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Methodologies for the Assessment of Current Account Benchmarks

Leonor Coutinho, Alessandro Turrini and Stefan Zeugner

Abstract

This paper describes two methodologies to compute benchmarks for current account balances. The first benchmark helps to assess the implications of current account balances for the Net International Investment Position (NIIP). These NIIP-stabilising benchmarks are the current account/GDP ratios required to stabilise the stock of net external liabilities at their current levels, or for the NIIP to reach a pre-specified prudential target. The second benchmark computes current account norms which represent current account balances that are in line with economic fundamentals. This benchmark is obtained from the estimation of an empirical model for current accounts based on annual data from a panel of 65 advanced and emerging economies following a methodology akin to Phillips et al. (2013). Current account norms are computed as the prediction from the model restricted to explanatory factors that can be considered as fundamentals, i.e. non-temporary economic factors and policy-related variables at 'normal' (world-average) level. The first two benchmarks provide complementary information in assessing current account positions: the NIIP-stabilising current account permits the implications of stock imbalances to be assessed from a prudential perspective; while current account norms allow deviations from economic fundamentals over the medium-to-long term to be evaluated.

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Keywords: Current account, Net International Investment Position, external sector assessment, external crisis, early-warning indicators.

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CONTENTS

LIST OF TABLES

LIST OF GRAPHS

1. INTRODUCTION

Economic surveillance in the EU context includes the monitoring of current account developments. Avoiding excessive current account imbalances helps maintaining macroeconomic stability, smooth growth paths and orderly international economic relations. In light of deep interdependencies, current account developments are subject to surveillance by international institutions and are the object of discussion on economic policy cooperation in international fora. The experience with the financial crisis has revealed that sudden stops and current account reversals may also concern euro-area countries. Since 2011, the EU is endowed with a framework for the surveillance of macroeconomic imbalances (Regulation (EU) 1176/2011); surveillance on current accounts is an integral part.

Assessing whether current accounts are excessive requires an adequate benchmark. One-size-fits all benchmarks are sometimes used as a prima-facie terms of comparison. ([1]) However, current account benchmarks that are assumed to be constant and the same across the board do not take into account that there are country-specific risks linked to stock imbalances, as well as economic fundamentals that lead some countries to borrow and run current account deficits while others are expected to lend in international markets and run surpluses.

This paper proposes methodologies for the computation of country-specific benchmarks for the assessment of current accounts. Two complementary benchmarks are developed, which permit to analyse current accounts from both from an external sustainability viewpoint and a perspective on economic fundamentals. The benchmarks permit to synthetise relevant country-specific information and enrich the information basis for the assessment of external positions. A careful interpretation is needed, as the benchmarks are based on a number of assumptions and their estimation is subject to usual uncertainty linked to sample definition and model specification.

A first benchmark permits to assess the implications of current accounts for the Net International Investment Position (NIIP) of the economy. Ever-growing net foreign liabilities imply increased repayment burden and higher vulnerability to financial markets. For this reason, large and persistent current account deficits create sustainability issues. Arguably, under some circumstances, also persistent large current account surpluses could at some stage be associated with increased risk, since a growing share of financial wealth would depend on foreign debtors and be exposed to sources of risk outside the control of domestic policy. This NIIP-stabilising current account benchmark requires the stabilisation of the NIIP/GDP ratio at current level or the reduction of net foreign liabilities to a given prudential target.

A second benchmark consists of a current account "norm" that permits to evaluate if current accounts are in line with fundamentals. The first step to obtain current account norms is the estimation of an empirical model of current account determinants. The empirical model is obtained by regressing the current account balance on a number of explanatory factors using annual data from a sample that spans three decades and includes 65 advanced and emerging countries that account for most of world GDP. The specification is akin to that found in Phillips et al. (2013), with the inclusion of additional explanatory variables that help capturing some specific characteristics of EU economies. The second step is the computation of the norms, which consist of predictions from the empirical model restricted to explanatory factors that can be considered as fundamentals, namely, economic drivers that are not temporary and policy variables under normal conditions (i.e., in line with what is observed at world average).

([1]) Common thresholds across countries for current accounts are foreseen by the scoreboard used in the Alert Mechanism Report (AMR) of the Macroeconomic Imbalance Procedure. AMR analysis is not supposed to use the scoreboard mechanistically (Regulation (EU) 1176/2011, recitals 10 and 11), and deviations of the current accounts from thresholds do not have a direct implication for the assessment by themselves, while additional indicators and assessment tools enter the overall evaluation of current accounts. Country-specific thresholds for current account constitute an additional assessment tool in the MIP context, that do not replace the AMR scoreboard threshold and which are not supposed to determine by themselves the overall final assessment on current accounts.

The comparison of cyclically adjusted current account balances to benchmarks reveals a number of features of the external position of countries. The two benchmarks represent current account positions that satisfy particular requirements. The current account norm incorporates the requirement that current accounts do not deviate from what is implied by economic fundamentals. This current account 'norm' purely considers fundamentals and therefore does not consider external sustainability concerns embodied in the level of the NIIP. This instead is the role of the NIIP-stabilising current account, which focuses on the requirement to keep the NIIP stable or converging to a prudent level at satisfactory pace. These are requirements that are likely to hold over the medium-to-long term, while deviations over the short term are expected to be frequent. A meaningful comparison with benchmarks thus needs to purge current accounts from temporary elements linked to the domestic and foreign cycle. Current account gaps so obtained permit to assess the structural adjustment in the current account required to satisfy either requirement: NIIP stabilisation or current account balances reflecting fundamentals. The analysis in the paper shows that the two requirements are generally compatible, so that current account gaps compared with the two benchmarks tend to have the same sign, although values may differ.

The remainder of the paper is organised as follows. Section 2 includes a brief review of the literature. Section 3 describes the methodology for estimating NIIP-stabilising current accounts. Section 4 describes the empirical model for explaining current account developments and the methodology for estimating current account norms. Section 5 presents main features and patterns of the estimated benchmarks and gaps with respect to cyclically-adjusted current account balances over a sample of EU countries. Section 6 concludes. The Annexes provide details of the methodologies illustrated in the paper.

2. BRIEF LITERATURE REVIEW

Current account imbalances permit to better allocate savings and exploit investment opportunities at global level. There are good reasons why current accounts should not be balanced: some countries may find it cheaper to fund profitable opportunities from international markets and will run deficits, while other countries may profit from lending abroad because by doing so they would obtain better returns compared with those available in the domestic market and will therefore tend to run current account surpluses. Since the current account reflects the difference between savings and investment, based on forward-looking decisions, current account models need to be cast in inter-temporal frameworks. This is the basic tenet of modern open macroeconomics (Obstfeld and Rogoff, 1996), which predicts that countries will run deficits if their current income falls short of their long-term "permanent" income or, equivalently, when their domestic return to capital is higher than the cost of borrowing internationally. Recent adaptations of intertemporal current account models aim at rationalising the frequent deviations from their predictions, as capital often flows "uphill", from poor to rich countries (a phenomenon referred to as "Lucas' paradox" or "Feldstein-Horioka puzzle") and the fact that, empirically, current accounts imbalances are smaller than those predicted by basic intertemporal models. Recent theoretical models produce results more in line with facts, by incorporating structural differences between rich and poor countries underlying higher export saving in the latter, including a higher price of investment goods (Caselli and Feyrer, 2007), capital market distortions (Gourinchas and Jeanne, 2013) and limited availability of safe assets (e.g., Caballero et al., 2008) or insurance possibilities (e.g., Mendoza et al., 2009).

Excessive current account imbalances may jeopardise macro-financial stability. Large and protracted external deficits may pose a repayment problem as the debt burden grows and domestic profitable investment opportunities shrink. Under exchange rate pegs, protracted deficits imply official reserve outflows, so that capital outflows may be triggered abruptly since markets react to signals anticipating forthcoming depreciations linked to reserve depletion (e.g., Krugman 1979; Obstfeld, 1996). Also under floating exchange rates or hard pegs, excessive and persistent current account deficits are frequently subject to sudden stops and reversals linked to revised expectations on repayment probability, often amid a generalised risk reappraisal.([2]) Sudden capital outflows provoke a sharp correction of large deficits amid domestic demand compression, possibly accompanied by nominal exchange rate depreciations. The impact of current account sudden stops and reversals is generally largely negative on output, and additional second-round effects could be linked to associated financial sector deleveraging, bankruptcies, distress in private and sovereign debt markets. ([3]) For reasons linked to macro-financial stability and associated spillovers, and in order to ensure an open and stable environment for international trade and financial relations, surveillance on current account balances at supra-national level is regularly carried out **(**e.g., Blanchard and Milesi-Ferretti, 2012).

Computing current account benchmarks is an integral part of the assessment of the external balance and is linked to the evaluation of exchange rates. Since different country characteristics justify different values for the current account, a proper assessment of external positions require country-specific benchmarks based on well-defined criteria. Such benchmarks are regularly used in surveillance to assess not only external balance positions but also exchange rates. The practice of estimating equilibrium exchange rates has a long-standing tradition in applied and policy-oriented analysis (see, e.g., McDonald, 2000; Driver and Westaway, 2004; Siregar and Rajan, 2006; Isard, 2007; for surveys on the topic). In spite of undeniable progress by the economic profession in devising more reliable and sophisticated

([2]) The definition of sudden stop can be found in Calvo (1998) and Calvo et al. (2004); "sudden stops" are episodes within which private capital inflows are sharply reduced, or equivalently, the rate of return required by foreign investors sharply increases and the economy has therefore to suddenly "devalue" or contract demand abruptly to repay its debts.

([3]) The potential for sudden stops to generate sharp depreciations and significant drops in output has been well documented in the literature (see Guidotti et al., 2004).

estimation techniques, estimates remain subject to uncertainty, notably associated with sample and model specification (e.g., Detken et al., 2002). ([4])

Methodologies for the estimation of current account benchmarks are rooted in academic research and keep being further developed in institutions carrying out economic surveillance. Recent literature on current account benchmarks include, among others, Debelle and Faruqee (1996), Chinn and Prasad (2003), Gruber and Kamin (2005), Barnes et al. (2010), Lee et al. (2008), Salto and Turrini (2010), Bussière et al. (2010), Ca' Zorzi et al. (2012a), Phillips et al. (2013), Moral-Benito and Röhn(2016), De Santis and Cesaron (2016). Methodologies have been evolving incrementally over time, reflecting lessons from the experience in applying benchmarks in economic surveillance and advancements in empirical analysis.

Two main alternative approaches have been put forward in the literature and are currently used in surveillance. A first approach consists of estimating the current account balance that allows reaching or maintaining a target level for the Net International Investment Position as a share of GDP. A second approach is based on the estimation of current account benchmarks that reflect economic fundamentals. Empirical current account equations are estimated from reduced form specifications on panel data, following the approach pioneered in Chinn and Prasad (2003). The prediction obtained from this empirical model permits to derive a "norm" for the current account, once the explanatory variables are adequately treated in such a way to represent structural conditions rather than temporary fluctuations or exceptional situations.

Current account benchmarks based on requirements on the evolution of the NIIP are commonly interpreted as prudential thresholds for external sustainability. These benchmarks generally represent a lower limit that the current account needs to reach to stabilise an NIIP position that would otherwise be deteriorating. In case the requirement concerns the stabilisation of NIIP stocks that are positive and growing, the threshold is interpreted as an upper limit. These benchmarks rely on partial equilibrium equations representing the dynamics of the NIIP ([5]). The dynamic equation relating current accounts to the NIIP stock can either assume all other variables as exogenous or articulate an endogenous response of selected variables. A key assumption concerns the level at which the NIIP is to be stabilised. Often it is assumed that the NIIP is to be stabilised at its current level, which is viewed as a minimum prudential requirement in case of large current account deficits and large stocks of net foreign liabilities. Other key assumptions regard the remaining drivers of the NIIP/GDP ratio, generally assumed to be exogenous (mainly, nominal growth, the capital account, valuation effects).

Current account norms are interpreted as values for the current account balance that can be explained by countries' fundamentals. The first step is an estimation of an empirical current account model on variables that affect savings and investment decisions, while the second step consists of using the coefficients obtained from the estimate of the empirical model to obtain a "normal" current account balance, by setting all explanatory variables to their fundamental or normal values. Generally, use is made

([4]) Current account benchmarks are required for the estimation of "equilibrium exchange rates" according to approaches that became known in the literature as Fundamental Equilibrium Exchange Rate (FEER, see e.g., Williamson, 1994) or the Natural Equilibrium Exchange Rates (NATREX, see, e.g. Stein, 1994). Broadly speaking, the FEER method requires both internal (output in line with potential) and external balance, while in the NATREX approach the additional requirement is that the current account is consistent with an NIIP stable at its steady-state level (e.g., Siregar and Rajan, 2006; Isard, 2007). The equilibrium exchange rates are obtained from the derivation of an exchange rate gap starting from a current account gap (difference from a measure of the current account purged from its transitory component and current account benchmarks) by means of a semi-elasticity of the current account with respect to the real effective exchange rate (REER). An alternative approach to the estimation of equilibrium exchange rate is to estimate an empirical model for the REER, and to compute a gap from the actual REER and the prediction from this model (see, e.g., Clark and MacDonald, 1998; Alberola et al., 1999, Lee et al., 2008; Phillips et al., 2013) or to base an direct assessment of the exchange rate gap from the residuals of a cross-country relations between Purchasing Power Parity and income per capita (e.g., Froot and Rogoff, 1995).

([5]) This approach is known as "external sustainability" approach in both the Consultative Group on Exchange Rate Issues (CGER, see Lee et al., 2008) and the External Balance Assessment (EBA, see Phillips et al., 2013) assessment frameworks developed by the IMF.

of sufficiently large cross-country panels to enhance the robustness of the estimates to the sample definition. Applications include, among others, Gruber and Kamin (2007), Lee et al. (2008), Salto and Turrini (2010), Lane and Milesi-Ferretti (2012), Cheung et al. (2013), Ca' Zorzi et al. (2012a), Phillips et al. (2013), Moral-Benito and Röhn (2016). The early literature purged cyclical developments from the analysis by averaging the data over 4 or 5 years. The recent financial and sovereign debt crisis, however, showed that not all economic cycles have the same time-span. To eliminate cyclical movements in a data set spanning beyond 2008 would require longer period averages which would restrict the estimation sample significantly and reduce the information content of the data. ([6]) Partly for this reason, more recent contributions estimate models using annual data. This requires including variables in the model that capture the effects of the cycle, including output gaps, changes in exchange rates, etc. This new approach was pioneered by Phillips et al. (2013), and boils down to jointly estimating structural and cyclical components of the current account. Additional innovations were introduced over time in terms of expanding the set of variables able to capture movements in the current account, notably linked to financial and monetary conditions and policy frameworks.

([6]) Ca' Zorzi et al. (2012a) check the sensitivity of results to the length of the period over which averages of the variables are computed, and show that such length matters for the regression coefficients of certain explanatory variables, including the fiscal balance.

3. NIIP-STABILISING CURRENT ACCOUNT BENCHMARKS

3.1. NIIP STABILISATION AND THE CURRENT ACCOUNT

The current account balance is a key driver of the NIIP. The relevance of the current account for the evolution of the NIIP is easily understood by the following basic dynamic equation obtained from balance of payment relations, abstracting from errors and omissions:

$$NIIP_t = NIIP_{t-1}/(1+g_t) + CA_t + KA_t + VA_t, \quad (3.1)$$

where all variables are a expressed as a ratio of current GDP, $NIIP_t$ is the net investment position of a given country at time *t*, CA_t and KA_t are, respectively, the current account and the capital account balances, VA_t are valuation effects and g_t denotes the growth rate of nominal GDP at time *t*.

A current account that ensures NIIP stability is a minimum requirement for external sustainability. Ever and rapidly growing or falling stocks of net financial liabilities are inconsistent with respecting the inter-temporal budget constraint of an economy, which requires that outstanding net external debt needs to be repaid out of the present value of trade balances (Obstfeld and Rogoff, 1996). Large and growing stocks of net external liabilities may pose a sustainability problem already over the medium term and increase the probability of capital flights and sudden stops. ([7]) Large positive NIIPs, if growing continuously, could also be associated under some circumstances with increased creditor risk. ([8]) The stabilisation of the NIIP is one way to ensure the respect of the inter-temporal budget constraint of an economy, and is a minimum prudential requirement to derive current account benchmarks commonly used in surveillance. ([9]) Since capital account balances are generally rather limited, and since valuation effects are for most countries not of large magnitude and fluctuating around a mean close to zero, the current account balance and the growth of nominal GDP are generally the main drivers of the evolution of the NIIP/GDP ratio. Assuming, for simplicity, valuation effects to net out to zero, the current account stabilising the NIIP at the value observed at time *t* , CA_t^S , is determined by setting the NIIP identical at time *t* and time *t*-1 in equation (3.1) above, and is obtained as: ([10])

$$CA_t^S = \frac{g_t}{(1+g_t)} NIIP_t - KA_t. \quad (3.2)$$

Equation (3.2) defines a minimum value for the current account balance for countries where the NIIP is to be stabilised from a downward trajectory, and a maximum current account balance for those countries where the NIIP is on an upward trajectory.

