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The Effect of External Positions on FX Misalignments

A study of the G10 countries applying the Macroeconomic Balance Approach

Abstract

The aim of this paper is to investigate if the macroeconomic balance approach will generate different misalignments whether net foreign assets or cumulative current account is applied. The dataset consist of the G10 countries and range from 1981 to 2011. The relevant determinants of the current account are found to be fiscal balance, population growth, net foreign assets, cumulative current account and trade integration. The cumulative current account is concluded to have a greater impact on the current account than net foreign assets, which in turn results in a larger misalignment when the cumulative current account is significantly high or low. It is impossible to conclude whether net foreign assets or the cumulative current account is a better proxy for the external position of a country. However, the cumulative current account does in some cases appear to provide results that seem more in line with reality using subjective judgment. Valuation effects could be seen as enhancing net foreign assets as a measure, but could also contribute to misleading implications of the state of an economy.

Keywords: Foreign exchange rate assessment, macroeconomic balance approach, net foreign assets, cumulative current account

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ABBREVIATIONS

Balance of Payments	BoP
Current Account	CA
Cumulative Current Account	CCA
Equilibrium Current Account	ECA
Equilibrium Real Exchange Rate	ERER
External Sustainability	ES
International Investment Position	IIP
International Monetary Fund	IMF
Macroeconomic Balance	MB
National Bureau of Economic Research	NBER
Net Foreign Assets	NFA
Underlying Current Account	UCA

1 INTRODUCTION

The world is becoming more and more integrated and world trade has grown by an astonishing eight times[1] since the 1980´s. This have led to an increased importance of understanding the drivers of foreign exchange rates and its effect on firms, governments, banks and other market participants.

Predictability in the foreign exchange market is essential for firms to have the courage to invest internationally as well as in future activities, which prompt world trade and sustainable economic growth. Today there is no generally accepted approach to value exchange rates, and numerous researchers argue that a couple of approaches should be used in combination to get a reliable assessment. This paper focuses on the macroeconomic balance (MB) approach, which is an equilibrium approach where the misalignment is measured by comparing an estimated underlying current account (UCA) to an equilibrium current account (ECA). (IMF, 2006A)

The current account (CA) is the main part of a countries balance of payments and it refers to the flows of payments and receipts from goods and services, income and current transfers (IMF, 2007). The CA has long been used as an indicator of currency misalignments, and has become even more important due to the currently ongoing sovereign debt crisis. Some economists even states that the euro area suffers from a balance of payments crisis, and not a debt crisis (Krugman, 2013).

The net international investment position (IIP) of a country, which is one of the determinants of the CA, is essential to estimate for many reasons. However, making it correspond to the basic accounting identity in international economics has proven to be impossible. Obviously, for every debtor there must be a creditor and the external balances should add to zero. Still, this is not the case in practice. The structure of international balance sheets differs tremendously across countries along dimensions such as the composition of debt and equity, currency, maturity structures and liquidity. This means that a change in the relative prices of assets have implications for the dynamics of external balances. This in turn leads to

[1] World trade has grown by approximately eight times since 1981 according to WTO statistics (WTO, 2013).

asymmetric valuation affects in the financial terms of trade, since individual countries have variable exposures to specific assets. (Lane & Milesi-Ferretti, 2005)

Net foreign assets (NFA) and the cumulative current account (CCA) are two of the measures that can be estimated to determine the external position of a country. The two measures should theoretically show the same result, but as the asymmetric valuation effects described above are present these two measures can differ substantially. One would though expect them to point in the same direction and give a somewhat similar picture of the state of the economy. One example of these differences is a study on the Swedish external position conducted by Statistics Sweden in 2012. This study discusses and questions the large difference between NFA and the CCA. According to the authors, NFA show an official net position of close to negative 500 million in 2012, while the CCA is well above 2 billion. In this case, intuition probably tells most of us that the CCA is a better measure, as Sweden is generally known to have strong fundamentals. More evidence concerning this problem can be seen in a study by Lane and Milesi-Ferretti (2006A) were large discrepancies between the variables are observed. These results awakens the question which one of these measures that states the external position of a country in the most ”truthful” way, and which one of the measures that would give the most reliable misalignment when it is used as a determinant of the CA in the MB approach. To the knowledge of the authors, there are no studies investigating the impact and differences in misalignments when the CCA replaces NFA in the MB approach. Hence, the purpose of this paper is to investigate how the exchange rate misalignment will differ when the CCA replaces NFA. This purpose translates into the following research question:

How will the foreign exchange rate misalignment be affected by the discrepancy between NFA and CCA when the MB approach is applied to the G10 countries between 1981 and 2011?

The outline of the thesis is organized as follows; Chapter 2 presents and explains important theories to set the base knowledge for understanding all of the components involved in the MB approach. In Chapter 3 the methodology is presented together with a description of the dataset, and Chapter 4 presents the results as well as a thorough analysis. In Chapter 5, the main results are summarized and the conclusions derived from the analysis will be stated.

2 THEORY

This chapter presents the theoretical background to the chosen methodology. It starts by presenting the building blocks of the balance of payments with an in depth explanation of the current account as well as an explanation of the relationship between net foreign assets and the cumulative current account. This is followed by a presentation of the theory behind the macroeconomic balance approach.

2.1 Balance of Payments

The Balance of Payments (BoP) expresses the relationship between countries accounting record of all monetary transactions with the rest of the world. In other words, the BoP refers to a country´s record of payments and receipts of its residents to the transactions with residents of other countries. The BoP is vital for national and international policy formulation in an increasingly interdependent world economy. Moreover, the BoP is of great importance in research such as determination of the causes of payment imbalances, implementation of adjustment measures, relationships between trade and direct investments, international banking flows etc. (IMF, 2007)

IMF (2007) structures the BoP through the components *current, financial and capital account*. The major classifications of the CA are goods and services, income and current transfer. The CA can be defined as all transactions that involve economic values and occur between residents and non-resident entities. The components of the *financial account* consist of direct investments, portfolio investments, other investments and reserve assets, and the *capital account* components consist of capital transfers and acquisitions of non-produced, non-financial assets[2].

2.1.1 The Current Account

As previously stated, the CA refers to the payments and receipts of *goods and services*, *income* and *current transfers*. *Goods* cover general merchandise that is exported or imported. Furthermore, it covers goods for processing abroad, repairs on goods, goods produced in ports by carriers as well as non-monetary gold exports and imports. *Services* covers the transaction between residents and nonresidents with regards to transportation, travel costs

[2] Non-produced, non-financial assets covers intangibles such as patented entities, leases or goodwill etcetera.

communications services and construction, insurance services, financial services, computer and information services, royalties and license fees as well as other business services. Moreover, *services* cover temporary construction services abroad. *Income* refers to compensation of nonresident investors as well as investment income of nonresident investors. *Current transfers* are transfers of ownership of real resources or financial items between residents and non-residents. (IMF, 2007)

The foreign exchange rate in a country is related to the CA since the CA should reflect the state of the economy. If a country`s exports and imports balance, and if it is gaining from inflows of capital on the capital account, the currency will appreciate in value because of its scarcity in international markets. This means that if a country has a CA balance that is relatively high and positive, the currency will increase in value. (Ickes, 2008)

2.1.2 Net Foreign Assets and the Cumulative Current Account

IMF (2007) defines the IIP as a country´s stock of external financial assets and liabilities (also referred to as NFA). The NFA position is related to the BoP since a change in NFA is equal to the CA balance of the country[3]. In other words, a country that runs a CA deficit will have to borrow abroad, which decreases the NFA position in order to balance the CA. When a country runs a CA surplus the country will generate savings, which in an open economy will be invested abroad and hence increase the NFA position. (Sörensen & Whitta-Jacobsen, 2010)

From another point of view, the NFA position of a country equals the CCA, which is the sum of a country`s CA balance (Ickes, 2008). This is intuitive since a country`s debt is the cumulative value of past lending and borrowing. However, valuation effects influence NFA and lead to a discrepancy between the variables. Ickes (2006) refers to the CCA as the "naive" measure of the net external position as it under- or overstates the NFA, which is referred to as the "true position"[4]. To see this, one needs to understand the properties of NFA:

$$NFA_{it} = FDI^*_{it} + D^*_{it} + P^*_{it} + FX_{it} \qquad (1)$$

Where FDI^*_{it} is net foreign direct investment, D^*_{it} is the net external debt, P^*_{it} is net portfolio holdings and FX_{it} is foreign exchange reserves. These components are all influenced by

[3] Note that NFA is a stock variable and the CA balance is a flow variable.

