreen, 2010; Prasad, 2014).

A lot has been written on the determination of the international means of payments (Hartmann, 1998; Eichengreen, 2010; Prasad, 2014) but there has been little, if any, research on its effects. Theoretical models on the connection between seigniorage and trade deficits have been provided by Chen and Zhang (2011) and Canzoneri et al. (2013), but empirical research has been absent so far. The closest thing has been a report by Dobbs et al. (2009) on the benefits of owning a reserve currency. Unfortunately they only use one year of data for a single country, ignore the principal of US assets transferred to foreigners, and confuse national benefit with national production, rendering the paper useless.

I try to reach a less ambitious but more conclusive result by testing the following hypothesis:

*The US trade deficit during the period 2003-2015,
is caused by the use of the dollar as an international means of payment.*

A counterfactual is established, where the dollar isn't used for international transactions at all. In this counterfactual the size of the trade deficit is far smaller than in reality. The difference with its actual value is attributed to the use of the dollar as an international means of payments.

The international use of the dollar is demonstrated to cause the trade deficit through several steps. Firstly, the use of the dollar as an international means of payment is proven to cause the use of dollar denominated assets as international reserves. Secondly, the size of international reserves is shown to have increased, raising demand for dollar denominated assets. Thirdly, these dollar denominated assets are established to have originated in the US, which has a competitive advantage related to the monopoly on dollar banknotes. This created a US financial account surplus. Fourthly, the financial account surplus is shown to have caused a trade deficit because the other components of the balance of payments weren't able to absorb the surplus.

Using the relevant statistical data and literature, each step in this process will be shown to be theoretically valid and empirically true, proving the hypothesis and explaining the trade deficit.

2.3 The Dollar as an International Currency

The international transactional use of the dollar provides an explanation for the trade deficit. Before deducing its effects on the balance of payments, it is important to understand the role of the dollar as an international currency. In this section, the theoretical origin and empirical representation of the global use of the dollar is examined. Special regard is given to the relation between the transactional use of the dollar and the use of dollar denominated securities as a store of value.

Currency is a good used to facilitate transactions. Currency enables deviations from barter in the form of one sided transactions. Only one side provides something of direct use, the other currency, which can be traded against something useful with another party, at another time and in another place. This increases the possibilities of trade considerably and is beneficial for all involved. For a good to properly function as a currency it needs to have certain attributes. Durability allows sale and purchase to happen at distinct times, transportability at distinct places and divisibility enables the transactions to be of different size. Uniformity helps to determine value objectively and without cost (Smith, 1776).²

² Stability of value is a prerequisite for durability. Scarcity is necessary so far as it renders the currency to be of sufficiently small size to be transportable.

These intrinsic properties are possessed by a variety of objects. Noble metals naturally fulfill the criteria, but banknotes and forms of digital code have been designed to perform equally well. For the sake of uniformity however, the use of a single currency is the most efficient. What object will be used as currency, is for a major part determined by network effects (Kindleberger, 1981; Portes & Rey, 1997; Lai & Yu, 2015). Money is only of use if others are willing to accept it, others are only willing to accept it if it is of use. The more a currency is used, the better it is able to perform its function and the more it will be used. This makes a currency spread, over geographical areas as well as categories of use. A currency will be readily accepted in a city if it is used in all of the surrounding cities. Likewise, it will be accepted as payment for clothing if it is already in use for transactions in food and housing. This is just as much the case for international as for national transactions. When a currency can be used to obtain imports from every surrounding country it is natural to accept it as payment for exports. When it is used as payment for goods and services, it makes sense to use the same currency to denominate loans. If it wasn't for government intervention, it is possible there would be just a single currency in the world. Governments prefer to issue their own currency, to finance their expenses and retain an autonomous monetary policy, and they enforce use by prohibiting refusal and requiring taxes to be paid in this currency (Mundell, 1961; Fischer, 1982).

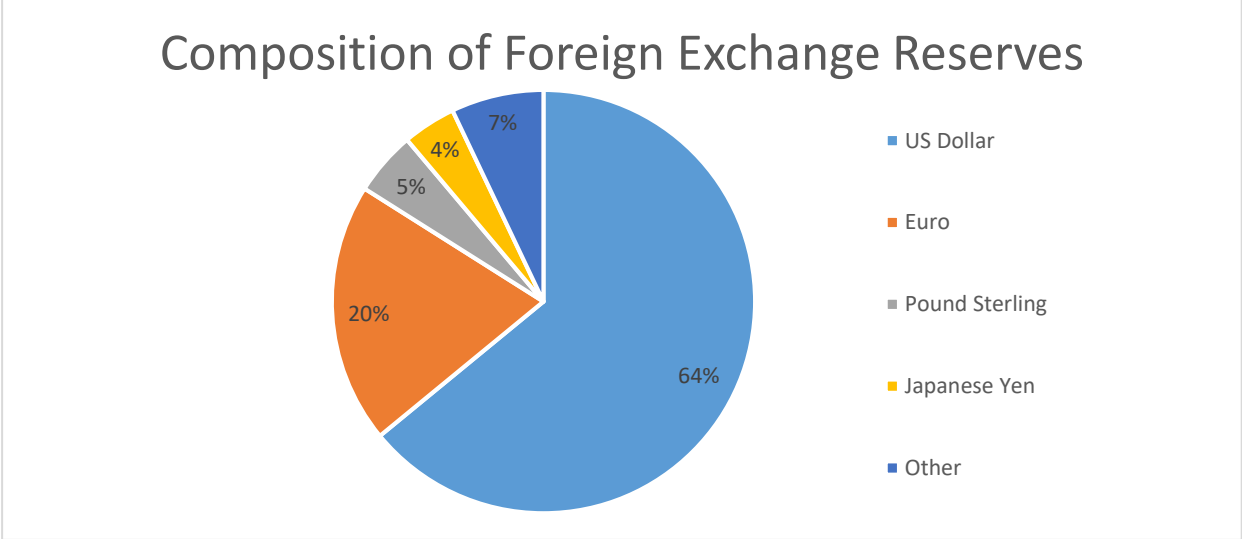
In international transactions the most widely used currency is the dollar. Commodities, like petroleum and metals are denominated and transacted in the dollar. Although some large currency areas are able to partly trade in their own currency, trade between smaller currency areas is entirely invoiced and transacted in the dollar (Krugman, 1984; McKinnon & Schnabl, 2004). The dollar is present in over 80% of transactions in the foreign exchange market, where it functions as a vehicle currency (Bank of International Settlements, 2013), and there are at least 66 countries that have pegged their currency to the dollar or use the dollar itself domestically (Coren, 2016).

This role as an international medium of exchange leads to the use of dollar assets as an international store of value. Just like reserves for domestic transactions are preferably denominated in the domestic currency, reserves for international transactions are preferably held in the dollar (see section 2.3).

Table 1: The private and official uses of international money, as described by Kenen (1983) and Hartmann, (1998).

| <i>Uses of the international currency</i> | Private use | Official use |
|---|--------------------|---------------------|
| Medium of exchange | Vehicle | Intervention |
| Unit of account | Invoice | Peg |
| Store of value | Banking | Reserve |

Figure 3: The composition of the allocated foreign exchange reserves of central banks as of the fourth quarter of 2015. 64% of reserves is denominated in the dollar and a further 29% in other currencies which are widely used in international transactions. A mere 7% of holdings is issued by other countries, although these make up 88% of the global population and 52% of the gross world product (World Bank, 2016).



Source: International Monetary Fund (IMF hereafter), 2016

There is very little that distinguishes the dollar or dollar denominated assets intrinsically. The main reason everyone uses dollars for international transactions, is that everyone else is using them. Refusing to use the dollar would be disastrous to the international trade of a country, let alone of a private company. The dominance of the dollar finds its origin partly in the important position of the US in world trade, but the eurozone and China are even more prominent there (World Bank, 2016). The use of the dollar by third countries is just as important and, for the most part, a matter of historical accident. The strong network effects of currency usage create path-dependency. After the second world war every industrialized nation except for the US was severely impaired. All industrialized nations had dollar denominated loans or reparations to pay to the US. It is only natural the dollar became the international currency and it maintains that status to this day (Eichengreen, 2010).

The dollar retains its position by inertia, more than any intrinsic property. In theory, a world with a different global currency can well be imagined. The international use of the dollar can be considered an exogenous variable, of which the effects can be estimated independently. In this thesis, the effects of the global use of the dollar on the American trade deficit will be determined.

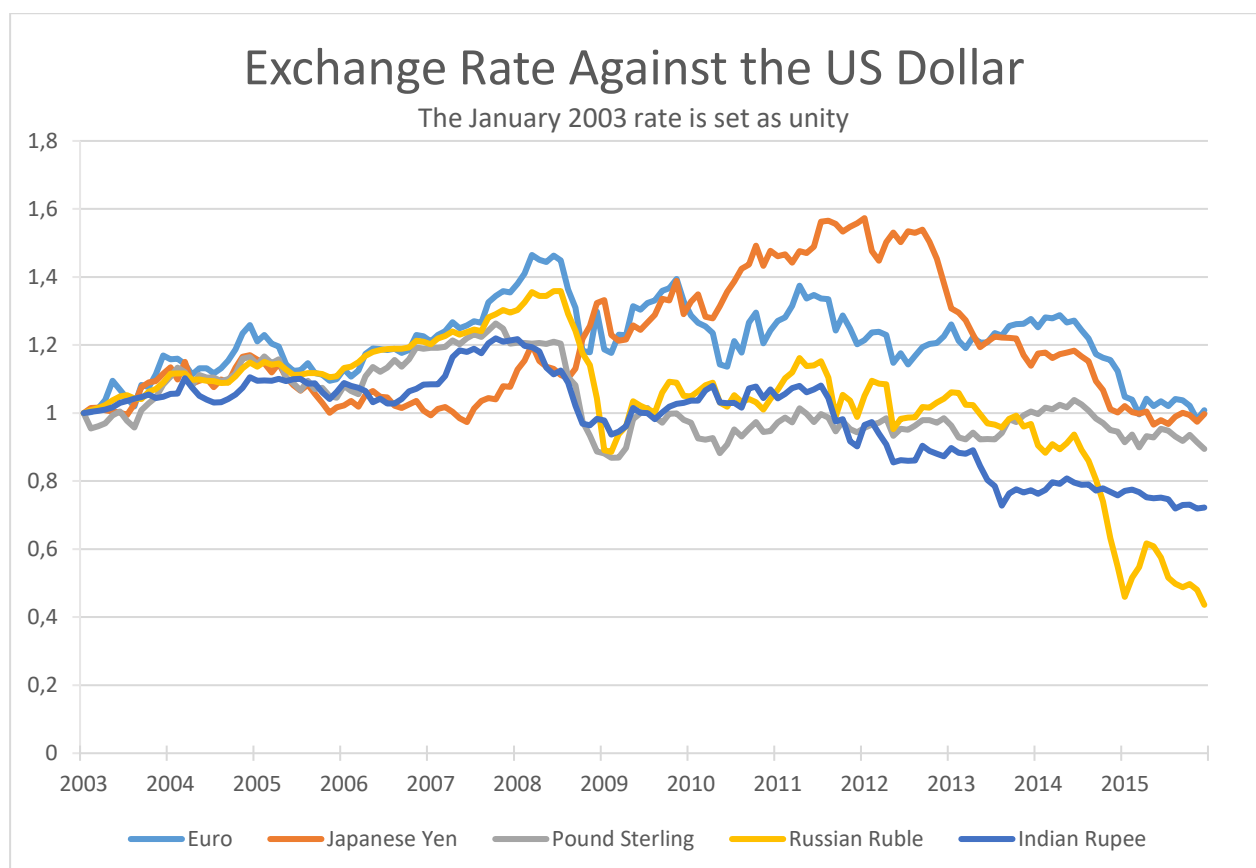
2.4 The Importance of the Currency of Denomination

Central to the hypothesis is the idea that the currency of denomination is an important determinant of the demand for financial assets. In this section the existing literature on this idea will be reviewed.

There are compelling reasons to think the currency of denomination influences the demand for financial assets. As both the earnings and expenditures of investors are denominated in specific currencies, it should make sense for them to obtain assets denominated in the same currency. Differences in denomination cause transactions costs and exchange rate risk.

Transactions costs decrease returns, especially when smaller currencies or unexpectedly large volumes are exchanged (Hartmann, 1999). Even more important however, is exchange rate risk. The relative value of currencies changes continuously. Exchange rates are erratic and unpredictable, adding considerable risk to investments which are denominated in other currencies than are needed for expenditures (Adler & Dumas, 1983). Direct evidence for the substantial effect of exchange rate risk on investment is provided by Dumas and Solnik (1995) and Zhang (2006).

Figure 4: The exchange rate of a few selected currencies in terms of the exchange rate at the beginning of the period. Their value fluctuates enormously with little discernible trend.



Source: Investing.com, 2016

To hedge exchange rate risk, it's to engage in a forward, future or option contract, at least in the case of major currencies. Although the specifics differ, all of these contracts can be considered bets on the direction the exchange rate will take. If contracts are bought that deliver a loss when a gain is made on the investment but a gain when the investment loses value, exchange rate risk could be theoretically eliminated. In practice however, the exchange rate risk is simply transferred to the counterparty. Unless this counterparty holds assets that are denominated in the required currency, the aggregate risk isn't changed, just the bearer of the risk. The counterparty requires compensation for this risk and is likely to default when it is needed most. Exchange rate risk can't be hedged in the aggregate, unless properly denominated assets are obtained (Meera, 2002).

Several empirical observations are also indicative of an important influence of the currency of denomination. It is well known that investors have a strong preference for assets issued in their own country (French & Poterba, 1991). As these assets are usually denominated in the domestic currency, a possible explanation for this home bias would be exchange rate risk minimization. Fidora et al. (2006) provide empirical evidence for this assertion. The high correlation between savings and investment (Feldstein & Horioka, 1980) and its disappearance after the introduction of a common currency (Blanchard & Giavazzi, 2002) is also consistent with the importance of the currency of denomination. Savers wish to have their savings denominated in the domestic currency, which is only possible if they lend to domestic borrowers.

Despite these arguments, the currency of denomination is often ignored in financial theory. Currently, assets are valued by a wide variety of factors, ranging from average return to firm size. Yet even in models for international markets the currency of denomination is generally ignored (Fama & French, 2012; Hou et al., 2011; Griffin, 2002, Fama & French, 1998). As explained before, the effect of currency denomination on the US balance of trade has not been examined in any serious work.

Ignoring the currency of denomination could be a major deficiency in financial theory. Establishing the importance of this asset characteristic, might ultimately be even more important than exploring the effects of international currency issuance and explaining the origin of the trade deficit.

CHAPTER 3 Methodology

Two regressions are employed to prove the hypothesis. The connection between the international transactional use of the dollar and the use of dollar denominated assets as international reserves is tested with a 2SLS regression. The effect of the use of dollar denominated assets as international reserves on their return is estimated with another least squares regression. The remaining links to the trade deficit are covered by the interpreting of accounting data.

3.1 First Regression

To determine the effect of the denomination of international transactions on the denomination of international reserves, a statistical test is necessary. Otherwise the motivations for the denomination of international reserves can't be objectively assessed. For a cross-section of countries, the share of global international reserves denominated in their national currency is regressed on the share of international transactions conducted in that national currency. As the sole purpose of international reserves is providing the means for future international payments, this relationship is expected to be close to one-to-one and control variables should not be necessary.

If such a regression was performed directly, the result could be influenced by interdependency. The share of international reserves might be of influence on the share of international transactions, while only the reverse relation is of interest. To prevent this problem of simultaneity, a 2SLS regression is conducted. This two-stage regression consists of a first regression of the independent variable on a so called instrumental variable, which influences the independent variable but has no direct relation with the dependent variable. The resulting coefficients are used to estimate values of the independent variable for each observation. In a second regression, the dependent variable is regressed on these estimations, instead of the real values of the independent variable. The results are valid for the pure effect of the independent variable and free of any interdependency.

The size of international trade, measured as the sum of exports and imports, is used as the instrumental variable.³ Because currencies of countries with a larger share in international trade can be used to obtain a wider variety of imports, these currencies are more likely to be accepted as compensation for exports. The larger the size of international trade of a country, the larger the share of their national currency in international payments. However, the share of reserves is not directly influenced. If trade with a country is conducted in a currency other than its national one, international reserves should be held in that other currency, however large the size of trade may be.

³ If the hypothesis turns out to be correct, the amount of international reserves influences the balance of trade, and therefore perhaps also the size of trade, creating some reverse causality. This effect is assumed to be so minor that the generated bias is negligible.

China is a good example. China's international trade is larger than that of the US (World Bank, 2016), but, because this trade is mainly conducted in the dollar, the renminbi holdings in international reserves are very minor. The same can be observed when smaller countries are combined. Regions like Latin America, Africa, the Middle East and South Asia have important roles in international trade and yet the share of their collective currencies in international reserves is negligible. In fact, even when these regions are combined, and their share in international trade becomes the largest in the world, the combined holdings of international reserves in their national currencies remains under 3%.⁴ That more than a single government would be located in these regions is not relevant, this is the case for the eurozone too.

The observations are averages over 2014, the year with the most data available. The following two equations are estimated:

$$\begin{aligned} \text{Payments} &= \alpha_0 + \alpha_1 * \text{Trade} \\ \text{Reserves} &= \beta_0 + \beta_1 * (\alpha_0 + \alpha_1 * \text{Trade}) \end{aligned}$$

The estimated value of β_1 is of interest. If this is significantly positive and sizable, the first part of the hypothesis has been confirmed: The international transactional use of the dollar leads to the accumulation of international reserves in dollar denominated assets.

The null hypothesis is that the share of a currency in international transactions does not influence the share of a currency in international reserves. The alternative hypothesis is that the share in international transactions raises the share in international reserves.

$$H_0: \beta_1 = 0$$

$$H_a: \beta_1 > 0$$

Heteroscedasticity is clearly present for both regressions. The standard error rises as the size of trade goes up in the first equation, it rises as the estimated share of international payments becomes larger in the second. For the first regression this isn't much of a problem, as heteroscedasticity does not bias coefficients and only point estimates are required. For the second one, the invalid standard errors would alter the significance of the results. The heteroscedasticity-consistent White standard errors are therefore employed. Because cross-sectional data is used any problems involving autocorrelation are avoided.

⁴ World Bank (2016) for the size of imports and exports, IMF (2016) for the share of the national currency in international reserves.

To summarize, a 2SLS regression with White standard errors is performed on a cross section of countries with the share of global international reserves denominated in the national currency as the dependent variable, the share of international payments conducted in the national currency as the independent variable and the size of international trade as the instrumental variable.

In this regression only the single year of 2014 is considered, while the remainder is proven to be the case over the period 2003-2015. The former is extrapolated to the latter to prove the hypothesis. Although this is theoretically inconsistent, limitations on the available data have forced the research to be performed this way. In practice, this is very unlikely to distort the results. The currency composition of international reserves is stable and the motivations for holding reserves in a specific currency do not shift from one year to another.

3.2 Second Regression

A second regression is employed to determine the effect of the international use of a currency on the required return for assets denominated in that currency. First, the differences in the required return for assets denominated in different currencies is determined. Then, these so-called currency premia are regressed on the share of their currency in international reserves and a set of control variables.

To obtain the currency premia, the concept of interest rate parity is utilized. There are two kinds of interest rate parity: Covered and uncovered. According to covered interest rate parity:

$$1 + i_A = \frac{S_t}{F_t} * (1 + i_B)$$

where i_A refers to the domestic interest rate and i_B to the foreign interest rate, both over one period, S_t to the current spot rate (foreign currency in terms of domestic currency) and F_t to the current forward rate (foreign currency in terms of domestic currency, if the trade will take place one period in the future). Covered interest rate parity must hold in well-functioning markets, because perfect hedging is possible. If one trades currencies on the spot market, and simultaneously engages in an opposite forward contract, one would receive the difference in return, without incurring any risk. Covered interest rate parity is simply a variation of the law of one price. Empirical research shows indeed that covered interest rate parity generally holds (Taylor, 1989; Kia, 1996; Skinner & Mason, 2011).

According to uncovered interest rate parity:

$$1 + i_A = \frac{S_t}{E(S_{t+1})} * (1 + i_B)$$

Where $E(S_{t+1})$ refers to the expected spot rate one period ahead. If uncovered interest rate parity holds, the expected return on both currencies is equal. This implies that the demand for assets denominated in either currency compared to the supply of these assets is identical. No perfect hedge exists in this case, due to the uncertainty of the future spot rate. When currencies are traded without an offsetting forward contract, unexpected changes in the exchange rate make the return of such a transaction uncertain. To test uncovered interest rate parity empirically, a measure of the expected future spot rate is necessary. Usually, this is done by assuming unbiased expectations, which means that on average:

$$E(S_{t+1}) = S_{t+1}$$

In this way, the following hypothesis can be tested:

$$1 + i_A = \frac{S_t}{S_{t+1}} * (1 + i_B)$$

Empirical studies show that uncovered interest rate parity virtually never holds (Froot & Thaler, 1990; Lothian & Wu, 2011). This is indeed to be expected, because investors care about the denomination of their assets, as has been explained in section 2.4. Currencies have premia or discounts so that:

$$1 + i_A = \frac{S_t}{S_{t+1}} * (1 + i_B) * (1 + P)$$

where P refers to the premium obtained as a reward for holding the foreign currency. It is this premium that will be estimated. This relationship can also be stated as:

$$S_{t+1} = S_t * \frac{1 + i_B}{1 + i_A} * (1 + P)$$

When covered interest rate parity holds:

$$F_t = S_t * \frac{1 + i_B}{1 + i_A}$$

This means that:

$$S_{t+1} = F_t * (1 + P)$$

$$P = \frac{S_{t+1}}{F_t} - 1$$

This notation is useful, because data on spot and forward rates is readily available, while data for interest rates is harder to obtain. With this formula, a premium can be calculated for every exchange rate. To compare the premia of different currencies, they need to be relative to the same currency. The US dollar is chosen, because it is by far the most commonly traded currency, which means the most data is available.

The obtained currency premia will be the explained variable in a regression. As discussed, the premium of a currency depends on the demand and supply for assets denominated in this currency. What is of interest, is the effect of the international use of a currency on this ratio. The first explanatory variable will therefore be the share of the currency in international reserves. Because the foreign accumulation of a currency raises its demand, the coefficient is expected to be negative.

Because the international use of a currency isn't the only influential factor, control variables are necessary. The stability of a currency's value might be another important determinant of its worth as a store of value. To control for this, the inflation rate is used as another explanatory variable. While exchange rate volatility is also an indicator of stability, it is necessary bilateral and doesn't provide an indication of whether a currency needs a discount or premium. Inflation is measured against the goods that can be purchased with the currency, so it doesn't have this problem. To control for domestic demand and supply, economic variables of the domestic currency area are added: GDP per capita, the growth rate of GDP and gross savings as a percentage of GDP. This list is by no means exhaustive and omitted variables could bias the coefficients, when they are correlated with the international use of the currency.

The data used, has both a time and a currency dimension. Time fixed effects are used, to control for time-specific omitted variables. Currency fixed effects are not employed, because there is too little variation in the share of international reserves over time. The regression is a least squares estimation, with White standard errors to control for heteroskedasticity. It looks like this:

Currency Premium

$$= \beta_0 + \text{Time Fixed Effect} + \beta_1 * \text{Reserves} + \beta_2 * \text{Inflation} + \beta_3 * \text{GDP per Capita} + \beta_4 * \text{GDP Growth} + \beta_5 * \text{Savings Rate}$$

In this case, the null hypothesis is that the share of reserves does not influence the currency premium, and the alternative hypothesis is that the share of reserves induces a currency discount.

$$H_0: \beta_1 = 0$$

$$H_a: \beta_1 < 0$$

It should be noted, that this regression will be highly dependent on the assumptions of covered interest rate parity and a lack of correlation between omitted variables and the currency share of international reserves. The method is only used because there is no superior alternative and extreme care should be taken when interpreting the results.

3.3 Other

The coverage of the other mechanisms will consist of their confirmation in accounting data, an explanation of their causes through literature and a description of their relevance to the main hypothesis. Their proof is, while often ignored, clearly documented and statistical tests are redundant. Although this comprises the bulk the results, the methodology is straightforward. Rising holdings of international reserves are accounted for by statistical data. These reserve assets originate in the US, as is made clear by the large American financial account surplus. That this surplus causes a trade deficit will be shown by accounting data of the US balance of payments, which, strictly seen, has already been done in the introduction.

CHAPTER 4 Data

For first regression, the data required consists of the share of currencies in international payments, the size of currency areas' international trade and the share of currencies in international reserves. For the second regression the share of currencies in international reserves is used again, in addition to spot and forward exchange rates and currency areas' inflation rate, GDP per capita, GDP growth and savings rate. For the remainder of the thesis, the increase in official reserves and total foreign financial assets by country, and the composition of the US balance of payments are needed.

The shares of currencies in international payments are obtained from reports by the Society for Worldwide Interbank Financial Communication (SWIFT hereafter). This is a cooperative that provides a network on which financial institutions can send and receive information regarding transactions. Although there are other channels to communicate payments, it facilitates the majority of cross-border flows (SWIFT, 2015). Data on the currency composition of international payments is described in several publications. SWIFT (2015) provides the percentages for the US dollar, the euro, the British pound, the Japanese yen and the Chinese renminbi for 2014. The allocation of the remaining payments is not specified. More detailed information can be found in monthly reports (SWIFT, 2016), where the shares in international payments are presented for the twenty highest currencies, from September 2012 to June 2016. This data is only provided by month, while a yearly average is needed. This yearly average is estimated as the sum of the monthly averages, divided by the number of months. This number of months is only eleven because there is no data available for November. The size of international payments varies by month and this distorts the average, adding some noise. This distortion is not prohibitive, as the currency shares do not vary that much by month and the size of payments is not expected to be very volatile. So, for the US dollar, the euro, the British pound, the Japanese yen and the Chinese renminbi, the numbers are gathered from the 2015 paper and for other documented currencies from the monthly reports. For the remaining currencies it can only be inferred their share is below that of the lowest included currency (the Turkish lira with a share of 0.34%). This makes the lower observations precise at the level of whole percentages, to which all observations are rounded for consistency.

The size of international trade of the issuing country is measured as the sum of exports and imports. Data for both is obtained from the World Bank (2016), which uses official sources to obtain its numbers. When the reported areas do not coincide with a currency area, they are discarded. This goes for regions with more than one currency issuer (such as North America and the Arab World), for countries that share a currency (like Germany for the euro and Burkina Faso for the West African CFA franc), and for countries that utilize a currency not designed for them (like Ecuador which uses the dollar and Montenegro which uses the euro). 108 observations remain, under which all issuers of internationally important currencies. The import and export of the euro area is given as the sum of the countries comprising this area, not as the trade of the area

as a whole with the rest of the world. The former measure accounts only for extra-euro area trade, whereas the latter also covers intra-area trade. This latter measure is superior, as it are individual countries that hold international reserves. Because countries in the eurozone can't expand the money supply on their own, they need euro reserves for trade with other euro countries too.