3.2. COMPUTING CURRENT ACCOUNT BENCHMARKS BASED ON NIIP STABILISATION

The derivation of current account benchmarks from the requirement of NIIP stabilisation needs to address a number of issues, reflected in the NIIP stabilising current account provided in equation (3.3).

([7]) The net international investment position (NIIP) provides an aggregate view of the net external position of a country and therefore constitutes a relevant starting point for the assessment of external sustainability. However, it is important to bear in mind that the NIIP is not the single gauge of external sustainability risks. The composition of the NIIP also matters to further qualify the vulnerabilities of an economy. For example, external sustainability risks are particularly relevant when liabilities are biased towards debt.

([8]) The continuous accumulation of net foreign assets may imply growing exposure to exchange rate risk and reduced room for national authorities to reduce risk (e.g. via prudential or regulatory measures) as the share of assets in domestic portfolios originating in foreign countries grows larger. Negative valuation effects on foreign assets may also lead to liquidity stress.

([9]) See Faruqee and Isard (1998), Lee et al. (2008), Salto and Turrini (2010) and Phillips et al. (2013).

([10]) In financial forecasting, asset prices are usually assumed to evolve according to a random walk whose best forecast is therefore the latest figure available. Note that empirically, several countries display valuation effects that remain persistently positive (most notably the US) or negative over long periods of time (e.g. Spain). Over the long run, however, empirical valuation effects do not seem to significantly differ from zero for the overwhelming majority of EU economies (see Habib, 2010).

- First, in the case of large negative NIIP stocks, the simple stabilisation requirement may not be sufficient to define a prudential threshold for the current account (e.g., Catão and Milesi-Ferretti, 2014). In such a case, a target for the NIIP above the current level should be reached first, which would imply that the current account should aim at an improvement in the NIIP rather than a stabilisation.

- Second, current account benchmarks need to be able to provide a relatively stable medium-term anchor to policy, while the value of the current account that stabilises the NIIP defined in (3.3) fluctuates over time also when the NIIP/GDP ratio is kept stable, as it depends on current nominal growth and the capital account.

- Third, a benchmark for the current account needs to refer to a pre-defined forward-looking horizon, which provides a time framework for the improvement or the stabilisation of the NIIP.

Taking the above considerations into account, two cases need to be distinguished for the determination of current account benchmarks under the NIIP stabilisation approach.

The first case is when the observed level of the *NIIP is above a minimum prudential threshold* $NIIP^{min}$. In such a case, *the current account benchmark is the current account* ***required to stabilise the NIIP*** *over a given time horizon*:

$$CA^{S}_{t,t+T} = \frac{g^{e}_{t,t+T}}{(1+g^{e}_{t,t+T})} NIIP_{t\text{-}1} - KA^{e}_{t,t+T}. \qquad \text{if } NIIP_{t\text{-}1} \geq NIIP^{min} \tag{3.3}$$

where the superscript "*e*" denotes average expected values and the subscript reports a notation for the time horizon over which the variables are defined, i.e., between *t* and *t*+*T*.

The second case is when the observed *NIIP is below a prudential threshold*. In this case, *the current account benchmark is the current account* ***required to reach the prudential level*** $\boldsymbol{NIIP^{min}}$ *over a pre-defined time horizon*. Iterating between t and $t+T$, the formula in (3.1) allows computing the required current account balance needed to reach the NIIP target in year $t+T$:

$$CA^{S}_{t,t+T} = \left(NIIP^{min} - NIIP_{t\text{-}1}/\left(1+g^{e}_{t,t+T}\right)^{T}\right).\frac{g^{e}_{t,t+T}/(1+g^{e}_{t,t+T})}{1-1/(1+g^{e}_{t,t+T})^{T}} - KA^{e}_{t,t+T} \text{ if } NIIP_{t\text{-}1} < NIIP^{min} \tag{3.4}$$

In other words, the stabilisation of the current level of the NIIP is conditional on the NIIP being above a minimum prudential threshold. Below that, the current account should aim first at an improvement of the NIIP, and only afterwards, once the minimum level $NIIP^{min}$ is reached, at its stabilisation.

The required current account might either correspond to a surplus or to a deficit. Expression (3.3) shows that, in absence of cases where nominal growth is expected to remain negative for long or the capital account balance to record large values, the current account required to stabilise the NIIP is expected to exhibit the same sign as the NIIP. This comes from the simple fact that whenever growth is positive, the NIIP/GDP ratio improves over time if negative while it worsens if positive. This means that stabilisation allows for some current account deficits to persist in case of negative NIIPs and surplus to be maintained in the case of positive NIIP stocks. Looking instead at equation (3.4), it is visible that the sign of the current account required to achieve the NIIP target depends on the distance to target, the time horizon and expected nominal growth. The larger the distance to target and the shorter the time horizon, the larger the likelihood that the required current account is a potentially large surplus.

A number of hypotheses need to be made for the computations of NIIP-stabilising benchmarks. These hypotheses concern the minimum NIIP threshold, time horizon, growth rates and capital accounts.

Different assumptions are equally plausible, and could be flexibly accommodated with this approach to the computation of benchmarks. In the present application the following assumptions are made: ([11])

- the minimum NIIP value $NIIP^{min}$ is the -35% threshold for the NIIP from the MIP Alert Mechanism Report scoreboard. Alternative assumptions could be made, including to allow for country-specific NIIP benchmarks;

- g^e is the average growth rate of nominal GDP between t+1 and t+T, computed on the basis of available forecast. ([12]) The use of an expected average growth rate over a multi-year period permits to reduce short-term fluctuations in the benchmark;

- KA^e is the average capital account balance between t+1 and t+T. As capital accounts tend to be relatively stable and long term projections are not easily available, it is assumed that the net balance of the capital account remains constant as % of GDP, at a level that corresponds to the median of the latest three available years;

- the time horizon for the stabilisation is 10 years (so that the average expected nominal growth is computed over a 10-year horizon). The use of a sufficiently long time horizon helps abstracting from short-term fluctuations in real growth or inflation. The time horizon for reaching the minimum NIIP value is set at 20 years (the average expected growth spans a 20-year horizon), an assumption that, in the case of countries with largely negative NIIP stocks, permits to derive required current account surpluses not overly higher than those historically observed.

- **The current account benchmarks require careful interpretation**. The benchmark defined above permits a consistency check that holds under a number of simplifying assumptions. They represent the current account required on average over a given time horizon either to stabilise or to reach a given improvement in the NIIP, conditional on nominal growth forecasts and assumptions on the capital account. The benchmark is continuously recomputed to take into account revisions in these forecasts and possibly NIIP changes that may have reduced or increased the distance to the prudential target. Note also that the approach, being a partial equilibrium one, does not permit to take into account the interaction between current account and NIIP adjustment and the remaining relevant variables (e.g., the implication of current account improvements for aggregate demand and growth). Overall, current account benchmarks provide a useful yardstick to assess the sustainability of macroeconomic developments. However, the current account only partially responds to domestic policy, and therefore these benchmarks cannot be employed as immediate policy targets, like in the case of fiscal benchmarks.

The required trade balance to stabilise the NIIP provides relevant insights from a policy perspective. The current account is the sum of a number of components as follows,

$$CA_t = TB_t + IB_t + NIB_t + RE_t + NTR_t \tag{3.5}$$

where all the variables are defined as a share of current GDP, TB_t is the trade balance, IB_t is the net investment income balance, NIB_t is the non-investment primary income balance, RE_t are reinvested earnings, and NTR_t represents net current transfers. ([13]) Income balances and reinvested earnings are relatively independent of policy over the medium term (as they are mainly determined by the existing

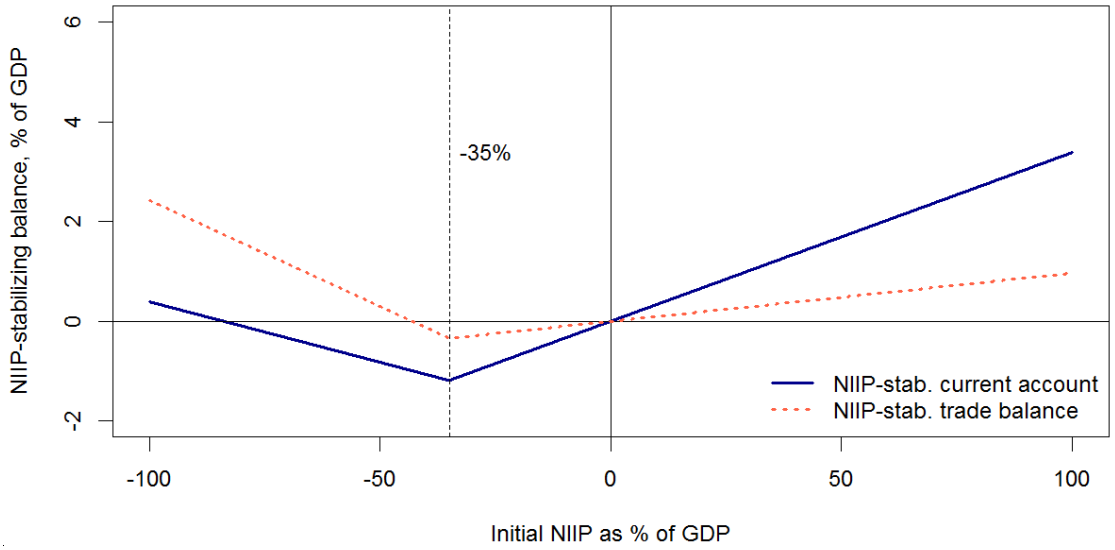
([11]) The same assumptions underlie also the computations shown in European Commission Alert Mechanism Reports and in MIP in-depth-reviews.

([12]) GDP projections used in the computations presented in section 5 and in applications found in the Alert Mechanism Reports and in-depth-reviews stem from the most recent European Commission forecasts (up to two years ahead), the T+10 European Commission forecasting framework (between two and ten years) and from the latest Commission fiscal sustainability long-run projections (beyond ten years).

([13]) Note that net current transfers are also referred to as secondary income balance.

stock of foreign assets and liabilities and their returns, in the case of the net investment balance, and on specific practices of firms and households for what concerns non-investment income, reinvested earnings, and net transfers). Over the medium term, policy matters for current account adjustment especially for what concerns the trade balance, as policies may significantly affect domestic absorption (e.g., fiscal policies) and therefore imports, the relative price of imported vs. exported goods (e.g., policies affecting the real exchange rate) or other policies affecting competitiveness and export capacity.

Graph 3.1: **NIIP-stabilising current account and trade balance**



Notes: The underlying assumptions are as follows: average 3% expected nominal GDP growth; zero capital account balance, secondary income balance, non-investment income balance reinvested earnings balance; yield on foreign liabilities equal to 2.7% and on foreign assets equal to 2.2%; foreign assets equal to 150% of GDP.

Computing the required trade balance for NIIP stabilisation requires additional assumptions regarding the evolution of current account components. Assuming that the return on foreign assets and liabilities is roughly the same and equal to r_t, the current account can be expressed as follows,

$$CA_t = TB_t + r_t NIIP_{t-1} + NIB_t + RE_t + NTR_t \tag{3.6}$$

which yields the following expression for the trade balance required for the stabilisation of the NIIP:

$$TB^S_{t,t+T} = \left(g^e_{t,t+T} - r^e_{t,t+T}\right) NIIP_t - \left(NIB^e_{t,t+T} + RE^e_{t,t+T} + NTR^e_{t,t+T} + KA^e_{t,t+T}\right) \tag{3.7}$$

The assumption that the returns on foreign assets and liabilities can be roughly identical is not in line with stylised facts, and more plausible assumptions are provided in Annex 1, which distinguish between returns on assets and liabilities on the basis of expected returns to domestic government bonds in the case of foreign liabilities, and on the basis of foreign government bonds in the case of foreign assets. Assumptions for what concerns projected values for non-investment income and reinvested earnings can rely on extrapolations from past values, as these components are relatively stable and country-specific.

The required trade balance depends also on the returns on foreign assets and liabilities. Expression (3.6) helps conveying the idea that the required trade balance depends also on the expected return on the stock of foreign assets and liabilities. High average rates of return on the NIIP imply that debtor countries need larger trade balances (and creditor countries can afford larger trade deficits) to stabilise the external position. Economies that earn lower rates of return on their assets than they pay out

on their liabilities (for example, because of risk premia on their external debt) must—other things being equal—run larger trade surpluses to stabilise their net foreign assets.

The required trade balance may differ substantially from the required current account, especially if NIIP stocks are strongly negative or positive. In absence of major differences between the returns on assets and liabilities, large stock of foreign net liabilities (resp. assets) tend to imply larger current account deficits (resp. surpluses) through the income balance, thereby requiring a stronger adjustment in the trade balance to compensate. Hence, in case of a negative NIIP, the stabilising trade balance is a smaller deficit (or a surplus) as compared with the required current account balance, while in the case of a positive NIIP the trade balance would be a smaller surplus (or a deficit) as compared with the stabilising current account. Such differences increase with the size of the NIIP. Graph 3.1 illustrates this point by plotting required current accounts and trade balances on the current NIIP stock. The particular configuration of assumptions on nominal growth, asset and liability returns, capital account and remaining current account components in the Graph implies that when the NIIP is below prudential target, a trade balance surplus is required to bring the NIIP to target, even when the required current account may be negative.

4. CURRENT ACCOUNT NORMS

4.1. INTRODUCTION

This section presents a methodology to estimate current account benchmarks based on fundamentals. Starting from the seminal contribution by Chinn and Prasad (2003), a number of papers have analysed current account determinants in panel regressions and established current account norms on this basis (see Chapter 2). In this tradition, this section presents an empirical model of the current account which permits to capture some of the particularities of current account developments in Europe and illustrates the steps followed to derive current account norms based on fundamentals from the estimation of this model.

The interpretation of the benchmark is that of a *reference point for current accounts*, i.e., a value that is likely to be the observed on average over the medium-to-long term once temporary factors and adjustment dynamics are taken into account. Large deviations from the benchmark, both positive and negative, signal cases that are difficult to explain on the basis of standard relations of current accounts with fundamentals.

The remainder of the chapter is structured as follows. The next section describes the specification of the empirical current account model, elaborating on the rationale for the selected explanatory variables. Section 4.3 illustrates the sample and the estimation method, and presents estimation results. Section 4.4 describes the methodology for the estimation of current account norms and discusses issues relating to their robustness.

4.2. AN EMPIRICAL MODEL FOR CURRENT ACCOUNTS

The specification and estimation approach used for the present analysis is akin to that found in Phillips et al. (2013). Table 4.4 describes the variables, their expected sign, statistical treatment and source.

- The choice of the variables reflects specifications that have been customarily used to model the determinants of the savings-investment balance. The specification departs from earlier approaches that exclude short-term cyclical variables by using a dataset made of non-overlapping averages over predetermined time periods (e.g., 5 years as in Chinn and Prasad, 2003; or Lee et al., 2008). In contrast, following Phillips et al. (2013), the present application performs *estimation on annual data*, and short-term cyclical variations in the data are purged by means of the inclusion of cyclical control variables.

- Since current account balances are determined not only by domestic variables but also by those of the other countries engaging in trade and financial transactions, *the variables are constructed, whenever meaningful, as differences compared with world averages*.([14]) This transformation induces stationarity of explanatory variables. It also provides a straightforward interpretation for the policy variables so transformed, which can be seen a deviations from a common norm corresponding to world averages. In order to adjust for *endogeneity issues*, certain variables either enter in lags or are instrumented.

- As compared with previous applications, a number of explanatory variables are included that help capturing features of current account balances in European countries (including manufacturing intensity, construction investment and the interplay between ageing and welfare generosity).

([14]) While all base terms are structured as differences with respect to the world average, for interaction terms only one factor is expressed as difference from world average in order not to affect the sign of the interacted term.

- As the sample used for the estimation needs to span a sufficiently large cross-country dimension, both advanced and emerging economies are included in the sample, and the choice of explanatory variables is partly dictated, as in other applications, by considerations regarding the availability of data for non-OECD countries.

A first set of variables are of structural nature: they do not depend on transitory economic factors or policy choices. As such, they are considered as *fundamentals* in the computation of current account norms (see Table 4.4 and Annex 2 for a detailed list of data sources and transformations):

- **Relative income.** Relative income per capita relative to a country or country group captures the prediction from theory that capital should be flowing 'downhill' from rich to catching-up economies, hence the expected sign is negative. Since empirical evidence often points to an opposite effect of relative income to current account balances, per-capita income (expressed in PPP terms) is further interacted with an indicator of capital account openness (Chinn and Ito, 2008). As shown in existing work (e.g., Reinhard et al., 2013) interacting relative income with capital account openness largely resolves this ambiguity: the sign of the relative income coefficient is unambiguously positive in the presence of no restrictions to the capital account.

- **Ageing.** The inter-temporal perspective of the current account highlights that demographic features such as ageing or the demographic dividend affect aggregate savings. Both contemporaneous and forward-looking demographic indicators are taken into account in the empirical specification.

- Since old-age population is expected to exhibit comparatively low savings rates, the **old-age dependency ratio** has an expected negative coefficient. ([15])

- In line with Phillips et al. (2013), **ageing speed** captures the forward looking aspect. Ageing speed, as proposed in Lane and Milesi-Ferretti (2012) represents the change in the old-age ratio expected over the subsequent twenty years. A priori, it should have a positive impact on the current account for a society that expects to age faster than the world average.