[4] Note that this does not say anything about which variable that explains the state of the economy in the most correct way, it is only used to refer to how NFA and CCA is related to each other.

valuation effects due to differences in asset valuations and foreign exchange rate movements. Thus, the NFA position and the CCA rarely balance, as it should in theory. The NFA position of a country is therefore the CCA plus valuation effects, as described in equation (2). (Lane & Milesi-Ferretti, 2001)

$$NFA_{it} = CCA_{it} + Valuation\ effects_{it} \qquad (2)$$

2.2 The Macroeconomic Balance Approach

The MB approach is an equilibrium approach that is applied in order to capture possible foreign exchange rate misalignments. The MB approach was initially employed by the IMF for exchange rate surveillance, and focuses on the requirements of achieving internal and external balance simultaneously. The approach involves three steps: first, the UCA is estimated in order to find the real exchange rate, R^1. Second, the ECA is estimated such that the equilibrium value of the real exchange rate, R^*, is obtained. Third, the slope of the UCA line is used to estimate how much R would have to change to eliminate the gap between the real exchange rate, R^1, and the equilibrium value of the real exchange rate, R^*. (Isard et al, 2001)

Figure 1: Illustration of the MB framework

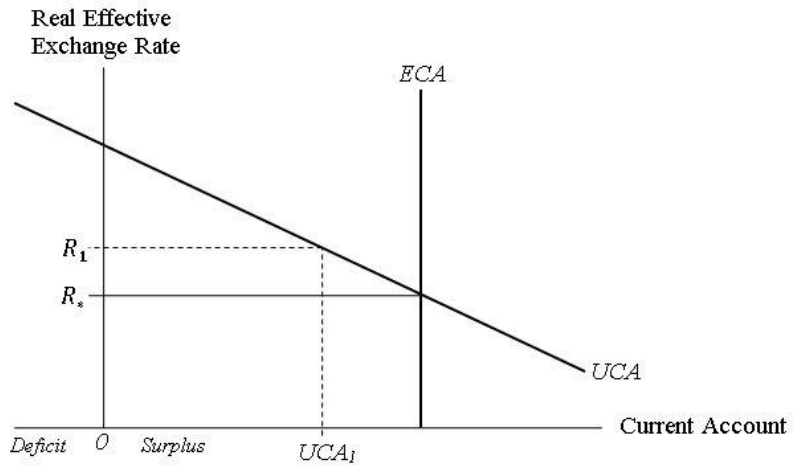

Figure 1[5] illustrates the basics of the MB framework where the relationship between the UCA and the real exchange rate can be seen in the negatively sloped line. This means that an increase in real exchange rate corresponds to an appreciation of the domestic currency.

[5] Based on figure 4 from Isard (2007:15).

Furthermore, the negative slope implies that an appreciation in the real exchange rate worsen the CA over the medium-term because of the decrease in the country`s relative competitiveness. The vertical line represents the difference between domestic savings and investments[6], which is the ECA, assumed to be independent of the real exchange rate. The intersections of the UCA and ECA line determine the equilibrium value of the real exchange rate. An UCA that is lower than the ECA would mean that the foreign exchange rate needs to depreciate in order to increase the UCA, which would imply that the foreign exchange rate is overvalued. If the UCA is higher than the ECA the foreign exchange rate needs to appreciate in order to decrease the UCA, which would imply that the foreign exchange rate is undervalued. (Isard et al, 2001)

The IMF (1999) is estimating the UCA to be the CA balance that would emerge at current market exchange rates if all countries were producing at their potential output level. Further, the ECA is determined by the coefficients of the variables determining the UCA. Explanatory variables for the UCA are explained in detailed in chapter 2.2.1. Country specific semi-elasticities[7] are applied in order to translate the gap between the UCA and the ECA into a relation between the actual and the equilibrium foreign exchange rate (Salto & Turrini, 2010). Moreover, the semi-elasticities capture the speed at which a country can close this gap.

2.2.1 Variables Determining the Current Account

Chinn & Prasad (2003) specifies a number of explanatory variables that determines the CA; fiscal balance, demographics, NFA, oil balance, economic crises and trade integration.

Fiscal balance: The fiscal balance is the ratio of the general government budget balance to GDP in deviation from the average budget balance of trading partners. The fiscal balance affects the CA balance through the government budget balance and national savings (Ahmed, 1986 and Chinn, 2005). A higher (lower) government budget balance will increase (decrease) national savings and hence increase (decrease) the CA balance. However, if the government budget balance were to increase in all countries there would be a modest effect on the CA balance of each country. Instead, there would be a world-wide macroeconomic effect.

[6] The equilibrium CA was called the savings-investment model in earlier versions of the MB approach.

[7] The semi-elasticity consists of country specific export and import in relation to GDP, as well as country specific trade elasticities.

Demographics: The CA is affected negatively by a higher share of the economically inactive dependent population, since it decreases national savings (Higgins, 1998 and Bloom & Canning, 2004). Higgins (1998) concludes that a substantial negative effect on national savings is due to increases in both the youth and old-age dependency ratios.

Net Foreign Assets: NFA is defined as a country´s stock of external financial assets and liabilities. The level of NFA can affect the CA balance in two ways. It can potentially be negatively related since an economy with a relatively high NFA can run CA deficits on an extended basis and still remain solvent. However, a positive relationship can occur as countries with high NFA experience high net foreign income flows. (Lane & Milesi-Ferretti, 2001). According to open economy macroeconomic models the second relationship should be stronger. The intuition is that if this was not true, NFA would tend to systematically increase in debtor countries and decline in creditor countries (Lane & Milesi-Ferretti, 2001).

Oil Balance: Oil balance influences the CA balance through oil prices, and the effect would differ whether or not a country is a net exporter or net importer. For instance, higher (lower) oil prices decrease (increase) the CA balance of oil importing countries and increase (decrease) the CA balance of oil exporting countries (IMF, 2006B).

Economic Crises: Sharp CA adjustments are expected during economic crises due to macroeconomic contraction, reduction of international financing sources and/or reduction of net external liabilities (Gruber & Kamin, 2005).

Trade integration: Substantial CA balance surpluses are expected for economies that serve as hubs for international financing flows. These economies tend to have net creditor positions which will have an influence on the CA balance. Furthermore, openness to trade is possibly correlated with other attributes that make a country attractive to foreign capital, which in turn will affect the CA balance (Bussiére et al, 2010).

3 METHODOLOGY

This chapter includes a detailed presentation of how the macroeconomic balance approach has been applied in this study. Furthermore, the chapter describes the data and its implications in detail.

3.1 Methodology Background

The method used in this study was first developed by the IMF in the 1960´s, and have since then been enhanced further by various IMF researchers, the CGER team, the European Commission as well as by independent researchers. The model in this study is built upon the MB approach and it has taken findings from various previous studies in consideration to form a framework that, according to the authors, suits the characteristics of the dataset in an optimal way. The objective of the study is to estimate the exchange rate misalignments of the G10 countries, both by applying the traditional specification where NFA is used as proxy for external position, but also by applying a new specification where the CCA is used instead. The difference between an estimated UCA will be compared to an estimated ECA in an attempt to derive how much the exchange rate would have to appreciate/depreciate to reach the equilibrium level. The analysis has been conducted in Eviews and MS Excel.

3.2 Motivation to the Choice of Model

There are various ways of determining exchange rate misalignments, but no generally accepted approach. In addition to the MB approach, the IMF CGER team has examined the ERER approach and the ES approach in their exchange rate assessment. They argue that all these three approaches complement each other and neither one should be used in isolation (IMF, 2006A). This paper does not argue that the MB approach would be the better approach used in isolation, but rather tries to improve this approach as a building block in a larger setting.

The MB approach is chosen for this analysis because of its historical importance in exchange rate assessments. The IMF staff started with key features of the MB approach as early as 1967, when they tried to evaluate the prospective devaluation of the sterling. The approach was also chosen because of its appropriateness to examine how the use of NFA and CCA will affect the misalignment.

3.3 Estimation Approach

There are three steps in the MB estimation process of the exchange rate misalignment. *First*, the UCA is specified according to CGER´s exchange rate assessment (IMF, 2006A). This step is done to produce coefficient estimates that later are used to estimate the ECA in step 2. The UCA is the relevant measure to use when evaluating exchange rates from a medium-term perspective, and it is defined as the value that the CA would exhibit if a country were producing at potential output levels. Lagged effects of past exchange rate changes are assumed to have been fully realized. *Second*, the ECA is estimated by using the coefficient estimates from the first step and applying these to the historical values of the explanatory variables. *Third*, the ECA is subtracted from the UCA, and then divided by the semi-elasticity. This will translate the gap into a foreign exchange rate misalignment that indicates how much a currency would have to appreciate/depreciate for the UCA to reach its equilibrium level, ECA (Isard et al, 2001).

3.3.1 Step 1: Specification of the Underlying Current Account

There will be two specifications of the UCA in this paper. The first one is the traditional one that includes the NFA (IMF, 2006A), and the second one is particular for this study, where the CCA replaces NFA. The specification of the UCA model is done by using a specific-to-general approach (Brooks, 2008).

$$ca_{it} = \alpha + \beta_1 Fiscal_{it} + \beta_2 Old_{it}^{d} + \beta_3 Pop_{it}^{d} + \beta_4 \boldsymbol{NFA_{it-1}} + \beta_5 Oil_{it} + \beta_6 Crisis_{it} + \beta_7 Trade_{it} + \varepsilon_{it} \quad (3)$$

$$ca_{it} = \alpha + \beta_1 Fiscal_{it} + \beta_2 Old_{it}^{d} + \beta_3 Pop_{it}^{d} + \beta_4 \boldsymbol{CCA_{it-1}} + \beta_5 Oil_{it} + \beta_6 Crisis_{it} + \beta_7 Trade_{it} + \varepsilon_{it} \quad (4)$$

Where α is the intercept, β_k is the loading on each explanatory variable and ε_{it} is an error term. The explanatory variables of the UCA used in the above panel regression are explained below. All variables are four year moving averages in order to filter out high-frequency fluctuations, and hence capture the medium-term relationship with the CA.

Fiscal balance: The fiscal balance ($Fiscal_{it}$) is defined as the general government structural balance ($GGSB_{it}$) to GDP, in deviation from the average ratio of trading partners. (Chinn, 2005)

$$Fiscal_{it} = (GGSB_{it}/GDP_{it}) - \frac{1}{N}\sum_{i=1}^{i}(GGSB_{it}/GDP_{it}) \quad (5)$$

Demographics: In order to account for demographic differences both the old-age dependency ratio (Old_{it}^{d}) and the population growth rate (Pop_{it}^{d}) are used. The old-age dependency ratio is the proportion of dependants, i.e. old people (over 64 years old) per 100 working age-population (between 15 and 64 years old). The annual population growth rate is the exponential percentage growth of midyear population year t-1 to t, and is derived from the total population. (The World Bank, 2013)

$$Old_{it}^{d} = Old_{it} - \left(\frac{1}{N}\sum_{i=1}^{i} Old_{it}\right) \quad (6)$$

$$Pop_{it}^{d} = Pop_{it} - \left(\frac{1}{N}\sum_{i=1}^{i} Pop_{it}\right) \quad (7)$$

Where $\mathrm{Old}_{\mathrm{it}}^{\mathrm{d}}$ is the demeaned old-age dependency ratio and Pop_{it}^{d} is the demeaned population growth.