The share of currencies in international reserves is obtained from the IMF (2016). The IMF retrieves the data from 145 reporters, consisting of governments and other foreign exchange reserve holding entities. Large amounts of foreign reserves, such as private holdings of banknotes, are bound to remain unreported. Of the reserves that are reported, almost half are not allocated to a currency. If the unregistered reserves were non-random and overweighed in specific currencies, this could add unwarranted noise. There is unfortunately no way to fix this. The quarterly measurements are summed for each currency and divided by the sum of quarterly measurements for total allocated reserves, to retrieve a value weighted estimate. Like in the case of the shares in international transactions, only the top currencies are given. For the remaining currencies, it is only certain they are below the lowest measurement (the Swiss franc with 0.23%), so the numbers are rounded to the nearest whole percentage in this case as well.

Data for the spot and forward rate of currencies against the US dollar, is obtained from Bloomberg (2017). Although the regression is run on yearly data, monthly forward rates and future spot rates one month ahead are gathered to calculate monthly currency premia, which are subsequently averaged and annualized in the following way:

$$P_{annual} = \left(\frac{\sum (1 + P_{monthly})}{12} \right)^{12} - 1$$

Monthly instead of yearly premia are used to obtain more data, making unexpected shocks in the spot rate less influential. This data is obtained for the period 2003-2015, for all 36 currencies for which it is available.⁵ Due to missing values, there are only 444 observations.

For the 36 corresponding currency areas, yearly data is obtained for the inflation rate, GDP per capita, savings rate and GDP growth, from the World Bank (2016).

⁵ United Arab Emirates dirham, Argentine peso, Australian dollar, Bulgarian lev, Brazilian real, Canadian dollar, Swiss franc, Chilean peso, Chinese yuan, Colombian peso, Czech koruna, Danish krone, Egyptian pound, euro, British pound, Hong Kong dollar, Hungarian forint, Indonesian rupiah, Japanese yen, Moroccan dirham, Mexican peso, Malaysian ringgit, Nigerian naira, Norwegian krone, New Zealand dollar, Omani rial, Peruvian sol, Philippine peso, Polish zloty, Qatari riyal, Russian ruble, Swedish krona, Thai baht, Turkish lira, Ukrainian hryvnia, US dollar and South African rand.

The IMF data is used again to obtain the increase in official reserves and an estimate of their dollar denominated proportion. Again, the assumption is made that the currency shares of allocated reserves are representative for the entire size of official reserves.

The World Bank provides data for the accumulation of official reserves by country. This covers total reserves minus gold and is not the same as the increase in currency reserves. Holdings of special drawing rights and IMF reserve positions are added by the World Bank, while they shouldn't be. Fortunately these only make up a few percent of the total reserves (IMF, 2015) and the annual sums of the World Bank measure of reserves is virtually identical to those of the IMF.

Further needed is are the financial account balances by country. Unfortunately, direct estimates unavailable. However, the World Bank does report the values of the current account by country, of which the inverse gives a close approximation. The current account is defined as follows:

$$\begin{aligned} \textit{Current Account} \\ &= \textit{Balance of Trade} + \textit{Balance on Primary Income} \\ &+ \textit{Balance on Secondary Income} \end{aligned}$$

Given the identity of the balance of payments given in chapter 1:

$$- \textit{Current Account} = \textit{Financial Account} + \textit{Capital Account} + \textit{Statistical Discrepancy}$$

The inverse of the current account is equal to the value of the financial account, when the capital account balance is negligible and the statistical discrepancy is caused by an undervaluation of the financial account. These assumptions are likely to hold reasonably well. The value of the capital account is universally negligible, amounting to at most a few billion dollars. The statistical discrepancy can be sizable but attributing it to the financial account doesn't necessarily bias the results. If the measured financial account was used instead as an estimate of the real financial account, the assumption would have been that none of the statistical discrepancy was caused by a mismeasurement of the financial account. This would be far more distortive, as demonstrated in section 5.4.1.

A detailed description of the US balance of payments is presented by the BEA, a US government agency concerned with the provision of macroeconomic and industry statistics. It is BEA data that establishes the existence and size of the trade deficit, so this data should be used to analyze its origin as well. The balance of payments is covered since 1960, but is described in much more detail after 2003. This year is therefore the starting point of the investigated period.

Summarizing, the currency composition of international transactions is obtained from SWIFT, the currency composition and size of reserves is gathered from the IMF, World Bank data is used for the size of trade, the inflation rate, GDP per capita, GDP growth, the savings rate and worldwide financial accounts and the increase of official reserves by country, the Bloomberg Terminal provides data for spot and forward exchange rates, and the BEA is consulted for specifics of the US balance of payments. The data has its defects but is consistent and can be expected to provide a reasonable representation of reality.

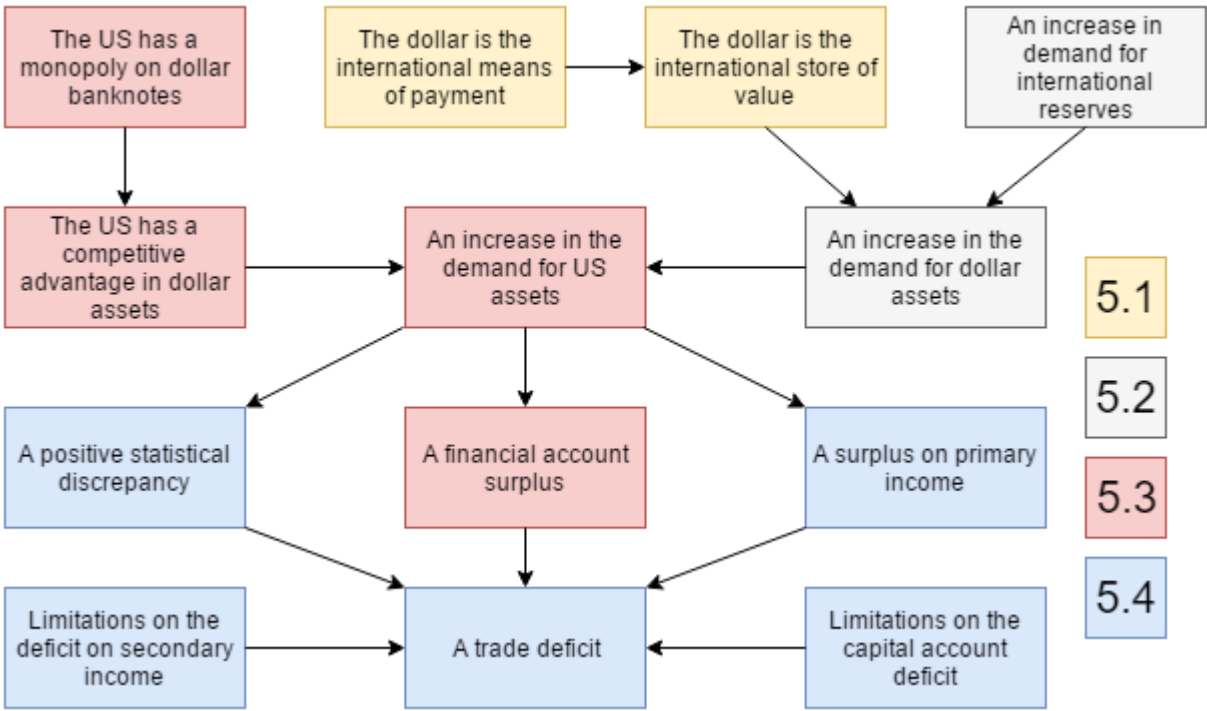
CHAPTER 5 Results

The results cover many processes, from the use of the dollar as an international medium of exchange to the US trade deficit. The results are divided in four sections, each of which will cover a particular mechanism.

1. From Dollar Transactions to Dollar Reserves
2. From Dollar Reserves to Demand for Dollar Assets
3. From Demand for Dollar Assets to a Financial Account Surplus
4. From a Financial Account Surplus to a Trade Deficit

By establishing that each mechanism can be theoretically explained and empirically holds, the hypothesis is confirmed.

Figure 5: A graphical representation of the line of thought. The colors represent the sections discussing the claims.



5.1 From Dollar Transactions to Dollar Reserves

Before connecting the international transactional use of the dollar to the US balance of payments, it has to be proven to cause the foreign accumulation of dollar denominated financial assets. This will be done in the current section.

As explained, a 2SLS regression is performed. The independent variable is the share of currencies in international payments, as measured by SWIFT. The instrumental variable is the size of the international trade of the currency issuers, given by the World Bank. The dependent variable is the share of international reserve assets denominated in the currency, accounted for by the IMF.

The outcome of this 2SLS regression complies to expectations. The coefficient is positive and statistically different from zero at the 0.01% level.⁶ The null hypothesis can be clearly rejected at any conventional significance level. The share of international transactions conducted in a specific currency has a positive effect on the share of international reserves held in that currency. Other expectations are fulfilled as well. The relationship is close to one-to-one, while the intercept isn't significantly different from zero. The regression equation explains an astonishing 92% of the variation in international reserves.

Table 2: Summary of the 2SLS regression results (N = 122).

| Coefficient | Value | Standard Error | |
|---|--------------|-----------------------|--|
| Constant | 0.04 | 0.06 | |
| Share of international transactions (%) | 0.91*** | 0.19 | |
| R ² = 0.92 | | | |

*** denotes significance at the 1% level

Even when the US dollar is removed from the sample, both the significance and size of the coefficient are retained. This conclusively proves the international transactional use of the dollar is a cause for the high share of dollar denominated assets in international reserves.

Table 3: Summary of the 2SLS regression results, when the US dollar is omitted (N = 121).

| Coefficient | Value | Standard Error | |
|---|--------------|-----------------------|--|
| Constant | 0.00 | 0.02 | |
| Share of international transactions (%) | 0.69*** | 0.02 | |
| R ² = 0.98 | | | |

*** denotes significance at the 1% level

A remaining caveat is the lack of a normal distribution for the residuals. For the regressions including and excluding the US, the Jarque-Bera statistics are respectively 35823 and 8270, reducing the probability of a normal distribution in each case to below 0.01%. Because both heteroscedasticity and non-normal distributions of the residuals are present, there is not even asymptotic normality and the p-values are wrong.

⁶ As the alternative hypothesis is one-sided this should still be divided by two. However, in this case it doesn't make a difference.

However, the coefficients far exceed the standard deviations and the results are significant for any plausible distribution of the residuals. Least squares regression are relatively robust to non-normality and the sample size is reasonably large, so the results are not invalidated (Frost, 2014).

The regression went according to expectations, even after exclusion of the dollar. This outcome confirms that the noise added by the defects in the data, was small. The effect of the international use of a currency as a means of payment on the accumulation of assets denominated in this currency as international reserves turns out to be of high significance, great size and in the expected direction. The regression shows currency denomination clearly matters, when assessing the demand for financial assets. Denomination in an international currency creates demand for an asset, additional to traditional staples of asset valuation like return and volatility. The use of the dollar as an international means of payment leads to its use as an international store of value.

If the dollar wouldn't be used for international transactions, dollar denominated assets wouldn't be accumulated as international reserves. In both regressions, the point estimate of a currency without use in international transactions for the share in international reserves is very close to and not significantly different from zero. Heteroscedasticity makes the estimates uncertain at higher values but at lower values there is little variety. Of the more than 100 currencies that are only used domestically, none has a share over 0.5% in international reserves. In the counterfactual, the share of dollar denominated official reserves is equal to zero.

5.2 From Dollar Reserves to Demand for Dollar Assets

Because international reserves are predominantly dollar denominated, any increase in the demand for international reserves leads to increased demand for dollar denominated assets. This chapter covers first the occurrence of such an increase and then its causes, which are organized by motivation of the acquirers.

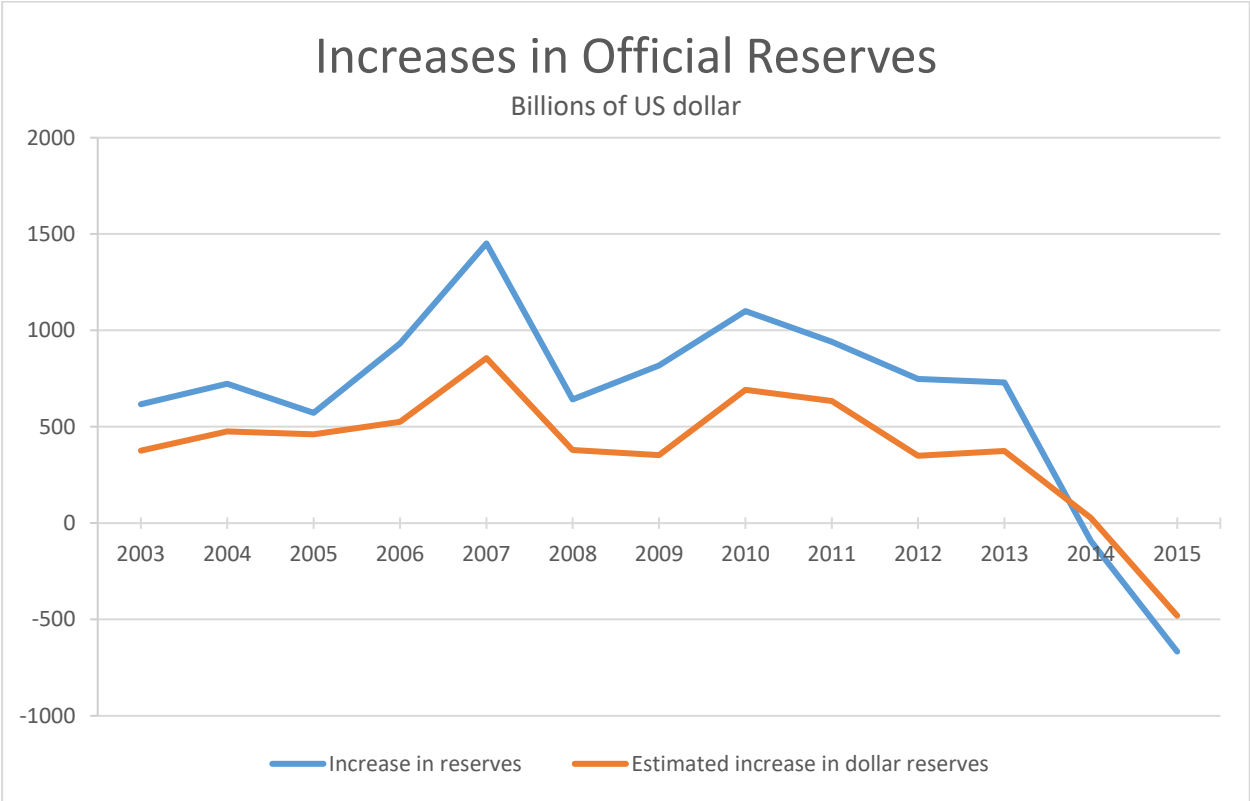
5.2.1 Increasing International Reserves

During the investigated period the demand for international reserves rose sharply. The value of official reserves rose by more than 8.5 trillion dollar. A significant part of this increase consisted of additions of dollar denominated assets. Of the yearly increase in reserves allocated to a currency, a weighted average of 63% was dollar denominated. If the increases in unallocated reserves are assumed to have the same currency composition, the total increase in dollar denominated official reserves can be calculated with the following formula:

$$\text{Increase in Dollar Reserves} = \text{Increase in Reserves} * \frac{\text{Increase in Allocated Dollar Reserves}}{\text{Increase in Allocated Reserves}}$$

If this assumption holds for each year, the increase in dollar denominated official reserves equals 5.0 trillion dollar.

Figure 6: The increases in official reserves and the estimated dollar component of this increase by year.



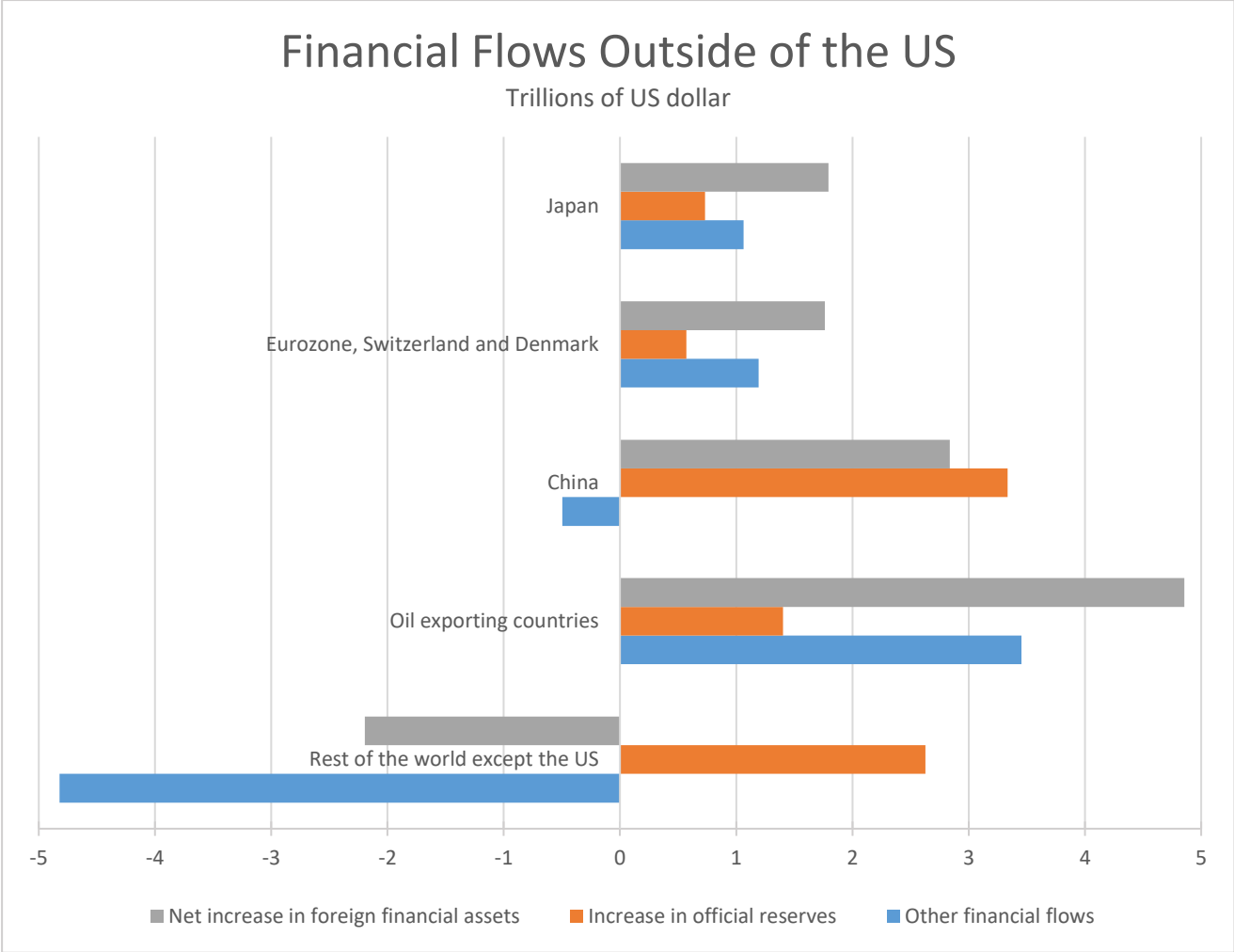
Source: IMF, 2015

Simultaneously with this increase in official international reserves, there was a surge in unofficial international reserves. Aside from central banks, foreign assets were accumulated by governments, corporations and other institutions. As will be explained, many of these unofficial reserves served similar goals as the official reserves, and were largely dollar denominated as well. In some cases the distinction is largely artificial. Nevertheless, any effects of unofficial reserve accumulation on the demand for dollar assets will be ignored. The currency composition of unofficial holdings is unknown and the link between this denomination and the share of currencies in international transactions is doubtful, as the regression was only performed on official reserves.

If the dollar wasn't used for international transactions, then it wouldn't be used for international reserves. The incremental international reserves would have been accumulated in other currencies, with which international payments could be made. If the dollar was only used for domestic payments, a rise in international reserves would never lead to increased demand for dollar assets, however large this rise may be. In the counterfactual, there would have been an estimated 5.0 trillion dollar fewer accumulation of dollar denominated assets as official reserves.

The increase in international reserves occurred in a variety of countries, that had a variety of motives. In Japan and parts of Europe, deflationary recessions were the cause. In the case of China it was a byproduct of export-driven industrialization. Oil exporters built up reserves due to the high price of oil. Some developing countries offset their increased private debt by accumulating official reserves. In the remainder of this chapter, the motives for accumulating these reserves will be specified and the ultimate causes of the increase assessed.⁷

Figure 7: The international flows of different acquirers of international reserves, with different motivations.



Source: World Bank, 2016

5.2.2 Recessions

A first cause for the accumulation of foreign financial assets is the occurrence of deflationary recessions and the use of money creation to resolve them.

⁷ Only a selection of countries will be explicitly discussed. Describing every country with a financial account surplus would be prohibitively time-consuming.

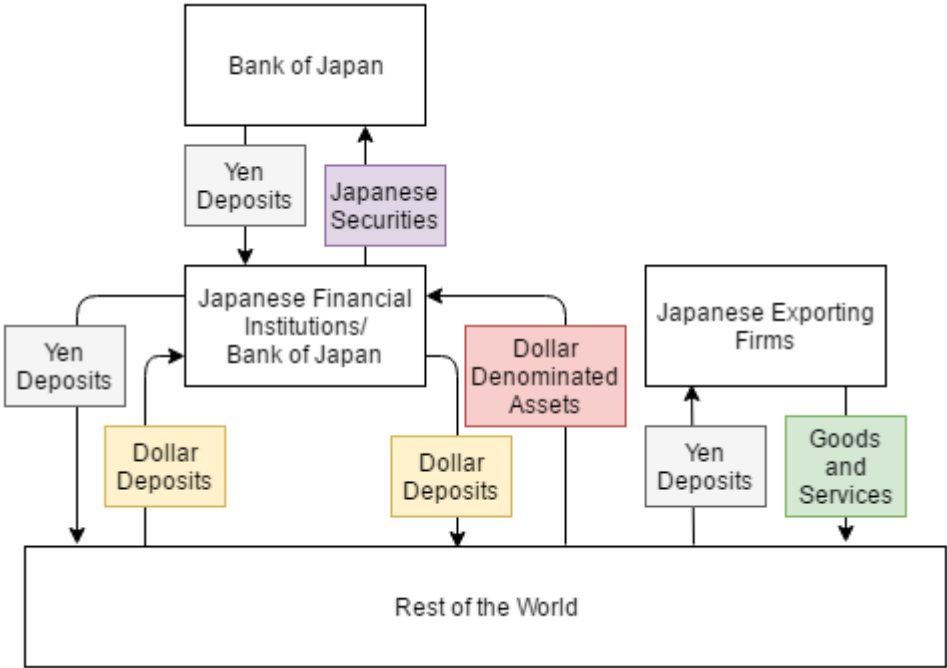
Japan is perhaps the best example of a country accumulating international reserves for this reason. In the early 1990s Japanese asset prices declined sharply due to the collapse of an asset bubble, while the value of debt remained nominally fixed. This vastly increased the ratio of debt to assets, creating debt overhang. Corporations used all of their free revenue to pay off their debts in an effort to improve their balance sheets and stopped investing. This increased the demand for money and reduced the demand for goods and services, which induced deflation as the price of money relative to goods and services increased. The deflation decreased asset prices and increased the real value of the debts, causing a vicious cycle (Koo, 2009).

Japanese corporations saved their earnings to improve their balance sheets and didn't invest. Export revenues were retained instead of spent on imports, resulting in increasing foreign reserves (Horioka, 2015). Japanese foreign trade is, aside from the Japanese yen, predominantly denominated in the dollar (Tavlas, 1997), so mainly dollar denominated financial assets were accumulated.

To remedy the vicious cycle of deflation, the Japanese central bank, the Bank of Japan, expanded the money supply. The rising demand for money would be offset by a rising supply, allowing prices stay constant or even rise, while the value of debts declined (Bernanke, 1999). This money creation caused an even further accumulation of foreign assets. The newly created yen lowered the exchange rate as it found its way into the international market. As product prices are not as flexible, Japanese goods and services became cheaper relative to foreign goods. This raised exports and lowered imports, leading to even greater capital outflows (Nanto, 2007).

Whether the foreign financial assets are accumulated by central banks, and therefore count as official reserves, depends on how the new yen is brought into circulation. When the Bank of Japan makes purchases of foreign assets, official reserves are increased. This amounted to around to 731 billion dollar or 41% of the cumulative financial account deficit (World Bank, 2016). When the Bank of Japan makes purchases of domestic assets instead, it are corporations that bring the extra yen to the world market. This increases the financial account deficit but does not raise official reserves. When Japan is able to escape its recession these reserves can be used to purchase imports and raise consumption.

Figure 8: The flows resulting from the actions of the Bank of Japan.



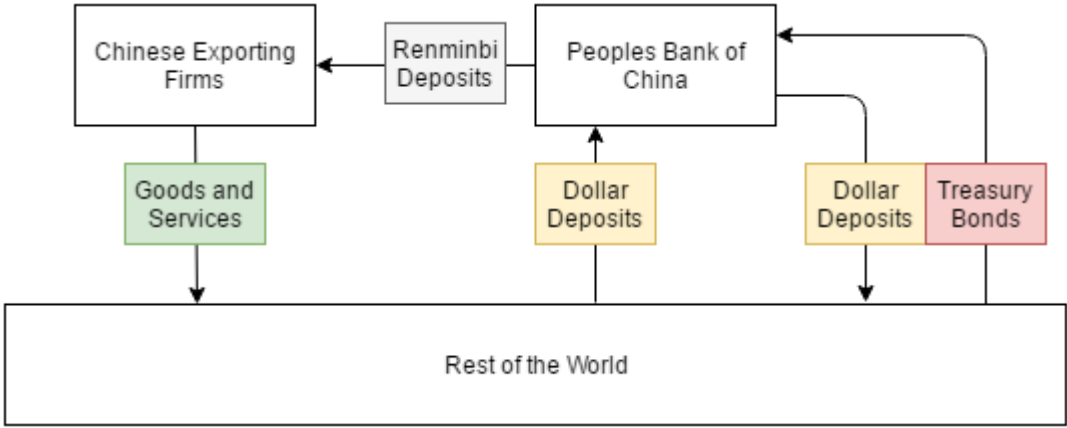
The financial crisis of 2008 put North America and Europe in a similar situation (Koo, 2009). Here too, attempts were made to resolve the problem with money creation. In Switzerland, Denmark and more recently the Eurozone, this process also led to financial account surpluses (World Bank, 2016).