- The selected specification departs from that in Phillips et al. (2013) for what concerns two interaction terms aimed at better qualifying the impact of ageing according to country characteristics. Demographic variables are first used to qualify a welfare generosity indicator (see below). This qualification is particularly relevant in European countries that tend to exhibit welfare generosity above what found outside Europe. Second, an interaction between **ageing speed and per-capita income** is considered part of the fundamentals. Savings are expected to increase in anticipation of fast ageing only to the extent that financial systems are sufficiently developed and perceived as safe, and contractual enforcement of property rights protected. These aspects are more likely to be present in high per-capita income countries, which are therefore expected to exhibit a stronger reaction to ageing speed, as shown, inter-alia, in Lane and Milesi-Ferretti (2012). A positive interaction term is also consistent with the empirical finding that higher per capita lifetime income is associated with higher propensity to save (e.g., Dynan et al., 2004).

- The additional age-related variable that commonly features among the explanatory factors in current account regressions is **population growth**. Countries with higher population growth not only have more young people that do not save but population growth could also be expected to yield higher future GDP growth and are thus make a country more likely to run a current account deficit.

- **Manufacturing intensity**. Countries specialising in manufacturing may run higher current account balances for a number of reasons. The first reason is that a specialisation in manufactures reflects

([15]) Chinn and Prasad (2003) and Chinn et al. (2013) also include the youth dependency ratio with mixed results. The youth dependency ratio is in fact likely to interact with financial frictions (see, e.g., Gourinchas and Rey, 2014).

relative efficiency in the production of tradable goods, which would normally translate into a relative large supply of tradables and more positive trade balances. Moreover, because of the slower pace of trade liberalisation in services, countries with a stronger specialisation in manufacturing tend to accumulate trade balance surpluses (e.g., Barattieri, 2014). Manufacturing also plays a role via global value chains in manufacturing production processes which are empirically positively associated with current account balances. ([16]) The **variable share of manufacturing value added in total value added** has therefore a positive expected sign. Since for this variable the issue of reverse causation could be problematic (as countries with current account balances in surplus for reasons independent of a comparative advantage in manufactures are likely to exhibit a relatively abundant supply of tradable goods, including manufactures) the variable is instrumented with the share of manufacture exports on total exports, to capture the idea that manufacturing intensity is not only the outcome of external adjustment but reflects a structural composition of exports.

- **Commodity resources**. From the intertemporal perspective, finite natural resource endowments are expected to be associated with surpluses, as some of the revenues are saved in anticipation of future depletion. Empirically, countries with large primary resource endowments generally post current account surpluses. The **oil and gas balance** and the **share of export of mining products on total exports** are the variables aimed at capturing this effect.

- **Reserve currency status**. The "exorbitant privilege" from reserve currency status contributes to the demand of assets denominated in that currency, reducing the risk of balance-of-payment crises and improving external financing conditions, thus allowing for a reduced external constraint (e.g., Gourinchas and Rey, 2014). The expected sign is therefore negative for the variable constructed as the share of own currency in total foreign exchange reserve holdings, as reported by the IMF's COFER database.

- **Corporate financial centre status**. Five countries in the sample (Netherlands, Luxembourg, Switzerland, Singapore and Hong Kong) have been an attractive centre for portfolio investment related to corporate funding and offshoring operations for decades and display persistent surpluses. Likewise, these economies are characterised by surpluses on other important current account surplus items, such as merchanting (e.g. Beusch et al., 2014) or re-exports. Following Lee et al. (2008), these effects are captured by a corporate financial centre dummy for those five countries, which is expected to relate positively with current account balances.([17])

A set of variables that contribute to explain current account balances are instead of temporary nature, and are therefore *not included among the fundamentals* for the computation of current account norms.

- **NIIP / GDP.** Most current account specifications include the NIIP as an explanatory variable, with an expected sign that is ambiguous a-priori. On the one hand, a substantially negative NIIP will entail a negative income balance, thus weighing negatively on the current account balance. Yet, inter-temporal considerations suggest an effect in the opposite direction: a negative NIIP may raise sustainability concerns and thus exert upward pressure on the trade balance. In addition to the NIIP/GDP variable, following Phillips et al. (2013), the specification also includes the **negative NIIP/GDP in excess of -60%**. The inclusion of this interaction term permits to separate the positive net income effect from

([16]) The ECB (2017) analyses the impact of value chain participation on the current account.

([17]) Note that among EU countries, Ireland and Malta have acquired a comparable status during the last two decades but are not covered by the corporate financial centre dummy as this does not apply to the full sample period. Cyprus likewise is characterized by similar financial operations, although with characteristics that are not necessarily implying a tendency towards surpluses. Also in the case of Cyprus a financial centre dummy is not included. Phillips et al. (2013) mention that Belgium has lost this status during the 2000s. For transparency, the financial centre dummy is only used for countries that are characterized by important corporate financial centre status throughout the estimation period.

the negative trade balance effect, which is expected to be dominant provided that the NIIP stock is sufficiently negative.

- **Changes in global risk aversion** have a major influence on international capital flows and therefore on current accounts. Global financial conditions are proxied in this application by the VIX index. ([18]) As in Phillips et al. (2013), the **VIX index** is further **interacted with capital openness** (as risk aversion in financial markets affect especially countries with an open financial account) and in **a triple interaction term with capital openness and the share of currencies in total reserves**. The latter term accounts for the fact that, for countries with a reserve currency, an increase in risk aversion in financial markets rather than implying capital flights and then an improved current account balance, would likely imply capital surges linked to increased demand for reserve currency.

- **Medium-term GDP growth expectations**. Strong expected growth justifies borrowing on aggregate and therefore lower current account balances. The **expected real GDP growth over the next 5 years** has therefore a negative expected sign. Our specification is in this respect follows Phillips et al. (2013) but, while these authors interpret this variable as part of fundamentals and mainly capturing potential growth prospects, we prefer to provide a transitory interpretation in light of the record of frequent revisions in medium-term growth forecast and in potential growth estimates. Such a choice permits to maintain a conservative approach to the determination of current account norms and to reduce the short-term variations in the benchmarks obtained.

- **Welfare expenditure**. Welfare protection is expected to reduce households' needs for precautionary saving, thereby impacting the external balance negatively. The complete universe of social expenditure is hardly comparable across countries worldwide. Kerdrain et al. (2010) have suggested the use of public health expenditure as a proxy, as this variable is more easily comparable. Hence, in line with Phillips et al. (2013), the variable used is **health expenditure as a share of GDP** with respect to world average, with negative expected sign.

- The specification departs from Phillips et al. (2013) in that it also includes the **interaction of the old-dependency ratio with public health expenditure as a share of GDP**. This interaction permits to take into account the impact of age-related expenditure when measuring the impact of social welfare on precautionary savings.

- **Fiscal balance**. Fiscal savings in excess of those of the rest of the world should result into reduced aggregate borrowing and therefore an improvement in the current account. Most existing analyses find a significant explanatory power for this variable on current accounts, confirming the "twin-deficit" hypothesis. The variable used is the **structural fiscal balance as a share of GDP**, expressed as the difference with respect to the world average. The variable, subject to possible endogeneity and reverse causation issues, is instrumented as in Phillips et al. (2013). ([19])

- **Foreign currency reserve accumulation**. Current account balances may partly reflect targeting of official reserves by monetary authorities, which has both a direct (via savings-investment balances).and indirect (via exchange rate impact) effect on the current account. It has been shown, however, that for official reserve variables to have a significant explanatory power on current accounts, the change in foreign reserves needs to take into account the extent to which capital mobility could potentially offset the impact of official intervention on currency markets (Reinhardt et al., 2013). For this reason, following Phillips et al. (2013), the variable is specified as the **change in foreign reserves/GDP interacted by the Chinn-Ito indicator of capital account controls**.

([18]) Note that earlier studies often use a dummy for the Asian crisis (see Lane and Milesi-Ferretti, 2012) to account for capital market disruptions in specific periods.

([19]) The instrument list includes: the contemporaneous world structural fiscal balance, lagged domestic and world structural fiscal balance and output gap, as well as global risk aversion proxied by the VIX index.

Moreover, as endogeneity and reverse causation for this variable can be problematic (it may be the case that monetary authorities target foreign reserves exactly to counter current account shocks), the variable is instrumented with variables capturing independent motives for targeting reserves: overall trends in reserves accumulation at world level, M2/GDP, U.S. short term real interest rate.

- Other typical temporary factors taken into account to obtain "underlying" values for the current account is the effect arising from past, recent changes in exchange rates, i.e., exchange rate dynamics that already took place but that have not produced yet the expected impact on current accounts due to lags. To this purpose, the specification also includes the **lagged change in the REER over three years**. The estimated coefficient is expected to be negative.

- **Construction investment**. The current account mechanically arises as the difference between savings and investment. Nonetheless, construction investment plays a particular role for current account dynamics (e.g., Gete, 2014) not only because it is highly volatile but also because it draws resources from tradable activities. Hence the sign of the **construction investment/GDP** variable is expected to be negative.

- **Private-sector credit**. Recent research has revealed a robust negative association between current account balances and private credit variables, reflecting either the extent to which financial development better allows for consumption smoothing (e.g. Gruber and Kamin, 2009) or the financing of real estate bubbles (e.g., Aizenman and Jinjarak, 2014). Two variables are considered; the **stock of private credit on GDP** (difference from country average) and the **lagged 3-year change in the private debt stock as a percentage of GDP**. Both variables have a negative expected sign.

- Studies where data are transformed into multi-annual averages (e.g. Chinn and Prasad, 2003) typically forego the business cycle as a determinant of current accounts. In the present application, the **output gap** is used, with an expected negative sign.

Country fixed effects are deliberately omitted from the estimation, following the bulk of the literature. Country fixed effects would pick up the impact of many of the fundamentals that do not change significantly overtime. This would leave most of the structural cross-country differences unexplained, providing a weak basis for the computation of the norms. This disadvantage is generally judged to be more serious than the possible omitted variable bias associated with excluding country fixed effects.

4.3. SAMPLE, ESTIMATION AND REGRESSION RESULTS

The sample covers an unbalanced panel of 65 countries for the period 1987-2016 (see Table 4.3). Throughout these three decades, the available data for these countries covers more than 90% of world GDP. Similar to the 49 countries of Phillips et al. (2013), the sample covers the range from lower middle-income countries to high income countries but excludes low-income countries for lack of sufficiently long time series. ([20])

With annual frequency observations the dependent variable is likely to exhibit a certain degree of persistence (possible linked to habit formation, see e.g., Gruber, 2004). Filtering high-frequency movements in the data by using non-overlapping averages of the data helps reducing data persistency addressing the inconsistency problem, which has been followed in past applications (Chinn and Prasad, 2003; Lee et al., 2008). The drawback of averaging, however, is that in practice results are very sensitive to the choice of periods over which to average, and for this reason this avenue is not pursued. To account

([20]) The main difference from the countries coverage by Phillips et al. (2013) is that this study covers many more small countries, most notably all EU Member States. In terms of time coverage, 52 countries have data available for more than 20 years, and all other countries provide time series in excess of 10 years.

for the persistence in annual current account data, one option is to include a lagged-dependent variable, which however implies small-sample bias for the pooled least squares estimator, especially when the time dimension is small compared with the cross-section dimension. ([21]) More fundamentally, the inclusion of the lagged dependent variable would basically imply predicting current accounts on the basis of previous-year values, i.e., including quasi-fixed effects. For this reason, following Phillips et al. (2013), the lagged dependent variable is not included. Residuals are likely to be subject to serial autocorrelation and heteroscedasticity, as well as contemporaneous correlation across panels. The standard errors of OLS estimate are therefore corrected à la Driscoll and Kraay (1998) to account for heteroskedasticity, serial correlation and cross-sectional dependence across panels. ([22])

The estimated model is described by the following equation:

$$CA_{it} = \alpha + \beta' X_{it}^{F} + \gamma' X_{it}^{N} + \varepsilon_{it} \quad (4.1)$$

where $CA_{it}$is the current account/GDP ratio of country i at time t, X_{it}^{F} is the set of explanatory fundamental variables while X_{it}^{N} are non-fundamental variables and ε_{it} denotes the error term.

Table 4.1 **reports current account regression results.** In general, the sign and magnitude of the estimated coefficients correspond to those found in previous studies. The regression is able to explain more than 60 % of the variance of the dependent variable despite the omission of country fixed effects and a lagged dependent variable.

([21]) GMM estimation (e.g., Arellano and Bover, 1995) permits to address the bias provided that regression coefficients are homogenous across panels (Pesaran and Smith, 1995), an assumption which is unlikely to hold in large cross-country samples.

([22]) The Prais-Winsten FGLS estimator with AR(1) residuals as used in Phillips et al. (2013) may help correcting for the omitted variable bias arising from the absence of the lagged dependent variable but could still be subject to non-negligible distortion in light of an unbalanced panel structure and short time series for some of the panels. Annex 2 shows that Prais-Winsten estimates yield qualitatively similar coefficients to OLS and a Durbin Watson statistic very close to the one obtained with OLS estimates, which are used as baseline in light of likely less precise standard error estimates with FGLS in panels with short time series (see, e.g., Beck and Katz , 1995).

Table 4.1: **Baseline current account regression**

	Dependent: Current account balance as % of GDP	(1)	(2)	(3)	(4)
	Explanatory variables	Relative to world average	Interaction term	Coefficient	Statistical significance
Fundamentals	Relative income per capita in PPP (lagged)	✔		0.034	***
	Relative income interacted with capital account openness (lagged)	✔	✔	0.033	*
	Ageing speed	✔		-0.025	
	Ageing speed wrt. world * income per capita (PPP) as % of G3 mean	✔	✔	0.164	**
	Old-age dependency ratio	✔		-0.047	*
	Population growth HP-filtered (lagged)	✔		-0.576	**
	Share of manufacturing in value added, instrumented	✔		0.234	***
	Oil & gas balance / GDP 5Y-mov.av., if positive	✔		0.427	***
	Mining products exports as % of total exports (lagged)	✔		0.002	
	Domestic currency % use in world FX reserves			-0.041	***
	Financial centre dummy			0.016	***
Non-fundamentals	NIIP / GDP (lagged, in USD terms)			0.032	***
	NIIP exceeding -60% of GDP (lagged)		✔	-0.030	**
	VIX*(capital account openness) (lagged)		✔	0.084	***
	VIX *(capital account openness) * reserve currency status		✔	-0.210	*
	Annual real GDP growth expected 5 years ahead	✔		-0.310	***
	Public health expenditure / GDP (lagged)	✔		-1.739	***
	Health exp. wrt. world av., interacted with old-age dep. ratio	✔	✔	4.773	***
	Structural fiscal balance, instrumented	✔		0.272	***
	(FX reserve change)/GDP * capital closedness, instrumented	✔	✔	0.338	**
	REER growth (over 3 years, lagged)			-0.086	***
	Construction investment / GDP (lagged)	✔		-0.099	***
	Change of private debt in pp. of GDP (over 3 years, lagged)	✔		-0.059	***
	Private debt stock/GDP (demeaned by country historical average)	✔		-0.011	
	Output gap / potential GDP	✔		-0.385	***
	Constant			-0.392	**
	R^2			0.641	
	Adjusted R^2			0.635	
	RMSE			3.42	
	Number of observations			1589	
	Durbin-Watson stat			0.64	
	Sample condition number			9.5	

The main drivers behave as expected. The response of the current account to an increase in relative income depends on the degree of capital account openness, tending to be insignificant for relatively closed countries. The effect also accentuates an economy's aging speed, that is, richer countries that age faster also save more in net terms than poorer countries aging at the same speed. Table 4.1 displays a significant and positive coefficient for outright relative income, as well as its two interaction terms. While ageing speed may seem insignificant, its marginal impact is distributed across the coefficient of outright ageing speed and its interaction with relative income. Both coefficients are jointly significant and suggest that increasing ageing speed raises the current account. The old-age dependency ratio tends to induce lower current account balances and is also jointly significant across its base and interaction term. ([23]) Likewise, population growth impacts negatively on the current account. In contrast, manufacturing

([23]) The effect is less straighforward when taking public health expenditure into account. While an economy that is older than the world average tends to have a lower current account, it also dampens the impact from public health expenditure. Overall, the interaction term with health expenditure may dominate the base term, i.e. for an economy with very low public health expenditure a higher old-age dependcy ratio may actually result into a higher current account. Note that this also holds when linear transformations are applied to the health expenditure base term and its interaction term in order to reduce collinearity between the two.

intensity, the oil and gas balance in resource rich countries and the importance of mining exports, improve the current account balance (although the latter variable has limited significance). The reserve currency status softens external balance constraints and is associated with lower current account balances, as expected. In contrast, the financial centre dummy has positive sign, indicating that countries that are particularly attractive for corporate offshoring operations tend to exhibit more positive current account balances. Temporary and policy-related factors have the expected sign and are statistically significant.

Results are qualitatively robust with respect to sample perturbations, alternative estimation methods and specifications. Table A2.1 in Annex 2 presents results relating to alternative sample definition, estimation methods, as well as the specifications found in Phillips et al. (2013) and previous specifications used in the context of EU MIP surveillance. It also presents the outcome of a systematic robustness check with respect to all possible alternative selections of interaction terms by means of Bayesian Model Averaging. Results show a high posterior inclusion probability for all base terms in the model, while only few interaction terms display inclusion probabilities of similar magnitude.