Net Foreign Assets: The NFA (NFA_{it-1}) is the initial NFA position divided by GDP. In order to avoid a reverse link to the CA balance, NFA is lagged by one year in the regression specification (3).

$$NFA_{it} = \frac{nfa_{it}}{GDP_{it}} \quad (8)$$

Cumulative Current Account: The CCA (CCA_{it-1}) is a stock variable and is the aggregated CA over the sample period. It is lagged by one year in the regression specification (4) to avoid a reverse link to the CA.

Oil Balance: IMF (2006A) estimate oil balance (Oil_{it}) as export minus import as a ratio to GDP. In the equation below, $\mathrm{Oil}_{\mathrm{it}}^{\mathrm{X}}$ is a country`s oil export at time t and $\mathrm{Oil}_{\mathrm{it}}^{\mathrm{M}}$ is a country`s oil import at time t.

$$Oil_{it} = \frac{1}{GDP}(Oil_{it}^{X} - Oil_{it}^{M}) \quad (9)$$

Economic Crisis: In order to capture the effect of an economic crisis ($Crisis_{it}$), which could have an impact on the current account, the general methodology of The National Bureau of Economic Research (NBER) is used (NBER, 2010). This methodology defines a macroeconomic contraction as a decline in GDP growth over two consecutive quarters.

$$Crisis_{it} = ln(GDP_{it}^{SA}/GDP_{it-1}^{SA}) \quad (10)$$

Where $\mathrm{GDP}_{\mathrm{it}}^{\mathrm{SA}}$ is a country`s seasonal adjusted GDP at time t and $\mathrm{GDP}_{\mathrm{it-1}}^{\mathrm{SA}}$ is the same for the previous year. From the result of the above, dummy variables are constructed where 1 denotes

a contraction and 0 is used otherwise. In this way it is possible to examine if previous economic recessions have had a significant effect on the UCA.

Trade integration: Trade integration ($Trade_{it}$) is defined as the sum of export and imports to GDP, which is in accordance with Chinn and Prasad´s (2003). The estimation of trade integration is shown below, where X_{it} and M_{it} denotes a country`s export and import at time t.

$$Trade_{it} = \frac{1}{GDP_{it}}(X_{it} - M_{it}) \quad (11)$$

The variables that show a significant impact on the UCA will be used in the next step to generate the ECA.

3.3.2 Step 2: Estimation of the Equilibrium Current Account

The ECA is estimated by using the coefficients generated by the UCA regression and by applying these to the medium-term values of the regressors[8]. This will filter out high frequency fluctuations, which enables the specification to show the medium-term relation between the CA and its determinants. This creates an equilibrium relationship between the set of plausible macroeconomic fundamentals and the CA.

3.3.3 Step 3: Foreign Exchange Rate Misalignment

In order to estimate the foreign exchange rate misalignment one needs to obtain the semi elasticity $\eta_{i,t}$, which is shown in formula (12) below:

$$\eta_{it} = \frac{P_{it}^{X} X_{it}}{P_{it} Y_{it}} \eta_X - \frac{P_{it}^{M} M_{it}}{P_{it} Y_{it}} (\eta_M - 1) \quad (12)$$

Where $P_{it}^{X}X_{it}$ and $P_{it}^{M}M_{it}$ are nominal export and import. $P_{it}Y_{it}$ is the nominal GDP, and η_X and η_M are trade elasticity`s. According to Salto and Turrini (2010) the values for the trade elasticities are set to η_X= -1.5 and η_M=1.25, which they argue are consistent with previous empirical estimations[9] on aggregate data on advanced economies during the last decade. The foreign exchange rate misalignment is calculated as the difference between UCA and ECA divided by the semi-elasticity.

$$r = \frac{UCA_{it} - ECA_{it}}{\eta_{it}} \quad (13)$$

[8] Medium-term is defined as the 4 year moving average according to Lee et al (2008).
[9] See Goldstein and Kahn (1985) for a comprehensive survey.

3.4 Data

The data used in this study consists of a panel dataset collected from Macrobond, where databases such as IMF (WEO, IFS etc) and World Bank (WDI) are available. This study investigates the G10 countries: Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States. To the knowledge of the authors, no such study has been conducted on this set of countries before. The data used in this study can be considered rather homogenous as it focuses on some of the most influential industrial countries in the world. This provides sharper statistical results than studies where more heterogeneous samples are used. The most recent research is conducted by Bussiére et al. (2010) on a dataset that runs from 1981 to 2005. In this study we extend this time-horizon to run from 1981 to 2011[10], and will in this way capture the years after the financial crisis that started in 2007. The sample is an unbalanced dataset consisting of 2889 observations. All prices are obtained in, or recalculated into USD.

The UCA as percentage of GDP is withdrawn from the IMF WEO database. It is based on CA projections made by IMF´s country experts in connection with the World Economic Outlook exercise. For industrial countries the projections are conditional on unchanged real exchange rates and that countries are operating at potential output levels[11] (Isard et al, 2001).

Country specific GDP is collected from the IMF WEO database as fiscal balance, oil balance, NFA, trade integration and economic crisis are all calculated as a ratio to GDP.

The general government structural balance as a percentage of GDP is obtained from the IMF, WEO database and is used in order to calculate the variable fiscal balance. The old-age dependency ratio is obtained from the World Bank (WDI database) and is used to account for demographic differences. Population growth is collected from the World Bank (WDI database) as well. NFA is gathered through two sources. Data between 1981 and 2007 is gathered from the database created by Lane and Milesi-Ferretti (2006B) where data from 1970-2007 is available. Data between 2008 and 2011 is obtained from IMF`s database in order to extend the dataset to 2011. Oil export and import is obtained from IMF, WEO.

[10] To check for robustness, the same time horizon as IMF (2006A) has been used (30 years).
[11] According to Isard et al(2001) this estimation of the CA can be interpreted as the underlying CA.

Country specific export and import is obtained from IMF IFS in order to calculate trade integration.

In this paper the countries of the euro area are treated as separate economies for two reasons: 1) relative inflation can still make the real effective exchange behave differently from country to country; and 2) the sample includes pre-euro data.

In accordance with previous studies the analysis will be conducted using panel data estimation[12] and fixed effects are applied in an attempt to capture cross-country variation. To be able to use OLS panel estimation the series must be stationary. The series are tested for the presence of a unit root and for cointegrating properties by using the approach by Enders (2009)[13]. Non-stationary series are adjusted for by first order integration. Period serial correlation is accounted for by using White´s coefficient covariance method, which generates robust standard errors.

[12] For example in IMF (2006A), Salto and Turrini (2010) and Isard et al., (2001).
[13] Chapter 2, stationary time series models.

4 EMPIRICAL FINDINGS & ANALYSIS

This chapter presents the empirical findings through a detailed analysis of the explanatory variables of the underlying current account. Furthermore, the chapter includes a detailed analysis of the differences in foreign exchange rate assessment depending on the use of either net foreign assets or the cumulative current account.

4.1 Specification of the Underlying Current Account

Tables of results for the medium-term determinants of the UCA[14] are presented in Table 1 and 2 in Appendix. The result for the NFA specification will be reported first and the CCA specification second.

The final specification when NFA is applied show a significant coefficient on fiscal balance of 0.24, which is in accordance with previous studies[15]. The positive coefficient indicates that an increase in fiscal balance, i.e. a rise in national savings of 1 percentage-point, leads to an increase in the CA by 0.24 percentage-points.

The effect of demographics on the CA is explained through the old-age dependency ratio and the population growth. The old-age dependency ratio is insignificant whereas the population growth is significant with a negative coefficient of 2.34 in the final specification. This implies that a 1 percentage-point increase in the population growth rate, relative to trading partners, will weaken the CA balance by 2.34 percentage points. This result is consistent with previous studies[16] and means that the G10 countries have faced an increased population that is economically inactive, which has resulted in reduced national savings, and hence decreased the CA.

NFA is significant with a coefficient of 0.04, indicating that a raise in NFA by 10 percent of GDP will increase the CA balance by 0.04 percent of GDP i.e. higher net foreign income flows tend to create a higher level of CA. This is not surprising, as previous studies[17] have also found this positive relationship. The result is also consistent with open economy

[14] From here forth the CA refers to both UCA and ECA.

[15] Ahmed (1986) and Chinn (2005) conclude that a higher (lower) government budget balance will increase (decrease) national savings and hence increase (decrease) the CA balance.

[16] Higgins (1998) conclude a substantial negative effect on national savings due to increases in population growth rate.

[17] Lane and Milesi-Ferretti (2001) conclude that economies with relatively high NFA will have higher net foreign income flows which in turn will give a positive relationship between NFA and the CA balance.

macroeconomic models where the intuition is that if this relationship were not true, NFA would tend to systematically increase in debtor countries and decline in creditor countries.

Trade integration is positively related to the CA with a significant coefficient of 0.06. The positive coefficient is consistent with previous studies[18] as economies that serve as hubs for international financing tend to have net creditor positions. Furthermore, openness to trade is often correlated with other attributes that make a country attractive to foreign capital, which most likely would increase the CA balance.