5.2.3 Supporting Emerging Industries

Another motive for undervaluing a currency and supporting exports is the development of emerging industries (Rodrik, 2008). China fits best into this category (Goldstein, 2007).

Until 2009, the Chinese government prohibited the export of yuan and the holding of foreign currencies, and even after this date foreign exchange was only allowed to a very limited extent (Hong Kong Monetary Authority, 2009). This caused international transactions to pass through the central bank, the Peoples Bank of China. As this was the sole institution exchanging the renminbi for foreign currencies, it was free to set any preferred exchange rate. The chosen exchange rate made foreigners more willing to purchase Chinese products than the Chinese were willing to purchase foreign products. This caused an export surplus, for which the Chinese were paid in the dollar (Ito & Chinn, 2014). The result was an outflow of goods and an inflow of dollars (State Administration of Foreign Exchange, 2016).

Figure 9: The flows caused by the People’s Bank of China. The first transaction denotes the purchase of Chinese goods and services with dollar deposits by foreigners, the second the purchase of treasury bonds with these deposits by the Chinese central bank.



China’s financial account deficit has grown with its national product and share in international trade. When Chinese industries mature and the economy develops, the need for a trade surplus disappears. The dollar reserves can then be used to purchase goods and services from foreign countries. Movements towards this transition can already be observed (Bernanke, 2016).

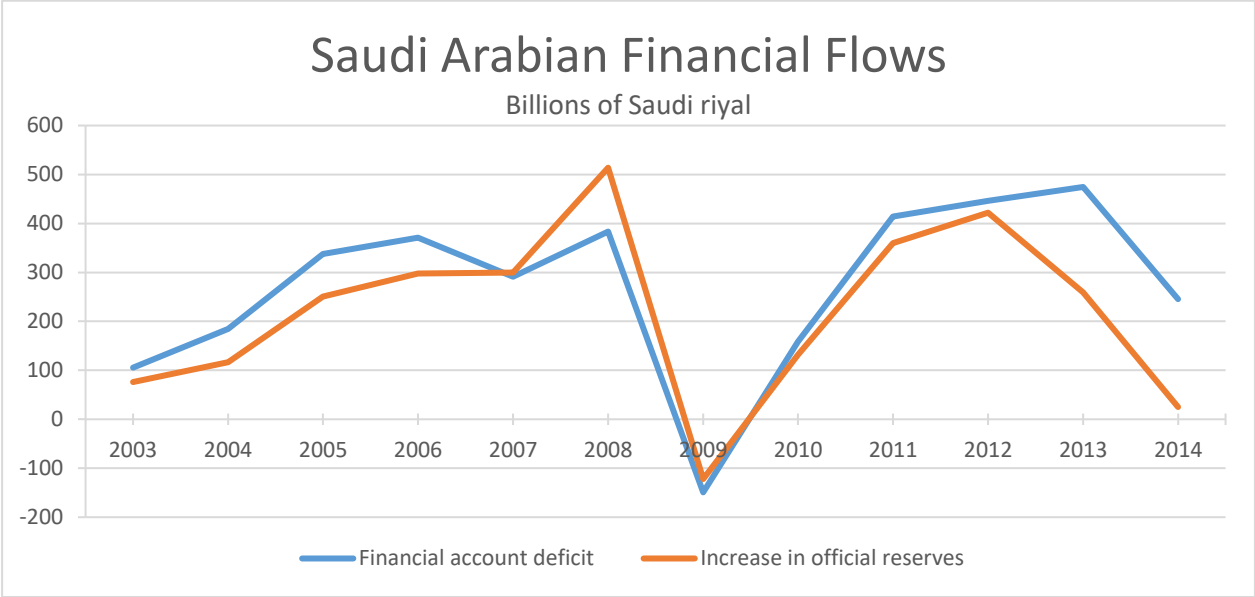
5.2.4 Smoothing Imports

A still other motive for acquiring international reserves is the smoothing of imports. In periods of high export revenues it makes sense to save a portion for future imports, especially if these revenues are erratic or temporary.

Saving for future imports was the predominant motive for oil exporting countries. The economic rise of China increased global demand for and therefore the price of oil, raising the revenues of oil exporters (Hamilton, 2009). Because oil earnings are volatile and ultimately temporary, it is common sense to save a large portion for future needs. When the price of oil is high, oil exporters increase their reserves with the proceeds from exports, when it is low, the reserves are run down to cover the costs of imports. The recent drop in the price of oil has reduced revenues and forced oil exporters into trade deficits, proving the benefit of their reserves (Hargreaves, 2016).

The governments of oil exporting countries profited from the high oil prices, through taxes, license costs and the dividends of state owned companies. They sharply increased their holdings of deposits and securities (Saudi Arabia Monetary Agency, 2015; Central Bank of the United Arab Emirates, 2016; Central Bank of Kuwait, 2015; Norwegian Ministry of Finance, 2016). Sometimes these were held by central banks, making them official reserves. This was the case for Saudi Arabia for example, where almost the entire export earnings were saved by the central bank.

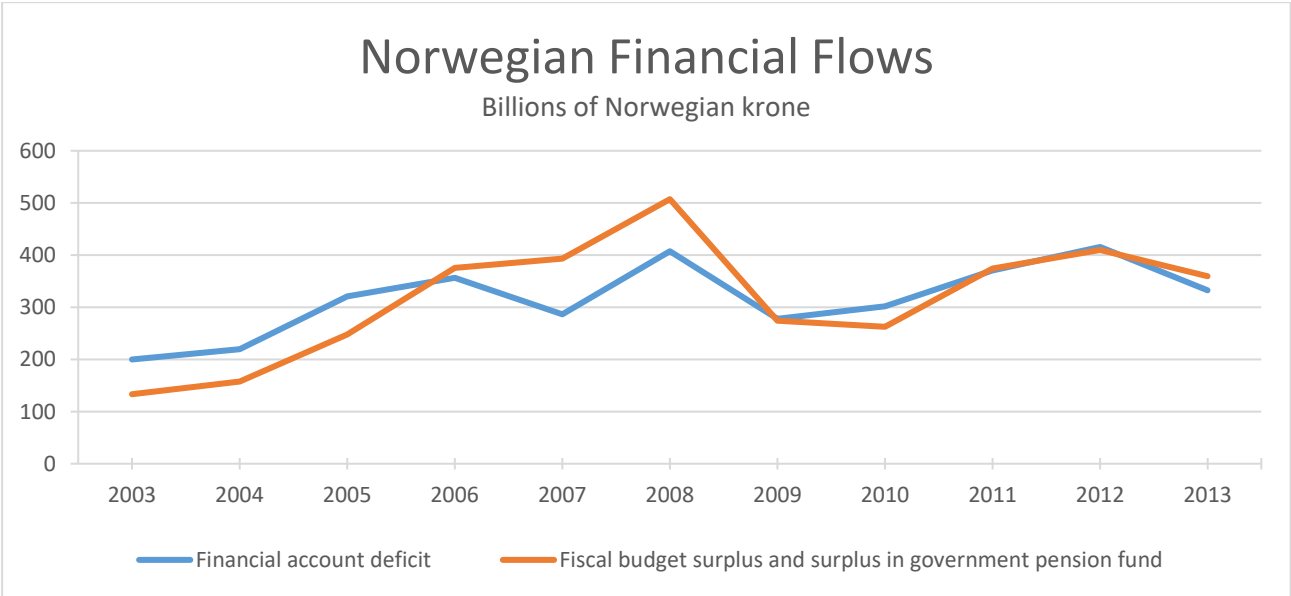
Figure 10: Saudi Arabian financial flows.



Source: Saudi Arabia Monetary Agency, 2015

Often however, the reserves were held by other institutions. Norway, for example, has scarcely increased reserves at the central bank, but keeps oil revenues at the central government and in a government pension fund. As such, their reserves are not measured as official reserves, although they serve the same purpose.

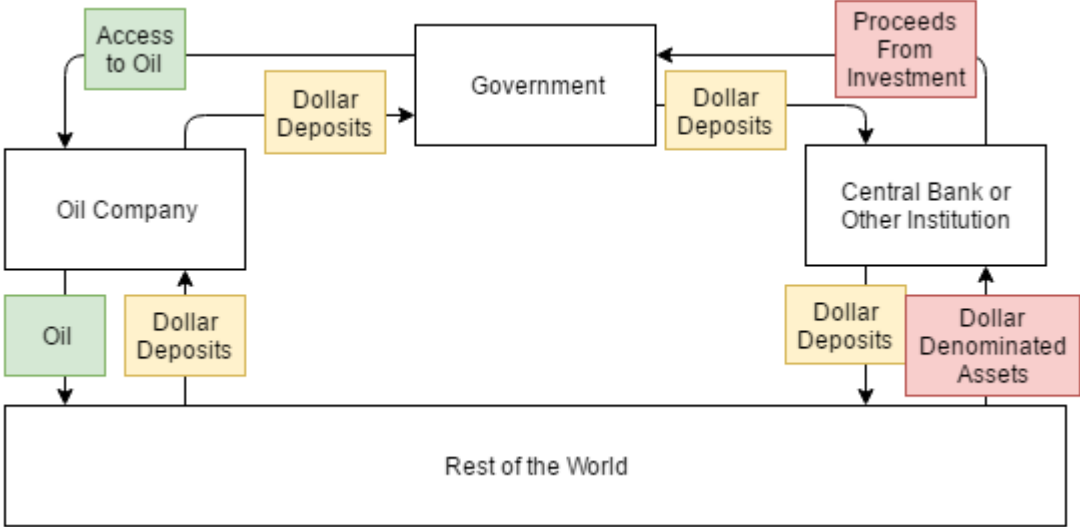
Figure 11: Norwegian financial flows.



Source: Statistics Norway, 2016; Norwegian Ministry of Finance, 2016

Oil is largely transacted in the dollar (Mileva & Siegfried, 2007) and although in most cases portfolios are classified, it can be inferred that a significant amount of the reserves is dollar denominated. Data from the US Treasury (2016) shows that significant amounts of treasury securities are held by oil exporting economies. Even oil exporting economies without any trade with the US, such as Russia (Bouhan & Swartz, 2011), Kazakhstan (Gizitdinov, 2010) and Azerbaijan (Derse, 2007), hold significant portions of their international reserves in dollar denominated assets. Both current revenues and future expenses are largely transacted in the dollar, so this makes perfect sense.

Figure 12: Possible flows of an oil exporting country.

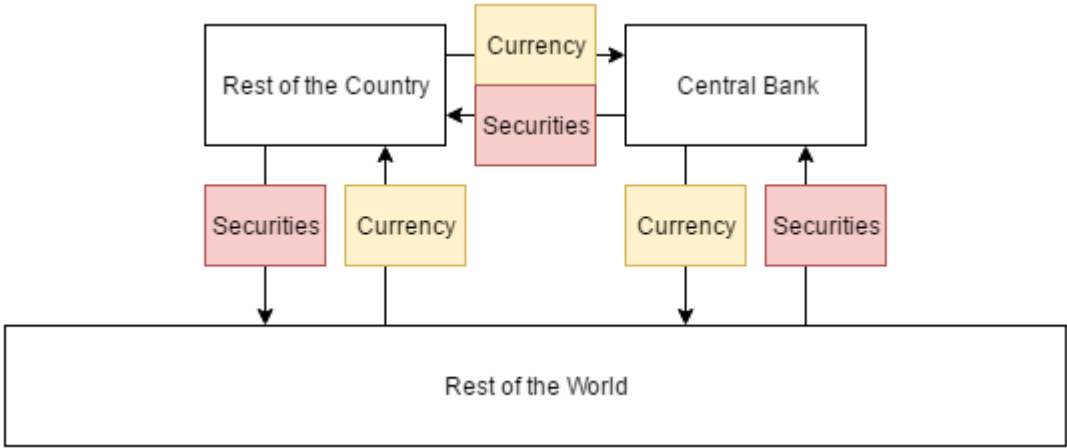


5.2.5 Preventing Currency Crises

All of the previously mentioned countries accumulated great amounts of foreign financial assets, which led to large capital flows towards other countries. Some countries did not welcome the accompanying exchange rate fluctuations. The contemporary capital inflow would have led to an appreciation of the domestic currency and asset bubbles, while future capital outflows could lead to depreciation and render foreign currency debt impossible to repay. Historical examples of such currency crises include the Latin American debt crisis of the 1980s and the East Asian crisis of the late 1990s (Dabrowski, 2001). In both cases the affected countries took years to overcome their problems.

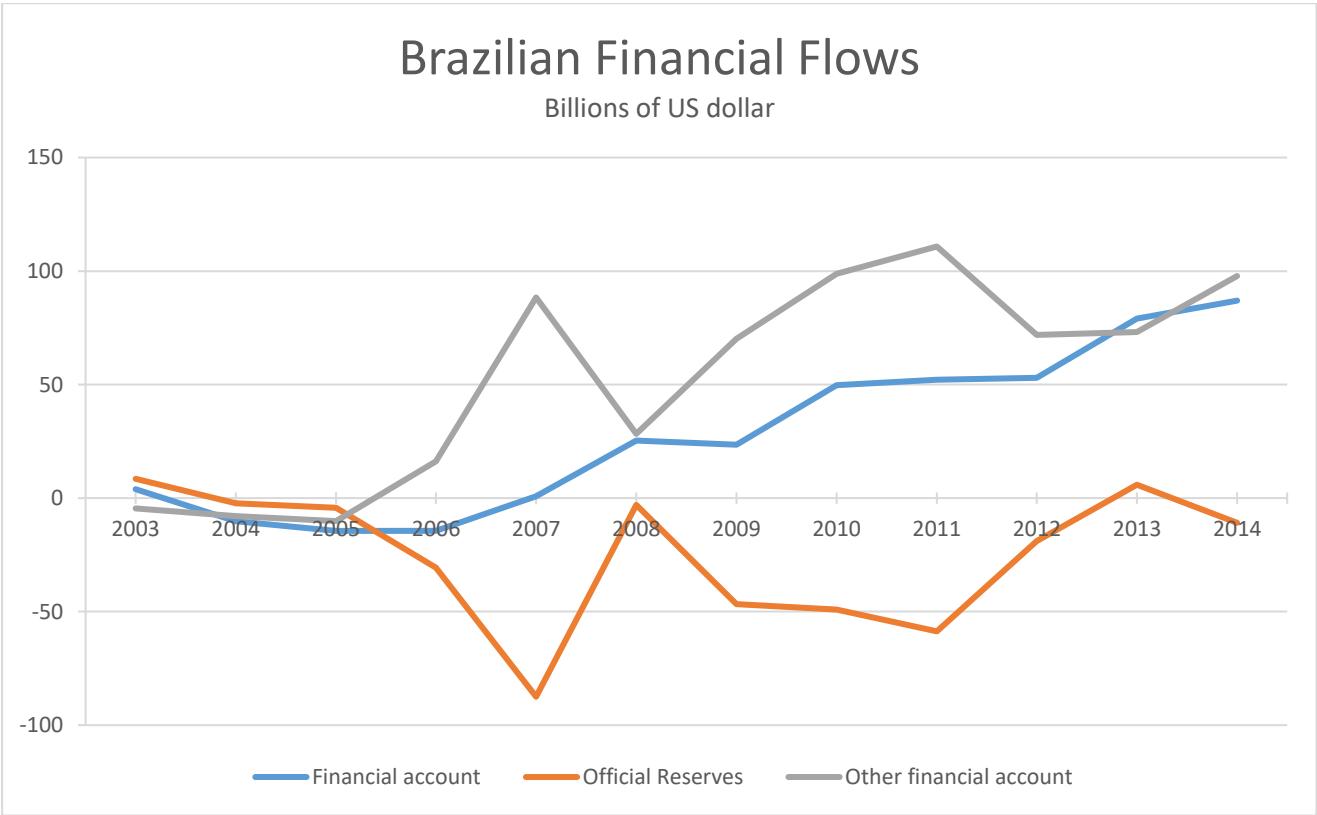
To prevent their countries from suffering a similar fate in the 2000s, several central banks decided to offset the capital inflows by increasing official reserves. This stabilized exchange rates and reduced the net foreign debt. Like with the countries suffering recessions, the increase in reserves largely occurred through money creation. In this case however, the money supply was kept constant by the sale of domestic assets to prevent inflation (Fernandes, 2013).

Figure 13: The central bank offsets any debt the rest of the country incurs.



Brazil was perhaps the best example of an acquirer of official reserves with this motive. The Brazilian government was notorious in its complaints about capital inflows (Frisch, 2011), and offset these with official capital outflows. Among others, India, Mexico and Turkey had similar financial flows (World Bank, 2016).

Figure 14: Brazil had an increase in official reserves to offset capital inflows through other channels. Nevertheless a net financial account surplus remained.



Source: Banco Central do Brasil, 2015

The importance of this motive is generally overestimated. Bernanke (2005) and Prasad (2014) attribute the world's entire accumulation of foreign financial assets to the prevention of currency crises. Even in theory this makes little sense. Such a measure should never result in a net inflow of financial assets. It would serve no purpose to push official savings beyond unofficial borrowing. Empirical data confirms this. Countries that acquired official reserves for this reason had net capital inflows (World Bank, 2016).

While this mechanism did not raise the demand for international reserves, it did induce a shift in the nature of these reserves. Unofficial reserves were converted to official reserves and the ultimate debtors were changed, in many cases towards US entities.

5.2.6 Summary

The increase in demand for international reserves was largely driven by three motivations. Firstly, it was a byproduct of recessions in the case of Japan and parts of Europe. Secondly, it was accessory to the mercantilist policies of China. Thirdly, it was necessary to smooth consumption in the case of oil exporting countries, which enjoyed high earnings. Many of the remaining countries increased official reserves to reduce the deterioration of their net international investment position.

This led to a large increase in the demand for international reserves, most of which was covered by official institutions. As explained, these reserves were largely dollar denominated due to use of the dollar in international transactions. The contemporary outflow of goods caused an inflow of dollars, and any future inflow of foreign goods will have to be accompanied by an outflow of dollars. The real investments that were financed by this accumulation of dollar assets, were only of secondary concern. Of these international reserves, an estimated 5.0 trillion dollars was dollar denominated. If the dollar wasn't used in international transactions, the foreign demand for dollar denominated assets would not have increased, however large the increase in international reserves. If world trade was conducted in gold, the euro or the renminbi, it would be assets denominated in those currencies that were accumulated. The conduction of international transactions in the dollar has caused a foreign accumulation of dollar reserves over the investigated period, amounting to an estimated 5.0 trillion dollars.

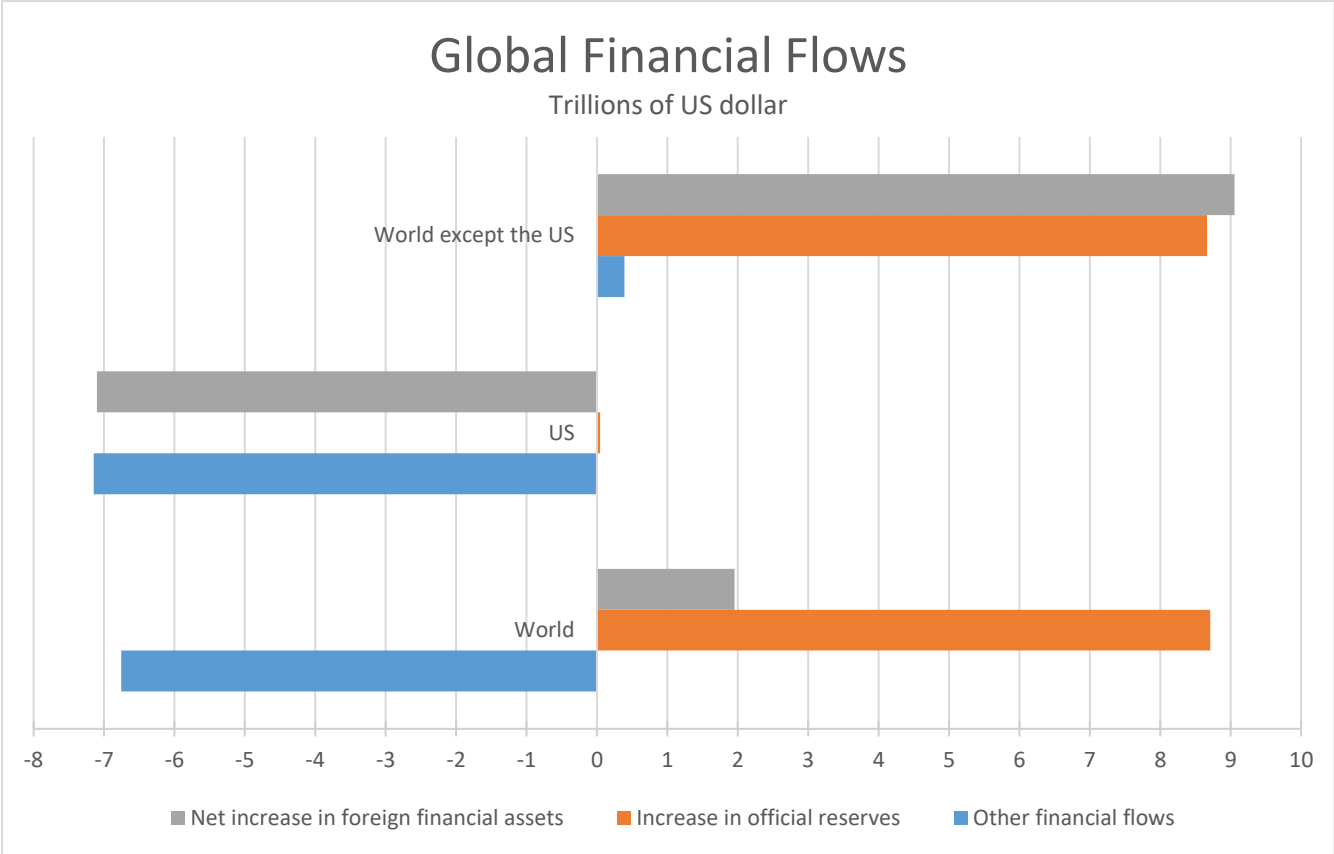
5.3 From Demand for Dollar Assets to a Financial Account Surplus

The dollar denomination of international transactions has been shown to lead to increased foreign accumulation of dollar denominated assets, but as of yet no connection has been made to the US economy. In this section the increased foreign demand for dollar assets is shown to have caused a US financial account surplus. First, the dollar assets are demonstrated to originate in the US. After establishing this fact, its reasons are explained by asset category.

5.3.1 The Financial Account Surplus

Aside from the US, the world greatly increased its holdings of financial assets, most of which was covered by an increase in dollar denominated official reserves. Naturally, the US took the reverse position and had a large outflow of financial assets.

Figure 15: Global financial flows during 2003-2015.⁸



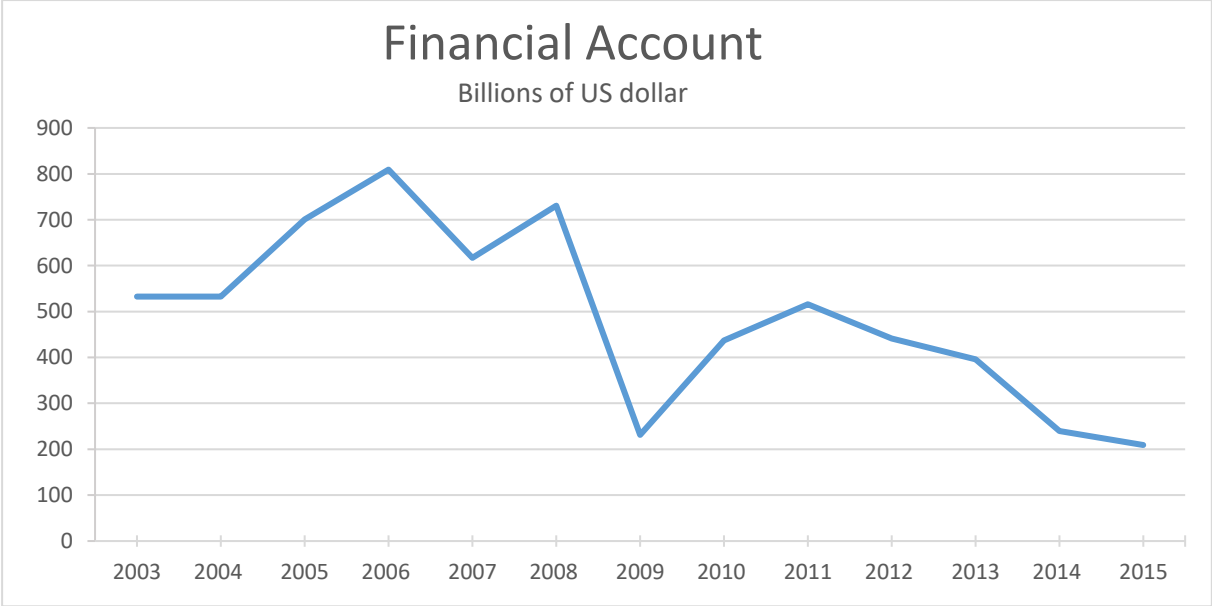
Source: World Bank, 2016

These US assets were almost universally dollar denominated, so it was the US that provided the accumulators of international reserves with dollar denominated assets. When available, data on the asset composition of official reserves confirms this. A large majority of the foreign assets of the Bank of Japan (Gresham, 2011) and the Swiss National Bank (Swiss National Bank, 2016) consists of US Treasury securities. According to Bouhan and Swartz (2011), China’s, Russia’s and Brazil’s increase in official reserves also consisted largely of US Treasury and agency securities, with smaller amounts of US corporate debt, equity and deposits.

⁸ Note that the world balance doesn’t sum to zero, as would be theoretically expected. This means a substantial amount of assets is unaccounted for.

A transfer of financial assets from the US to other countries is equivalent to a US financial account surplus. As explained in the previous section, an estimated 5.0 trillion in dollar denominated assets was accumulated by central banks, because of the international role of the dollar, which would not have happened in the counterfactual. This means the cumulative financial account surplus would be decreased by an estimated 5.0 trillion dollars if the dollar wasn't used for international transactions. There would be no demand for these assets so no counterparty to sell them to.

Figure 16: The US financial account surplus.