4.4. OBTAINING CURRENT ACCOUNT BENCHMARKS

Algebraically, the norm is defined as the sum of contributions from fundamentals. The current account balances predicted on the basis of the empirical model estimates are as follows:

$$\widehat{CA}_{it} = \hat{\alpha} + \hat{\beta}' X_{it}^{F} + \hat{\gamma}' X_{it}^{N} + \hat{\varepsilon}_{it} \tag{4.2}$$

where the "hat" sign denotes estimates. The current account norms consider only benchmark based on fundamentals is thus defined as:

$$CAN_{it} = \hat{\alpha}^{F} + \hat{\beta}' X_{it}^{F}, \tag{4.3}$$

where $\hat{\alpha}^{F} = \overline{CA} - \hat{B}'\bar{X}^{F}$, with the dash sign denoting averages. Note that as compared with equation (4.2) where $\hat{\alpha} = \overline{CA} - \hat{B}'\bar{X}^{F} - \hat{\Gamma}'\bar{X}^{N}$, the constant term for the computation of norms needs to take into account only the impact of fundamentals. This is a consistency requirement that also ensures that any affine transformation of the explanatory variables has no impact on the estimated norms.

Current account norms are obtained as predictions using only explanatory variables that can be considered as fundamentals, namely: (i) non-temporary factors; (ii) policy determinants in line with the world average. By interpreting world averages for policy variables as norms, and since variables are expressed relative to world averages, the estimation of norms requires to set these transformed policy variables to zero.

The criteria followed in this paper for the definition of fundamentals aim at obtaining stable and predictable current account norms. As compared with previous literature (e.g., Isard and Faruqee, 1998; Lee et al., 2008; Phillips et al., 2013) tighter criteria are used for considering variables as fundamentals, which also tends to the exclusion of some variables exhibiting a certain degree of persistency. Moreover, the definition of norms does not require judgement on policy variables, thanks to the assumption that normal policies correspond to values in line with world averages.

On the basis of arguments already sketched in section 4.1., the following variables are considered as fundamentals.

- **Relative income** is a persistent variable reflecting structural differences, and in line with the literature, this indicator is considered as a fundamental.

Table 4.2: **Current account drivers: time series vs. cross-country variation**

	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5
Financial centre dummy	0.00	0.00	0.00	0.00	0.00
Domestic currency % use in world FX reserves	0.06	0.10	0.13	0.14	0.16
Old-age dependency ratio	0.04	0.08	0.12	0.16	0.19
Relative income per capita in PPP (lagged)	0.06	0.10	0.13	0.17	0.20
Oil & gas balance / GDP 5Y-mov.av., if positive	0.08	0.14	0.20	0.25	0.29
Mining products exports as % of total exports (lagged)	0.15	0.20	0.24	0.28	0.31
Public health expenditure / GDP (lagged)	0.15	0.22	0.28	0.31	0.35
Ageing speed	0.10	0.19	0.27	0.35	0.43
Share of manufacturing in value added, instrumented	0.16	0.23	0.28	0.33	0.37
Population growth HP-filtered (lagged)	0.12	0.23	0.33	0.41	0.47
NIIP / GDP (lagged, in USD terms)	0.26	0.35	0.43	0.52	0.58
Annual real GDP growth expected 5 years ahead	0.40	0.52	0.59	0.63	0.67
Construction investment / GDP (lagged)	0.28	0.46	0.60	0.71	0.80
Private debt stock/GDP (demeaned by country historical average)	0.35	0.57	0.74	0.91	1.08
Structural fiscal balance, instrumented	0.53	0.71	0.84	0.94	0.99
(FX reserve change)/GDP * capital closedness, instrumented	0.81	0.94	1.07	1.15	1.27
Change of private debt in pp. of GDP (over 3 years, lagged)	0.59	0.90	1.17	1.36	1.49
Output gap / potential GDP	0.79	1.18	1.39	1.51	1.55
REER growth (over 3 years, lagged)	0.78	1.20	1.49	1.54	1.53
VIX*(capital account openness) (lagged)	3.05	4.89	5.94	6.58	6.60

Figures present the standard deviation of variable first differences of lag order 1 to 5, divided by the standard deviation of variable levels. The Table is ordered by the average ratio across the five lag orders. Bold font indicates fundamental variables.

- **Old-age dependency ratio, ageing speed, population growth,** as demographic state and trend variables are typical structural fundamental drivers of the savings-investment balance.

- **Oil and gas balance, mining share in exports,** as commodity trade reflects mainly geographic characteristics, and are thus considered as fundamentals in most existing work.

- **Financial centre dummy:** the financial centre dummy reflects long-term institutional characteristics that are hard to change over the medium term.

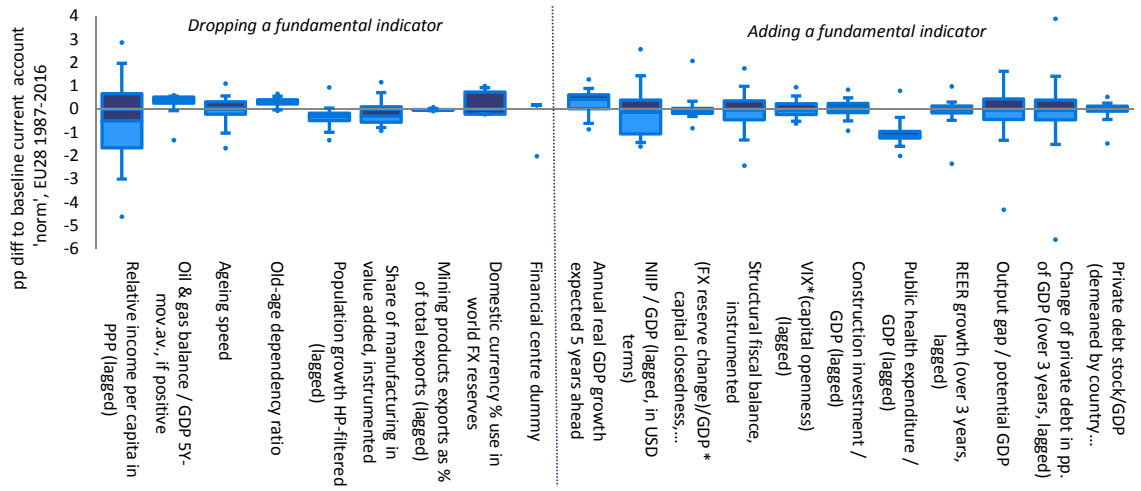
- **Manufacturing intensity:** manufacturing intensity is persistent and hard to change significantly over the medium term being largely driven by geography, the skill set available within a country's population, existing infrastructure, as well as institutional settings.

- **Domestic currency % use in world FX reserves,** as it is very persistent (see Table 4.2) and mainly shaped by the structural and institutional characteristics of the issuing country.

Interaction terms are considered as fundamentals only if they do not contain a transient component, i.e., only if all terms being interacted are fundamentals. In this vein, only two interaction terms are included among the fundamentals.

- **Interaction between relative income and capital openness,** which helps qualifying the extent to which relatively poor (rich) country are expected to run relatively larger deficits (surpluses)

Graph 4.1: **Current account norms, sensitivity to adding or dropping a fundamental indicator**



Graph shows the deviation of current account norms under a differing definition of fundamentals from the baseline defined above, for 25 EU countries (excl. Ireland, Malta and Cyprus, which are countries that have acquired features of corporate financial centres during the estimation period with implications for recent NIIP dynamics). The boxes display the interquartile range, with the upper, dark blue part of each box representing the third quartile, while the lower, light blue part describes the second quartile of alternative current account norms. The horizontal line within boxes consequently represents the median current account norm under the respective definition. The vertical 'whiskers' display the 5th and 95th percentile, while dots represent the maximum and minimum observations in each case.

- **Interaction between aging speed and income per capita,** that permits to distinguish the impact of ageing prospects according to countries' structural and institutional characteristics summarised by the per-capita income variable.

Evidence regarding the variability of the variables across the sample supports the selection of fundamentals. Indicators that vary mostly over the cross section rather than over time are better candidates for being considered as fundamentals. Conversely, variables with derive their variance largely from the time dimension (such as the output gap) are more likely to be variables affected by the cycle and characterised by a large transitory component, and therefore to be considered as non-fundamentals. Table 4.2 broadly confirms that the fundamentals defined above are indeed the variables with the lowest ratio of temporal to cross-sectional variance.

The distinction between fundamental and non-fundamentals may not be straightforward for a handful of variables. This is especially the case of the NIIP and the health expenditure variables. Despite its persistency, it is not obvious that the NIIP is part of the structure of an economy as its origin may be linked to temporary policy deviations, and since its fluctuations could be quite sizable and associated to nominal GDP growth volatility or valuation effects ensuing inter-alia from exchange rate gyrations. Moreover, excluding the NIIP from the set of fundamentals helps reducing the volatility of the estimated norms, by eliminating their dependence from the inherited NIIP stock which undergoes major fluctuations in some cases. Table 4.2 shows that public health expenditure varies rather slowly over time. Nevertheless, there are no major reasons not to consider this variable in the same fashion as other policy variables. Despite its persistency, reforms have been enacted in a number of countries in the sample that have changed health expenditure considerably over short horizons (e.g., quite numerous episodes of changes above 1 pp of GDP in a one-year time frame since 2000).

Graph 4.1 **shows that current account norms would be only moderately affected if additional indicators were classified as fundamentals.** For most base terms, classifying them as fundamentals would change the norm by less than 1 pp. for 90% of EU countries over the period 1987-2016 and have a zero impact on average. Classifying the NIIP as a fundamental would not affect sizably most individual norms, except few cases where there could be a reduction by up to three pp. of GDP. Considering health

expenditure as a fundamental would lower the current account norm for nearly all EU countries by about 1 pp. of GDP.

Table 4.3: **Available sample for the estimation of the current account model**

Country	Code	Sample	Country	Code	Sample	Country	Code	Sample
Argentina	ARG	1987-2016	Hong Kong	HKG	1994-2009	Philippines	PHL	1989-2016
Australia	AUS	1987-2016	Hungary	HUN	1992-2016	Poland	POL	1995-2016
Austria	AUT	1987-2016	Iceland	ISL	1993-2016	Portugal	PRT	1987-2016
Belgium	BEL	1990-2016	India	IND	1988-2016	Romania	ROU	2000-2016
Brazil	BRA	1991-2016	Indonesia	IDN	1996-2016	Russia	RUS	1997-2016
Bulgaria	BGR	2002-2016	Ireland	IRL	1990-2016	Serbia	SRB	2006-2016
Canada	CAN	1987-2016	Israel	ISR	1996-2016	Singapore	SGP	1999-2016
Chile	CHL	1991-2016	Italy	ITA	1989-2016	Slovakia	SVK	1997-2016
China	CHN	1987-2016	Japan	JPN	1987-2016	Slovenia	SVN	1997-2016
Colombia	COL	1991-2016	Korea, Republic	KOR	1987-2016	South Africa	ZAF	1987-2016
Costa Rica	CRI	1991-2016	Latvia	LVA	2002-2016	Spain	ESP	1987-2016
Croatia	HRV	2004-2016	Lithuania	LTU	2000-2016	Sri Lanka	LKA	1987-2016
Cyprus	CYP	1998-2016	Luxembourg	LUX	2000-2016	Sweden	SWE	1987-2016
Czech Republic	CZE	1997-2016	Malaysia	MYS	1987-2016	Switzerland	CHE	1987-2016
Denmark	DNK	1990-2016	Malta	MLT	2004-2016	Thailand	THA	1991-2016
Egypt	EGY	1987-2016	Mexico	MEX	1991-2016	Tunisia	TUN	1996-2016
Estonia	EST	1997-2016	Morocco	MAR	1996-2016	Turkey	TUR	1987-2016
Finland	FIN	1987-2016	Netherlands	NLD	1987-2016	Ukraine	UKR	2003-2016
France	FRA	1987-2016	New Zealand	NZL	1992-2016	United Kingdom	GBR	1987-2016
Germany	DEU	1992-2016	Norway	NOR	1987-2016	United States	USA	1987-2016
Greece	GRC	1988-2016	Pakistan	PAK	1996-2016	Uruguay	URY	1991-2016
Guatemala	GTM	2000-2016	Peru	PER	1991-2016			

Observations used for regression in Table 4.1. Time ranges indicate years with complete observations for all regressors.

Table 4.4: **Empirical current account model: Description of variables and transformations**

Variable	Rel. to world av.	Interaction term	Construction/Transformation	Data source
Relative income per capita in PPP (lagged)	✔		GDP in current PPP, divided by number of persons aged 15 to 64	IMF WEO (for GDP in PPP) and UN (for population)
Relative income interacted with capital account openness (lagged)	✔	✔	GDP in current PPP, divided by number of persons aged 15 to 64, times capital openness index. The capital account openness used ranges between 0 for full restriction and 1 for no restriction. It represents the quantiles of the Chinn-Ito (2006) 'kaopen' index.	IMF WEO and UN; Chinn and Ito (2008) for capital controls
Ageing speed	✔		For any year T, ageing speed is defined as the old-age dependency ratio (as defined above) at year T+20 minus the old-age ratio in year T	UN ESA population projections
Ageing speed * income per capita (PPP) as % of G3 mean	✔	✔	Ageing speed minus world average ageing speed, times income per capita in PPP (as defined above) divided by the arithmetic mean of income per capita in PPP of Germany, Japan, and the US.	UN ESA population projections (for demographic data), and IMF WEO (for GDP in PPP)
Old-age dependency ratio	✔		Persons aged 65 and over divided by persons aged 30-64	UN ESA population projections
Population growth HP-filtered (lagged)	✔		Actual annual population growth is HP filtered (with parameter λ=5). The result closely matches annual population growth as provided by the Penn World Tables (9.0)	HP filter on AMECO, IMF WEO, and Worldbank WDI
Share of manufacturing in value added, instrumented	✔		Manufacturing value added as % of GDP relative to world average is instrumented by the lagged domestic and world average share of manufacturing goods in total goods and services exports.	For the instrumented variable, Worldbank WDI and UN. For manufacturing exports as % of total exports, AMECO, IMF IFS, Worldbank WDI, IMF BoP
Oil & gas balance / GDP 5Y mov.av. (if positive)	✔		Five-year moving average of (nominal) net exports of oil and gas in USD, divided by GDP. Set to zero if negative.	UN Comtrade
Mining products exports as % of total exports (lagged)	✔		Exports of mining products (in USD), divided by total goods and services exports	Worldbank WDI for mining exports. For total exports, AMECO, IMF IFS, Worldbank WDI, IMF BoP
Domestic currency % use in world FX reserves			the share of the currency in world foreign exchange reserves, in case the domestically issued currency is covered in the IMF COFER database, and zero in all other cases	IMF COFER
Financial centre dummy			A dummy for all observations of Netherlands, Luxembourg, Switzerland, Singapore, and Hong Kong	None
NIIP / GDP (lagged, in USD terms)			Net international investment position (NIIP) in USD, divided by GDP in USD	Eurostat, IMF BoP, Lane and Milesi-Ferretti (2007)
NIIP exceeding -60% of GDP (lagged)		✔	Max(140,Min(NIIP/GDP+60,0)	Eurostat, IMF BoP, Lane and Milesi-Ferretti (2007)
VIX*(capital account openness) (lagged)			Chicago VXO index demeaned by the average index since 1987, times capital openness index	CBOE (for VXO) and Chinn and Ito (2008) for capital controls

(Continued on the next page)

Table (continued)

VIX*(capital account openness) * reserve currency status		✔	Chicago VXO index demeaned by the average index since 1987, times capital openness index, times " Domestic currency % use in world FX reserves"	CBOE (for VXO), Chinn and Ito (2008) for capital controls, IMF COFER for reserve currency use
Annual real GDP growth expected 5 years ahead	✔		For any year T, real annual GDP growth expected for T+5 in year T	IMF WEO, EIU
Public health expenditure / GDP (lagged)	✔		Public health expenditure in USD, divided by GDP	WHO public health expenditure. Pre-1995 data imputed with OECD public health expenditure, and Phillips et al. (2013).
Health exp. wrt. world av., interacted with old-age dep. ratio	✔	✔	Public health expenditure in USD, divided by GDP minus corresponding world average, times the outright old-age dependency ratio as defined above	WHO, OECD, and Phillips et al. (2013) for public health expenditure, UN population projections for demographic data
Structural fiscal balance, instrumented	✔		General government structural fiscal balance as % of GDP, where available. Otherwise the cyclically adjusted fiscal balance.	AMECO, IMF WEO, OECD, and Phillips et al. (2013)
(FX reserve change)/GDP * capital closedness, instrumented		✔	As in Phillips et al. (2013), the instrumented variable computed as the annual change of foreign exchange reserves as pp. of GDP times one minus the capital openness index. Instrumented by its contemporaneous world average, its domestic lag, the US T-bill rate times capital closedness and domestic M2 growth times capital closedness	IMF IFS and Chinn and Ito (2008) for the instrumented variable, IMF IFS for US T-bills, IMF IFS and OECD for M2 growth
REER growth (over 3 years, lagged)			Three-year percentage change in CPI-based trade weighted real effective exchange rate index vs 167 countries	Darvas (2013)
Construction investment / GDP (lagged)	✔		Residential and non-residential construction investment as % of GDP	AMECO, OECD, UN, and own calculations following Inklaar and Yang (2012)
Change of private debt in pp. of GDP (over 3 years, lagged)	✔		Three-year change of the private debt stock (as defined above) as pp. of GDP	IMF IFS banking claims on the private sector (in local currency)
Private debt stock/GDP (demeaned by country historical average)	✔		Contemporaneous debt stock divided by GDP in local currency, minus the country-specific arithmetic mean over 1987-2016	IMF IFS banking claims on the private sector (in local currency)
Output gap / GDP	✔			AMECO, IMF WEO, OECD, and Kalman filter (with lambda=100)

5. PATTERNS OF CURRENT ACCOUNT BENCHMARKS ACROSS THE EU

5.1. INTRODUCTION

The purpose of this chapter is to illustrate main features and patterns of current account benchmarks. It also presents features of current account gaps, namely the difference between actual current account balances and current account benchmarks. As current account benchmarks and concepts referred to medium-term and abstract to short-term variations, current account gaps are computed after purging current account balances from their cyclical component.