The determinants that do not have a significant impact on the CA are the old-age dependency ratio (previously discussed), oil balance and economic crisis. The effect of oil balance on the CA depends on whether or not a country is a net exporter or a net importer. Considering the result, one could argue that the oil balance constitute a relatively small part of the G10 countries CA compared to other determinants. The effect of the dummy variable for economic crisis is insignificant, which indicates that economic crisis produce only a temporary effect on the economy (Salto & Turrini, 2010).

The final specification that determines the CA when NFA is applied is fiscal balance, population growth rate, NFA and trade integration. When the CCA replaces NFA, the same specification holds. The regression results are presented in Table 2 in Appendix where one can see that the CCA has a coefficient of 0.33, which is highly significant. This means that the impact of the CCA on the CA is higher than the effect from a move in NFA. The impact on the misalignment will be discussed in detail below.

4.2 Misalignment Analysis – Net Foreign Assets vs. Cumulative Current Account

In this analysis the dynamics of the two specifications will be analyzed in detail. It is important to keep in mind that we are dealing with different specifications, even though they are similar at first sight. One should therefore be careful to compare them directly without considering the underlying dynamics. Furthermore, it is a one-country model, which means that the misalignments are not affecting each other. When the terms under- and overstating of the "true position" are used, it only refers to how the valuation effects affect the NFA. Hence, it does not imply anything about how well it represents the state of the underlying economy. It

[18] Bussiére et al (2010) conclude that substantial CA balance surpluses are expected for economies that serve as hubs for international financing flows.

is also important to keep in mind that the misalignment is thought to move towards equilibrium over a period of 4 years. The foreign exchange rate misalignments, when NFA or CCA is applied, are presented in Table 3, 4 and 5 as well as in Graph 1 and 2 in Appendix. A positive foreign exchange rate misalignment implies an overvaluation whereas a negative misalignment implies an undervaluation. Historical foreign exchange rate misalignments as well as historical NFA and CCA data are presented in Graph 3 to 24 in Appendix. Furthermore, valuation effects are shown in Graph 25 to 35 in Appendix.

Starting with the countries of the euro area, the NFA of Belgium has been larger than the CCA during 2011. However, the opposite was true between 2002 and 2010. This means that Belgium experienced positive valuation effects in 2011 and negative valuation effects between 2002 and 2010. In 2011 the CCA understates the "true position" of the country with approximately 2 percent of GDP. The model implies a misalignment of 14.8 percent when the CCA is applied, which can be compared to 10.0 percent when NFA is used. As could be seen in the final specification in Table 1 and 2, the CCA coefficient is significantly larger than the NFA coefficient. Hence, the ECA will move further away from the UCA as the CCA show large positive and negative values, which in this case creates a larger misalignment than if NFA is applied. The currency would need to weaken in an attempt to reach the ECA, thus the currency is considered overvalued in 2011 according to both the NFA and the CCA specification. Belgium´s fundamentals look rather healthy, but obviously don't live up to the high relative value that the euro experience today.

France has a larger CCA than NFA during 2011, which means that they experience negative valuation effects i.e. their CCA overstates their "true position". There is though not a large difference in misalignment, which is 16.6 percent when NFA is applied and 17.1 percent when CCA is used. France is currently a net debtor, which can be seen in the negative CCA growth in recent years. Furthermore, NFA are as low as -15 percent of GDP in 2011. This puts France in a very bad position as they need to fund their CA deficit, which will decrease their NFA even further. This scenario will not be sustainable in the long-run. The CCA of France is close to zero, and even if it has a large coefficient it will not push the ECA downwards as much as the NFA in this case, resulting in almost the same misalignment.

Germany´s NFA and CCA have been relatively close during the examination period, with the exception of 2011 when NFA depreciated as the CCA appreciated. Negative valuation effects

will lead to a larger misalignment when the CCA is applied, which is because of the large impact from the CCA coefficient. The negative valuation effects, which push the NFA downwards, will lead to the ECA moving closer to the UCA and resulting in a reduced misalignment. This can be seen in 2011 when the misalignment is 5.0 percent when NFA is applied and 18.7 percent when CCA is used.

Italy has a negative CCA and an even lower NFA, they therefore experience negative valuation effects that results in a larger misalignment when NFA is used. The negative CCA will affect the ECA in a negative direction, which will in fact draw it closer to the UCA. As the CCA overstates the "true position" of Italy it is intuitive to think that it appears less undervalued when measured in this way. The misalignment applying NFA is 15.5 percent and only 7.7 percent when the CCA is used.

The Netherlands have relatively strong fundamentals and have been running CA surpluses during the entire sample period. Their CCA is approximately 40 percentage points larger than the NFA in 2011, which implies negative valuation effects. These effects results in an overvaluation of 18.5 percent using the CCA and a minor overvaluation of 0.5 percent when NFA is applied. The negative valuation effects will push the ECA higher as the CCA overstates the "true position", which leads to a larger misalignment.

According to the model, the euro area countries are all considered overvalued and all but Belgium experience negative valuation effects. Even though these countries can fund themselves with euros, they most probably have a lot of debt in dollars. The negative valuation effects may arise because of the depreciation of the euro against the dollar during 2011. It is also clear that the discrepancy between NFA and the CCA has become larger since the introduction of the euro in 1999. It is evident that the misalignments are larger when the CCA is used, which according to the authors appears to be reasonable result. The euro´s value is largely build upon its position in the currency hierarchy, where it seems to be considered number two after the dollar.

The condition in Sweden is similar to the one in the Netherlands, but more extreme. Sweden has a CCA that is approximately 70 percentage points larger than the NFA, when measured as a percentage of GDP. The negative valuation effects results in an extreme overvaluation when the CCA is applied, as it significantly overstates the "true position". The model implies a

negative misalignment of 1.9 percent when the NFA is applied and a positive misalignment of 30.5 percent when the CCA is applied. The Swedish krona is undervalued when NFA is used since it implies that the ECA is smaller than the UCA. The Swedish krona must then appreciate in value in order for the UCA to decrease (lower competitiveness and thereby lower net export). Moreover, the CCA overstates the net position of Sweden in such a magnitude that it appears extremely overvalued and the UCA should therefore decrease in the medium-term to reach ECA. These results completely contradict each other. As Sweden has been considered a safe haven during the crisis, large flows of capital have entered Sweden. The scarcity of Swedish krona in international markets have probably made the currency appreciate more in value than it would if it was strictly fundamentals that decided it´s value. Considering this, the overvaluation of 30.5 percent appears reasonable and implies that the Swedish krona should decrease in value to reach its ECA.

Switzerland has historically experienced positive valuation effects, with an exception in 2007/2008 when the financial crisis started. The NFA and the CCA are positive during the entire sample period which results in a significantly larger misalignment when the CCA is applied. The large coefficient pushes the ECA far away from the UCA, hence a large misalignment of 60.2 percent emerges. The use of NFA, which has a relatively small effect on the ECA, results in a misalignment of 5.2 percent. It is common knowledge that Switzerland has very strong fundamentals. In 2011 when the Swiss franc reached record highs (because of its safe haven status during the crisis), the Swiss National Bank decided to intervene in the currency market as they considered the country to be hurt by the extreme overvaluation of the currency. This confirms, to some extent, the large misalignment that appears in 2011 as the CCA is applied in the model.

Canada experienced negative valuation effects during the 1980`s and 1990`s, which slowly decreased and changed direction after 2000. Both NFA and CCA are negative over the sample period, however, both variables has recovered over the last 10 years. The small effect from the rather insignificant valuation effects in 2011results in a relatively small difference in foreign exchange rate misalignment. This is due to the fact that the CCA is closer to zero than the NFA, which eliminates some of the effects from the large CCA coefficient. Canada has been seen as a safe haven throughout the financial crisis even though they do not encounter splendid macroeconomic fundamentals. As flows have been going into Canada the Canadian

dollar has become scarce in international markets and in that way the price of the currency have gone up more than it should have in proportion to its fundamentals.

Japan`s NFA and CCA have slowly increased during the sample period where there have only been small negative valuation effects. Hence, the large CCA coefficient creates a larger foreign exchange rate misalignment than NFA (79.0 percent and 17.1 percent respectively). A large overvaluation of the yen is exactly what the Bank of Japan is arguing for, and their reason for intervening in the foreign exchange market to weaken the yen.

The United Kingdom has had large CA deficits since 1984 and has mostly experienced positive valuation effects throughout the sample period. The large negative value of the CCA in combination with the large coefficient will push the ECA downwards and create a large negative misalignment of 15.6 percent, compared to a positive misalignment of 9.8 percent when NFA is applied. This contradicting result appears since the UCA is lower than the ECA (in the NFA specification), which can be explained by the positive valuation effects. The valuation effects are not included in the CCA and therefore it understates the "true position". The explanation to this somewhat odd result is that the CCA implies that the United Kingdom should operate at a lower, even more negative ECA, and to reach this the currency would have to appreciate in value. The NFA specification suggests differently and implies that the currency should depreciate in order to reach the ECA.

The United States is a special case since they can fund their large CA deficit in dollar as it is the world reserve currency. Americans earn more on assets owned abroad than foreigners do on American assets, which is visible through the positive valuation effects. When NFA is used, the model implies that the dollar is overvalued with a misalignment of 19.0 percent. When the CCA is applied, the dollar is considered to be extremely undervalued with a negative misalignment of 74.6 percent.

The United States and the United Kingdom can be analyzed in a similar way. At first sight it seems more reasonable that both these countries would be overvalued as the NFA specification implies. But, considering the CCA misalignment in isolation it could mean that these countries would actually work more efficiently with larger CCA deficits since they both experience such large positive valuation effects. If this were to be true, the question is how sustainable this would be in the long-run?