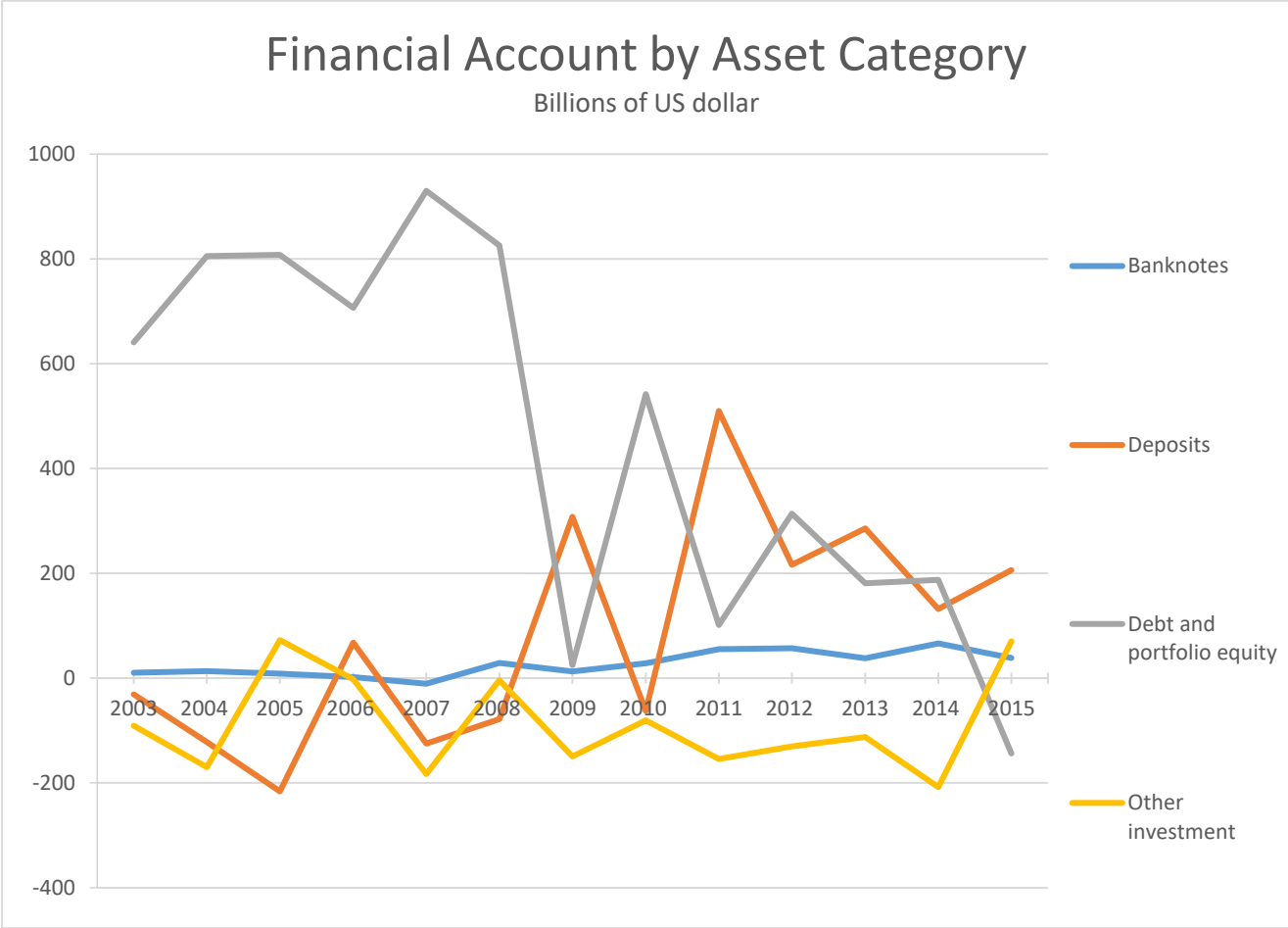


Source: BEA, 2016a

The connection between the increase in demand for dollar denominated assets and the US financial account surplus has been firmly established, but not yet logically explained. What remains to be resolved is why the accumulated dollar assets originated in the US and not in any other country. In section 5.1 it has been proven that the currency of denomination matters for the demand for financial assets. However, this would be completely inconsequential for international financial flows if the currency of denomination was a trivial matter for the issuers of financial assets.

In the remainder of this section, the competitive advantage of the US in the production of dollar denominated assets is explained and the direct beneficiaries of foreign accumulation are pointed out. To do this, the financial account surplus will be discussed by asset category. A small part of the financial account consists of the provision of banknotes. Much larger components are the balances on deposits and debt and portfolio equity. Other financial assets don't contribute to the surplus.

Figure 17: The American financial account by asset category.



Source: BEA, 2016a

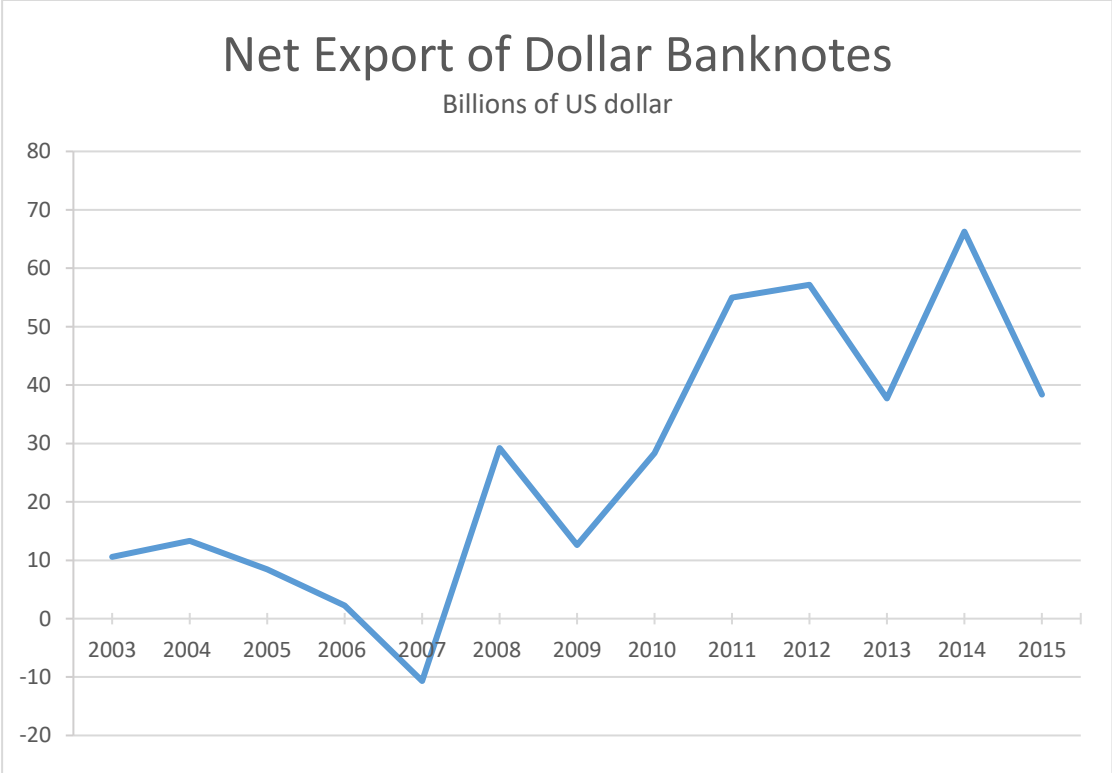
5.3.2 Banknotes

Exporting banknotes is the most intuitive way to generate trade deficits from the distribution of an international currency. When the use of banknotes extends beyond the national borders, so does the opportunity for seigniorage. Although this is a relatively small component of the financial account, the ultimate effect of banknote production extends to the entire surplus.

Virtually all banknotes are produced by the Bureau of Printing and Engraving. This is a US government agency, that physically produces the notes from linen against negligible costs. Theoretically, foreign countries could reverse-engineer the process of production. Putting this into practice, however, would be considered a declaration of war, against the most powerful military in the world, in which little international support can be expected. Counterfeiting is therefore restricted to small scale operations. Only an estimated 1 in 10,000 banknotes in circulation is fake (US Treasury, 2006). For all practical purposes, the US can be regarded to possess a monopoly on the production of dollar banknotes.

In the BEA data, transfers in banknotes are displayed as reported by the Federal Reserve cash offices. These consists of withdrawals and deposits of cash at the Federal Reserve, where the ultimate counterparty is located outside the US, and covers most commercial banking transfers. The currency exported is rising from a low point in 2007 to a peak of 66 billion dollars in 2014; about 205 dollar per US citizen. The transfer of foreign banknotes is not measured. This could lead to an overestimation of net transfers, but in fact an underestimation is more likely. The American holdings of foreign currency are small but the net export of dollar bills substantially surpasses the stated amounts. Non-banking channels are completely ignored and cash payments are not registered. Porter and Judson (1996) show the official numbers are lower than any other method of estimation. Their alternative estimations exceed the BEA numbers for 1988-1995 by factors ranging from 2.2 to 3.3. Several countries consistently had net flows to the US. This would be hard to explain without alternative flows towards those countries. Just controlling for these inflows, raises the net dollar transfers to 80 billion in 2010, almost tripling the current value (Judson, 2012).

Figure 18: The net transfer of dollar bills to the rest of the world.



Source: BEA, 2016a

This foreign demand for dollar bills increases their value or, equivalently, decreases the dollar price of foreign products. When these products are exchanged for dollar bills, Americans increase their consumption and decrease circulating banknotes. The domestic demand for cash remains, so withdrawals from bank accounts are made. The banks obtain banknotes from the Federal Reserve when they decrease their deposits there. The Federal Reserve in turn receives these notes, by way of the US Treasury, from the Bureau of

Engraving and Printing. So far the result has been an increase in consumption by American citizens and a decrease in deposits at the Federal Reserve, by way of deposits at private banks. But this is not the ultimate effect. The Federal Reserve is in control of the money supply, so it can increase its deposits freely by purchasing assets, such as treasury securities. As the profits from the Federal Reserve are transferred to the US Treasury, it is the US Treasury that benefits when the domestic money supply is held constant. Private banks and households are only temporary vessels. The former exchange assets for cash and the latter cash for foreign produce. The beneficiary is the government as it supplies cost-free banknotes in return for goods and services. The ultimate results should be lighter taxes and more extensive public services for American citizens.

Figure 19: A detailed exposition of possible flows caused by foreign demand for banknotes. Bank deposits, Federal Reserve deposits and treasury securities cancel out and the net effect is an exchange between the treasury and the rest of the world.

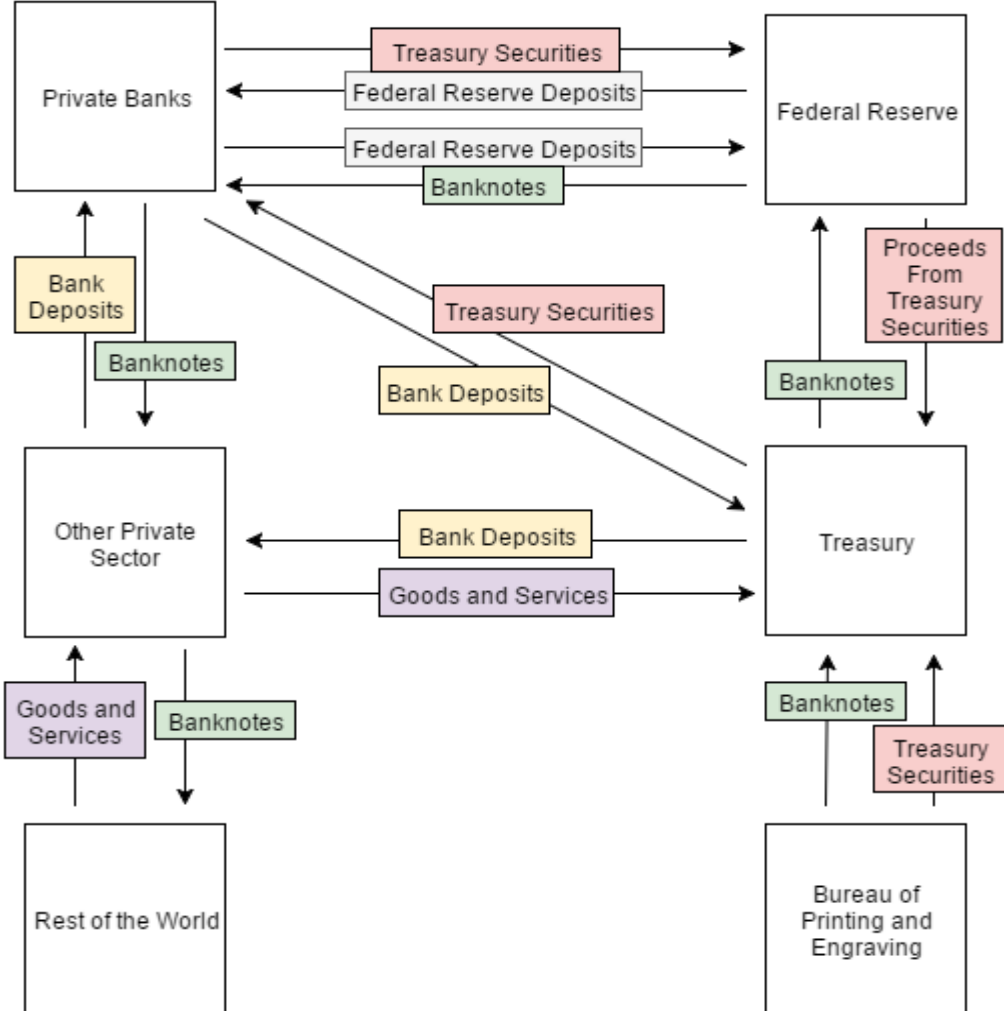


Figure 20: A more comprehensible exposition of the effect of foreign demand for banknotes.



The US has a clear monopoly on the production of dollar banknotes. Although the transfer of these banknotes abroad brings only a small contribution to the financial account surplus, this monopoly will be shown to be essential in the competitive advantage on other dollar denominated assets.

5.3.3 Deposits

Deposits are financial assets, created by banks. A provision of funds through banknotes or a deposit at another bank, enables the depositor to withdraw these funds at another time and place. Like banknotes, deposits are often used for transactions. Deposits provide the owner with interest and insurance, and transactions are far less costly with large amounts or over long distances. The banks keep a portion of the deposited banknotes and deposits at other banks for withdrawal and invest the remainder in a variety of assets.

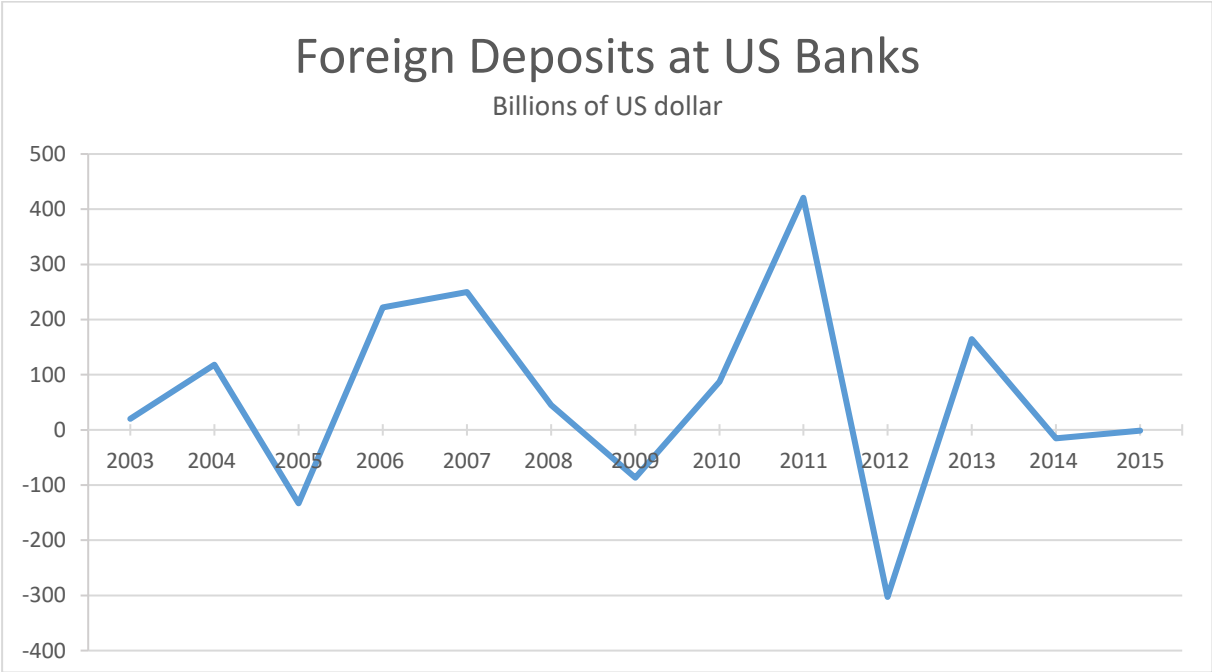
Banks do not physically invest themselves. Deposits are claims on a financial intermediary. The owners of deposits have an indirect claim on the assets of the bank. The intermediary position of bank deposits means they do not directly influence the financial account balance. It is the origin of the bank assets that is important, not the location of the banks themselves. As long as assets and liabilities are denominated in the same currency, exchange rate risk should be non-existent. Because of this, the US does not possess a clear competitive advantage in the production of dollar deposits. While US banks have a chance of being bailed out by the Federal Reserve, they are also subject to regulation and sanctions on depositors by the US government (Friedman, 1971). Substantial funds are held at banks located in Europe, the Caribbean and Canada, as so called Eurodollar deposits.

The balance on deposits is the sum of two components. Net increases of foreign deposits in US banks minus net increases of US deposits in foreign banks. The former category will be addressed first.

When a foreign entity deposits funds at a US bank, this only increases US liabilities if these funds are invested within the US. Otherwise, the bank has both assets and liabilities located abroad, leaving the financial account balance unchanged. US banks invest almost exclusively within the US (He & McCauley, 2012). Their holdings of securities and business and consumer loans have US counterparties. Prudential reserves are held in the form of dollar banknotes and deposits at the Federal Reserve. As explained in the previous section, dollar banknotes originate within the US. The effect of increased deposits at the Federal Reserve depends on the assets held there. These consist of Treasury bonds and other securities issued by US entities (Federal Reserve, 2016).

An increase of foreign deposits in the US would increase US liabilities owned by the rest of the world, and therefore push the financial account towards a surplus. Through these deposits, the rest of the world would increase their (indirect) holdings of US securities and loans. There is a large amount of substitution between deposits and directly owned liabilities. The erratic behavior of the foreign deposits at US banks is mirrored by other components of the financial account and the balance is not influenced. Foreign investors swap US bank deposits for other American assets in the valleys and vice versa in the peaks (BEA, 2016a).

Figure 21: The net increase in the foreign holdings of deposits at US banks.



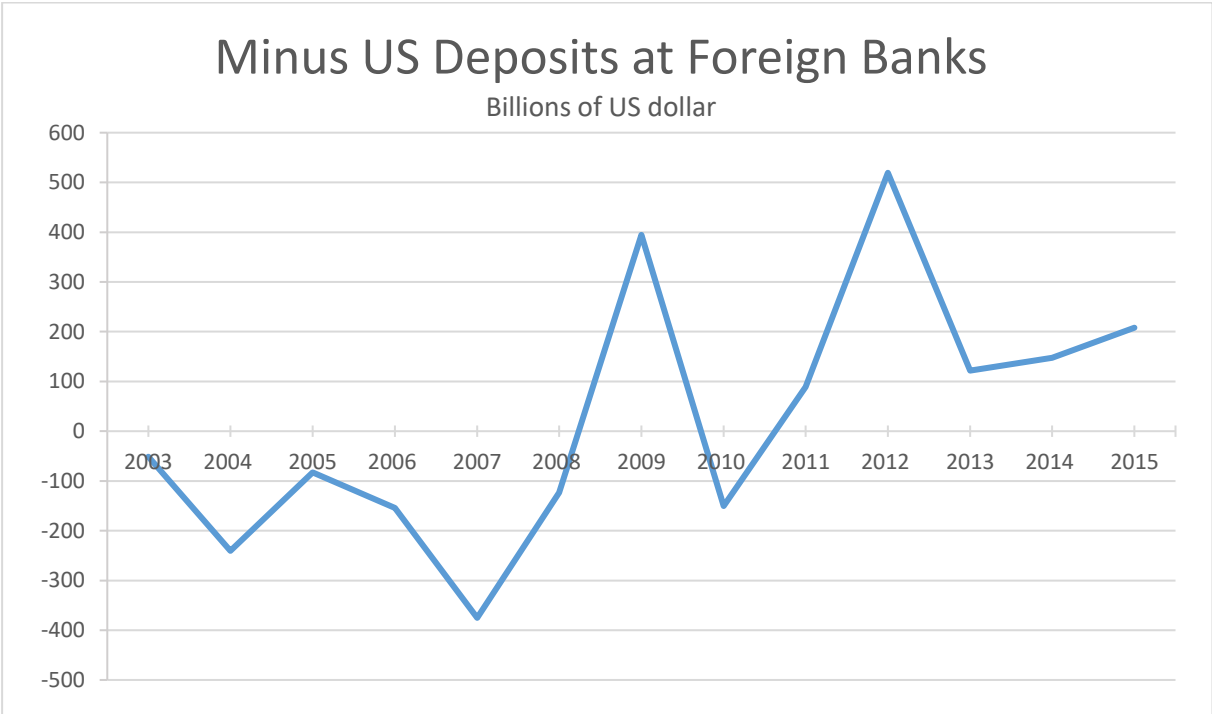
Source: BEA, 2016a

US deposits at foreign banks only influence the balance of payments when the assets of these banks are located abroad. When Americans deposit funds at a foreign bank, this only increases US assets if the deposits are lent to foreign entities. In practice this only happens to a very limited extent and the deposits are generally reinvested in the US (He & McCauley, 2012). The capital makes a round-trip. An increase in

assets is offset by an increase in liabilities, neutralizing any influence on the financial account balance. This is similar to a deposit at a domestic bank. What matters is the location of the depositor and the ultimate lender. Whether the intermediary is located in New York, London or the Cayman Islands does not influence the net financial position.

US deposits at foreign banks have several spikes, when US entities withdraw their deposits at US banks. Again, the deposit volatility does not lead to financial account volatility. The withdrawal of deposits coincides with a return of securities to the US. Both the assets and liabilities abroad disappear. The spikes of the deposits are completely dissolved by decreases in debt securities and the financial account remains stable. This is true for each region as well as for the aggregate, rendering a coincidence virtually impossible.

Figure 22: The net decreases in the US holdings of deposits at foreign banks.



Source: BEA, 2016a

Dollar deposits owned by non-Americans at non-American banks are not captured in the deposits account. They have a large role in world finance, are indispensable for international transactions and they do influence the financial account. However, the increase in US liabilities is captured by purchases of securities and the granting of loans, not by any increase in deposits.

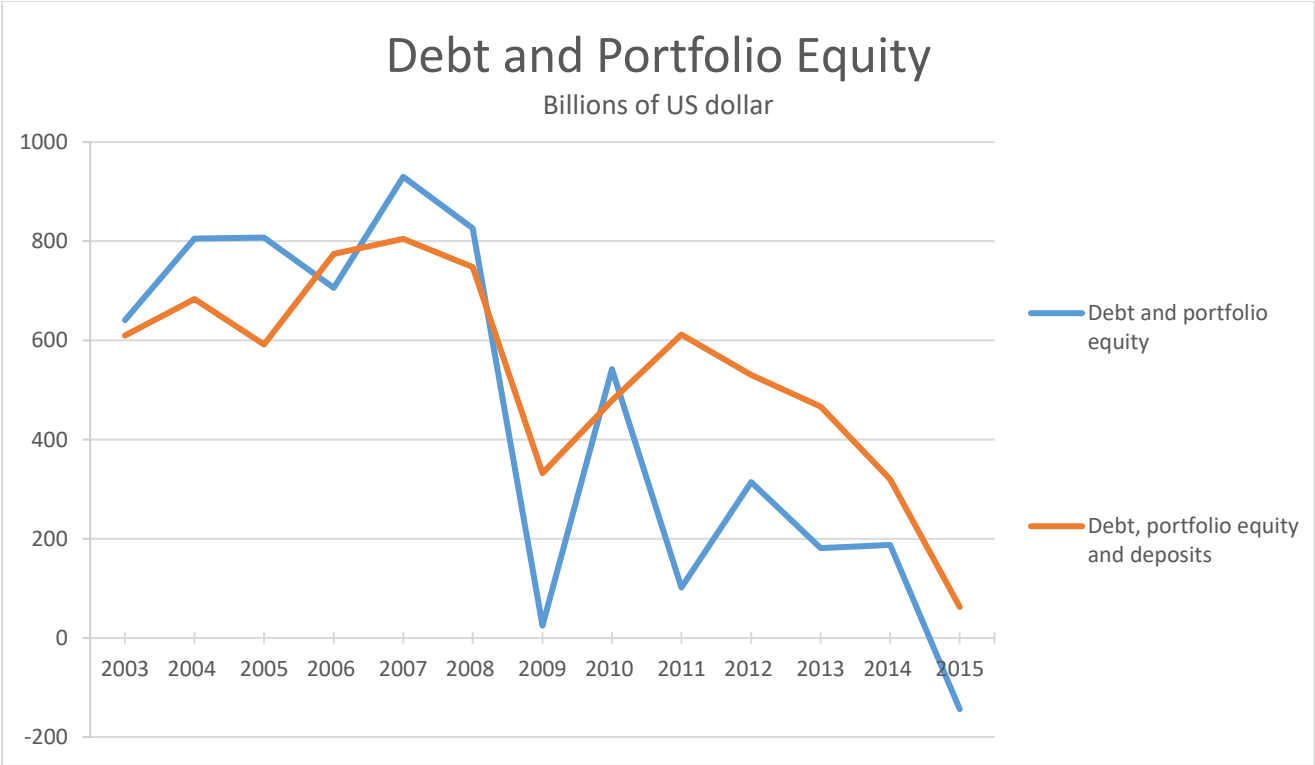
The behavior of deposits is altogether inconsequential for the financial account balance. It are only the bank assets that are relevant. These consist of dollar denominated securities and loans. The competitive advantage of the US in the production of these assets will be discussed next.

5.3.4 Debt and Portfolio Equity

Debt and portfolio equity form the majority of the financial account surplus. Direct investment, defined as investment in a foreign company when there is significant influence over the management, will be discussed in the subsequent section because of its unusual behavior.

The balance on debt and portfolio equity is erratic, largely due to substitution with deposits. As deposits consists of debt and equity managed by banks, the actual transfer is far more stable.