The remainder of the chapter is structured as follows. The first section introduces the concept of cyclically-adjusted current accounts, which are used to compute current account benchmarks. The following section analyses main patterns of current account benchmarks. The last section is devoted to the description of main patterns of current account gaps.

5.2. ADJUSTING CURRENT ACCOUNTS FOR THE CYCLICAL COMPONENT AND COMPUTING CURRENT ACCOUNT GAPS

Since current account benchmarks are interpreted as medium-term anchors, they should ideally be compared to actual current account figures adjusted for short-term business cycle effects. Both current account norms and NIIP-stabilising current accounts abstract from short-term cyclical conditions. In order to avoid that current account gaps are mainly driven by cyclical factors, actual current account figures are commonly purged from the effect of the cycle. ([24]) The main idea behind the cyclical adjustment of current accounts is that a strong domestic cycle implies relatively high imports, while buoyant cyclical conditions in foreign economies are associated with export dynamism. Hence, a strong domestic cycle tends to lower current account balances on a temporary basis, while the opposite is true for the foreign cycle.

Most methodologies for the cyclical adjustment of current accounts rely on output gap estimates and estimates of trade elasticities with respect to output. This is the case also in the present application to EU countries. ([25]) Assuming that the activation of imports associated with domestic or foreign output remains relatively constant and independent of output movements, the cyclically-adjusted current account can be computed as follows:

$$CA_t^{adj} = CA_t + \theta_M \frac{M_t}{Y_t} \frac{Y_t - Y_t^*}{Y_t^*} - \theta_X \frac{X}{Y_t} \frac{Y_t^F - Y_t^{*F}}{Y_t^{*F}} \quad (5.1)$$

where CA_t^{adj} and CA_t are, respectively, the cyclically current account balance and the headline current account as a percentage of GDP, $\theta_M$and θ_X are, respectively, the import and the export elasticity with respect to output, $\frac{M_t}{Y_t}$ and $\frac{X_t}{Y_t}$ are, respectively, the fraction of import and export as a percentage of nominal GDP, and starred output variables denote nominal potential output, so that $\frac{Y_t - Y_t^*}{Y_t^*}$ and $\frac{Y_t^F - Y_t^{*F}}{Y_t^{*F}}$ are the domestic and the foreign output gaps. As not all foreign economies are equally important trade partners, foreign output is computed by weighting the output of 42 advanced and emerging economies with double export weights (i.e., weights that take into account market shares also on third markets). ([26]) Potential output figures are computed by the European Commission (AMECO database); if not available, IMF and

([24]) Current account figures could also be adjusted to take into account temporary relative price effects (see, e.g., Bayoumi and Faruqee, 1998; Lee et al., 2008; Salto and Turrini, 2010).

([25]) See Salto and Turrini (2010) for a more detailed description of the approach to current account cyclical adjustment applied in the present analysis. The present methodology has been regularly applied in analyses in the MIP context.

([26]) The weights are the same as those used by the European Commission for the computation of real effective exchange rates.

OECD figures are used. In case also such figures are also not available, computations rely on Hodrick-Prescott filtering ($\lambda = 100$). The values of trade elasticities with respect to output, both on the import and the export side, are set to 1.5, based on ample empirical evidence suggesting elasticities between 1 and 2. ([27])

Cyclically-adjusted current account balances deserve an adequate interpretation. The cyclically-adjusted balance as defined above corresponds to a situation where both the domestic and the foreign economies are operating at potential, so that short-term cyclical effects play no role. A number of caveats are necessary for a correct interpretation.

- First, it is assumed that the whole effect of the cycle is reflected in the trade balance, while it could be the case that income balances vary with the cycle. However, since the relation between current account components other than the trade balance and the cycle is largely of country-specific nature and does not lend itself to an intuitive modelling, it is generally neglected.

- Second, changes in the cyclically-adjusted current account balance are often interpreted as a measure of the "structural adjustment" of the external balance, i.e., an adjustment mainly related to factors such as relative prices and other long-term competitiveness drivers. In this respect, it is important to stress that cyclically-adjusted current accounts cannot provide, in absence of additional devoted analysis, a complete account of the extent to which external rebalancing is structural in nature and driven by what factors. However, they allow for an easy check of the extent to which improvements in the current account are linked to reductions in potential output. It was often the case that after boom-bust cycles potential output of countries was revised downward, reflecting an overestimation during the boom period and implying a persistent reduction in the import bill.

- Third, in interpreting results one should keep in mind that cyclically-adjusted current account estimates are conditional on a number of assumptions that may not always hold, linked for instance to the estimation of trade elasticities and possible fluctuations over time.

- Finally, it is worth recalling that cyclical effects depend for their size on the degree of openness of the economies and, for their size and sign, on the relation between the domestic and the foreign cycle. In the latter respect, what matters is not only where the domestic economy is in the cycle, but whether the cycle co-moves with that of other economies (an economy undergoing a stronger cyclical expansion with respect to competitors tends to exhibit a negative cyclical effect on its current account, while a strong degree of co-movement would result into cyclical effects close to zero).

5.3. PATTERNS OF CURRENT ACCOUNT BENCHMARKS ACROSS THE EU

Data for current account balances, cyclically-adjusted current accounts and current account benchmarks are analysed across a sample of 28 EU countries over the period 1997-2016. The aim of the analysis is to assess main patterns, trends and relations between current account balances and benchmarks. Data sources and treatment are described in Table 4.4 for what concerns current account balances and current account norms and in chapter 3 for what concerns NIIP-stabilising current accounts. The data sources for implementing the cyclical adjustment of budget balances are described in the previous section. The sample starts in 1997, as this is the earliest year for which double export weights for the computation of the foreign output gap are available. As there are missing values for a number of countries, notably former transition countries in earlier years, the panel is unbalanced. The figures for

([27]) See, e.g., Goldstein and Kahn (1985). The literature points to a relatively large dispersion of estimates of trade elasticities from macro data, implying that exact estimates may vary from country to country, year to year. Rather than estimating repeatedly those elasticities from different countries and time periods (which would induce additional variation in cyclically-adjusted current account figures, blurring interpretation), elasticities are kept fixed.

NIIP-stabilising current account balances take into account whether NIIPs are above or below the common prudential threshold of -35%: in the latter case they represent the required balance to reach the NIIP threshold rather than to stabilise the NIIP at the current level (see chapter 3). ([28])

Current account balances display a higher degree of variability as compared with benchmarks. This holds both in terms of variations over time and for what concerns variations across countries. As shown in Table 5.1, the standard deviation across the whole sample of headline and cyclically-adjusted current account balances is much higher than that of current account norms and NIIP-stabilising current accounts. The difference is even largerin terms of standard deviation computed for country-specific time averages, i.e., when only the cross-section variation is taken into account (figures reported in parenthesis). This means that differences in current account positions between different countries go well beyond what explained by economic fundamentals or what required for NIIP stabilisation.

Table 5.1: **Current account balances and benchmarks: main statistics and correlations, EU28 1997-2016**

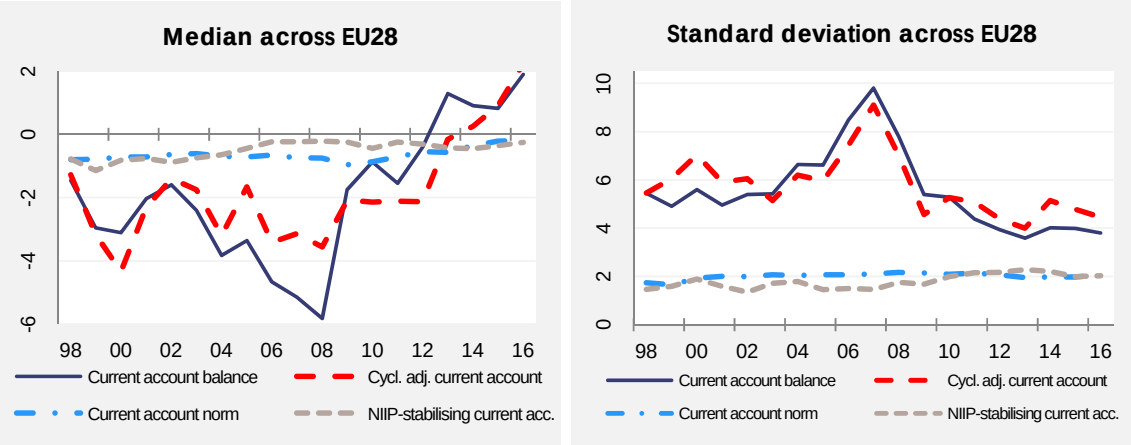
	Current account balance	Cyclically-adjusted current account balance	Current account norm	NIIP-stabilising current account benchmark
		Main statistics		
Mean	-1.50	-1.22	-0.37	-0.88
Median	-1.31	-1.34	-0.61	-0.46
Min	-28.01	-26.45	-3.39	-5.28
Max	15.29	20.06	6.52	4.81
Standard deviation	6.09 (4.54)	6.01 (4.48)	3.87 (1.97)	3.23 (1.53)
		Correlations		
Current account balance	1			
Cyclically-adjusted current account balance	0.93 (0.99)	1		
Current account norm	0.68 (0.91)	0.66 (0.89)	1	
NIIP-stabilising current account	0.29 (0.53)	0.29 (0.51)	0.42 (0.56)	1

Figures in parenthesis describe the standard deviation of, and correlation between, country-specific means. See Table 4.4 for the data sources of current account balances and norms, chapter 3 for NIIP-stabilising current account benchmarks and section 5.2 for cyclically-adjusted current account balances.

The cross-section dispersion in current account benchmarks was remarkably stable during the period considered, while that of current account balances has been growing markedly before the financial crisis and narrowing considerably afterwards. The limited variability in time of current account benchmarks results in a relatively stable distribution of benchmarks across countries. This is consistent with the flat evolution in the cross-country standard deviation of both benchmarks (Graph 5.1). This compares with a standard deviation of current account balances that surges during the mid-2000s, when current account positions polarised and growing deficits, notably in catching-up non-euro area countries and the euro area periphery, were coupled with surpluses, notably in the euro area core and some Nordic countries. The dispersion of current account positions across Europe has recently been narrowing and approaching that observed in current account benchmarks; i.e., a pattern of imbalances which appears increasingly in line with fundamentals and prudential requirements.

([28]) More precisely, the benchmark shows the average current account required to stabilize the NIIP over ten years, for countries with an NIIP higher than -35% of GDP. For countries with an NIIP worse than -35% of GDP, this benchmark shows the average current account balance required to halve the distance to -35% of GDP within ten years.

Graph 5.1: **Evolution of median and standard deviation across EU28 of current account balances, cyclically-adjusted current accounts, current account norms, NIIP-stabilising current accounts**

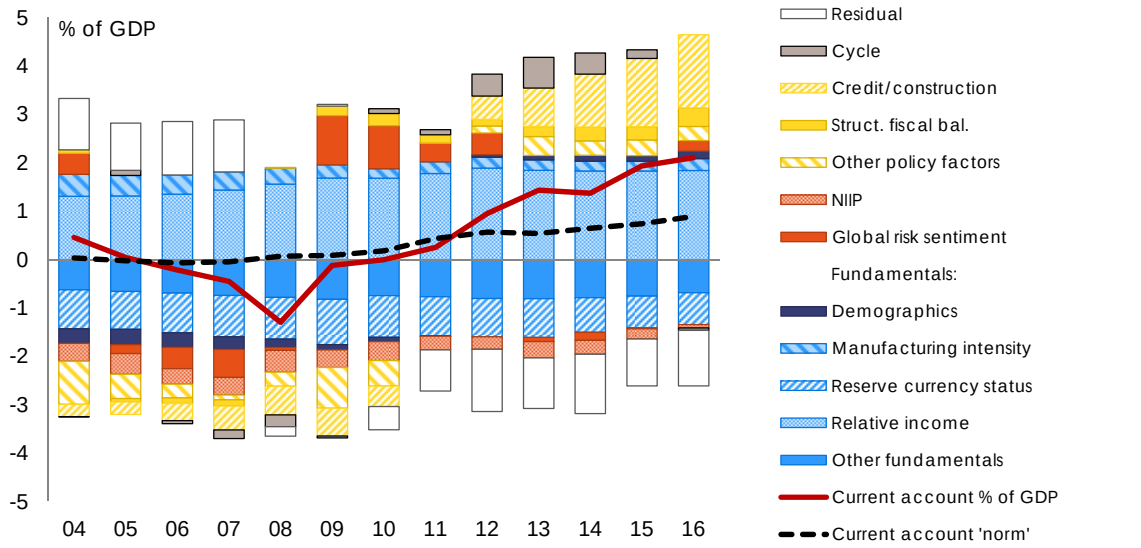


See Table 4.4 for the data sources of current account balances and norms, chapter 3 for NIIP-stabilising current account benchmarks, and section 5.2 for cyclically-adjusted current account balances.

Headline and cyclically-adjusted current accounts co-move quite closely, but the correlation is less than perfect. The co-movement is expected as, over sufficiently long time periods, phases where the cycle tend to inflate current account figures are compensated by phases where the cycle tend instead to narrow current account balances. The correlation between headline and cyclically-adjusted current account balances over the whole sample is slightly above 0.9, revealing a close but not perfect correlation linked to the operation of the cycle over time. Adjusting current accounts for the cycle thus yields figures that are on average very close to those of headline current account balances. Differences between headline and cyclically-adjusted current account balances become visible especially during periods when output is far from potential. This is visible from Graph 5.1, reporting the evolution of median values across the EU of current account balances and norms. Before the crisis, most EU countries' output gaps exceeded that of trade partners, so the cycle was contributing to reduce the value of headline current accounts. The opposite happened after 2008, when the severe recessions hitting most EU countries implied in general a positive contribution of the cycle to current account balances.

The correlation between current account balances and benchmarks is also positive. The positive relation between current account balances and current account norms results mostly from the fact that countries whose fundamentals justify large current account norms also tend to exhibit large headline current account balances. This is understood from the large correlation between country-specific time averages reported in parenthesis in Table 5.1. A similar cross-country correlation is also found between headline current accounts and NIIP-stabilising current accounts. Such relation is understood by recalling that, for a given expected rate of nominal potential growth, the stabilisation of a larger NIIP stock is obtained in correspondence with a higher current account balance (see Chapter 3, equation 3.3). Noting that higher NIIPs tend to be associated with a history of high current account balances, a positive relation could on average be expected, across countries between current account and NIIP-stabilising current account balances. The relation between current account balances and benchmarks is instead quite weak along the time series dimension. As shown in Graph 5.1 the evolution of the median current account balance does not exhibit a significant co-movement in time with that of neither current account benchmark. As expected, current account balances vary much more in time than benchmarks. While median current account balances exhibit a v-shaped pattern over the period considered, the medians of both benchmarks display a mild upward trend.

Graph 5.2: **Factors contributing to the evolution of current account balances and current account norms, EU28 aggregate**



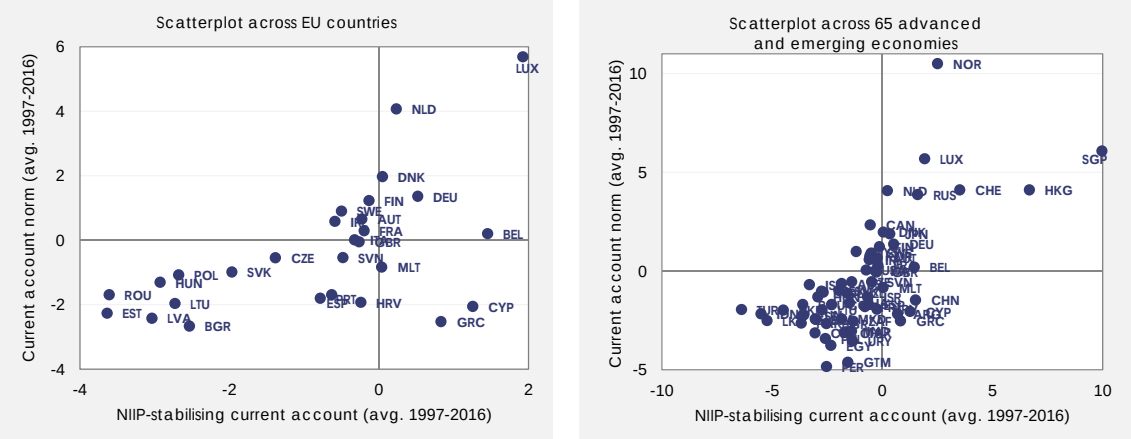
Note: The graph displays the contribution by different explanatory variables to predicted current accounts and current account norms. The model is illustrated in chapter 4.