When taking all the country specific analyses into account it can be concluded that using the CCA in the MB framework often results in a larger misalignment then when the NFA is used. It is possible to find arguments to support the use of both variables, and it is important to note that we don not imply that one is better to use than the other. It is though important to realize what kind of variable we are dealing with and what it really tells us when it is used as a determinant to the CA. The NFA is a measure of the net position of a country where valuation effects are included. Since these effects are hard to track and define it can result in biased estimates of the CA. On the one hand it can be argued that it is a good measure because of the fact that valuation effects are accounted for. On the other hand the CCA, unaffected by valuation effects, could be seen as a biased measure of the net position because of this, but could also be thought of as a more solid measure that is not affected by market fluctuations. Sweden, the Netherlands and the United States all have large historical differences between their NFA and CCA position, which makes one wonder if valuation effects could really have this big of an impact? Maybe there is another story to be told as well, if further efforts were to be taken to get to the bottom of these discrepancies. The answers to these issues are unfortunately out of the scope of this paper as the focus is only on examining if there arise differences in misalignment when we apply NFA and CCA.

5 CONCLUSION

In this paper the difference in medium-term foreign exchange rate misalignments when using NFA or CCA is examined through the MB approach. By using a sample of 2889 observations on macroeconomic fundamentals of the G10 countries between 1981 to 2011, it can be concluded that the relevant determinants of the CA in this context are fiscal balance, population growth, NFA, CCA and trade integration. The same specification stays robust whether NFA or CCA is applied. Furthermore, the large coefficient of the CCA results in a greater impact on the CA than the NFA, which results in a larger misalignment when the CCA is large (both negative and positive).

Rapid growth in global trade during the past decades have increased the impact from valuation effects on countries that engage in world trade, as assets and liabilities are not effectively matched. It can be concluded for countries that are net debtors, that it is crucial in what currency they fund their deficit in as well as what their level of risk premium is (i.e. how high is the interest rate on lending). For net creditors, return on investments and currency fluctuations will determine the net valuation effects.

The inspiration behind this paper was the discrepancies observed between NFA and the CCA which in theory should balance. After analyzing the effect from this discrepancy it is not possible to say that one is more reliable than the other. Though, the CCA in some cases appears to provide us with a result that seems closer to reality using subjective judgment. Valuation effects could be seen both as enhancing the NFA as a measure but could also contribute to misleading implications of the state of an economy. The CCA is not affected by the valuation effects and might be a more solid measure when the external position of a country should be applied as a determinant to the CA.

The value of a currency is, as argued in this paper, partly driven by macroeconomic fundamentals. But there are several other factors that drive it as well, which makes foreign exchange rate assessment a problematic activity. The euro area sovereign debt crisis, the economic issues in the United States, currency manipulation to increase competitiveness and political risks, are all activities that needs to be taken into account when assessing currencies today. The MB approach can be seen as a reliable guide when assessing misalignments associated with the CA, but should never be used in isolation.

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LIST OF TABLES, GRAPHS & FIGURES

APPENDIX

Table 1: Current Account Determinants, Net Foreign Assets

Variable	1	2	3	4	5	6	7
Intercept	0.013120**	0.013121***	0.012838***	0.014106***	0.014481***	0.014755***	0.013160***
	(0.000434)	*(0.000522)*	*(0.000458)*	*(0.000403)*	*(0.000428)*	*(0.000889)*	*(0.000815)*
Fiscal Balance	0.179237***	0.179155**	0.220243***	0.208365***	0.206688***	0.203079***	0.244117***
	(0.063170)	*(0.075935)*	*(0.066547)*	*(0.064925)*	*(0.066063)*	*(0.066878)*	*(0.079833)*
Old-age Dependency Ratio		-0.000811					
		(0.198792)					
Population Growth			-2.363269**	-2.604126***	-2.640061**	-2.629744***	-2.337101**
			(1.003168)	*(0.976580)*	*(0.988924)*	*(0.965957)*	*(0.995002)*
Net Foreign Assets (-1) I(1)				0.047830*	0.047646*	0.048311*	0.044005*
				(0.025372)	*(0.025018)*	*(0.025918)*	*(0.025331)*
Oil Balance I(1)					0.071437		
					(0.322406)		
Economic Crisis						-0.005357	
						(0.005865)	
Trade Integration I(1)							0.066508**
							(0.027921)
R^2	0.67	0.68	0.70	0.73	0.73	0.73	0.74
Statistical model	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
Coefficient Covariance Method	White Period	White Period	White Period	White Period	White Period	White Period	White Period

*Significance levels of 1%,5% and 10% are denoted as ***,**,**
Standard error is expressed within brackets.*

Table 2: Current Account Determinants, Cumulative Current Account

Variable	1	2	3	4	5	6	7
Intercept	0.013120**	0.013121***	0.012838***	0.011404***	0.011727***	0.012204***	0.010674***
	(0.000434)	*(0.000522)*	*(0.000458)*	*(0.000941)*	*(0.0001013)*	*(0.001376)*	*(0.000979)*
Fiscal Balance	0.179237***	0.179155**	0.220243***	0.161120***	0.161009***	0.154235***	0.190217***
	(0.063170)	*(0.075935)*	*(0.066547)*	*(0.048117)*	*(0.050208)*	*(0.767863)*	*(0.058757)*
Old-age Dependency Ratio		-0.000811					
		(0.198792)					
Population Growth			-2.363269**	-1,753171**	-1.792051**	-1.780633**	-1.577998*
			(1.003168)	*(0.782131)*	*(0.787001)*	*(0.767863)*	*(0.840571)*
Cumulative Current Account(-1) I(1)				0.335954***	0.336584***	0.338003***	0.327910***
				(0.096570)	*(0.094743)*	*(0.094586)*	*(0.095313)*
Oil Balance I(1)					-0.033873		
					(0.351027)		
Economic Crisis						-0.006727	
						(0.006794)	
Trade Integration I(1)							0.054979**
							(0.024018)
R^2	0.67	0.68	0.70	0.79	0.79	0.79	0.80
Statistical model	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects	Fixed Effects
Coefficient Covariance Method	White Period	White Period	White Period	White Period	White Period	White Period	White Period

*Significance levels of 1%,5% and 10% are denoted as ***,**,**
Standard error is expressed within brackets.*

Table 3: Foreign Exchange Rate Assessment, Net Foreign Assets

Year 2011	Underlying CA/GDP	Equilibrium CA/GDP	Semi-Elasticity	Foreign Exchange Rate Misalignment
Belgium	-1.4%	14.7%	-1.637	10.0%
Canada	-3.0%	3.2%	-0.458	13.6%
France	-2.0%	4.4%	-0.388	16.6%
Germany	6.2%	9.7%	-0.715	5.0%
Italy	-3.1%	3.5%	-0.441	15.5%
Japan	2.0%	6.2%	-0.237	17.1%
Netherlands	9.7%	10.3%	-1.245	0.5%
Sweden	7.0%	5.9%	-0.575	-1.9%
Switzerland	8.4%	11.5%	-0.599	5.2%
United Kingdom	-1.3%	2.2%	-0.359	9.8%
United States	-3.1%	0.4%	-0.186	19.0%

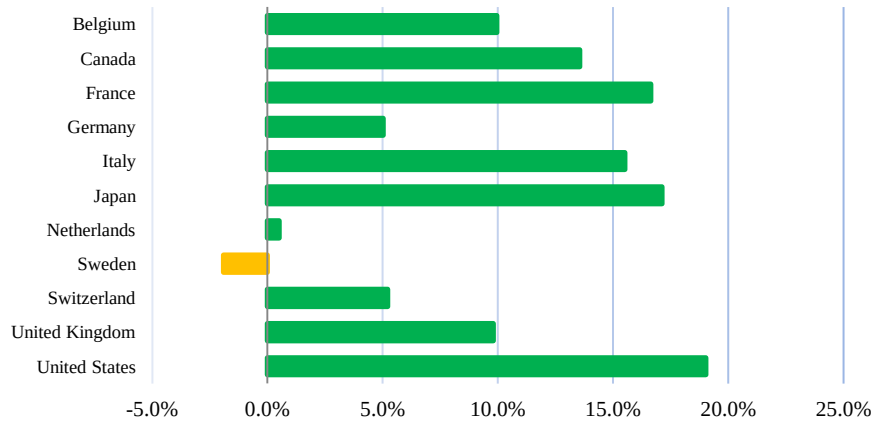
Table 4: Foreign Exchange Rate Assessment, Cumulative Current Account

Year 2011	Underlying CA/GDP	Equilibrium CA/GDP	Semi-Elasticity	Foreign Exchange Rate Misalignment
Belgium	-1.4%	22.4%	-1.637	14.8%
Canada	-3.0%	0.8%	-0.458	8.2%
France	-2.0%	4.5%	-0.388	17.1%
Germany	6.2%	19.4%	-0.715	18.7%
Italy	-3.1%	0.2%	-0.441	7.7%
Japan	2.0%	21.5%	-0.237	79.0%
Netherlands	9.7%	31.2%	-1.245	18.5%
Sweden	7.0%	25.2%	-0.575	30.5%
Switzerland	8.4%	43.4%	-0.599	60.2%
United Kingdom	-1.3%	-7.0%	-0.359	-15.6%
United States	-3.1%	-16.9%	-0.186	-74.6%