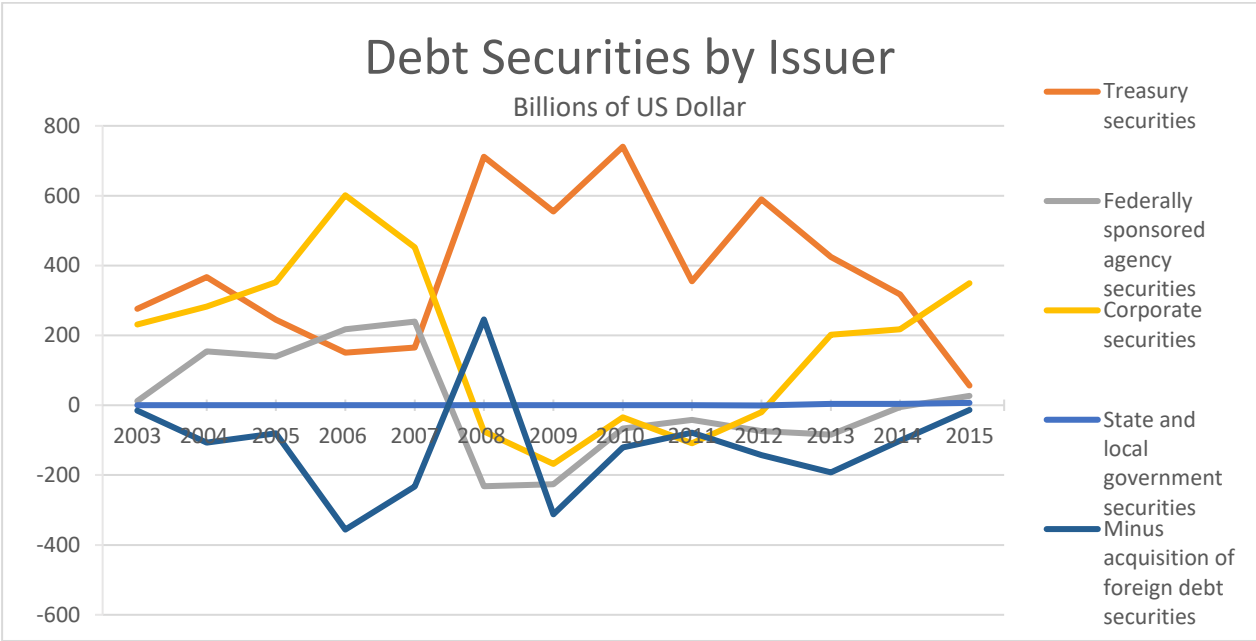
Figure 23: The net transfer of debt and portfolio equity from the US to the rest of the world.



Source: BEA, 2016a

Debt securities see a large shift in the aftermath of the financial crisis. The export of treasury securities intensifies while that of corporate and federally sponsored agencies and loans (made predominantly to private institutions) decreases sharply. From 2012 onwards this is reversed. This pattern is a consequence of the shift from private to public spending during the great recession (Federal Reserve Bank of Saint Louis, 2016). State and local government securities are negligible. The US acquisition of foreign debt securities continues throughout the period but is by no means sufficient to offset the balance.

Figure 24: The composition of debt security transfers to the rest of the world.



Source: BEA, 2016a

Treasury securities are issued by the federal government of the US. These assets are backed by the Federal Reserve, which will buy up treasury securities whenever the government has trouble providing payments. Because the Federal Reserve is able to distribute newly printed dollar banknotes, default is impossible (NBC News, 2011). Treasury securities will always pay out, even when the US government is not able to. If treasury securities are redeemed by money creation, the cost will be carried by the current holders of dollar denominated assets. This might make it riskier to hold dollar denominated assets in general (although there is no alternative without supply shocks), but it makes the ones issued by the US Treasury safer. As these assets are default-free, interest rates stay low and refinancing debt is easy (Krugman, 2012). Foreign dollar bonds, even those of stable and trustworthy governments, will never be able to match this level of safety. Just like with banknotes, a foreign accumulation of treasury securities finances government expenditures.

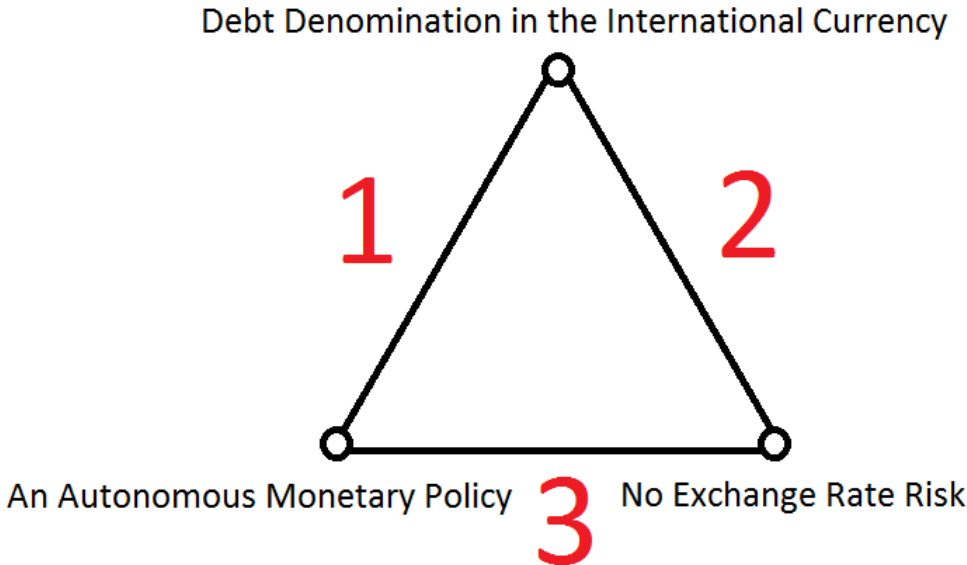
The bonds of federally sponsored agencies are mainly issued by residential mortgage lenders (Kosar, 2007). These securities are backed by the federal government, so they are implicitly backed by the Federal Reserve as well. This gives these securities the same advantage as treasury bonds. Whether the ultimate lender (the home owner with a mortgage) is able to stay free from default is largely irrelevant. The federal government, and ultimately the Federal Reserve, repays the debt anyway. During the financial crisis this could be observed in practice, when the Treasury bailed out Freddie Mac and Fannie Mae (US Treasury, 2008), and the Federal Reserve purchased their securities (Federal Reserve, 2008). The beneficiaries of foreign accumulation are, in this case, American home owners, who can more easily acquire mortgages.

Debt securities from corporations are not backed by money creation, but even here the US has a competitive edge. Just like acquirers of international reserves look for earnings that match their expenditures, borrowers want expenditures denominated in the same currency as their revenues. Because of its monopoly on printing banknotes, the US is unique in its ability to maintain both domestic circulation of the international currency and an autonomous monetary policy. Domestic circulation of the dollar eliminates exchange rate risk between the debt repayments and revenues of the borrower. For foreign countries with a domestic currency circulating in their economies the situation is different, as is explained in section 5.2.5. Dollarization of the domestic economy would solve this problem but would forfeit an autonomous monetary policy. It would mean foregoing seigniorage, the backing of domestic government bonds and control of the money supply to accommodate business cycles. This could turn out to be disastrous in times of recession. The rigidity of gold in the 1930s (Bernanke, 1995) and of the euro in the 2010s (Feldstein, 2011) are clear examples. A lack of monetary policy is not only crippling for the domestic economy, it thereby also lowers the expected return on investment.

As all countries other than the US lack the ability to create dollar banknotes, they are faced with the following trilemma:

1. Denominate debt in the dollar but maintain a separate currency for domestic circulation, thereby incurring exchange rate risk.
2. Denominate debt in the dollar and dollarize the domestic economy, thus foregoing an autonomous monetary policy.
3. Denominate debt in a domestic currency and give up on issuing dollar debt.

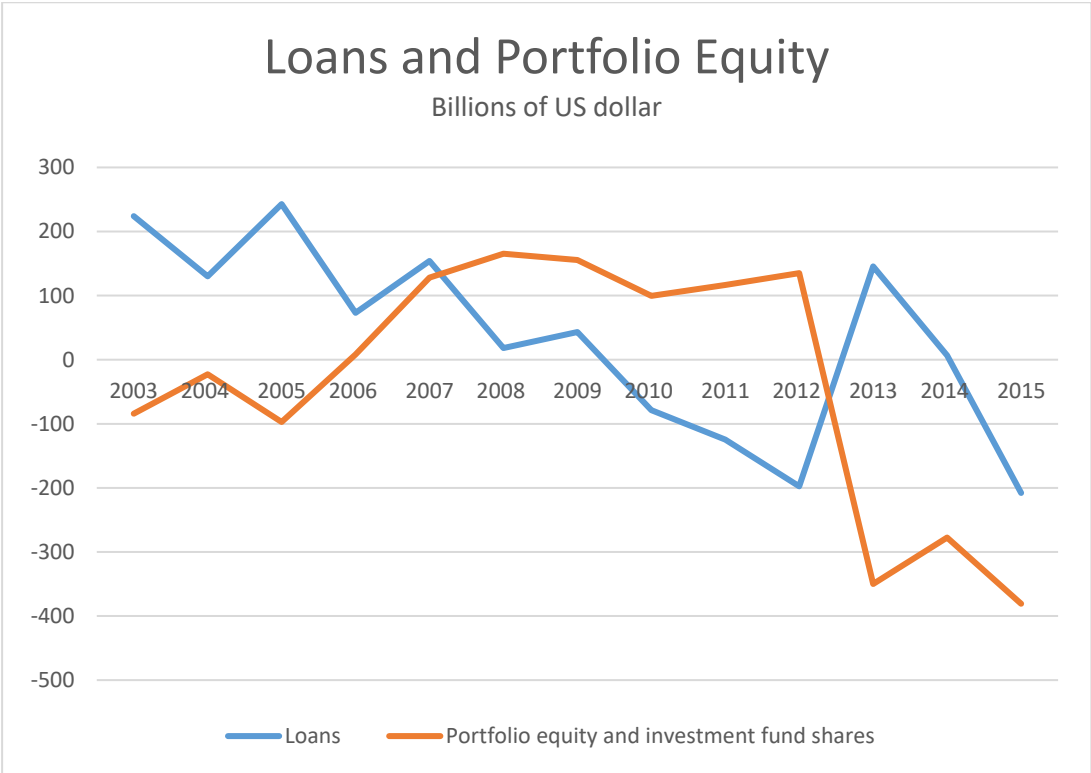
Figure 25: The trilemma faced by normal countries. They can choose one side of the triangle. Only the US has all three advantages.



Countries other than the US are severely impaired when it comes to issuing dollar denominated corporate debt. A rising demand for American corporate debt, results in increased investment. Foreign resources can be used on new projects. This benefits everyone voluntarily involved in these projects: the entrepreneurs, the consumers and the suppliers of goods, services and labor.

Theoretically, loans and portfolio equity have the same advantages. However, as loans are less liquid and equity is more risky, these asset classes are not as suitable for foreign reserves. Although they raise the financial account surplus on average, their contribution is not as great as that of debt securities.

Figure 26: The net incurrence of loans and the net transfer of portfolio equity to foreign countries.



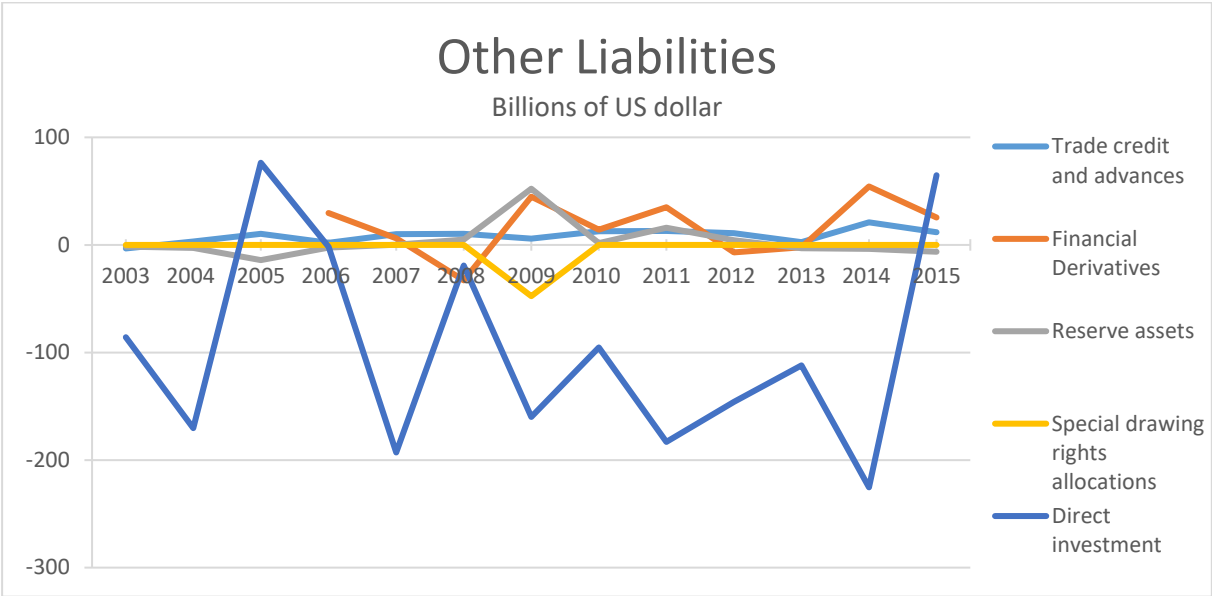
Source: BEA, 2016a

The US has a clear advantage in the production of dollar denominated debt and portfolio equity. Ultimately, this comes down to the unique ability of the Federal Reserve to issue dollar banknotes. Because international reserves are mainly composed of dollar denominated securities, this is an important result. It explains why an increased demand for foreign reserves translates into a transfer of American securities to the rest of the world.

5.3.5 Other Components

There still remain other, relatively minor parts of the financial account. These have little relationship with the dollar and don't push the financial account into a surplus. For completeness they are discussed here.

Figure 27: The net transfer of other liabilities to the rest of the world.



Source: BEA, 2016a

Trade credits and advances consist of the assets and liabilities created by a lag between the purchase and delivery of goods. They are of negligible size.

Financial derivatives are only measured since 2006. Net transfers are towards the US, but these are limited in value and have no clear direction.

Special drawing rights are certificates issued by the IMF, that can be exchanged against dollars or gold. In 2009 they were allocated among a select few governments to provide liquidity during the financial crisis (IMF, 2009). This can be considered an exorbitant privilege itself, but one unrelated to the dollar. The special drawing rights were held instead of used for expenditures, resulting in a symmetric response on the reserve assets account.

The acquisition of reserve assets is extraordinarily small. The ability to obtain international reserves domestically, reduces the necessity of accumulating foreign reserves.

Direct investment is overwhelmingly negative. This is unrelated to the international use of the dollar and probably caused by its extraordinary high return (see section 5.4.2).

5.3.6 Summary

The US monopoly on the creation of dollar banknotes caused a competitive advantage in the issuance of dollar assets. Because of this competitive advantage in dollar denominated financial assets, it was the US that provided the world with dollar reserves, and not any other country. The US had an outflow of dollar denominated assets summing to 8.5 trillion dollar, of which an estimated 5.0 trillion became official reserves. In the absence of the use of the dollar as an international currency there would not have been any increase in the demand for dollar assets. The competitive advantage of the US in producing dollar assets would have been irrelevant for international financial flows, just like the competitive advantage of Armenia in producing assets denominated in the Armenian dram.

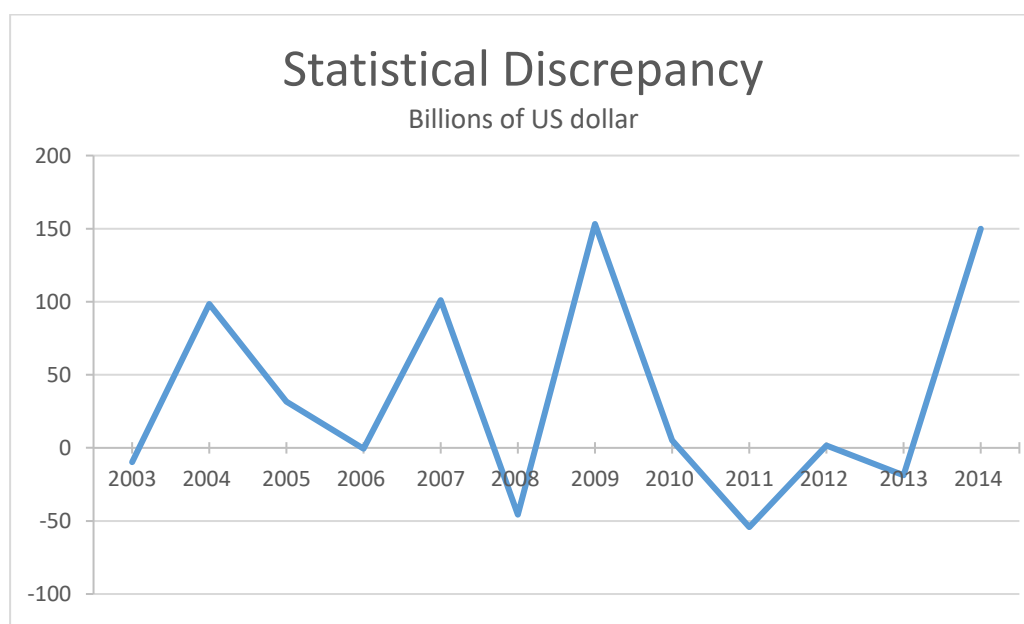
5.4 From a Financial Account Surplus to a Trade Deficit

The use of the dollar in international transactions has been shown to cause a financial account surplus for the US. All that remains to prove the hypothesis, is to establish the connection between the financial account surplus and the trade deficit. In this chapter the surpluses on the statistical discrepancy and the balance on primary income are discussed, and the strong restrictions secondary income and the capital account deficits will be explained. Finally, the specifics of the trade deficit are given and the hypothesis is confirmed.

5.4.1 The Positive Statistical Discrepancy

A substantial part of the balance of payments is not accounted for by the BEA, which means the statistical discrepancy is large. This discrepancy is erratic but certainly positive on average. An examination of the origin of the statistical discrepancy exposes a substantial undervaluation of the financial account.

Figure 28: The statistical discrepancy is repeatedly large and positive.



Source: BEA, 2016a

The statistical discrepancy is derived by the following formula:

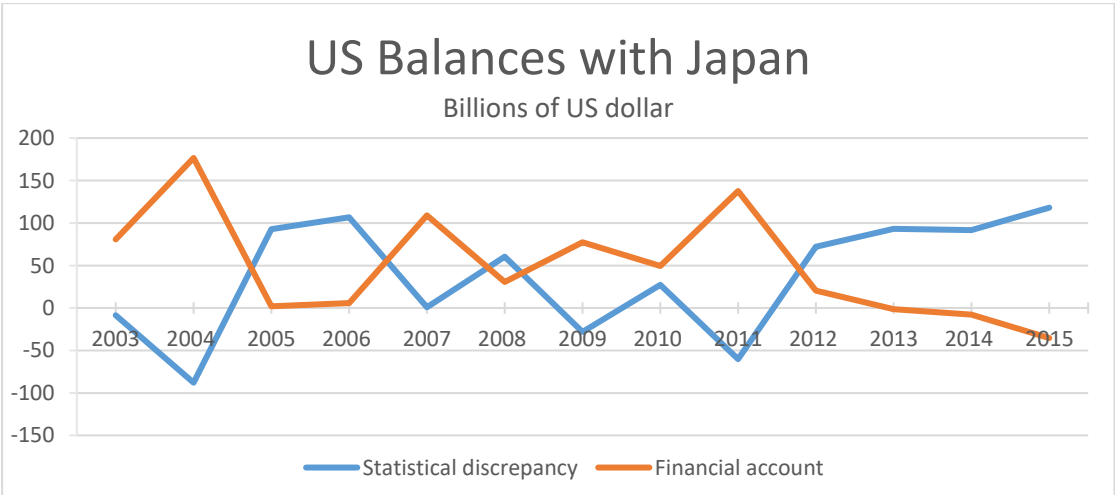
$$\text{Statistical Discrepancy} = - (\text{Balance of Trade} + \text{Balance on Primary Income} + \text{Balance on Secondary Income} + \text{Capital account} + \text{Financial Account})$$

A positive statistical discrepancy is therefore caused by an undervaluation of one of the following :

1. The balance of trade.
2. The balance on primary income.
3. The balance on secondary income.
4. The capital account.
5. The financial account.

The great size renders anything other than an undervalued balance of trade or an undervalued financial account highly unlikely. Transfers of goods or services that are so large and volatile as to account for the discrepancy seem impossible to remain unregistered. An undervaluation of the financial account remains the only reasonable candidate. This is supported by the data. There is a strong negative correlation between the statistical discrepancy and the financial account. This is more pronounced for individual regions, confirming the existence of substitution instead of coincidence. The high correlation is remarkable, as it is confounded by changes in the real value of the financial account. Aside from the direction, the absolute amounts are virtually identical as well. While the statistical discrepancy and financial account are erratic on their own, their sum is far more stable. It seems safe to assume the positive statistical discrepancy is caused by an undervalued financial account.

Figure 29: The statistical discrepancy and financial account are clear substitutes in the case of Japan. The near perfect correlation is not hard to observe.



Source: BEA, 2016a

Table 4: The Pearson correlation for the statistical discrepancy and the financial account by region.

| Region | Correlation |
|---|-------------|
| Europe | -0.95 |
| Canada | -0.55 |
| Latin American and Other Western Hemisphere | -0.92 |
| China | -0.90 |
| Japan | -0.97 |
| Middle East | -0.95 |
| Other Asia and Pacific | -0.78 |
| Africa | -0.03 |
| International organizations and unallocated | -1.00 |
| Total | -0.52 |

Source: BEA, 2016a.

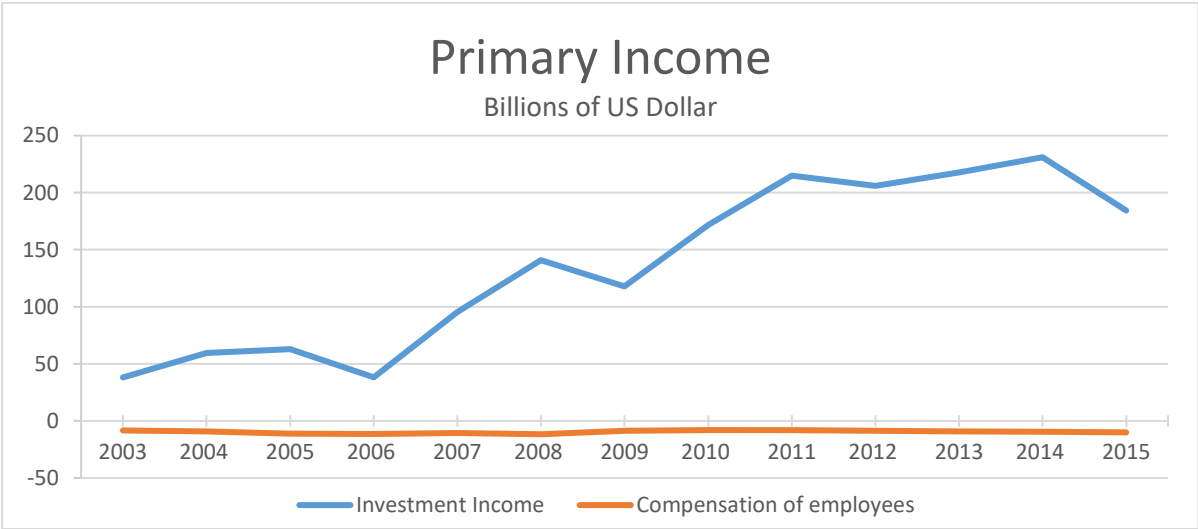
It is more likely that the BEA fails to register certain transfers than that it does register non-existing ones. This makes an underestimation of the incurrence of liabilities more likely than an overestimation of the acquisition of assets. Further specification on the identity of these underreported liabilities is speculative and imprecise. Why financial flows regularly remain unregistered in large quantities, is beyond the scope of this thesis.

Given the evidence, it is uncontroversial to state the positive statistical discrepancy is, for the most part, an extension of the financial account surplus. Instead of absorbing a part of the financial account surplus, the statistical discrepancy raises this surplus even higher, when it is properly allocated.

5.4.2 The Surplus on Primary Income

Primary income is composed of the compensation of employees and the return on financial assets. The compensation of employees has no clear link with the dollar and is very limited in size, so it shall be omitted from this analysis. The surplus on investment income is far more interesting. The American balance of payments is not only extraordinary in its large financial account surplus, but even more so in the simultaneous occurrence of a surplus on primary income. While the international financial position is negative and keeps decreasing, the return on investment is positive and rising.

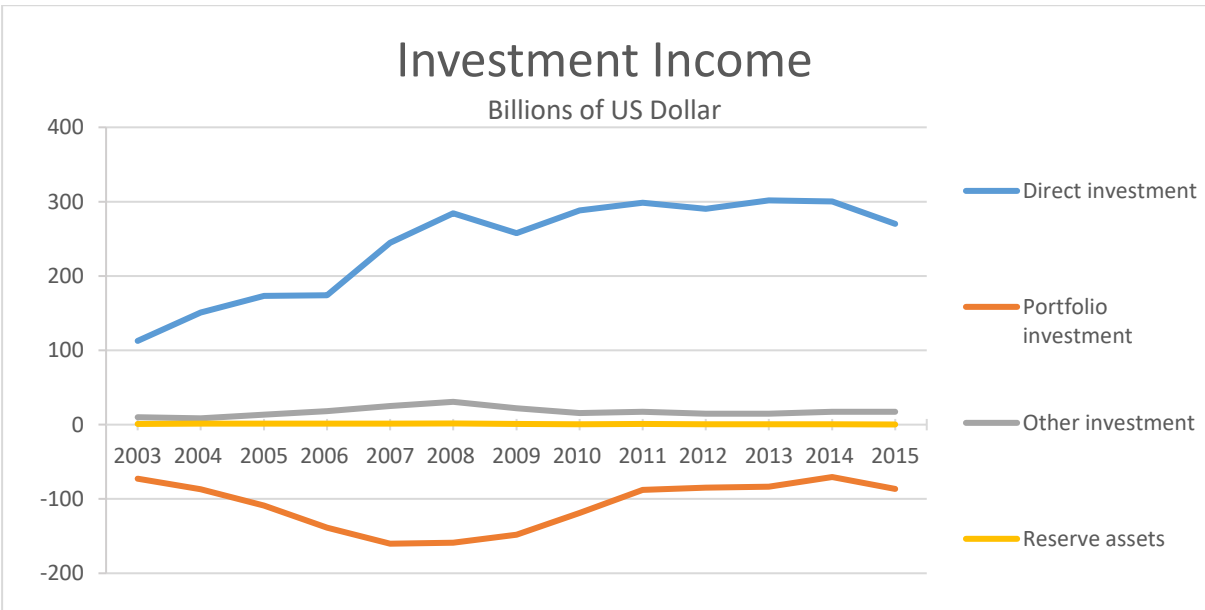
Figure 30: The composition of the balance on primary income.