The empirical current account model developed in the paper helps assessing the main drivers of current account balances and current account norms. For illustration, Graph 5.2 displays its contributions to the aggregate EU current account balance, which evolved from a deficit to a surplus during the financial crisis. ([29]) The dotted line represents the current account norm, which only incorporates the contributions from fundamentals. The Graph shows that a part of this surplus increase can be explained by fundamentals. While the contribution of relative per-capita income has increased somewhat before the financial crisis, declining manufacturing intensity (vs. the rest of the world) has largely offset this increase. Demographics are an important driver of the recent increase in the norm: as ageing speed in the EU has accelerated vs. the rest of the world, this has led to comparatively higher net savings. Graph 5.2 also shows that non-fundamental drivers explain a large part of current account dynamics. Quantitatively, the most important driver of swings in the EU current account was the boom in private credit and in construction before 2008, followed by subsequent deleveraging. The swings of global risk sentiment throughout the crisis have affected EU Member States, in particular during the initial stage of the crisis. As the post-crisis recessions unfolded, the negative EU output gap partly contributed to the reduction of the EU current account deficit. Moreover, as the EU fiscal stance has remained somewhat tighter than in the rest of the world, this further contributed to raise net national savings.

Graph 5.2 **also illustrates that the current account norm evolves over time.** During the 2010s, the EU is ageing considerably faster than the world average, as its baby boomer generation nears retirement. Current projections suggest that this ageing should further raise the EU current account norms until the mid-2020s. Beyond that point, the EU population will be already old, whereas ageing in the rest of the world (notably Asia) accelerates. Current demographic and productivity projections consequently suggest that the EU current account norm will gradually decline from the late 2020s and that fundamentals suggest the EU to run a current account deficit from the late 2030s onwards. ([30])

([29]) The chart displays time series from 2004, as not all data for Croatia and Malta was available for earlier periods.
([30]) This long-term result is based on EU demographic projections as of 2016 and UN demographic projections as of 2013, as well as real and nominal GDP forecasts from the EU Debt Sustainability Monitor 2016. The long-term forecast for relative income also takes into account real GDP growth for the rest of world, which is assumed to grow constantly at the rate published for the

Graph 5.3: **Scatterplots between NIIP-stabilising current accounts and current account norms**



See Table 4.4 for the data sources of current account balances and norms, chapter 3 for NIIP-stabilising current account benchmarks and section 5.2 for cyclically-adjusted current account balances.

Countries with higher current account norms also tend to exhibit higher NIIP-stabilising current account benchmarks. The correlation between the two benchmarks appears to be positive across the full EU sample (Table 5.1) and is mostly driven by a positive cross-section correlation. Current accounts explained by fundamentals are generally associated positively with NIIP-stabilising current accounts. The reason is that higher current account norms imply the tendency to run persistent surpluses and therefore to record large NIIPs. Since NIIP-stabilising current accounts are positively associated with NIIP stocks, a positive relation is expected also with current account norms. Graph 5.3 shows that the positive cross-section relation is quite strong on average across EU countries but with some exceptions, notably observed for those countries where nominal potential growth over the period considered deviates from that of other countries or where the NIIP stock has been recorded much below the -35% prudential threshold. In particular, in few cases, economic fundamentals would justify deficits (reflected in negative current account norms), while the NIIP stabilising criterion, inspired by the prudential criterion not fully incorporated into current account norms, would require current account surpluses. Vice-versa, in other cases economic fundamentals would predict surpluses without these being required from the viewpoint of NIIP stabilisation. The positive relation between the two benchmarks, however, appears quite strong across the full set of advanced and emerging economies for which current account benchmarks are computed, suggesting that broadly consistent messages are expected in a majority of cases.

5.4. PATTERNS OF CURRENT ACCOUNT GAPS ACROSS THE EU

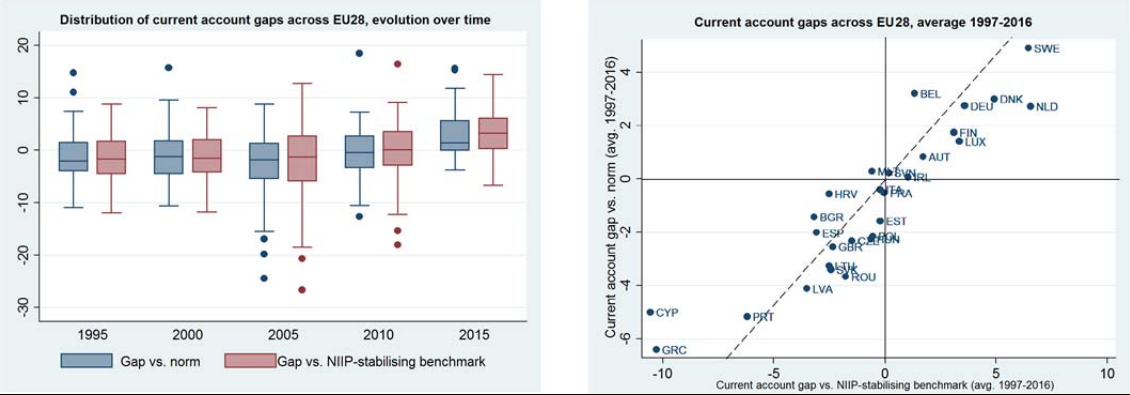
In most EU countries, current account gaps were negative and reducinguntil the financial crisis, narrowed thereafter and became positive since 2012. As shown in Graph 5.1, the median EU cyclically-adjusted current account was below but close to both benchmarks at the end of the 1990s and started falling until the burst of the financial crisis. This reflects the fact that despite a relatively balanced current account position for the EU on aggregate (Graph 5.2), a majority of countries started recording large deficits, while few countries started accumulating large surpluses. The sudden stop in the financing of a number of large current account deficits in the aftermath of the financial crisis led to a sharp

IMF WEO Oct 2017 T+5 forecast. Reserve currency status, manufacturing intensity, and the oil balance are assumed to remain constant over the long-term.

contraction in the median deficit and a narrowing of the median current account gap. Starting from 2012 the median current account gap turned positive, reflecting a growing number of countries recording cyclically-adjusted current account positions above benchmark. This is a by-product of the asymmetric adjustment that has taken place within the EU, whereby deficit countries eliminated their large deficits and reached balanced or surplus positions, while surplus countries have retained or even widened their surpluses.

The distribution of current account gaps is quite stable over time and similar for the two different benchmarks. Graph 5.4(left panel) reports the distribution of current account gaps with respect to both benchmarks across EU countries and over 5-year time intervals. For each interval, the distribution is computed for all EU28 countries over the number of years available in the sample and belonging to the interval. The graph indicates that the distribution of the gaps is quite similar irrespective of the benchmark, and that such distributions are fairly stable over time and roughly symmetrical. It is visible thought that before the financial crisis large negative gaps were recorded in a number of EU countries, reflected in the reduction in the median value of the gap. The post-crisis rebalancing process was followed by a reduced frequency of large negative gaps and the emergence of large positive gaps. The rebalancing process coincided with a narrowing dispersion of gaps and a gradual move in positive territory for the median gap.

Graph 5.4: **Current account gaps across EU28, evolution over time and average gaps per country**



See Table 4.4 for the data sources of current account balances and norms, chapter 3 for NIIP-stabilising current account benchmarks and section 5.2 for cyclically-adjusted current account balances. Current account gaps are obtained as differences between cyclically-adjusted current accounts and current account benchmarks.
Notes for left panel: Years reported correspond to the first of non-overlapping 5-year periods. The period starting in 1995 contains only years between 1997 and 1999. The period starting in 2015 only contains values for 2015 and 2016. The upper and lower limits of boxes are, respectively, the 75th and 25th percentiles; the horizontal lines cutting the boxes represent the median. The vertical whiskers display 'adjacent' values that are 1.5 times the interquartile range above the 75th or below the 25th percentile; dots represent 'outsider' observations beyond those whiskers.

Current account gaps according to the two benchmarks are closely correlated across countries. This is shown in Graph 5.4(right panel) reporting the average benchmarks recorded in EU countries over the period considered. Countries recording a high gap with respect to the current account norm also record a gap with respect to the NIIPs-stabilising benchmark. As benchmarks display a smaller variability across countries than cyclically-adjusted current account balances (compare standard deviations in parentheses in Table 5.1), the cross section variation in gaps is mostly driven by cyclically-adjusted current account balances. This implies that gaps tend to have the same sign, irrespective if they are measured with respect to norm or NIIP-stabilising benchmark. The gaps with respect to the two benchmarks tend to be quite close in value but with some remarkable differences in some cases. In a majority of cases positive gaps are higher if computed with respect to the NIIP-stabilising benchmark (the points in the scatterplot in Graph 5.4appear below the 45-degree line), while in case of negative gaps the pattern is less clear cut. Very large gaps (either negative or positive) are observed especially when measured against the NIIP-

stabilising benchmark, a pattern that is visible both looking at the gap distribution after mid 2000s and at the scatterplot in Graph 5.4, which is mainly associated to the large dispersion of NIIP positions across EU countries since the crisis period.

6. CONCLUSIONS

Current account benchmarks are a standard tool to assess current account positions. Avoiding excessive current account imbalances is a key requirement to maintain macroeconomic stability. In light of deep interdependencies, current account developments are subject to surveillance by international institutions. Assessing current accounts requires the comparison with an adequate benchmark. Ideally, such benchmarks should be country-specific to take into account that there are reasons linked to economic fundamentals why some countries are expected to borrow and run current account deficits while others are expected instead to run surpluses, and to reflect country-specific risks related to stock imbalances.

This paper proposes methodologies for the computation of country-specific benchmarks for the assessment of current accounts. The benchmarks help the assessment of current account balances in Commission analysis. They do not replace but rather complement MIP thresholds included in the scoreboard of the Macroeconomic Imbalance Procedure. Two benchmarks are developed, which are used in a complementary fashion to analyse current accounts from different perspectives. A first benchmark permits to assess the implications of current accounts for the Net International Investment Position (NIIP) of the economy. This *NIIP-stabilising current account benchmark* requires the stabilisation of the NIIP/GDP ratio at current level, or the reduction of net foreign liabilities to a given prudential target. A second benchmark consists of a *current account norm* that permits to evaluate if current accounts are in line with fundamentals. This benchmark is based on the estimation of an empirical model of current account determinants whose specification is akin to that found in Phillips et al. (2013). The norms consist of predictions from the empirical model restricted to explanatory factors that can be considered as fundamentals, namely, economic drivers that are not temporary and policy variables under normal conditions (i.e., in line with what is observed at world average).

The two benchmarks represent different requirements for current accounts but generally have compatible implications for current account adjustment. In principle the two requirements respectively – i.e., an NIIP that is stable or converges to a prudent level, or balances in line with what is implied by economic fundamentals – may not necessarily coincide. Results for EU countries reveal that the dispersion of headline or cyclically-adjusted current accounts is much higher than that of both benchmarks. Moreover, the two benchmarks appear positively correlated across countries (countries with large norms tend to exhibit also large NIIP-stabilising current accounts), as countries with economic fundamentals underpinning current account surpluses (deficits) also tend to be those with positive (negative) NIIPs. For these reasons, current account gaps for a given country generally have the same sign irrespective whether they are computed with respect to norm or NIIP-stabilising benchmarks.

The benchmarks help the assessment of current accounts in additional respects. The empirical current account model underpinning the estimation of norms helps assessing the main drivers of current account developments and those that explain changes in the values of norms. The framework for the computation of NIIP-stabilising current accounts can be used to gauge the implications in terms of trade balance adjustment.

A careful interpretation of the benchmarks is needed, as they are based on a number of assumptions and their estimation is subject to usual uncertainty linked to sample definition and model specification. For these reasons, current account benchmarks should not be used mechanistically and the assessment should be complemented by additional country-specific information.

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ANNEX 1
NIIP-stabilising trade balances

Estimating the NIIP required trade balance (or primary current account balance) requires additional assumptions on the investment income balance and the remainder of the primary and secondary income balances. The assumptions underlying computations of the required trade balance carried out to complement required current accounts according to the NIIP stabilisation benchmarks are explained in detail in this Annex.

A1.1. THE NON-INVESTMENT INCOME BALANCE

The part of the current account balance that is neither related to the trade balance nor to investment income is generally relatively stable and minor. It covers the secondary income balance (current transfers), as well as non-investment primary income (mainly labour income of cross-border workers). Over the medium term, both components are relatively stable for most EU countries. They are consequently assumed to remain constant over the projection period and their level to equal the median over the last three available years (in % of GDP). ([31])

A1.2. THE INVESTMENT INCOME BALANCE

The net investment income balance depends on two parameters: the stock of assets and liabilities and the corresponding yields. A projection of these different parameters is thus needed to project the investment income balance. Empirically, investment income balances are characterised by different yields on assets and liabilities depending, inter-alia, on the conditions at which countries can borrow on foreign markets, the currency denomination, the extent to which assets and liabilities take the form of equity versus debt, etc. (e.g., Lane and Milesi-Ferretti, 2007b). Differentiated yields on assets and liabilities imply that the investment income balance depends on the stocks of assets and liabilities during the projection period and not only on their difference.

The evolution of assets and liabilities are assumed to follow dynamics that are linked to that of the NIIP. The following formulation is chosen for its tractability: it assumes that the income on assets is fully reinvested, the payment on liabilities is fully refinanced and that the difference between the financial account balance and the investment income balance is allocated in a fixed proportion between assets and liabilities,

$$A_t = A_{t-1}.\frac{(1+r_t^A)}{(1+g_t)} + \kappa.\left(CA_t + KA_t - IB_t\right) \quad \text{(A1.1)}$$

$$L_t = L_{t-1}.\frac{(1+r_t^L)}{(1+g_t)} - (1-\kappa).\left(CA_t + KA_t - IB_t\right), \quad \text{(A1.2)}$$

where:

- A_t and L_t are the stocks of assets and liabilities in percent of GDP, so that $NIIP_t = A_t - L_t$;
- κ is a fixed key for the allocation of financial account net of net investment income, such that $\kappa = A_t/(A_t + L)$;
- IB_t is the investment income balance in percent of GDP defined as the income received on assets minus the income paid on liabilities ($IB_t = IB_t^A - IB_t^L$);

([31]) Note that the values for minor terms are assumed to hold steady over the projection period (capital account, non-investment income balance) do not stem from the latest observation. While those components are generally relatively stable, there have been a few outliers for several economies. In order to adjust for outliers, the minor terms are assumed to remain constant at a level equal to the median over the last three available annual observations preceding the projection period.

- g_t is the growth rate of nominal GDP;

- r_t^A (resp. r_t^L) is the implicit nominal yield on assets (resp. liabilities) calculated as:

$$r_t^A = IB_t^A(1 + g_t)/A_{t-1} \qquad r_t^L = IB_t^L(1 + g_t)/L_{t-1} \tag{A1.3}$$

In general, given initial conditions, the exact assumptions on how the evolution of the NIIP translates into assets and liabilities will have only second-order effects on the net investment income balance. ([32])

A1.3. PROJECTING IMPLICT EXTERNAL YIELDS

Projecting the investment income balance requires a view on the evolution of external asset and liability yields. Forecasts of implicit external yields are not available. However, forecasts of implicit government debt yields for EU countries can be obtained from those used in the context of public finance sustainability assessment carried out by the Commission in cooperation with the EPC Ageing Working Group. ([33]) As shown in Table A1.1, correlations between the variation in domestic government bond yields and the changes in external yields are generally positive. Moreover, external asset yields are more correlated with the aggregate euro area government yield than with the domestic one. It appears therefore appropriate to link liability yields to domestic government rates, and asset yields to euro area government rates. Levels of yields on foreign assets and liabilities tend to be above those on government bonds. Hence, the assumption used is as follows:

$$r_{t,t+T}^{eA} = r_{t,t+T}^{G,EA} + spread^A, \qquad r_{t,t+T}^{eL} = r_{t,t+T}^{G} + spread^L \tag{A1.4}$$

where *T* refers to the time horizon and the superscript "*e*", "*G*" and "G,*EA*" denote, respectively, expectation for the implicit yields on domestic and euro area government bonds. In other words, the expected yield on foreign assets is that in euro area government bonds plus a spread; that on foreign liabilities is that on domestic government bonds augmented by a spread. The spread for both asset yields and liability yields is kept constant over the projection period and is based on the median of the last three available years.