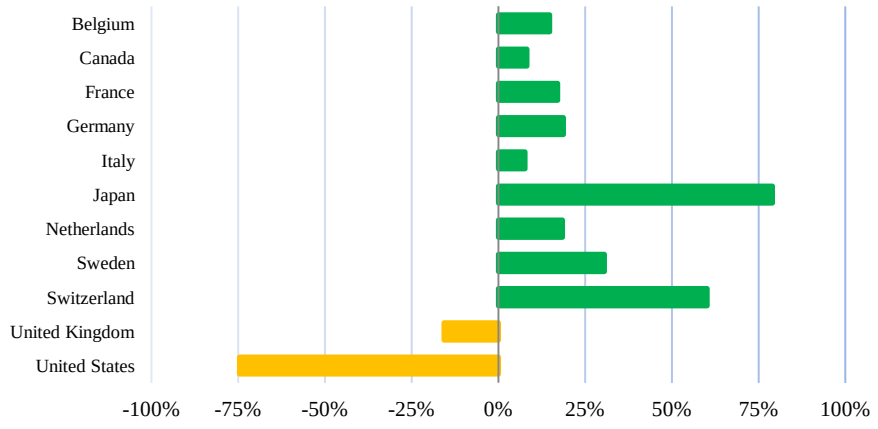
Table 5: Foreign Exchange Rate Misalignments

Year 2011	Net Foreign Assets	Cumulative Current Account
Belgium	10.0%	14.8%
Canada	13.6%	8.2%
France	16.6%	17.1%
Germany	5.0%	18.7%
Italy	15.5%	7.7%
Japan	17.1%	79.0%
Netherlands	0.5%	18.5%
Sweden	-1.9%	30.5%
Switzerland	5.2%	60.2%
United Kingdom	9.8%	-15.6%
United States	19.0%	-74.6%

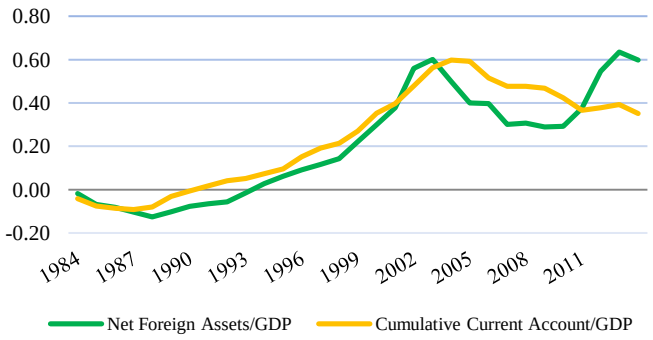
Graph 1: Foreign Exchange Rate Misalignment in 2011
Net Foreign Assets



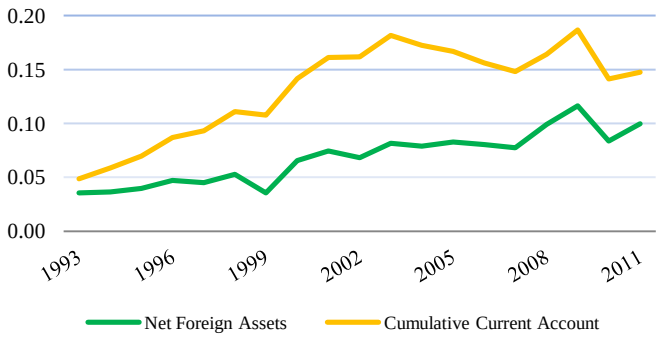
Graph 2: Foreign Exchange Rate Misalignment in 2011
Cumulative Current Account



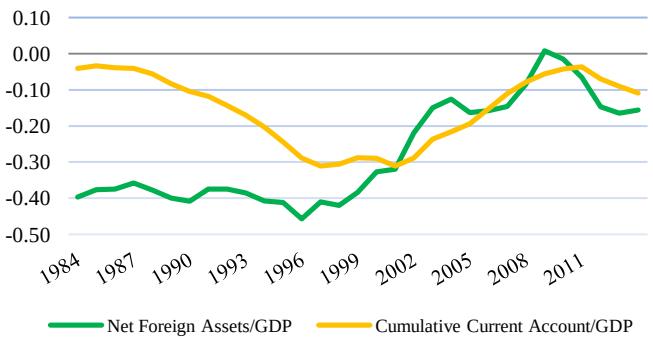
Graph 3: Belgium
Net Foreign Assets vs. Cumulative Current Account



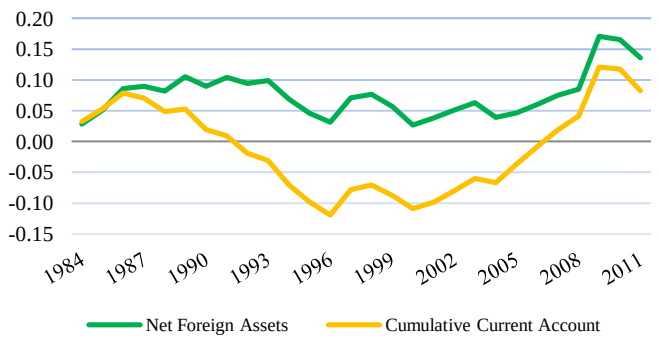
Graph 4: Belgium
Foreign Exchange Rate Misalignment



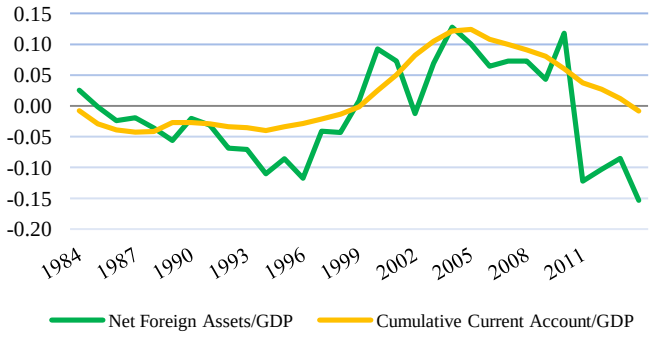
Graph 5: Canada
Net Foreign Assets vs. Cumulative Current Account



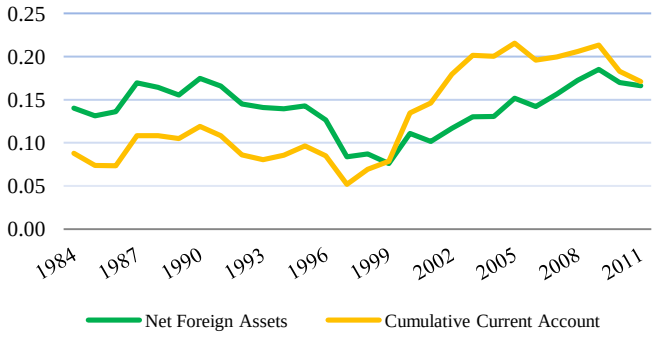
Graph 6: Canada
Foreign Exchange Rate Misalignment



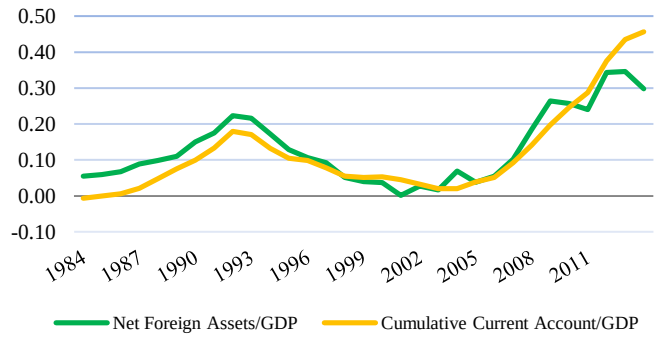
Graph 7: France
Net Foreign Assets vs. Cumulative Current Account



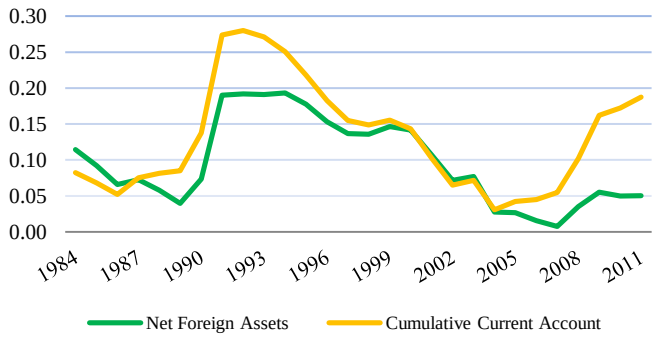
Graph 8: France
Foreign Exchange Rate Misalignment



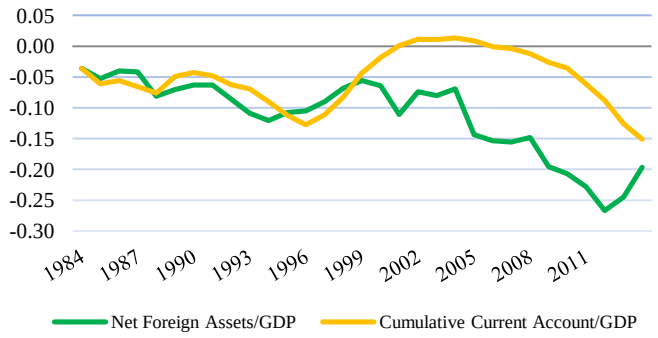
Graph 9: Germany
Net Foreign Assets vs. Cumulative Current Account



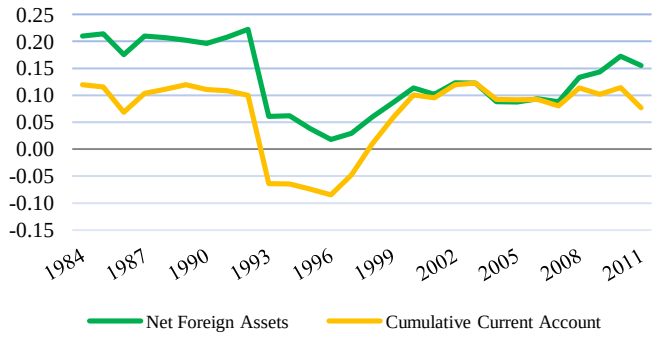
Graph 10: Germany
Foreign Exchange Rate Misalignment