Source: BEA, 2016a

The surplus on investment income finds its origin in a massive return on net direct investment. The net return on other categories is negative, but not of sufficient size to negate the surplus. The high return on direct investment is unlikely to be caused by the international use of the dollar, as direct investment isn't suitable for foreign reserves. The US probably has an unrelated competitive advantage here. This could be the result of a maturity premium (Mataloni, 2000), a risk premium (Hung & Mascaro, 2004) or fiscal reasons (Bosworth et al., 2007). The effect of the international use of the dollar on the net return of other asset categories however, could be substantial.

Figure 31: Investment income by asset category. The category 'Reserve assets' only covers the return on international reserves held by the US.



Source: BEA, 2016a

Net investment income is determined by the following formula:

$$\text{Net Investment Income} = \text{Foreign Assets Held by the US} * \text{Foreign Return} - \text{US Assets Held Abroad} * \text{US Return}$$

The income received from foreign assets held by the US, is assumed to remain unaltered by the international use of the dollar. While this might not be completely realistic, any influence would be very indirect and impossible to quantify. The effect on the quantity of US assets held by foreigners, and the effect on the return of those assets, will be estimated. The effect of the international use of the dollar on the balance of primary income is therefore divided into two parts:

1. A positive effect on the quantity of external liabilities for the US. As has been shown, the international use of the dollar leads to foreign accumulation of US assets.
2. A negative effect on the return of US liabilities. The increased demand for US assets should raise their price, which is equivalent to a decrease in their return.

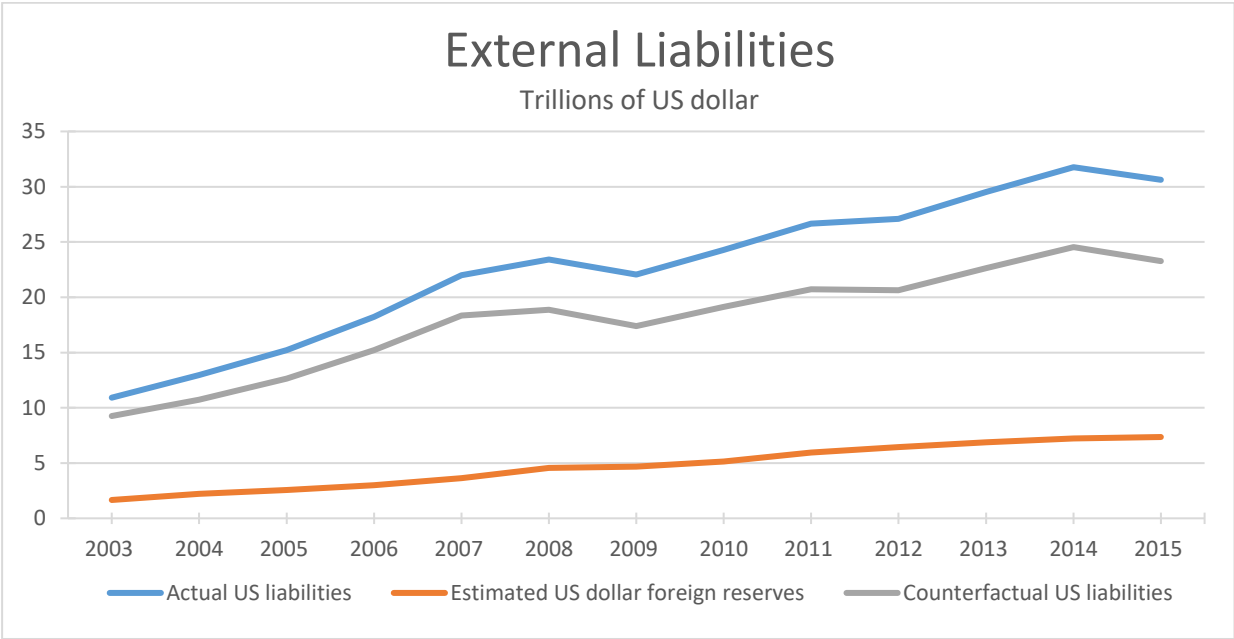
These two effects work in opposite directions, so theoretically the effect of the international transactional use of the dollar on the balance on primary income could be either positive or negative. The direction of the net effect must be determined empirically.

The first effect is relatively easy to quantify. Following the method used in section 5.2.1, the amount of US liabilities functioning as official foreign reserves can be estimated, with the following formula:

$$\text{Dollar Reserves} = \text{Reserves} * \frac{\text{Allocated Dollar Reserves}}{\text{Allocated Reserves}}$$

It has been established in section 5.1, that without the international transactional use of the dollar, this amount would be zero. The counterfactual quantity of US liabilities can therefore be estimated by subtracting the quantity of dollar denominated reserves from the actual quantity of US liabilities.

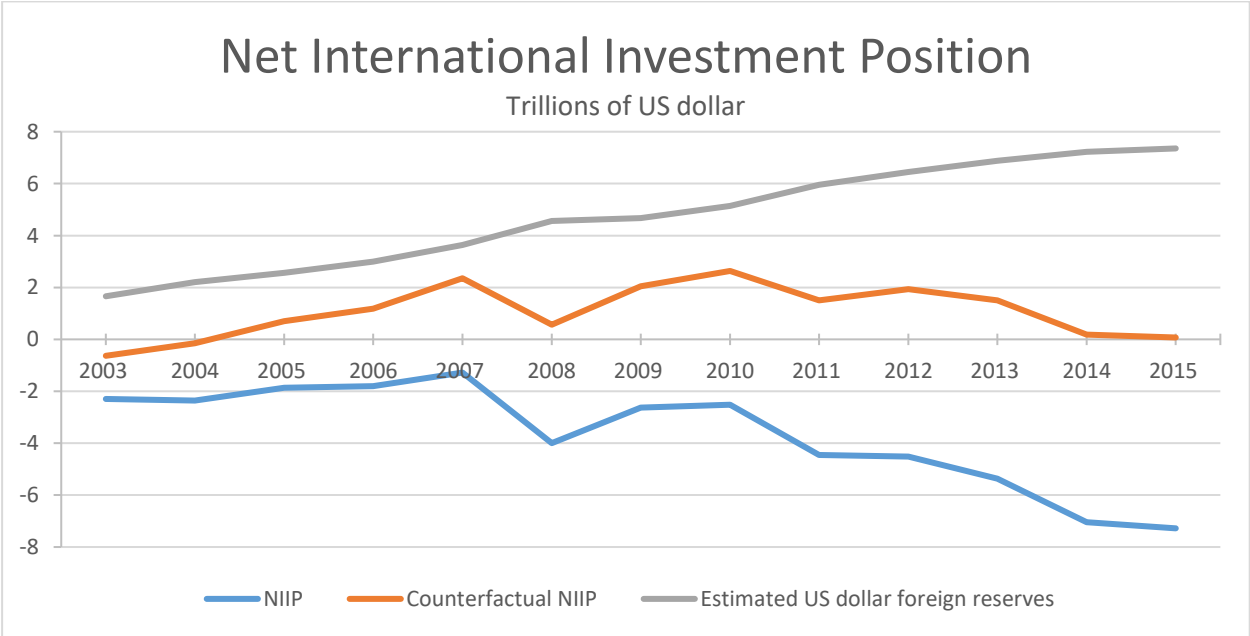
Figure 32: The effect of the international use of the dollar on the quantity of US assets held by foreigners.



Sources: BEA, 2016a and IMF, 2015

While this may seem like a relatively small difference when compared to the total amount of liabilities, the effect on the net international investment position (hereafter NIIP) is huge. The international use of the dollar is more than completely responsible for the large negative value of the US NIIP over the period. The actual average NIIP amounts to -3.6 trillion dollar, whereas in the counterfactual, this would be a positive 1.1 trillion.

Figure 33: The US NIIP with and without the foreign accumulation of dollar reserves.



Source: BEA, 2016a and IMF, 2015

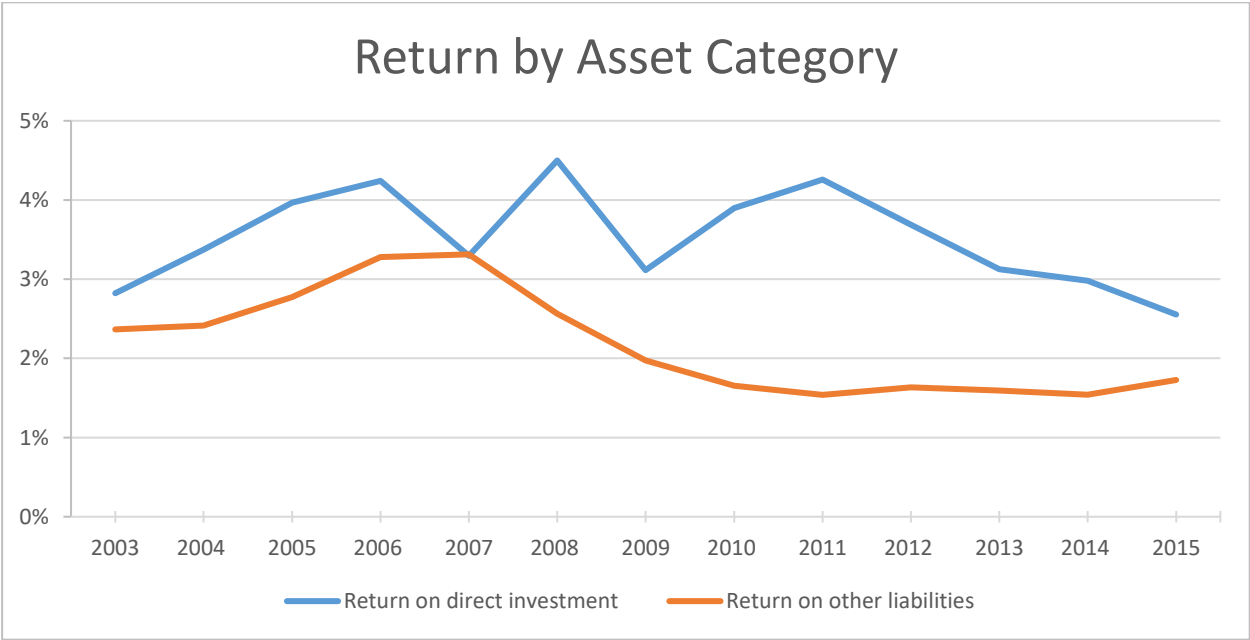
When fewer US assets are held by foreigners, the required payments on these assets are lower. So, through this channel, the international use of the dollar has a negative effect on the balance on primary income, diminishing the positive effect on the financial account and reducing the possibilities for trade deficits.

But this is not all that there is to it. It is likely that not only the quantity of US liabilities is altered, but their return as well. This latter change can be itself divided into two components:

1. A change in their composition by asset category.
2. A change in the required return within each asset category.

Foreign reserves are not composed of the same asset categories as other savings. Most important is the fact that international reserves usually don't consist of direct investment. In the counterfactual, the quantity of foreign direct investment in the US would therefore remain unaltered, while other US assets held by foreigners would decrease, which would raise the proportion of direct investment. This matters, because direct investment has a substantially higher return than other investment. In the counterfactual, this change in composition would therefore have a negative effect on the balance on primary income.

Figure 34: The return on direct investment exceeds the return on other asset categories.



Source: BEA, 2016a

To make an estimate of this composition effect, it is assumed that the entirety of dollar denominated international reserves consists of a perfect representation of the categories that are not direct investment. While this is obviously not entirely accurate, a more detailed assessment is beyond the scope of this thesis. So the following formula is used to estimate the return with the counterfactual composition:

Total Return on US Liabilities

$$= \text{Direct Investment Return} * \text{Direct Investment Share} + \text{Other Return} * \text{Other Share}$$

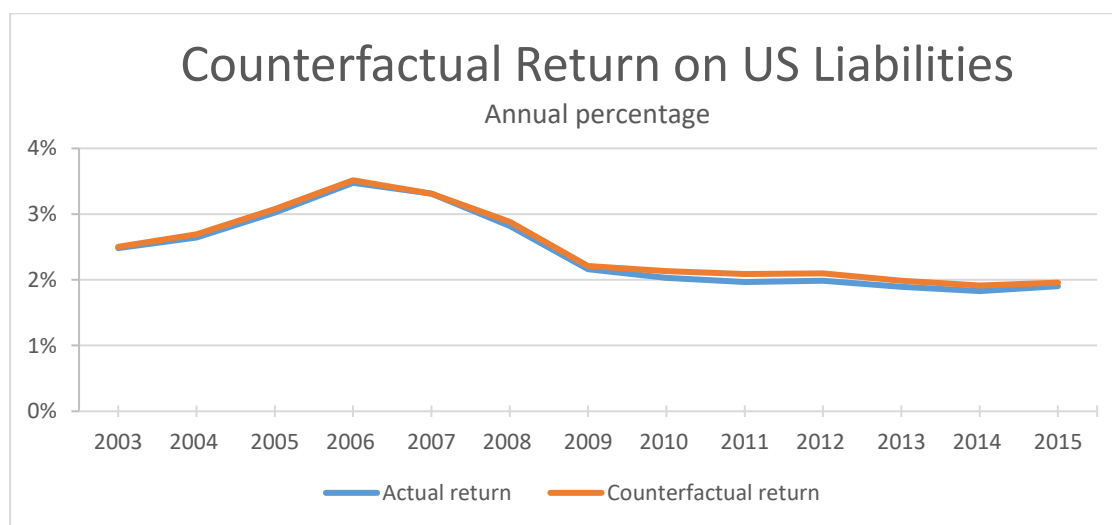
Table 5: An illustration of the share calculation, for the year 2015.

| 2015 US liabilities | Direct investment | Other investment | Direct investment share | Other investment share |
|---------------------|-------------------|------------------|-------------------------|------------------------|
| Actual | 6,543,809 | 24,077,599 | 0.21 | 0.79 |
| Counterfactual | 6,543,809 | 16,721,147 | 0.28 | 0.72 |

Source: BEA, 2016a

In 2015 the return on direct investment was 2.55% and on other investment 1.73%, so that the real total return was 1.90%, and the counterfactual total return would be 1.96%. This method is applied to each year. The effect turns out to be extremely minor, which indicates that there isn't much impact from a composition effect. Nevertheless, the adjusted estimate is more accurate and will be maintained.

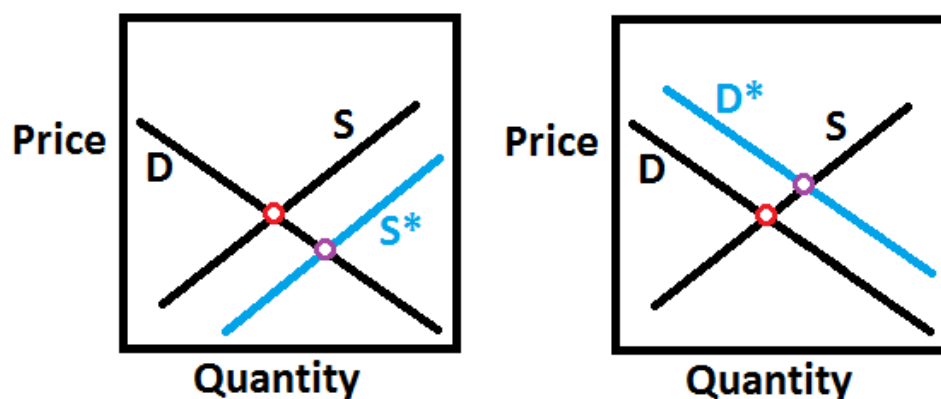
Figure 35: The effect of the change in composition on the average return is extremely small.



Apart from the composition effect, the general return on all liabilities might also be altered. Research from Gourinchas and Rey (2007) and Habib (2010) shows indeed that the US has a positive return differential within all classes of investment. The presence of subnormal returns for US assets confirms that the financial account surplus is caused by a strong demand for dollar securities, rather than a large supply of US investment opportunities. The supply of international reserves is limited by the willingness of the US to borrow. The more Americans borrow, the more investment opportunities disappear. To reach even more borrowers, the required return has to decline.⁹

⁹ This is not unique to the US. Japan, another country issuing an internationally important currency, has subnormal returns as well (Rogoff & Tashiro, 2015).

Figure 36: *D* stands for demand curve, *S* for supply curve. A large quantity transacted can have two causes. Either there is a large supply, in which case the price is low, or there is a large demand, in which case the price is high. Compared to other financial assets, those from the US have both a large quantity transacted and a high price. This is indicative of high demand, in this case caused by dollar denomination.



As explained in the methodology, the effect of the international use of the dollar on the required return is estimated with the help of a regression. The results are captured in the following table:

Table 6: Summary of the regression results. The currency premium is the dependent variable, time fixed effects and White standard errors are employed. 444 observations are used, spanning over 13 years and across 36 currencies.

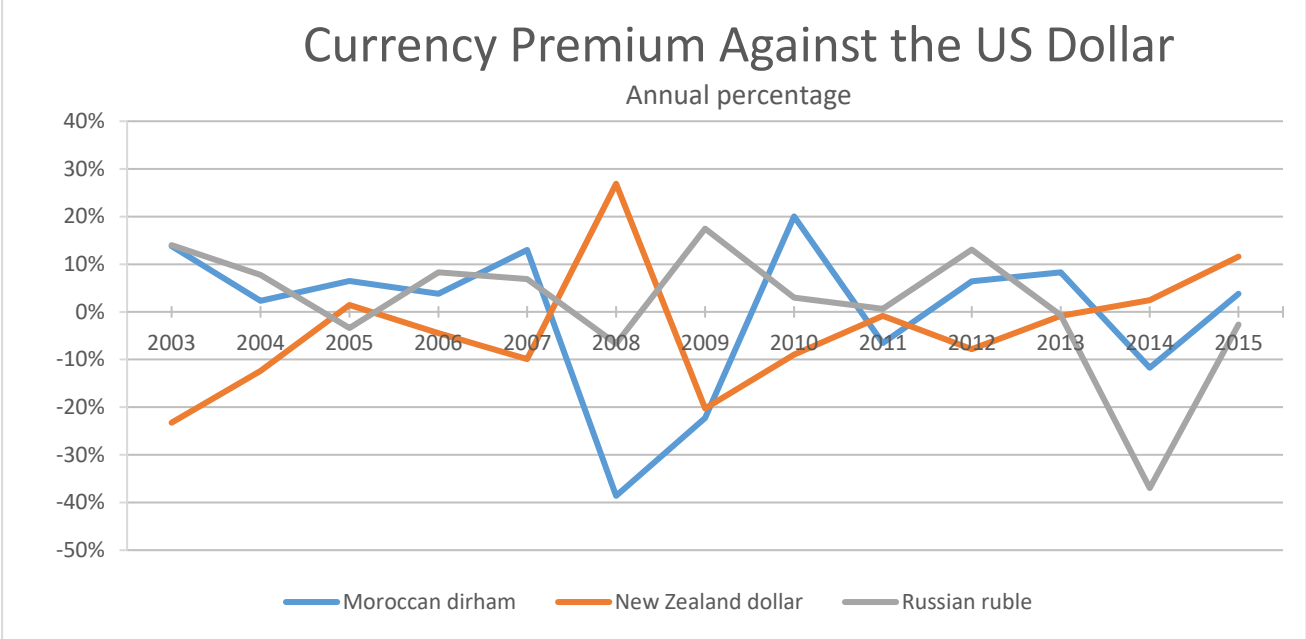
| Coefficient | Value | Standard Error |
|-------------------------------------|------------------------|----------------|
| Constant | 7.49*** | 2.70 |
| Share of Reserves (%) | -0.048 | 0.036 |
| Inflation (%) | 0.414*** | 0.121 |
| GDP per capita (1000s of US dollar) | -0.071 | 0.048 |
| GDP Growth (%) | -0.613 | 0.706 |
| Gross savings (% of GDP) | -0.082 | 0.084 |
| $R^2 = 0.18$ | F-statistic = 5.33 *** | |

*** denotes significance at the 1% level.

The most striking observation is the large size of the standard errors, which results in the occurrence of simultaneously very sizable and insignificant coefficients. The effect of the denomination of international reserves on the currency premium seems absurdly high. However, it's only statistically significant at the 10% level, even when it is considered that the test is just one-sided. The coefficients of GDP per capita, GDP growth and the savings rate are also sizable but completely insignificant. This insignificance is even understated because the residuals are far from normally distributed (the Jarque-Bera statistic exceeds 6200). The Durbin Watson statistic is 1.74, so serial correlation is not a serious problem.

The high standard deviations are likely caused by the fact that the actual future spot rate is a poor proxy for its expectation. Despite the use of monthly data, the calculated premia are extremely variable and much more influenced by unexpected exchange rate changes than the actual required rate of return. This is consistent with the significant coefficient on inflation, which presumably mostly captures unexpected monetary shocks. It again indicates the importance of exchange rate risk. Although the results are very imprecise and hard to interpret, they do show the large influence of exchange rate fluctuations, which is an important result in itself, and which strengthens the idea that currency denomination is of paramount importance.

Figure 37: The calculated currency premia are extremely variable.



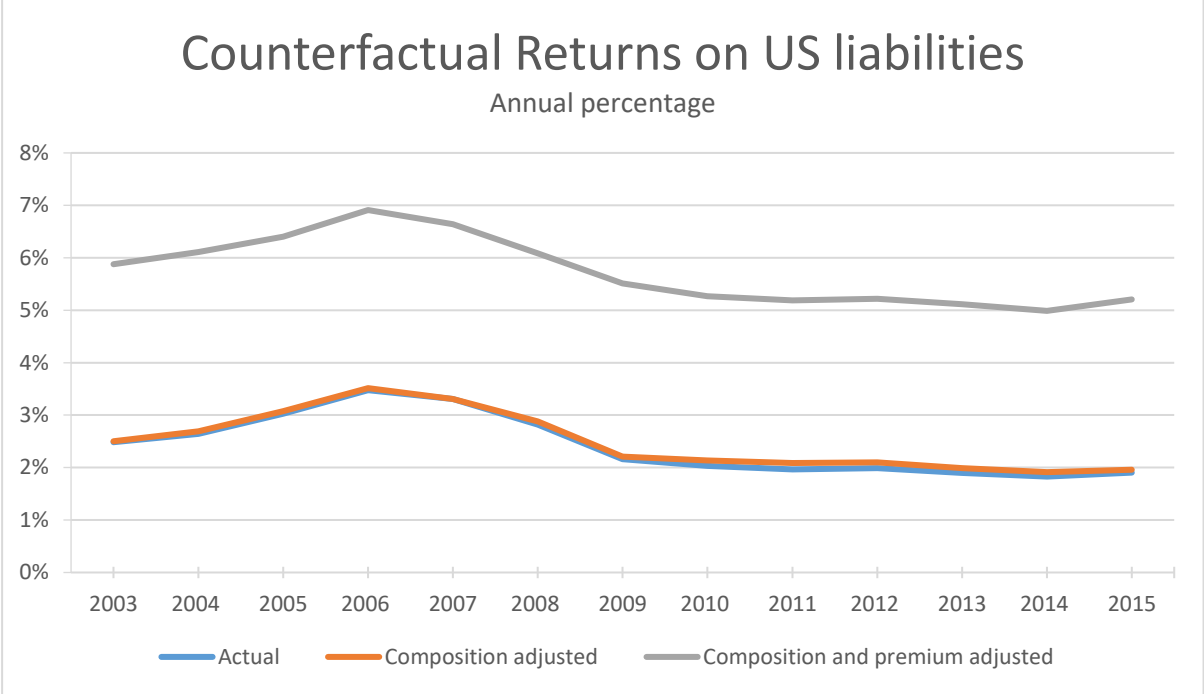
Source: Bloomberg, 2017

Despite the extreme uncertainty of the actual coefficient on the share of reserves, a point estimate is obtained from the regression. The effect of the international use of the dollar on the premium can be calculated for each year by multiplying the coefficient (0.048) by the dollar share in foreign reserves. With this information, the counterfactual required return on US liabilities can be calculated with the following formula:

$$\text{Counterfactual Required Return} = \frac{1 + \text{Composition Adjusted Required Return}}{1 + \text{Premium due to Reserves}} - 1$$

This calculation is made for each year, resulting in the following point estimates for the required return in the counterfactual:

Figure 38: The actual and counterfactual returns on US liabilities.



It's very likely that the required rate of return for the US is decreased by the foreign accumulation of dollar assets, but unfortunately the size of this effect can't be estimated with confidence. The point estimate seems to be excessive. The true counterfactual return is likely located between the point estimate and the estimate without a change in the currency premium, which will be referred to as the conservative estimate.

To obtain a point estimate for the counterfactual balance on primary income, the counterfactual quantity of liabilities is multiplied by the counterfactual return on those liabilities, and the obtained number is subsequently subtracted from the sum of the actual amount of receipts on investment income and the balance on the compensation of employees.

Figure 39: The balance on primary income, in the actual and counterfactual situations.