The projected yields are further refined to take on board additional aspects

- *Country's degree of financial intermediation***.** For countries such as Luxembourg, Malta, Ireland or the Netherlands, the major share of external liabilities is not linked to domestic capital but rather to external assets. For instance, much of the Irish external liabilities are dominated by mutual funds that reside in Ireland but whose assets stem from other countries. Correspondingly, much of the Irish income on its external assets directly 'passes through' to income paid on Irish external liabilities. Thus, for these countries, the domestic sovereign yield affect external liability yields only for the notional fraction of its liabilities that is directly linked to domestic developments. To this purpose, the extent to which countries can be considered financial centres, *FI*, is calculated as the stock of external assets over the sum of the capital stock and of external assets. ([34]) The expected yield on foreign liabilities is modified as follows to take into account the degree of cross-border financial intermediation:

$$r_{t,t+T}^{eA} = (1 - FI).r_{t,t+T}^{G,EA} + FI.r_{t,t+T}^{G} + spread^A \tag{A1.5}$$

([32]) For robustness checks were carried out on several reasonable, but more complicated, alternatives to the asset accumulation rule described here. Such adjustments of the rule affect the simulations only to a very minor extent.
([33]) European Commission (2014).
([34]) This is a figure between 0 and 1, with Luxembourg displaying a value close to 1 and Romania being close to zero. Note that in a stylized economy without 'round-trip' cross-border investment and asset valuations reflecting the capital stock, the total amount of assets held by that economy should equal external assets plus the (nominal) capital stock.

Table A1.1: **Correlations between yields on government bonds and external assets and liabilities**

	Including reinvested earnings			Excluding reinvested earnings		
	Domestic government bonds - External liabilities	Domestic government bonds - External assets	Euro-area government bonds - External assets	Domestic government bonds - External liabilities	Domestic government bonds - External assets	Euro-area government bonds - External assets
BE	0.20	0.42	0.43	0.61	0.68	0.71
BG	0.36	0.14	0.49	0.37	0.03	0.26
CZ	0.12	-0.03	0.37	0.34	0.04	0.28
DK	-0.13	-0.11	0.53	0.03	0.19	0.62
DE	0.31	0.02	-0.01	0.58	0.64	0.64
EE	0.11	0.44	0.67	0.86	0.56	0.65
IE	0.54	0.60	0.65	0.47	0.78	0.81
EL	0.89	0.03	0.59	0.93	0.33	0.64
ES	0.48	0.05	0.35	0.47	-0.60	-0.46
FR	0.40	0.20	0.20	0.52	0.48	0.42
HR	1.00	1.00	0.58	1.00	1.00	0.61
IT	0.61	0.63	0.77	0.78	0.85	0.93
CY	0.20	0.43	0.32	0.06	0.05	0.76
LV	-0.05	0.08	0.41	0.50	0.53	0.51
LT	-0.80	-0.63	0.22	-0.28	-0.60	0.63
LU	0.82	0.81	0.71	0.80	0.78	0.72
HU	0.00	-0.28	-0.14	-0.11	-0.44	0.33
MT	0.85	0.81	-0.20	-0.05	0.05	0.62
NL	0.27	-0.03	0.06	0.40	0.22	0.13
AT	0.08	-0.20	0.34	0.11	-0.06	0.54
PL	-0.15	0.31	0.45	0.38	0.58	0.48
PT	0.47	0.49	0.55	0.60	0.61	0.67
RO	-0.16	-0.45	0.61	-0.22	-0.14	0.51
SI	-0.23	-0.11	0.35	-0.20	-0.27	0.41
SK	-0.27	-0.37	0.11	-0.39	-0.33	0.30
FI	0.11	0.25	0.02	0.13	0.11	0.32
SE	0.23	0.21	0.28	0.33	-0.10	0.33
UK	0.06	0.20	0.30	0.12	0.17	0.30
Median	0.20	0.17	0.36	0.38	0.18	0.53

The table presents correlations of between the 1-year change of implicit government yields and the 1-year changes of implicit external liability and external asset yields, for the period 2002-2014 (unbalanced sample). Implicit yields are defined as interest payments and dividends divided by the outstanding stock in the year before. Government bond yields are computed as implicit domestic or euro-area aggregate government bond yield, 'EAgovt' refers to the implicit weighted-average government yield in the euro area. In the left panel, external asset and liability yields are computed as the countries debit and credit income payments divided by assets and stocks. In the right panel, the credit and debit yield flows exclude undistributed earnings and reinvested profits.
Data sources: Ameco (for government yields), Eurostat BPM6 where available, Eurostat BPM5 otherwise.

The projections on liability returns so amended appear to display a stronger correlation with actual returns compared with those computed as in equation (A1.3).

- *Reinvested earnings*. The yields on reinvested earnings is not linked to government bonds yields but rather linked to specific behaviour of firms and tend to exhibit a rather stable and country-specific pattern. ([35]) Correlations of yields on foreign assets and liabilities with government bond returns are

([35]) Reinvested earnings correspond to the attribution of retained earnings to their owners, i.e. FDI profits that do not leave the country. Therefore, in the Balance of Payments classification, reinvested earnings (more precisely, 'reinvested earnings and undistributed branch profits') are recorded simultaneously in the current account (investment income) and in the financial account ('new' financial investment).

stronger if net of reinvested earnings (see Table A1.1). For this reason, the reinvested earnings net balance is simply held constant as a % of GDP. ([36]) More precisely, reinvested earnings as % of GDP are assumed to remain at the median level of the three years preceding the projection period. Consequently, equations (A1.1) and (A1.2) are modified to take into account that the investment balance excludes reinvested earnings.

A1.4. COMPUTATION OF THE REQUIRED TRADE BALANCE

In light of the assumptions illustrated above, the following formulas are used to calculate the required trade balance, distinguishing for the case where the NIIP is above and below the prudential target:

$$TB^{S}_{t,t+T} = \left(g^{e}_{t,t+T} - r^{eA}_{t,t+T}\right)A_t - \left(g^{e}_{t,t+T} - r^{eL}_{t,t+T}\right)L_t - NIB^{e}_{t,t+T} - KA^{e}_{t,t+T} - RE^{e}_{t,t+T} - NTR^{e}_{t,t+T} \quad \text{(A1.6)}$$

if $NIIP_{t-1} \geq NIIP^{min}$, and

$$TB^{S}_{t,t+T} = \frac{1}{1+g^{e}_{t,t+T}} \frac{NIIP^{min} - \left(A_t.\left(\frac{1+r^{eA}_{t,t+T}}{1+g^{e}_{t,t+T}}\right)^{T} - L_t.\left(\frac{1+r^{eL}_{t,t+T}}{1+g^{e}_{t,t+T}}\right)^{T}\right)}{\left(\kappa.\frac{1-\left(\frac{1+r^{eA}_{t,t+T}}{1+g^{e}_{t,t+T}}\right)^{T}}{g^{e}_{t,t+T} - r^{eA}_{t,t+T}} + (1-\kappa).\frac{1-\left(\frac{1+r^{eL}_{t,t+T}}{1+g^{e}_{t,t+T}}\right)^{T}}{g^{e}_{t,t+T} - r^{eL}_{t,t+T}}\right)} - \left(NIB^{e}_{t,t+T} + KA^{e}_{t,t+T} + RE^{e}_{t,t+T} + NTR^{e}_{t,t+T}\right) \quad \text{(A1.7)}$$

if $NIIP_{t-1} < NIIP^{min}$, with the definition of the variables being provided in the equations above and in Chapter 3.

([36]) Reinvested earnings as % of GDP are assumed to remain at the median level of the three years preceding the projection period.

ANNEX 2

Estimating drivers of current account balances: robustness checks

This Annex details robustness checks of the model specification provided in Chapter 4. Specifically, this Annex explores whether the baseline specification from Chapter 4 is robust to the inclusion of alternative variables, variations in the data sample and choice of the estimator. Note that this Annex focuses on the robustness of the estimation of the empirical current account model, not on the robustness of the definition of current account norms, which is instead addressed in the last section of Chapter 4.

A2.1. ALTERNATIVE SPECIFICATIONS, SAMPLE AND ESTIMATION METHODS

The baseline model specification draws on Phillips et al. (2013). Additional explanatory variables have been selected on the basis of the criterion of statistical significance as compared with competing alternatives, consistency with expected sign and robustness of sign with respect to sample perturbations.

The set of additional base terms is limited for data availability reasons. The estimation approach from Chapter 4 rests on how drivers evolve with respect to the world average. A meaningful world average requires data from a large set of countries that represent the bulk of world GDP. An observation for a particular year and country can thus only be taken into account when this indicator is also available for the same year in all other sample countries. This limits, however, the number of potentially relevant explanatory variables of good statistical quality for which long time series are available. In view of these data limitations, only a handful of base terms have been added to the baseline specification on top of that in Phillips et al. (2013). These are manufacturing intensity, the change of private credit, construction investment and the REER change. ([37]) Chapter 4 details the conceptual motivation and expected signs of these variables. Several other variables have been tried out but did not pass the criteria mentioned. Table A2.1 reports a number of examples.

Although the set of conceivable independent regressors is limited, there is considerable scope for expanding the basic specification with additional interaction terms. Interaction terms permit to capture heterogeneous and non-linear responses of current account balances to certain explanatory factors, a phenomenon in line with theoretical literature (e.g., Reinhardt et al., 2013). Such interaction terms need to respond to some minimal criteria. First, as interaction terms capture joint effects and nonlinearity, the corresponding base terms need to be present in a model and kept except if clearly insignificant. Secondly, they need to be justified by ex-ante expectations based on theory. Finally, introducing interaction terms requires rigorous testing for whether they add value on top of the base terms, as well as compared to alternative interaction terms. For these reasons, a systematic test of alternative interaction terms considered in existing literature has been carried out by means of Bayesian Model Averaging (see next section). ([38])

Alternative specifications in addition to the baseline presented in chapter 4 are displayed in Table A2.1**.** Column (1) displays the baseline specification from Table 4.1. Column (2) reports the specification that had been used in Commission assessments until early 2017, which does not include the interaction terms between health expenditure and the old-age ratio, as well as between ageing speed and relative income per capita. The added value from these terms is illustrated by their significance in specification (1), the improved adjusted R-squared, as well as the BMA exercise below. ([39]) Comparing columns (1) and (2) show that these interaction terms affect the coefficients for ageing speed and health

([37]) For completeness, the model also includes mining exports as % of total exports, in order to reflect non-oil resource intensity. This term has an insignificant coefficient but has been present in the versions of the model used so far.

([38]) In principle, there are 2x231 two-way interaction terms possible between the 22 base terms of the baseline model (note that a handful of the regressors already are interaction terms). Even if these interaction terms represented random data unrelated to the current account, 23 of these interaction terms could be expected to be significant at the 5% level if added to the model. This feature can be partly addressed by tightening the significance level requirements for interaction terms, as well as data sampling techniques.

([39]) Note that the collinearity among regressors increases only moderately, as indicated by the sample condition number.

expenditure and help qualifying their impact but hardly affect the coefficients for the other variables. ([40]) Moreover, the significance of the interaction terms does not appear to be due to multicollinearity, as illustrated by the quite moderate sample condition number in column (1). Column (3) reproduces the specification in Phillips et al. (2013) with the sample used here. The RMSE and adjusted R-squared illustrate that such a specification is broadly comparable with the baseline but provides a somewhat inferior fit and several less significant coefficients, despite higher multicollinearity than in the baseline. ([41])

Adding further controls to the baseline has a negligible effect on the model fit. Column (4) in Table A2.1 adds to the baseline specification an index of institutional quality (similar to that in Phillips et al., 2013), life expectancy as a further demographic term and the base term for capital account openness. None of these additional variables improve model diagnostics, although institutional quality shifts the repartition of coefficients between outright relative income and relative income interacted with capital account openness. The specification in column (5) further adds two non-linear demographic terms suggested by IMF (2015), namely the old-age ratio relative to world × outright ageing speed, and ageing speed relative to world × the outright old-age ratio. The adjusted R-squared improves only slightly compared to the baseline. The significance of the ageing speed relative to world × outright old-age ratio interaction term derives from its 0.91 correlation with the ageing speed base term, which is also illustrated by the high sample condition number of column (5).

Columns (6) and (7) display a sample split between OECD countries and emerging economies, in the spirit of previous analyses (e.g., Debelle and Faruqee, 1996). ([42]) Most coefficients of the variables considered as fundamentals are quite robust with respect to the sample split. Relative income per capita is not significant in the OECD sample, although its combined effect from the base term and interaction with capital account openness has broadly similar magnitude in columns (6) and (7). The combined effect from the ageing speed base term and its interaction with relative income per capita likewise is broadly the same in both samples. ([43]) Differences are observed for some variables, such as reserve currency status, the financial centre dummy and interactions with capital openness, which stem from the fact that capital account restrictions are negligible in OECD countries, whereas financial centre and reserve currency status for non-OECD countries rely on very few observations. ([44]). Finally, the coefficients for the fiscal balance and foreign exchange reserves differ between high-income and emerging countries, a feature that has been repeatedly discussed in the literature (e.g., Chinn, 2018). ([45]) Robustness with respect to sample perturbations is also assessed with respect to the implications of 65 perturbations consisting of omitting a single country each in time. The row "coefficient volatility" in Table A2.1 measures how much standardised coefficients change across these 65 sample perturbations for each different model specification, and thus conveys in how far results are driven by particular country observations within the

([40]) Note that the combined effect of relative ageing and its interaction term with relative income in specification (1) is similar to that of specification (2). Since relative income averages 62% over the sample, the combined effect averages out to 0.63*0.164 – 0.025 = 0.078 , which does not significantly differ from the term in the specification (2).

([41]) Note that the ICRG institutional quality index used by Phillips et al. (2013) is not available for all countries. Institutional quality was therefore proxied with a similar index provided by Global Freedom. Likewise, data on commodity terms of trade was not available and therefore has been omitted from the specification.

([42]) Note that in this specification, world average refers to the entire sample, as in the baseline specification. Instrumented variables are likewise conditioned on the entire sample.

([43]) The arithmetic mean of relative income in the non-OECD sample is only 40% that of the corresponding OECD average. This scales the impact of the ageing speed interaction term in the non-OECD sample. Considering this scaling factor, the impact of aggregate ageing speed in the non-OECD sample is actually somewhat smaller than in the OECD sample.

([44]) Here, reserve currency status is based on four euro area countries that are not OECD Members, whereas financial centre status rests on Singapore and Hong Kong

([45]) Note that the coefficient for foreign exchange reserves is negative in the OECD sample, which is mainly due to the instrumentation approach and the impact of the 2010s in sample. There are also some noteworthy differences for the NIIP, construction investment and the private debt stock, which are also highlighted by the relative income interaction terms in Table A2.2. The conceptual reasons underpinning such differences are not immediately apparent and may be subject for further research.

sample. ([46]) Note that these results are still based on indicators that are constructed as difference with respect to world average, but coefficient significance and magnitudes are hardly affected when indicators are instead constructed with respect to subsample (OECD, respectively non-OECD) averages. ([47])

The baseline model is also fairly robust to the inclusion of fixed effects. Column (9) displays the baseline specification with *time* fixed effects, which are jointly significant and improve the model fit slightly. However, most coefficients do not differ significantly from baseline, except that if the VIX index. This illustrates that coefficients would not be altered much by controlling for global factors beyond the VIX index or specific period dummies (e.g., to capture the 2007/08 crisis and the ensuing recessions). Column (8) displays also the baseline specification with *country* fixed effects. Note that the inclusion of country fixed effects is not standard in empirical specifications aimed at estimating current account norms, as the presence of country effects tends to obliterate the significance of fundamentals (which vary more across countries than over time). Results confirm this expectation: country fixed effects render most fundamentals insignificant, along with health expenditure. Conversely most non-fundamental explanatory variables retain their signs and significance under country fixed effects.

The choice of the estimator has little impact on estimated coefficients of fundamental explanatory variables. The baseline specification does not include the lagged dependent variable as this would basically imply predicting current accounts on the basis of previous-year values, i.e., including quasi-fixed effects. However, this omission implies correlated residuals associated with omitted variable bias. The standard errors of OLS estimate are therefore corrected à la Driscoll and Kraay (1998) to address issues arising from residual auto-correlation for what concerns inference. ([48]) An additional potential issue could concern the magnitude of the estimated coefficients, in light of omitted variable bias. One way to partially obviate this issue is the use of the Prais-Winsten feasible GLS estimator (FGLS), as in Phillips et al. (2013), where regression coefficients are estimated after imposing an AR(1)-type autocorrelation structure in the residuals. In order to assess whether the choice of estimator has an impact on the value of the coefficients, Column (10) in Table A2.1 displays the baseline specification under the GLS estimator. Results show that the choice of the estimator hardly affects the magnitude of the estimated coefficients, while there are implications mostly for the statistical significance of a number of variables. Additionally, the extent of residual autocorrelation identified by the Durbin Watson statistics is similar under OLS and FGLS. ([49]) Results therefore are broadly supportive of OLS as an estimation method, as inference is addressed by correcting coefficient standard errors à la Driscoll and Kraay (1998)

([46]) The indicator measures how much standardized coefficients vary when countries are dropped from the sample. Standardized coefficients represent the impact a one-standard-deviation change of the regressor has on the dependent variable. A large standardized coefficient thus represents a regressor with a large impact. The approach here computes the standardized coefficients over 65 variations of the sample that each drop one country from the sample. Each coefficients' variance across these 65 variations indicates how much a particular regressor's impact is robust to such small sample variations. 'Coefficient volatility' displays the root mean of all regressor's coefficient variance, and thus conveys in how far the regressor impact diversifies when individual countries are omitted from the sample. Conversely, low coefficient volatility indicates that a specification's coefficients are relatively robust to omitting countries from the sample.