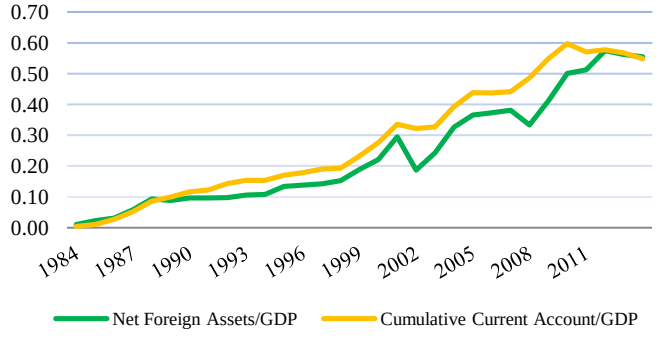
Graph 11: Italy
Net Foreign Assets vs. Cumulative Current Account



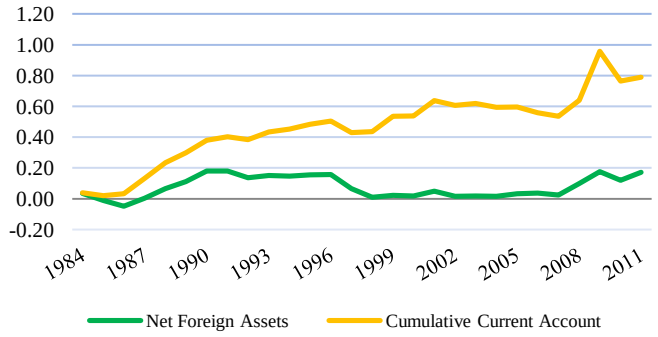
Graph 12: Italy
Foreign Exchange Rate Misalignment



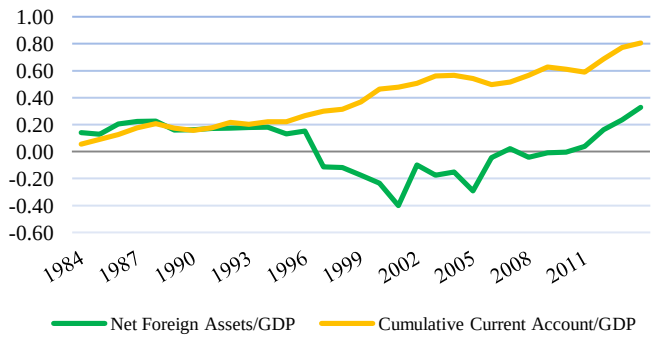
Graph 13: Japan
Net Foreign Assets vs. Cumulative Current Account



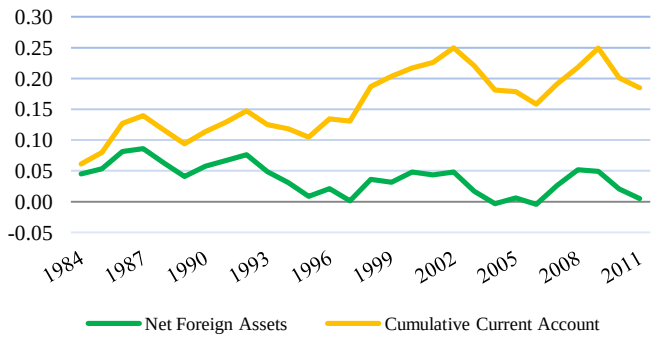
Graph 14: Japan
Foreign Exchange Rate Misalignment



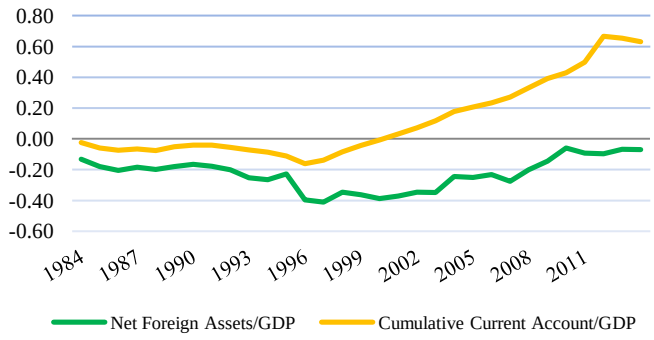
Graph 15: Netherlands
Net Foreign Assets vs. Cumulative Current Account



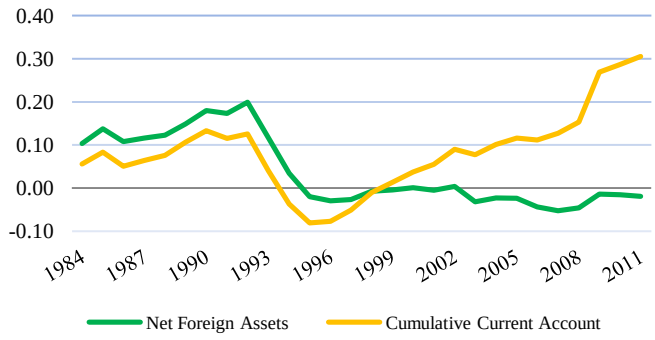
Graph 16: Netherlands
Foreign Exchange Rate Misalignment



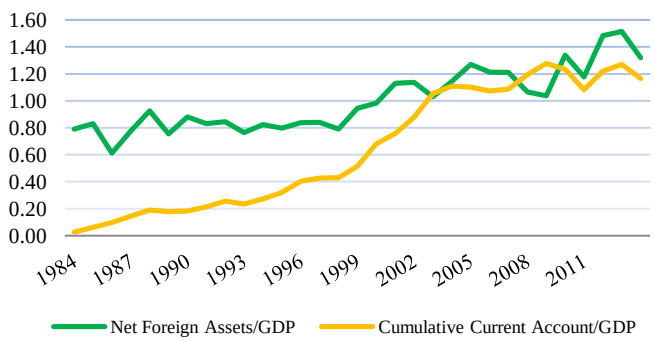
Graph 17: Sweden
Net Foreign Assets vs. Cumulative Current Account



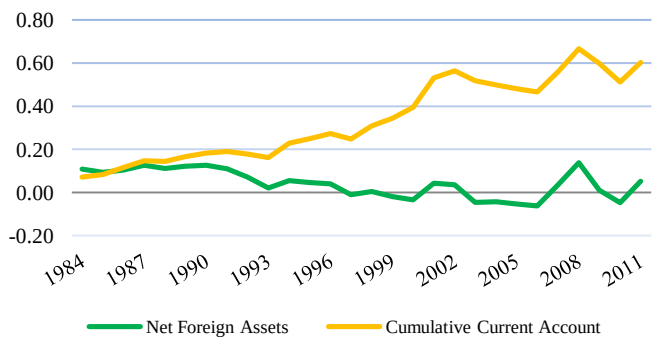
Graph 18: Sweden
Foreign Exchange Rate Misalignment



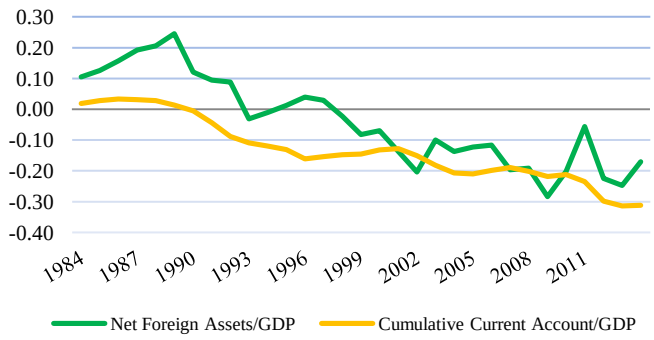
Graph 19: Switzerland
Net Foreign Assets vs. Cumulative Current Account



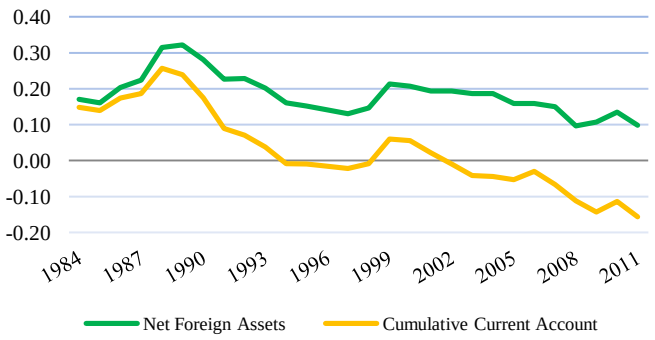
Graph 20: Switzerland
Foreign Exchange Rate Misalignment



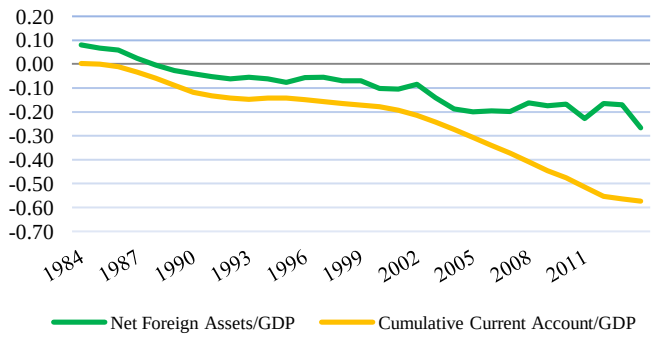
Graph 21: United Kingdom
Net Foreign Assets vs. Cumulative Current Account