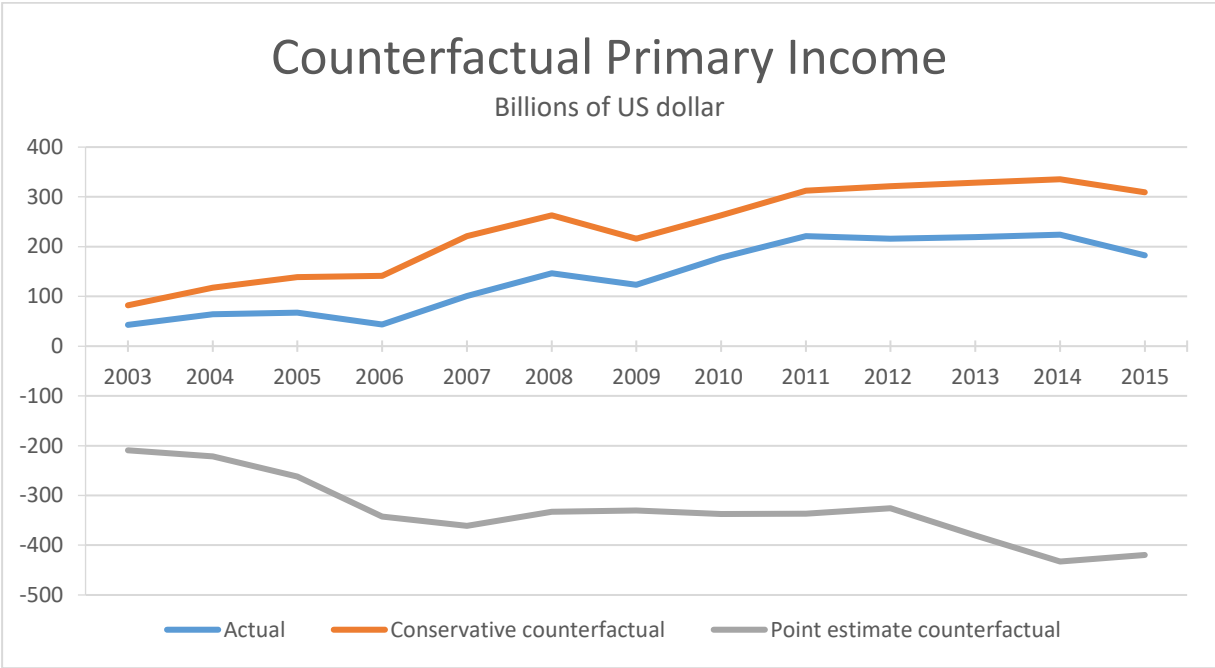


Table 7: Aggregates over the 2003-2015 period (Billions of US dollar).

| Balance on primary income | Value | Difference with actual |
|-------------------------------|-------|------------------------|
| Actual | 1828 | 0 |
| Conservative counterfactual | 3049 | 1221 |
| Point estimate counterfactual | -4293 | -6121 |

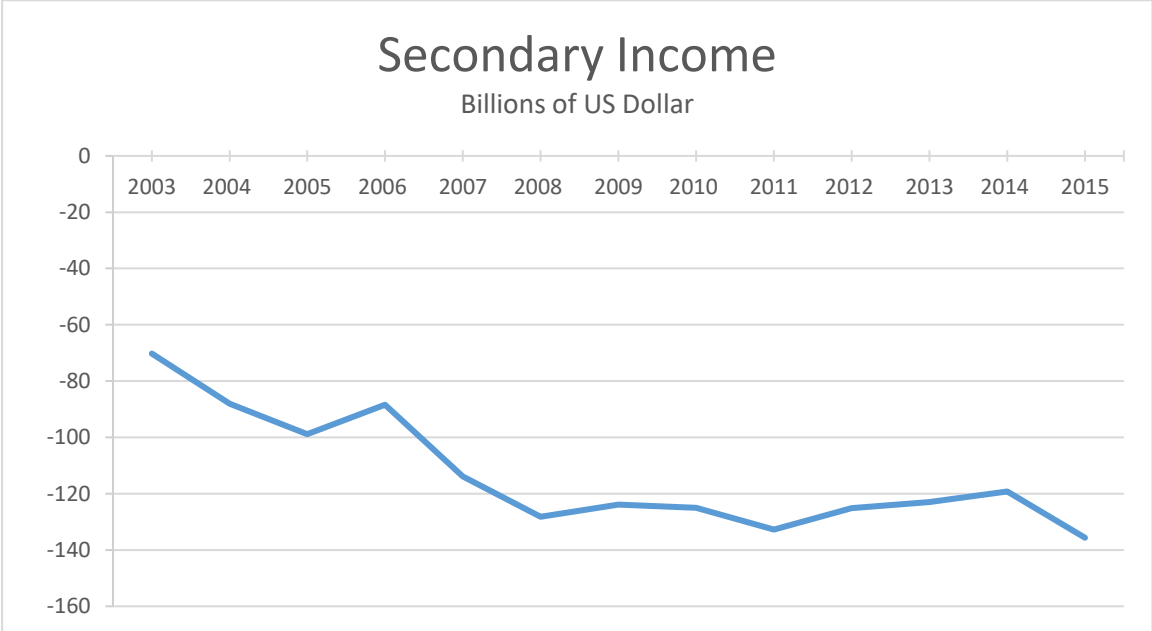
The conservative and point estimates of the effect on primary income are very far apart and even point in opposite directions. In the conservative estimate, the effect on the quantity of liabilities dominates, and the net effect is negative. On the contrary, in the counterfactual point estimate, the effect on the return dominates, and the net effect is positive. What can be stated with confidence however, is that the effect on the balance of primary income does not nullify the positive effect on the financial account. Even when the conservative estimate is assumed to hold, and the international use of the dollar has a negative effect on the balance on primary income, this effect is by no means large enough to compensate the positive effect on the financial account.

5.4.3 The Limited Deficit on Secondary Income

It has been shown that the international transactional use of the dollar contributed to a financial account surplus, a positive statistical discrepancy, and probably also a surplus on primary income. This necessarily had to be accompanied by a net deficit on the other components of the balance of payments. In practice, the main result was a trade deficit so there must have been restrictions on the deficits of the balance on secondary income and the capital account. The restrictions on the former will be discussed first.

Secondary income covers current transfers without compensation. These transfers can consist of goods and services as well as financial assets. The balance on secondary income is consistently negative: The US gives more away for free than it receives.

Figure 40: Net transfers of secondary income to the rest of the world.



Source: BEA, 2016a

However, the negative value is limited and by no means sufficient to offset the statistical discrepancy, financial account and balance on primary income. For obvious reasons, US entities prefer to be compensated for their provisions of financial assets. They would rather obtain oil, cars and cellphones than be left with empty hands. Like other humans, American citizens prefer consumption to forgoing consumption. Charities cause an outflow of funds, but its size is limited. The self-interest of the US puts a clear restriction on the magnitude of the secondary income deficit.

A special component of the deficit on secondary income are the remittances of migrant workers. As their families remain in their countries of origin, they have a strong incentive to make transfers. Theoretically, international reserves could be raised in this way too. As dollar assets increased in value, the dollar denominated US wages would too. This could cause an influx of migrant workers, sending their wages to their families. These families would purchase goods and services with the dollars, ultimately from the acquirers of international reserves. The US would be compensated by labor, instead of goods and services.

In practice, this is not possible due to restrictions on migration. Geographical, cultural and legislative barriers prevent this effect from coming to full fruition. The workers that do migrate would be attracted by higher wages due to the relative shortage of labor in developed nations anyway, even if the dollar was not a reserve currency.

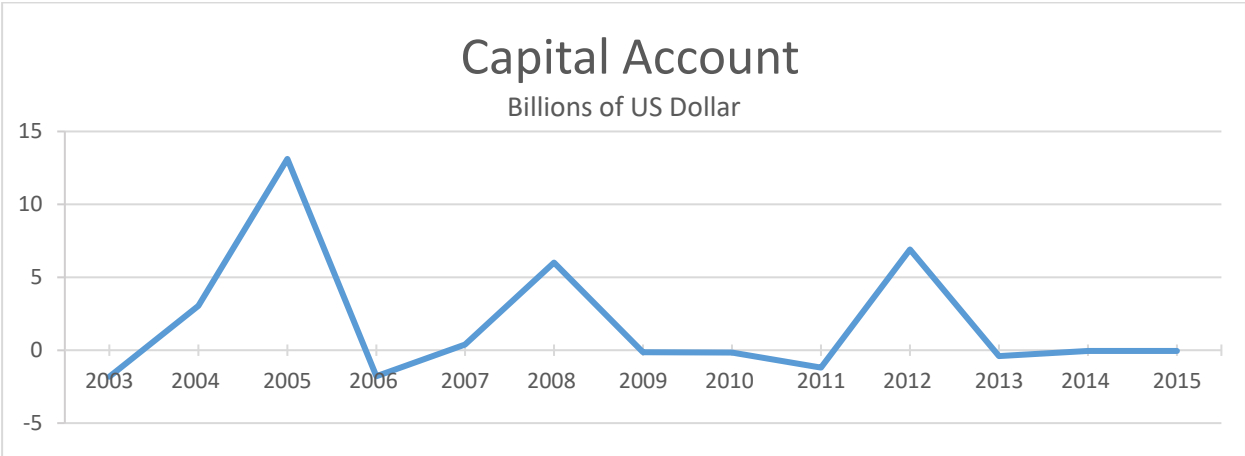
The deficit on secondary income is clearly limited by the self-interest of US citizens and the mobility of labor. Comparatively, the mobility of goods and services is far greater.

5.4.4 The Negligible Capital Account

The capital account consists of the transfers of capital and non-produced nonfinancial assets. The former includes debt forgiveness and nonlife insurance claims, the latter natural resources and contracts, leases and licenses. Transfers on the capital account are distinct because they do not influence the income or savings of either party.

There are only few items that fall under the capital account and, by definition, these can't be produced. This makes compensation through the capital account impossible. Debt forgiveness would destroy the value of international reserves and insurance claims are random occurrences. There is only a fixed and limited supply of non-produced, nonfinancial assets such as rights to minerals, offshore drilling, parts of the electromagnetic spectrum and trademarks. This results in the low impact of the transfers on the capital account.

Figure 41: Net transfers of capital and non-produced nonfinancial assets to the rest of the world.



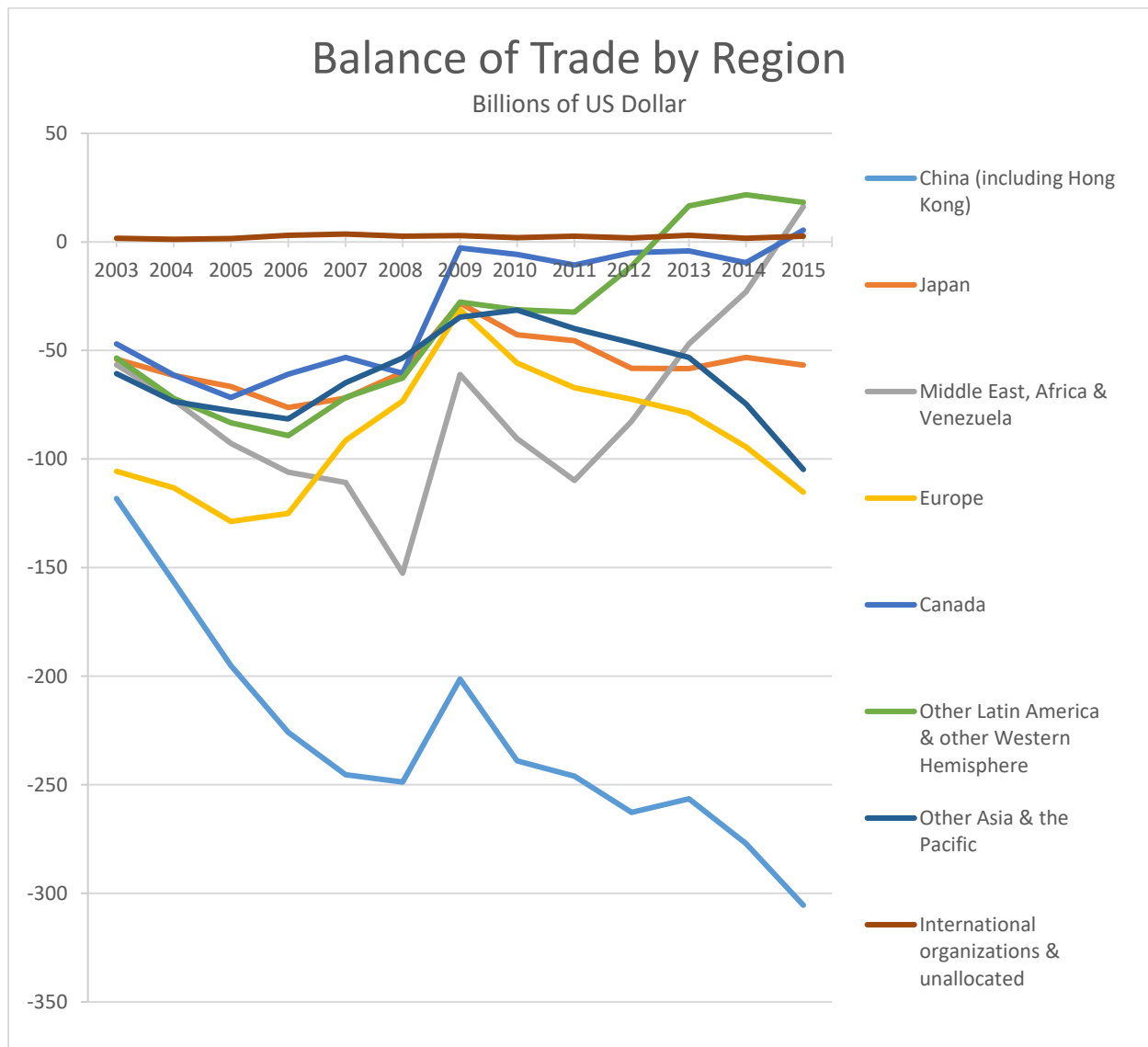
Source: BEA, 2016a

The limited opportunities for transfers on the capital account result in a negligible impact on the balance of payments. There are clear surpluses on the financial account and primary income and there is little room for deficits on secondary income and the capital account, so the inevitable result is a trade deficit.

5.4.5 The Trade Deficit

As every other component of the balance of payment has been discussed, it's time to turn to the balance of trade. The large financial account surplus wasn't offset by the balance on primary income, secondary income or capital account and is reflected in the trade deficit.

Figure 42: The balance of trade by region. The Middle East, Africa and Venezuela are grouped together to proxy for oil exporters.

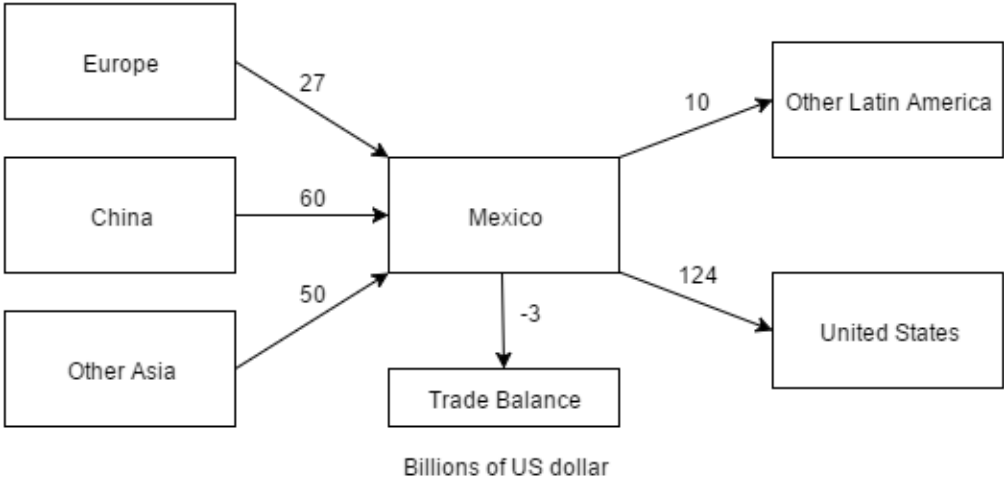


Source: BEA, 2016a

The balance of trade can be considered the mirror image of the financial account. This is no coincidence because the foreign motivations for running financial account deficits were intimately tied to developments in international trade. If currency undervaluation would not provide a boost for domestic exporters, China, Japan and European countries would not have pursued this policy, and the only reason oil exporters accumulated reserves, was because of their large oil revenues.

A substantial part of the trade deficit was ran with countries that did not keep the received dollar assets for themselves. These countries functioned as middle men, transferring financial assets from the US to the accumulators of international reserves, and goods and services in the reverse direction. The demand for dollar assets raised the value of the dollar. When more can be bought with dollars, it pays more to obtain them. The natural course of action was to export goods and services to the US and finance imports with the proceeds. This caused even regions with balanced trade to run surpluses with the US.

Figure 43: Mexico is an example of a transit country. It has significant trade deficits with Asia and Europe, but these are offset by a trade surplus with the US. Data is for 2014.

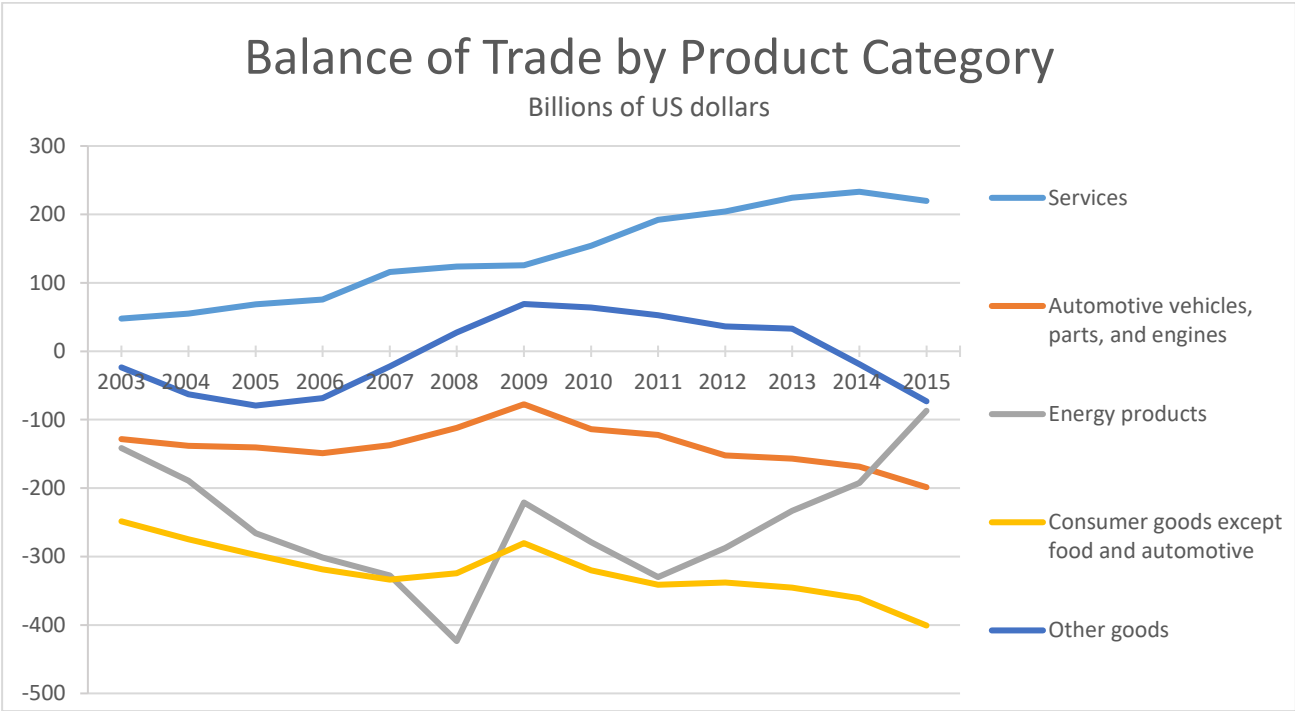


Source: Banco de México, 2016

The exporters of petroleum ran trade surpluses with every single region. In exchange for dollars, those in the former Soviet Union supplied oil to Europe and those in the Middle East and Africa to Asia and America (Holodny, 2015). China and Japan had trade deficits with these oil exporters but were more than able to finance this with the proceeds of trade surpluses with the rest of the world (National Bureau of Statistics of China, 2016). They provided America, Europe and the remainder of Asia with machinery and consumer products, and received dollars in return. To obtain these dollars, these regions had to run a trade surplus with the US as well. South East Asia provided electronics and apparel (Observatory of Economic Complexity, 2016). Europe shipped machinery, transport equipment and chemicals (European Commission, 2016). Latin America predominantly machinery, transport equipment and commodities (Observation of Economic Complexity, 2016).

This could only result in a trade deficit for the US. Imports exceeded exports for energy products (mostly crude petroleum) and consumer products (mostly cars, apparel and household goods). This was partly offset by a surplus on services (such as the provision of intellectual property, transport and maintenance and repairs). Nevertheless, a large deficit remained.

Figure 44: The American balance of trade by product category.



Source: BEA, 2016a

Chinese workers assemble cell phones, PC's and fridges for use by US citizens. Americans drive cars manufactured in Japanese factories with gasoline extracted from Arabian deposits. The clothes they wear were sewn together by Vietnamese laborers and the medicines they use developed by European scientists. A substantial part of this consumption is made possible by an increase in liabilities, which are only accepted because they are denominated in the dominant international currency.

The counterfactual is assessed a final time. If dollars would be useless for international transactions, dollar assets would not be accumulated as international reserves. The increase in international reserves would therefore not have led to an increase in demand for dollar denominated assets. As an estimated 5.0 trillion dollar worth of US assets became official reserves, the financial account surplus be 5.0 trillion dollar lower in the counterfactual, which amounts to 68% of the cumulative trade deficit. This could still be an underestimation because of official reserve accumulation by non-reporting countries and the accumulation of unofficial dollar reserves, such as by Japanese corporations and the Norwegian government.

The effect on the balance on primary income remains highly uncertain, due to the lack of accurate measurements on currency premia. When the conservative estimate is maintained, the effect on the balance on primary income is negative and the total effect of the international use of the dollar is reduced to 3.8 trillion dollar, or 51% of the trade deficit. When the point estimate is used, there is a positive effect on the balance on primary income, and the total effect rises to 11.0 trillion dollar, or a stunning 149% of the trade deficit. In this case more than the entire trade deficit is covered, which means the US would actually have a trade surplus in the counterfactual. The interest payments on their remaining debt, in addition to the remittances of migrant workers, would make exports exceed imports.

Table 8: An overview of the numbers. First the absolute value, then as a percentage of the trade deficit.

| | Absolute value | Percentage of trade deficit |
|--|-----------------------|------------------------------------|
| Trade deficit | 7.4 trillion dollar | 100% |
| Increase in official dollar reserves | 5.0 trillion dollar | 68% |
| Conservative increase in net investment income | -1.2 trillion dollar | -16% |
| Point estimate increase in net investment income | 6.0 trillion dollar | 81% |
| Conservative total effect | 3.8 trillion dollar | 51% |
| Point estimate total effect | 11.0 trillion dollar | 149% |

The real effect likely lies between the conservative and point estimate. The average of these two amounts to 100% of the trade deficit but, given the uncertainties involved, this is undoubtedly by chance. Although both estimates are far apart, both are very sizable and cover more than half of the trade deficit. So while the exact magnitude remains uncertain, the international use of the dollar is a far more powerful explanation of the US trade deficit, than any conventional alternative.

CHAPTER 6 Conclusion

The hypothesis is clearly confirmed by empirical data. The dollar is the dominant currency for international transactions and this creates a large negative pressure on the US balance of trade.

Dollar denominated securities function as international reserves because of the dollar's role as an international medium of exchange, as has been established by the 2SLS regression. The US has a monopoly on the production of dollar banknotes through the Bureau of Printing and Engraving, and this gives it, by way of the Federal Reserve, control over the monetary base of the dollar. This causes US entities to possess a competitive advantage in the production of dollar denominated assets. Securities from the Treasury and federally sponsored agencies are directly backed by money creation. Other issuers of liabilities have the advantage of operating domestically with a dollar of which the supply is tailored to the state of the economy. With these facts in place, an increase in the demand for international reserves, as occurred during 2003-2015 by China, Japan and the oil exporting economies, could only result in an increased demand for US liabilities. The increased demand indeed raised both the quantity and probably also the price of these liabilities, resulting in a financial account surplus and a positive balance on primary income. As the deficit on secondary income is limited in size by self-interest and immigration restrictions and the capital account by the limited supply of non-produced nonfinancial assets, the inevitable result was an American trade deficit.

This is a fact of great importance that has been badly overlooked. The negligence is inexcusable: The American trade deficit is a popular topic of investigation and the hypothesis has been regularly mentioned and was relatively easy to conclusively prove. All that was really needed, was a closer look at the motivations of the financiers of the deficit.

The conclusions can be extrapolated to the time before and after the investigated period. Before 2003 the trade deficit was far smaller. The difference can be explained by the economic rise of China. This increased the effects of their mercantilist policy and raised demand for oil, increasing oil prices and revenues. To what extent the deficit will continue to exist in the future, depends on the extent to which its requirements will be fulfilled. Limitations on the deficits on secondary income and the capital account are bound to remain in place. The US can be expected to remain the sole producer of dollar banknotes and retain the associated advantage in the production of dollar denominated assets. Due to the strong network effects of money, the dollar can be considered relatively safe in its position as an international currency as well. Uncertainties abound however, when foreign demand for international reserves is concerned. As has been described, this should be dependent on at least three developments:

1. The occurrence of recessions. The escape of Japan and Europe from their recessions will decrease the deficit if it is not substituted by new ones.
2. The prevalence of mercantilist development strategies. The economic maturation of China will probably decrease the deficit. Perhaps other developing countries will emulate the Chinese industrialization process.
3. The price of oil or, more correctly, the expectation of higher current than future oil revenues.

The results also provide a new interpretation of several phenomena related to the trade deficit.

Within the US, the large inflows of foreign goods and services decrease demand for native production, causing deindustrialization, depressed wages and unemployment. This can't be offset by the increase in the production of financial assets, as virtually no employees or supplies are required. The use of the dollar as the international currency could therefore lead to a decline in the living standards of industrial workers, while other groups in the US undoubtedly benefit from the vast amounts of cost-free imports.

The US financial bubbles and subsequent crises can be reinterpreted as well. The strong foreign demand for dollar denominated assets might have pushed interest rates down and ultimately caused the execution of terrible real investment projects. As the trade deficits continue, especially with capital flows redirected from default-free treasury securities to more risky investment, the possibility of a new American financial crisis, will have to be reassessed.

Because the US in general and the US government in particular seem to benefit from significant amounts of free goods due to the use of the dollar as an international payment, the threat of losing this advantage could be a motive for war. To link this with the invasion of Iraq however, the Iraqi government should have been influential in the determination of the international currency. This seems highly unlikely.

As the resulting financial and trade flows could have a significant influence on a variety of developments, the opportunities for further research are vast.

The existence of a negative pressure on the balance of trade for the issuers of other international currencies could be investigated. Currently, the most important examples are the eurozone, Japan and the United Kingdom. Although there has been a lively debate over the costs and benefits of a common currency in the European Union, the effects of control over an international currency were largely absent from this discussion (BBC News, 2003; Mursa, 2014; European Commission, 2015).

The desirability of the currency of denomination is often ignored by asset pricing models. In addition to return premia for risk, value and size, it is likely there exists a currency premium. Unfortunately, this premium could not be precisely measured, let alone explained, but here lie great opportunities for future research. If dollar denominated assets indeed have a lower required return, then investors with a currency preference other than the dollar, might want to avoid them in their portfolio selection.

Another topic worth investigating, is the effect of a decreased demand for foreign reserves. American liabilities would return to the US and compensation in the form of goods and services would be demanded. Can the US be expected to repay its debt by running trade surpluses or will it default? And on what factors would this decision depend?

The effects of the currency denomination of financial assets is an important topic of investigation and deserves more attention. Although this thesis has covered many angles, lots of questions remain. Further research could lead to a much better understanding of the world, a more accurate prediction of future developments and an increased effectiveness of both public and private policies.

REFERENCES

Adler, M. & Dumas, B. (1983) International Portfolio Choice and Corporation Finance: A Synthesis. *The Journal of Finance*, 38(3), 925-984.

Al-Hayat Media Center (2015) The Dark Rise of Banknotes and the Return of the Gold Dinar [Video]. Retrieved from <http://justpaste.it/o8rm>

Banco Central do Brasil (2015) Historical Series of the Balance of Payments [Data tables]. Retrieved from <http://www.bcb.gov.br/?HISTBPM5>

Bank for International Settlements (2013) Foreign Exchange Turnover in April 2013: Preliminary Global Result [Triennial Central Bank Survey]. Retrieved from <http://www.bis.org/publ/rpfx13fx.pdf>

Bank of Japan (2016) T-Bills Purchased by the Bank of Japan [Data Tables]. Retrieved from <https://www.boj.or.jp/en/statistics/boj/other/tmei/index.htm/>

Bank of Japan (2016a) Outright Purchases of Japanese Government Bonds [Report]. Retrieved from https://www.boj.or.jp/en/mopo/measures/mkt_ope/ope_f/index.htm/

Bank of Japan (2016b) T-Bills Purchased by the Bank of Japan [Data table]. Retrieved from <http://www.boj.or.jp/en/statistics/boj/other/tmei/index.htm/>

BBC News (2003) The great euro debate [Article]. Retrieved from http://news.bbc.co.uk/2/hi/uk_news/politics/3008201.stm

BEA (2016a) International Data [Data tables]. Retrieved from <https://www.bea.gov/iTable/iTable.cfm?ReqID=62&step=1#reqid=62&step=1&isuri=1>

BEA (2016b) U.S. International Economic Accounts: Concepts & Methods [Methodology volume]. Retrieved from <https://www.bea.gov/international/pdf/concepts-methods/9%20Chapter%20ITA-Methods.pdf>

Bernanke, B. (1995) The Macroeconomics of the Great Depression: A Comparative Approach. *Journal of Money, Credit and Banking*, 27(1), 1-28.

Bernanke, B.S. (1999) Japanese Monetary Policy: A Case of Self-Induced Paralysis? [paper]. Retrieved from <http://www.sistematikrisk.com/wp-content/uploads/Japanese-Monetary-Policy.pdf>

Bernanke, B.S. (2005) The Global Saving Glut and the U.S. Current Account Deficit [paper]. Retrieved from <http://www.federalreserve.gov/boardDocs/Speeches/2005/200503102/default.htm>

- Bernanke, B.S. (2016) China's trilemma – and a possible solution [article]. Retrieved from <http://www.brookings.edu/blogs/ben-bernanke/posts/2016/03/09-china-trilemma>
- Berton, P. (2001) Klondike: The Last Great Gold Rush, 1896-1899. Doubleday Canada, Limited.
- Bivens, J. (2015) Yes, Trade Deficits do Indeed Matter for Jobs [Article]. Retrieved from <http://www.epi.org/blog/yes-trade-deficits-do-indeed-matter-for-jobs/>
- Blackstone, B., Hannon, P. & Walker, M. (2015) Aggressive ECB Stimulus Ushers In New Era for Europe [Article]. Retrieved from <http://www.wsj.com/articles/ecb-announces-stimulus-plan-1421931011>
- Blanchard, O. & Giavazzi, F. (2002) Current Account Deficits in the Euro Area: The End of the Feldstein-Horioka Puzzle? *Brooking Papers on Economic Activity*, 2, 147-209.
- Bloomberg L.P. (2017) Spot and forward rates from 01/2003 to 12/2015. Retrieved from Bloomberg terminal.
- Bosworth, B., Collins, S.M. & Chodorow-Reich, G. (2007) Returns on FDI: Does the U.S. Really Do Better? [Paper]. Retrieved from <http://www.nber.org/papers/w13313>
- Bouhan, N. & Swartz, P. (2011) Quarterly Update: BRIC Financial Holdings – Dollar Appreciation Mitigates Reserve Accumulation [Article]. Retrieved from <http://www.cfr.org/india/quarterly-update-bric-financial-holdings-dollar-appreciation-mitigates-reserve-accumulation/p25634>
- Buchanan, P.J. (1998) *The Great Betrayal*. Little, Brown and Company.
- Canzoneri, M., Cumby, R., Diba, B. & López-Salido, D. (2013) Key Currency Status: an Exorbitant Privilege and an Extraordinary Risk [Paper]. Retrieved from <http://faculty.georgetown.edu/cumbyr/papers/Key%20Currency.pdf>
- Central Bank of Kuwait (2015) The Forty Third Annual Report [Report]. Retrieved from <http://www.cbk.gov.kw/en/images/Annual-2014-15-10-118970-5.pdf>
- Central Bank of the U.A.E. (2016) Central Foreign Bank Assets [Data tables]. Retrieved from http://www.centralbank.ae/en/index.php?option=com_content&view=article&id=181&Itemid=382
- Chen, S.K., Imrohorglu, A. & Imrohoroglu, S. (2009) A quantitative assessment of the decline in the U.S. current account balance. *Journal of Monetary Economics*, 56, 1135-1147.
- Cheng, W. & Zhang, D. (2011) The 'Exorbitant Privilege': A Theoretical Exposition [Paper]. Retrieved from <ftp://ftp.aefweb.net/WorkingPapers/w435.pdf>

- Chibber, K. (2014) Here are all the countries that don't have a currency of their own [Article]. Retrieved from <http://qz.com/260980/meet-the-countries-that-dont-use-their-own-currency/>
- Clark, W. R. (2005) Petrodollar Warfare: Oil, Iraq and the Future of the Dollar. New Society Publishers.
- Coren, C. (2016) Will Saudi Arabia Unpeg its Currency from the Dollar? [Article]. Retrieved from <http://www.dailyforex.com/forex-fundamental-analysis/2016/01/will-saudi-arabia-unpeg-its-currency-from-the-dollar/52910>
- Cuomo Commission on Competitiveness (1993) America's Agenda: Rebuilding Economic Strength. Routledge.
- Dabrowski, M. (2001) The Episodes of Currency Crisis in Latin American and Asian Economies [Paper]. Retrieved from http://www.case-research.eu/sites/default/files/publications/RC39_0.pdf
- Derse, A.E. (2007) SCENESETTER FOR AZERBAIJANI FINANCE MINISTER SHARIFOV'S TRIP TO WASHINGTON [Telegram]. Retrieved from https://wikileaks.org/plusd/cables/07BAKU1237_a.html
- Dobbs, R., Skilling, D., Hu, W., Lund, S., Manyika, J. & Roxburgh, C. (2009) An exorbitant privilege? Implications of reserve currencies for competitiveness [Paper]. Retrieved from http://www.mckinsey.com/insights/economic_studies/an_exorbitant_privilege
- Dooley, M.P., Folkerts-Landau, D. & Garber, P. (2003) An Essay on the Revived Bretton Woods System [Paper]. Retrieved from <http://www.nber.org/papers/w9971.pdf>
- Dumas, B. & Solnik, B. (1995) The World Price of Foreign Exchange Risk. The Journal of Finance, 50(2), 445-479.
- Dumas, B. & Solnik, B. (1995) The World Price of Foreign Exchange Risk. Journal of Finance, 50(2), 445-479.
- Eichengreen, B. (2010) Exorbitant Privilege: The Rise and Fall of the Dollar and the Future of the International Monetary System. New York: Oxford University Press.
- Elsässer, J. (2014) Der Krieg gegen Russland [Lecture]. Retrieved from <http://www.anti-zensur.info/azkmediacenter.php?mediacenter=conference&topic=10&id=91>
- Engel, C. & Rogers, J.H. (2006) The U.S. current account deficit and the expected share of world output. Journal of Monetary Economics, 53(5), 1063-1093.
- European Commission (2015) Why the euro? [Statement]. Retrieved from http://ec.europa.eu/economy_finance/euro/why/index_en.htm

European Commission (2016) European Union, Trade in goods with USA [Data Tables]. Retrieved from http://trade.ec.europa.eu/doclib/docs/2006/september/tradoc_113465.pdf

Fama, E.F. & French, K.R. (2012) Size, value and momentum in international stock returns. *Journal of Financial Economics*, 105, 457-472.

Fama, E.F., French, K.R. (1998) Value versus growth: the international evidence. *Journal of Finance*, 53, 1975–1999.

Federal Reserve (2008) Press Release [Press release]. Retrieved from <http://www.federalreserve.gov/newsevents/press/monetary/20081125b.htm>

Federal Reserve (2016) FEDERAL RESERVE Statistical Release [Data tables]. Retrieved from <https://www.federalreserve.gov/releases/h41/current/h41.htm>

Federal Reserve Bank of Saint Louis (2016) Federal Net Outlays as Percent of Gross Domestic Product [Graph]. Retrieved from <https://research.stlouisfed.org/fred2/series/FYONGDA188S#>

Federal Reserve Bank of St. Louis (2015) Japan Intervention: Japanese Bank purchases of USD against JPY [Graph]. Retrieved from <https://research.stlouisfed.org/fred2/series/JPINTDUSDJPY>

Feldstein, M. & Horioka, C. (1980) Domestic Saving and International Capital Flows. *Economic Journal*, 90 (358), 314-329.

Feldstein, M. (2011) The French Don't Get It [Article]. Retrieved from <https://www.project-syndicate.org/commentary/the-french-don-t-get-it?barrier=true>

Fernandes, G. (2013) Interventions in the Brazilian Foreign Exchange Market: An Empirical Investigation of the Determinants [Paper]. Retrieved from https://www.itau.com.br/arquivosstaticos/itauBBA/contents/common/docs/Itau_WP9_FX_may13.pdf

Ferrero, A. (2010) A structural decomposition of the U.S. trade balance: Productivity, demographics and fiscal policy. *Journal of Monetary Economics*, 57(4), 478-490.

Fidora, M., Fratzscher, M. & Thimann, C. (2006) Home Bias in Global Bond and Equity Markets – The Role of Real Exchange Rate Volatility [Paper]. Retrieved from <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp685.pdf?e8e562a584e26cadbb16830467ebd493>

Fischer, S. (1982) Seigniorage and the Case for a National Money. *Journal of Political Economy*, 90(2), 295-313.

- French, K.R. & Poterba, J.M. (1991) Investor Diversification And International Equity Markets. *American Economic Review*, 81(2), 222-226.
- Friedman, M. (1971) The Euro-Dollar Market: Some First Principles [Paper]. Retrieved from <https://www.chicagobooth.edu/~media/44CEE6C8A25B4FF2A48925163DAA2F85.pdf>
- Frisch, F. (2011) Brazil Can't Allow Invasion of 'Hot Money,' Mantega Says [Article]. Retrieved from <http://www.bloomberg.com/news/articles/2011-08-23/brazil-can-t-allow-invasion-of-hot-money-mantega-says>
- Froot, K.A. & Thaler, R.H. (1990). Anomalies: Foreign Exchange. *Journal of Economic Perspectives*, 4 (3), 179-192.
- Frost, J. (2014) How Important Are Normal Residuals in Regression Analysis? [Report]. Retrieved from <http://blog.minitab.com/blog/adventures-in-statistics/how-important-are-normal-residuals-in-regression-analysis>
- Gizitdinov, N. (2010) Kazakh Fund May Cut U.S. Treasuries, Add Brazil Debt [Article]. Retrieved from <http://www.bloomberg.com/news/articles/2010-11-08/kazakh-oil-fund-may-cut-holdings-of-u-s-treasuries-add-emerging-markets>
- Goldstein, M. (2007) A (Lack of) Progress Report on China's Exchange Rate Policies [Paper]. Retrieved from <https://piie.com/publications/working-papers/lack-progress-report-chinas-exchange-rate-policies>
- Gourinchas, P. & Rey, H. (2007) From world banker to word venture capitalist: US external adjustment and the exorbitant privilege [Paper]. Retrieved from <http://www.nber.org/papers/w11563>
- Gourinchas, P. & Rey, H. (2013) External Adjustment, Global Imbalances, Valuation Effects [Chapter]. Retrieved from <http://www.nber.org/papers/w19240>
- Gourinchas, P., Rey, H. & Govillot, N. (2010) Exorbitant Privilege and Exorbitant Duty [Paper]. Retrieved from <https://www.treasury.gov/about/organizational-structure/offices/RoundTable/2012%20session%201%20gourinchas%20rey%20govillot.pdf>
- Gresham, T. (2011) Bank of Japan Balance Sheet Charts [Graphs]. Retrieved from <http://greshams-law.com/2011/09/04/bank-of-japan-balance-sheet-charts/>
- Griffin, J.M. (2002) Are the Fama and French factors global or country specific? *Review of Financial Studies* ,15, 783–803.

- Groeneveld, J.M. & Visser, A. (1997) Seigniorage, Electronic Money and Financial Independence of Central Banks [Paper]. Retrieved from <http://ojs.uniroma1.it/index.php/PSLQuarterlyReview/article/viewFile/10571/10455>
- Habib, M.M. (2010) Excess Returns on Net Foreign Assets, The Exorbitant Privilege from a Global Perspective [Paper]. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1551873
- Hamilton, J.D. (2009) Causes and Consequences of the Oil Shock of 2007-2008 [Paper]. Retrieved from https://www.brookings.edu/wp-content/uploads/2009/03/2009a_bpea_hamilton.pdf
- Hammer, A., Jones, L. & Wang, Z. (2013) Methodology of U.S.-China-Hong Kong Triangular Merchandise Trade Statistic Reconciliation [Paper]. Retrieved from <https://www.usitc.gov/publications/332/RN201308A.pdf>
- Hargreaves, R. (2016) Sovereign Wealth Funds Set to Withdraw \$400 Billion From Listed Equities This Year [Article]. Retrieved from <http://www.valuwalk.com/2016/02/sovereign-wealth-funds-dump-equities/>
- Hartmann, P. (1998) Currency Competition and Foreign Exchange Markets. Cambridge University Press.
- Hartmann, P. (1999) Trading volumes and transaction costs in the foreign exchange market. *Journal of Banking & Finance*, 23, 801-824.
- Hausmann, R. & Sturzenegger, F. (2007) Global Imbalances or Bad Accounting? The Missing Dark Matter in the Wealth of Nations, *Economic Policy*, 22(51), 469-518.
- He, D. & McCauley, R. (2012) Eurodollar Banking and Currency Internationalization [Paper]. Retrieved from http://www.bis.org/publ/qtrpdf/r_qt1206f.htm
- Holodny, E. (2015) How oil flows in and out of every major region around the world [Article]. Retrieved from <http://uk.businessinsider.com/bp-map-world-oil-trade-movements-2014-2015-6?r=US>
- Hong Kong Monetary Authority (2009) Renminbi Trade Settlement [Press Release]. Retrieved from <http://www.hkma.gov.hk/eng/key-information/press-releases/2009/20090629-3.shtml>
- Horioka, C.Y. (2015) IS Imbalances and Current Account Surpluses in Japan: In Memory of Professor Ronald I. McKinnon [Paper]. Retrieved from <http://www.agi.or.jp/workingpapers/WP2015-14.pdf>
- Hou, K., Karolyi, G.A. & Kho, B.C. (2011) What factors drive global stock returns? *Review of Financial Studies*, 24, 2527–2574.
- Hudson, M. (2003) *Super Imperialism*. Pluto Press.

- Hung, J. H. & Mascaro, A. (2004) Return on Cross-Border Investment: Why Does U.S. Investment Abroad Do Better? [Paper]. Retrieved from <https://www.cbo.gov/publication/16204>
- Hunt, B. & Rebucci, A. (2005) The US Dollar and the Trade Deficit: What Accounts for the Late 1990s?, *International Finance*, 8(3), 399-434.
- IMF (2009) IMF to Make \$250 Billion SDR Allocation on August 28 [Announcement]. Retrieved from <http://www.imf.org/external/np/exr/cs/news/2009/CSO79.htm>
- IMF (2015) SURVEY ON THE HOLDINGS OF CURRENCIES IN OFFICIAL FOREIGN CURRENCY ASSETS 2015 [Data Tables]. Retrieved from <https://www.imf.org/external/~media/AF651C1D464A4E21AA94A971A6214818.ashx>.
- IMF (2016) Currency Composition of Official Foreign Exchange Reserves [Data tables]. Retrieved from <http://data.imf.org/?sk=E6A5F467-C14B-4AA8-9F6D-5A09EC4E62A4&sId=1408202905739>
- Investing.com (2016) Forex [Data tables]. Retrieved from <http://www.investing.com/currencies/>
- Ito, H. & Chinn, M. (2014) The Rise of the “Redback” and the People’s Republic of China’s Capital Account Liberalization: An Empirical Analysis of the Determinants of Invoicing Currencies [Paper]. Retrieved from <https://www.adb.org/sites/default/files/publication/156328/adb-wp473.pdf>
- Judson, R.A. (2012) Crisis and Calm: Demand for U.S. Currency at Home and Abroad from the Fall of the Berlin Wall to 2011 [Paper]. Retrieved from <http://www.federalreserve.gov/pubs/ifdp/2012/1058/default.htm>
- Kenen, P.B. (1983) The Role of the Dollar as an International Currency [Paper]. Retrieved from http://group30.org/images/uploads/publications/G30_RoleDollarIntlCurrency.pdf
- Kia, A. (1996) Overnight covered interest parity: Theory and practice. *International Economic Journal*, 10(1).
- Kindleberger, C.P. (1967) *The Politics of International Money and World Language*. Essays in *International Finance*, 61.
- Koo, R.C. (2009) *The Holy Grail of Macroeconomics: Lessons from Japan’s Great Recession*, John Wiley & Sons (Asia) Pte. Ltd.
- Kosar, K. R. (2007) Government-Sponsored Enterprises (GSEs): An Institutional Overview [Paper]. Retrieved from <https://www.fas.org/sgp/crs/misc/RS21663.pdf>

- Kraay, A. & Ventura, J. (2005) The Dot-Com Bubble, the Bush Deficits and the U.S. Current Account [Paper]. Retrieved from <http://www.nber.org/papers/w11543>
- Krugman, P. (1984) The International Role of the Dollar: Theory and Prospect [Chapter]. Retrieved from <http://www.nber.org/chapters/c6838.pdf>
- Krugman, P. (2012) Fighting Fiscal Phantoms [Article]. Retrieved from <http://www.nytimes.com/2012/11/26/opinion/krugman-fighting-fiscal-phantoms.html?src=recg&r=0>
- Lai, E.L.C. & Yu, X. (2015) Invoicing Currency in International Trade: An Empirical Investigation and Some Implications for the Renminbi. *The World Economy*, 38(1), 193-229.
- Lewis, P.R. & Jones, G.D.B. (1970) Roman Gold-Mining in North-West Spain. *Journal of Roman Studies*, 60(1), 169-185.
- Lothian, J.R. & Wu, L. (2011) Uncovered interest-rate parity over the past two centuries. *Journal of International Money and Finance*, 30(3), 448-473.
- Mataloni, R.J. (2000) An examination of the Low Rates of Return of Foreign-Owned U.S. Companies [Paper]. Retrieved from https://www.researchgate.net/publication/228119738_An_Examination_of_the_Low_Rates_of_Return_of_Foreign-Owned_US_Companies
- McKinnon (2005) Trapped by the International Dollar Standard [Paper]. Retrieved from http://networkideas.org/feathm/sep2006/pdf/Trap_Mckinnon.pdf
- McKinnon, R. & Schnabl, G. (2004) The East Asian Dollar Standard, Fear of Floating and Original Sin. *Review of Development Economics*, 8(3), 331-360.
- Meera, A.K.M.M. (2002) Hedging Foreign Exchange Risk with Forwards, Futures, Options and the Gold Dinar: A Comparison Note [Paper]. Retrieved from <https://www.lariba.com/site/pdf/Malaysia%20-%20GOLD%20-%20Hedging%20With%20Dinar.pdf>
- Mileva, E. & Siegfried, N. (2007) Oil Market Structure, Network Effects and the Choice of Currency for Oil Invoicing [Paper]. Retrieved from <https://www.ecb.europa.eu/pub/pdf/scpops/ecbocp77.pdf>
- Mundell, R.A. (1961) A Theory of Optimum Currency Areas, *The American Economic Review*, 51(4), 657-665.
- Mundell, R.A. (1971) The Dollar and the Policy Mix: 1971 [Essay]. Retrieved from https://www.princeton.edu/~ies/IES_Essays/E85.pdf

- Mursa, G. (2014) Euro – Advantages and Disadvantages [Paper]. Retrieved from http://ceswp.uaic.ro/articles/CESWP2014_VI3_MUR.pdf
- Nanto, D.K. (2007) Japan's Currency Intervention: Policy Issues [Report]. Retrieved from <https://www.fas.org/sgp/crs/row/RL33178.pdf>
- National Bureau of Statistics of China (2016) Statistical Communiqué of the People's Republic of China on the 2015 National Economic and Social Development [Report]. Retrieved from http://www.stats.gov.cn/english/PressRelease/201602/t20160229_1324019.html
- NBC News (2011) Greenspan: Downgrade 'hit a nerve' [video]. Retrieved from <http://www.nbcnews.com/id/21134540/vp/44036029#44050320>
- Norwegian Ministry of Finance (2016) National Budget [Reports]. Retrieved from <http://www.statsbudsjettet.no/Revidert-budsjett-2016/English/>.
- Observatory of Economic Complexity (2016) Visualizations [graphs]. Retrieved from <http://atlas.media.mit.edu/en/>
- Porter, R.D. & Judson, R.A. (1996) The Location of US Currency: How Much Is Abroad?. Retrieved from <https://www.federalreserve.gov/pubs/bulletin/1996/1096lead.pdf>
- Portes, R. & Rey, H. (1997) The Emergence of the Euro as an International Currency [Paper]. Retrieved from http://www.helenerey.eu/AjaxRequestHandler.ashx?Function=GetSecuredDOC&DOCUrl=App_Data/helenerey_eu/Published-Papers_en-GB/Documents_2012-13/71515708661_67186463733_ecopolicy.pdf
- Prasad, E.S. (2014) The Dollar Trap. Princeton University Press.
- Rodrik, D. (2008) The Real Exchange Rate and Economic Growth. Retrieved from <https://www.brookings.edu/bpea-articles/the-real-exchange-rate-and-economic-growth/>
- Rueff, J. & Hirsch, F. (1965) The Role and the Rule of Gold: an Argument [Interview]. Retrieved from https://www.princeton.edu/~ies/IES_Essays/E47.pdf
- Saudi Arabian Monetary Agency (2015) Fifty First Annual Report [Report]. Retrieved from <http://www.sama.gov.sa/en-US/EconomicReports/Pages/AnnualReport.aspx>
- Skinner, F.S. & Mason, M. (2011) Covered interest rate parity in emerging markets. *International Review of Financial Analysis*, 20, 335-363.

Smith, A. (1776) *An Inquiry into the Nature and the Causes of the Wealth of Nations*. London: W. Strahan and T. Cadell.

State Administration of Foreign Exchange (2016) Balance of Payments [Data tables]. Retrieved from <http://www.safe.gov.cn/wps/portal/english/Data/Payments>

Statistics Norway (2016) Balance of Payments [Data tables]. Retrieved from <https://www.ssb.no/statistikkbanken/selecttable/hovedtabelIHjem.asp?KortNavnWeb=ur&CMSSubjectArea=utenriksokonomi&PLanguage=1&checked=true>

SWIFT (2015) Worldwide Currency Usage and Trends [Paper]. Retrieved from <https://www.swift.com/node/19186>

SWIFT (2016) RMB Tracker documentation centre [Presentations]. Retrieved from <https://www.swift.com/our-solutions/compliance-and-shared-services/business-intelligence/renminbi/rmb-tracker/document-centre#topic-tabs-menu>

Swiss National Bank (2016) Foreign currency investments and Swiss franc bond investments (end of Q2 2016) [Table]. Retrieved from http://www.snb.ch/en/i/about/assets/id/assets_reserves

Tavlas, G.S. (1997) The International Use of the US Dollar: An Optimum Currency Area Perspective. *The World Economy*, 20(6), 709-747.

Taylor, M.P. (1989) Covered interest arbitrage and market turbulence. *Economic Journal*, 99, 376-391.

Triffin, R. (1978) The International Role and Fate of the Dollar. *Foreign Affairs*, 57(2), 269-286.

Trump, D.J. (2016a) REFORMING THE U.S.-CHINA TRADE RELATIONSHIP TO MAKE AMERICA GREAT AGAIN [Statement]. Retrieved from <https://www.donaldjtrump.com/positions/us-china-trade-reform>

Trump, D.J. (2016b) COMPELLING MEXICO TO PAY FOR THE WALL [Statement]. Retrieved from <https://www.donaldjtrump.com/positions/pay-for-the-wall>

UN Comtrade (2016) UN Comtrade Database [Data tables]. Retrieved from <http://comtrade.un.org/>

US Treasury (2006) The Use and Counterfeiting of United States Currency Abroad, Part 3 [Paper], Retrieved from <https://www.treasury.gov/about/organizational-structure/offices/Domestic-Finance/Documents/the%20use%20and%20counterfeiting%20of%20u.s.%20currency%20abroad%20%20part%203%20september2006.pdf>

US Treasury (2008) Statement by Secretary Henry M. Paulson, Jr. on Treasury and Federal Housing Finance Agency Action to Protect Financial Markets and Taxpayers [Statement]. Retrieved from <https://www.treasury.gov/press-center/press-releases/Pages/hp1129.aspx>

US Treasury (2016) MAJOR FOREIGN HOLDERS OF TREASURY SECURITIES [Data table]. Retrieved from <http://ticdata.treasury.gov/Publish/mfh.txt>

Utley, J.B. (2016) Trump's Trade Deficits [Article]. Retrieved from <http://www.theamericanconservative.com/articles/trumps-trade-deficits/>

Vasey, M. (1968) International monetary reform and the reserve currency problem. *Lo Spettatore Internazionale*, 3(4), 409-428.

Wade, R. & Veneroso, F. (1998) The Asian Crisis: The High Debt Model Versus the Wall Street-Treasury-IMF Complex [Paper]. Retrieved from <http://content.csbs.utah.edu/~mli/Economies%205430-6430/Wade-The%20Asian%20Crisis.pdf>

Wolf, M. (2014) *The Shifts and the Shocks: What We've Learned—and Have Still to Learn—from the Financial Crisis*. Penguin Press.

World Bank (2016) World Bank Open Data [Data tables]. Retrieved from <http://data.worldbank.org/>

Zemmour, E. (2014) *Le Suicide Français*. Albin Michel.

Zhang, X. (2006) Specification tests of international asset pricing models. *Journal of International Money and Finance*, 25(2), 275-307.