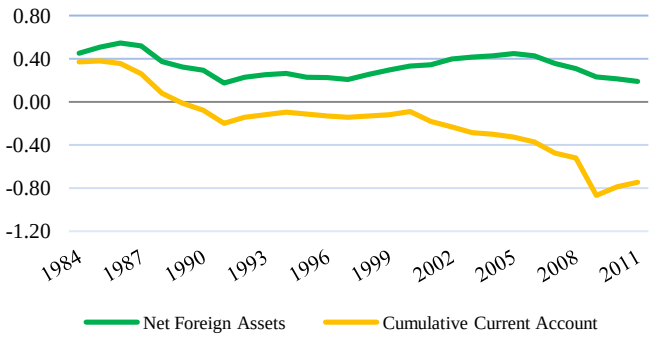
Graph 22: United Kingdom
Foreign Exchange Rate Misalignment



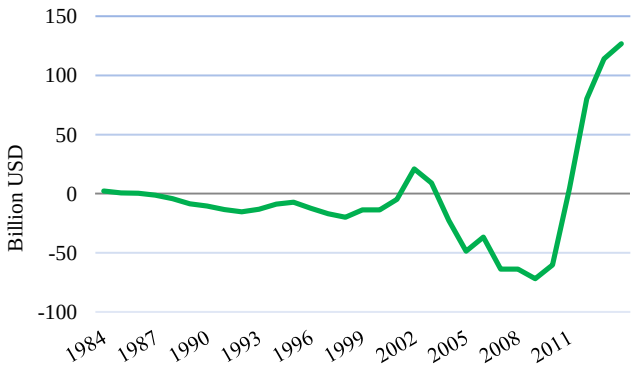
Graph 23: United States
Net Foreign Assets vs. Cumulative Current Account



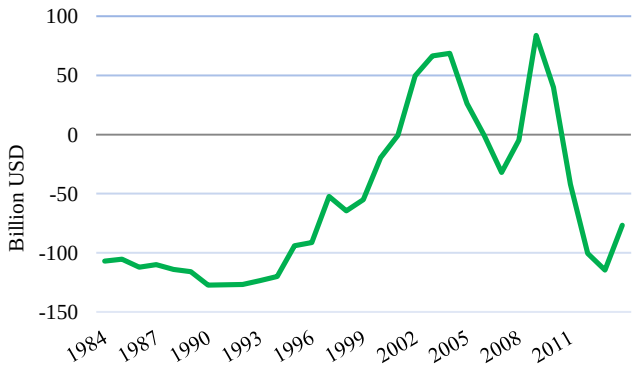
Graph 24: United States
Foreign Exchange Rate Misalignment



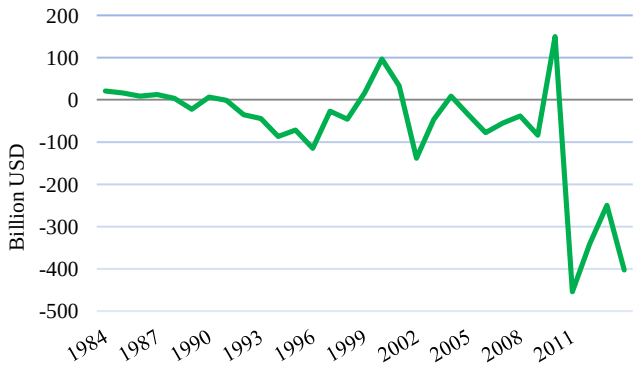
Graph 25: Belgium
Valuation effects



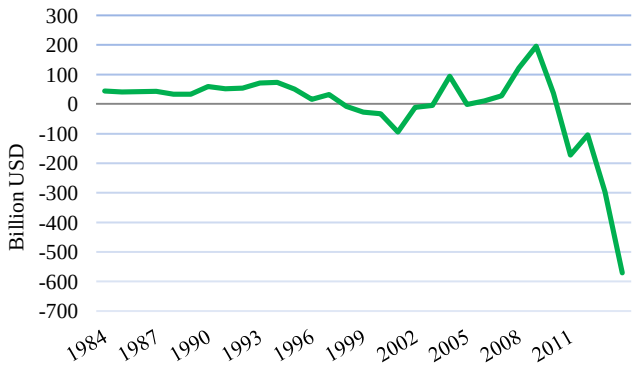
Graph 26: Canada
Valuation effects



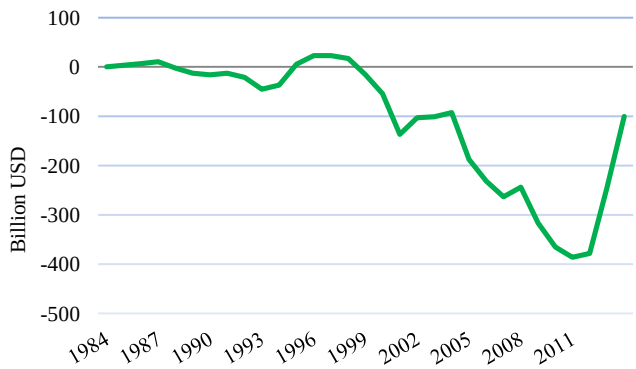
Graph 27: France
Valuation effects



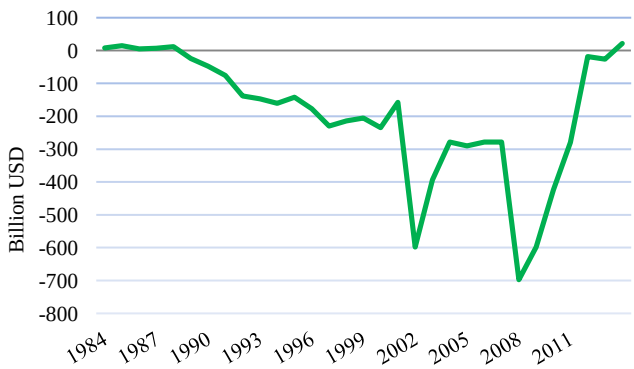
Graph 28: Germany
Valuation effects



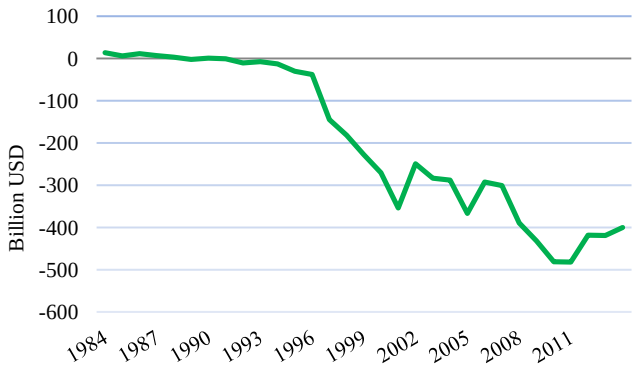
Graph 29: Italy
Valuation effects



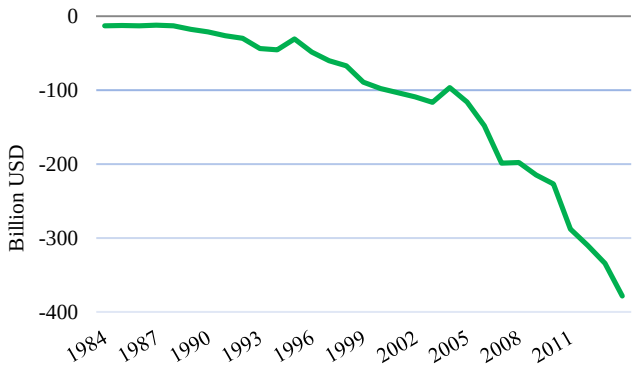
Graph 30: Japan
Valuation effects



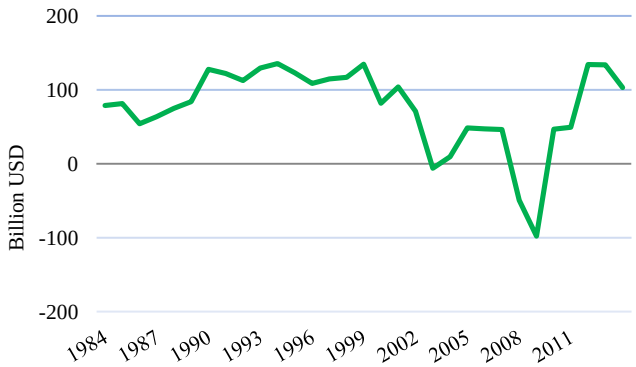
Graph 31: Netherlands
Valuation effects



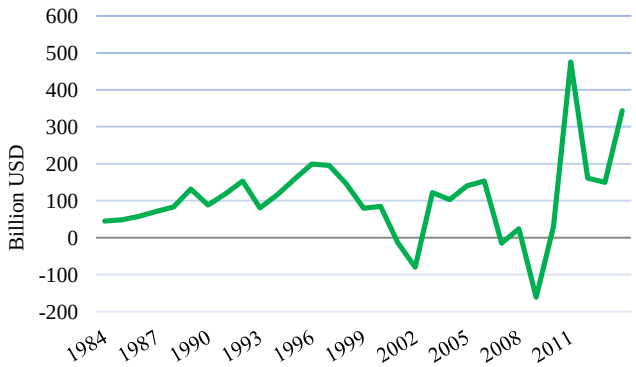
Graph 32: Sweden
Valuation effects



Graph 33: Switzerland
Valuation effects



Graph 34: United Kingdom
Valuation effects



Graph 35: United States
Valuation effects