([47]) An estimation of the baseline specification for the OECD (non-OECD) subsample provides coefficients that in most case do not differ significantly from the coefficients in columns (6) and (7) of Table A2.1. , since most indicators display similar GDP-wieighted averages for OECD and non-OECD countries. Even where subsample averages do differ, considerably, such as in the case of expected GDP growth, coeffients remain close to columns (6) and (7). Regarding interaction terms, the significance of coefficients shifts from interaction to base terms or vice versa for the non-OECD sample, but the marginal impact of the underlying terms remains comparable to column (7). The only noteworthy exception is health expenditure, whose base and interaction term are not significant in the OECD sample, whose indicators are computed with respect to the OECD average. In the non-OECD sample, the coefficients on health expenditure are very close to the ones from column (7).

([48]) Driscoll and Kraay (1998) standard errors permit to account for heteroskedasticity, serial correlation and cross-sectional dependence across panels.

([49]) Table A2.1, (10) displays a residual autocorrelation coefficient (rho) of 0.677 under the Prais-Winsten estimator. This autocorrelation broadly seems well-specified, as indicated by the AR1-adjusted Durbin-Watson statistic that considers the independently and identically distributed error term underlying the assumed residual autocorrelation structure. It remains, however, unclear whether the chosen autocorrelation structure is valid, and whether the rho estimate is unbiased in view of the panel unbalancedness and short time series. Notice moreover, that the feasible GLS estimator parametrizes residual autocorrelation but does not eliminate it from the model prediction, as indicated by the headline Durbin-Watson statistic in column (10).

without incurring into the typical distortion of FGLS standard error estimates in unbalanced panels with short time series for some of the panels (see, e.g., Beck and Katz, 1995), while omitted variable bias implications for regression coefficient estimates appear limited, as OLS estimates are close to those obtained under FGLS (therefore leading to similar estimated norms).

A2.2. TESTING ALTERNATIVE INTERACTION TERMS BY MEANS OF BAYESIAN MODEL AVERAGING

The inclusion of interaction terms among relevant variables requires systematic assessment. Potentially, many different interaction terms could be included, as in principle many explanatory variables could have non-linear effects on current accounts or could interact with the effects of other explanatory factors. Overall, this would amount to testing a very high number of alternative specifications against each other. To this purpose, BMA analysis helps providing synthesis. Moreover, still for the sake of focus and synthesis, only interactions between terms that have already been considered in the literature are reported here. The interaction terms considered are as follows:

- *Capital account restrictions:* capital account openness should affect how several determinants affect the external balance. For this reason, its interaction terms play a strong role in Phillips et al. (2013) and the baseline specification.

- *Relative income per capita:* relative income not only is a proxy for capital abundance but also an (imperfect) proxy of institutional stability, legal security or credit ratings. It thus may impact demographic dynamics in providing more opportunities to store real and financial wealth for particular age cohorts. Moreover, it could also affect other variables, such as flight-to-safety effects related to global risk aversion or the handling of surpluses in oil exporting countries, e.g. through sovereign wealth funds.

- *Reserve currency status:* issuing a reserve currency enables a country to benefit from 'exorbitant privilege' but also eliminates the need for foreign-currency funding and the corresponding build-up of foreign exchange reserves. It may moderate the current account reaction to global risk aversion and capital controls, for which reason the baseline model includes such interaction terms.

- *Old-age dependency ratio* and a*geing speed:* The age structure of a population can affect the current account in a non-linear way (as proposed by IMF, 2015) and have a bearing on the impact of other fundamental and policy factors.

- In order to perform a general assessment of potential interaction terms, the baseline model is thus stripped of its three existing interaction terms (e.g. the VIX index interacted with capital openness) and is extended by all required base terms (e.g. VIX and capital openness as separate regressors), as in Table 4.1. All base terms in this adjusted model are then interacted with the five terms above, and the resulting interaction terms added to the model. Overall, this yields 21 base terms and 108 interaction terms to evaluate, including the terms that are already in the baseline model. ([50])

Table A2.2 **shows the results of a Bayesian Model Averaging exercise that evaluates all feasible combinations of the base and interaction terms**, approximated by 10 million draws of competing

([50]) Note that the base terms also include i) the term with the NIIP exceeding -60%, as this cannot be easily represented through a multiplicative interaction and ii) foreign exchange reserve change times capital account openness, which has been instrumented. Note also that apart from ageing speed, all of the seven potential terms listed have non-negative signs. In all cases they represent the outright determinant, while the regressors in the model typically represent differences with respect to the world average. In the models discussed here the old-age dependency ratio interacted with itself thus is not the old age dependency ratio squared. Instead it represents the 'old-age dependency ratio with respect to world average' times the outright 'old-age dependency ratio'.

regression models. ([51]) In parentheses, the Table displays the posterior inclusion probability (PIP) for each variable, which represents the sum of posterior likelihoods over all regressions that include the variable. The PIP thus represents the probability that the variable is part of the true data generating process. ([52]) Moreover, the Table displays the estimated coefficient as a weighted average across all regressions. The results confirm that most base terms have high posterior inclusion probabilities (Table A2.2, column 1). In particular, this holds for the regressors that the baseline specification contains on top of Phillips et al. (2013), namely manufacturing intensity, change of private debt, construction investment, and REER growth.([53]) Table A2.1 (columns 1 and 3) also shows that these base terms are strongly significant when compared with the Phillips et al. specification. Two terms from Phillips et al. display a PIP below 80%. This concerns the FX reserve change, with a PIP of 62%, and population growth, with a PIP of 15%. The latter stems from the fact that the coefficient for population growth becomes insignificant for specifications that exclude certain non-fundamental variables. ([54])

The BMA results suggest that only few candidate interaction terms are to be considered for inclusion in a regression specification. Columns (2)-(6) show PIPs and coefficients for the interactions of base terms with selected variables. From these, besides terms already proposed by the literature (e.g., relative income interacted with capital restrictions) the results also highlight two additional interactions: (i) ageing speed relative to the rest of the world interacted with relative per-capita income; (ii) public health expenditures relative to the rest of the world interacted with the old age dependency ratio. The first interaction is supported in the literature (the stable institutions associated with high-income countries should facilitate saving for anticipated ageing, see also Lane and Milesi-Ferretti, 2012) and has a higher probability of inclusion compared to other interactions of aging speed, indicating that income per capita is perhaps the best candidate to qualify the effects of ageing on the current account. The second interaction has a logic theoretical justification (it takes into account age-related spending when assessing the impact of social welfare on precautionary savings) and because it has a high probability of inclusion, not challenged by other possible interactions qualifying the impact of relative health expenditures. Despite high PIPs, the baseline specification ignores the interaction of construction investment with relative income due to lack of theoretical justification for the coefficient to vary with income. Similarly, the interaction between the debt stock and aging speed is also ignored as spurious, since ageing populations are more likely to invest abroad than domestically and this therefore should dampen rather than strengthen the effects of debt on the current account. ([55]) All other interactions display relatively low PIPs.

Overall, the baseline specification appears to be fairly robust to variations of controls, the sample and the estimator. In particular the impact from fundamentals remains stable across such variations, which implies that current account norms would be little affected by slightly different specifications. Moreover, Tables A2.1 and A2.2 show solid support for the regressors that the baseline specification

([51]) In order to remain in a Bayesian setup allowing for proper posterior model probabilities, the individual models are estimated with Zellner's g-regression using individually estimated endogenous 'Empirical Bayes' shrinkage parameters (see Liang et al. 2008, or Ley and Steel, 2012). Since the estimated shrinkage equals 0.99 on average, the resulting coefficients in the individual models are broadly equivalent to OLS coefficients multiplied (or 'shrunk') by 0.99.

([52]) The required priors for this approach are chosen to remain as uninformative as possible, in line with the literature on BMA with interaction terms (e.g. Chipman, 1996, or Crespo Cuaresma, 2011). The binomial prior inclusion probabilities for base terms have been set at 20%, which implies the model to include 4 base terms a prior. Prior inclusion probabilities for interaction terms are lower, as their combinations are more numerous. The results in Table A2.2 follow the 'strong hereditary dilution prior' approach (e.g., George, 2010), such that the prior expected number of interaction terms equals 2. Moreover, the approach assigns a prior weight of zero to any model that includes an interaction term without both its parent base terms. The estimates are based on MC3 sampling from five random starting points with 50,000 burn-ins and 1,950,000 subsequent iterations each.

([53]) However, mining exports display a relatively low PIP.

([54]) Moreover, there is also 100% PIP for the base term of Chinn and Ito (2007) capital account restrictions. This base term is not part of the baseline specification, as it conceptually should have an impact as a moderator of other regressors, i.e. via interaction terms. The correlation between this indicator and its interaction with relative income per capita is 0.86, thus the conceptually well-grounded interaction term has been taken for the baseline specification, similar to Phillips et al. (2013).

([55]) The debt stock may also be understood as representing financial deepening, which should increase savings prospects. However, this effect is already covered by the interaction term between relative income and ageing speed, which also has a higher PIP.

includes on top of the variables suggested by Phillips et al. (2013). Among a large set of potential interaction terms, only few robustly enhance the model fit.

Table A2.1: **Alternative specifications**

		rel. to world	interaction	(1) Baseline	(2) Baseline excl. interactions	(3) Baseline sample with Phillips et al. (2013) spec.	(4) Additional variables	(5) Additional variables & interactions	(6) Baseline, OECD countries	(7) Baseline, Non-OECD countries	(8) Baseline, country fixed effects	(9) Baseline, time fixed effects	(10) Baseline, GLS
Fundamentals	Constant			-0.392 **	0.001	-0.245	-0.226	-0.225	-0.276	1.623			-0.751 **
	Income per person aged 15-64 in PPP	✓		0.034 ***	0.015	0.013	0.015	0.023	0.013	0.064 ***	0.076 ***	0.024 **	0.041 ***
	Income per person interacted with capital openness	✓	✓	0.033 *	0.044 ***	0.037	0.059 ***	0.046 **	0.046	0.018	0.015	0.038 **	0.021
	Ageing speed	✓		-0.025	0.086 ***	0.121 ***	-0.048	0.166	0.142 **	-0.085	-0.084	0.027	0.021
	Ageing speed wrt. world * income per capita (PPP) as % of G3 mean	✓	✓	0.164 **			0.173 **	0.284 ***	-0.019	0.429 ***	0.168 **	0.109 *	0.152 *
	Old-age dependency ratio	✓		-0.047 *	-0.046	-0.084 **	-0.066 **	-0.065	-0.053	0.021	-0.121	-0.034	-0.051
	Population growth HP-filtered (lagged)	✓		-0.576 **	0.047	-0.182	-0.742 ***	-0.622 **	-0.284	-0.277	-1.023 **	-0.416 *	-0.580
	Share of manufacturing in value added, instrumented	✓		0.234 ***	0.321 ***		0.243 ***	0.285 ***	0.309 ***	0.322 ***	0.506 ***	0.218 **	0.211 ***
	Oil & gas balance / GDP 5Y-mov.av., if positive	✓		0.427 ***	0.406 ***	0.383 ***	0.417 ***	0.423 ***	0.410 ***	0.448 ***	0.166	0.460 ***	0.363 ***
	Mining products exports as % of total exports (lagged)	✓		0.002	0.009		0.006	0.011	0.001	0.023	0.028	-0.006	0.019
	Domestic currency % use in world FX reserves			-0.041 ***	-0.040 ***	-0.022 **	-0.046 ***	-0.038 ***	-0.058 ***	-0.020	0.041	-0.046 ***	-0.017
	Financial centre dummy			0.016 ***	0.009 *	0.008	0.014 ***	0.017 ***	0.022 ***	-0.063 **		0.018 ***	0.038 ***
Non-fundamentals	NIIP / GDP (lagged, in USD terms)			0.032 ***	0.037 ***	0.042 ***	0.031 ***	0.030 ***	0.023 ***	0.055 ***	0.036 ***	0.031 ***	0.018 ***
	NIIP exceeding -60% of GDP (lagged)		✓	-0.030 **	-0.034 ***	-0.048 ***	-0.029 **	-0.031 ***	-0.024	-0.046	-0.041 **	-0.027 **	-0.014
	VIX*(capital account openness) (lagged)		✓	0.084 ***	0.081 **	0.080 **	0.083 ***	0.088 ***	0.017	0.192 ***	0.090 ***	-0.046	0.087 ***
	VIX *(capital account openness) * reserve currency status		✓	-0.210 *	-0.221 **	-0.292 ***	-0.196	-0.207 *	0.018	-1.949 ***	-0.273 **	-0.118	-0.195 *
	FX reserve change / GDP interacted with capital closedness, instr.	✓	✓	0.338 **	0.278 *	0.459	0.365 **	0.414 **	-0.938 ***	0.799 ***	0.355 ***	0.314 *	0.146
	Annual real GDP growth expected 5 years ahead	✓		-0.310 ***	-0.268 **	-0.453 ***	-0.317 ***	-0.354 ***	-0.325 **	-0.327 **	-0.548 ***	-0.377 ***	-0.280 **
	Public health expenditure / GDP (lagged)	✓		-1.739 ***	-0.575 ***	-0.635 ***	-1.773 ***	-1.953 ***	-1.714 ***	-1.795 ***	-0.705	-1.762 ***	-1.837 ***
	Health exp. wrt. world av., interacted with old-age dep. ratio	✓	✓	4.773 ***			4.923 ***	5.470 ***	4.985 ***	5.587 ***	0.787	4.808 ***	5.205 ***
	Structural fiscal balance	✓		0.272 ***	0.277 ***	0.213 ***	0.272 ***	0.230 ***	0.359 ***	0.105	0.013	0.286 ***	0.100 **
	Change of private debt in pp. of GDP (over 3 years, lagged)	✓		-0.059 ***	-0.065 ***		-0.057 ***	-0.051 ***	-0.061 ***	-0.045 ***	-0.036 ***	-0.056 ***	0.001
	Private debt stock/GDP (demeaned by country historical average)	✓		-0.011	-0.010	-0.055 ***	-0.011	-0.015 *	-0.021 **	0.000	-0.021 **	-0.018 **	-0.051 ***
	Construction investment / GDP (lagged)	✓		-0.099 ***	-0.128 ***		-0.111 ***	-0.111 ***	-0.236 ***	-0.022	-0.259 ***	-0.084 ***	-0.076
	REER growth (over 3 years, lagged)			-0.086 ***	-0.091 ***		-0.083 ***	-0.082 ***	-0.109 ***	-0.075 ***	-0.077 ***	-0.082 ***	-0.051 ***
	Output gap / potential GDP	✓		-0.385 ***	-0.399 ***	-0.493 ***	-0.378 ***	-0.373 ***	-0.268 ***	-0.445 ***	-0.382 ***	-0.377 ***	-0.432 ***
Additional terms	Global Freedom inst. quality index, lagged	✓				0.008	-0.018	-0.016					
	Life expectancy wrt. world	✓					0.001	0.001					
	Capital openness wrt world, lagged	✓					0.016 *	0.010					
	Safer institutional/political environment index (ICRG)	✓	✓					-0.377 ***					
	Old-age dep. ratio wrt world av., interacted with ageing speed	✓	✓					-0.004					
	Fixed effects										YES	YES	
	R^2			0.64	0.62	0.57	0.64	0.65	0.71	0.64	0.74	0.65	0.60
	Adjusted R^2			0.64	0.61	0.56	0.64	0.64	0.71	0.63	0.74	0.65	0.60
	RMSE			3.42	3.52	3.75	3.40	3.37	2.76	3.78	2.88	3.35	3.59
	Number of observations			1589	1589	1589	1589	1589	907	682	1589	1589	1589
	Durbin-Watson stat (headline)			0.64	0.62	0.52	0.65	0.65	0.66	0.71	0.85	0.63	0.52
	Durbin-Watson stat (AR1-adjusted)												1.62
	Sample condition number			9.45	6.80	15.31	11.34	19.30	9.45	9.45	9.45	9.45	9.45
	Coefficient volatility			0.06	0.05	0.07	0.06	0.07	0.06	0.06	0.10	0.09	0.05
	P-value joint FE significance										0.000	0.001	
	GLS autocorrelation paramter (rho)												0.677

Asterisks denote significance levels: *** 1%, ** 5%, * 10%. Specifications (1)-(9) are based on OLS reported with robust standard errors computed à la Discroll and Kraay (1998). Specification (10) denotes Prais-Winston feasible GLS with heteroskedasticity-consistent standard errors. All specifications are based on a data sample as of the Autumn Forecast 2017 for 65 countries over 1987-2016 (see Chapter 4). Note that the sample condition number may be based on based on linearly equivalent variants of the specifications above.

Table A2.2: **Bayesian Model Averaging with interaction terms**

	(1)	(2)	(4)	(5)	(6)	(7)
	Base term	Capital acc. openness	Relative income per capita in PPP	Interaction with Ageing speed	Old-age dep. ratio	Domestic currency % use in world reserves
Relative income per capita in PPP (lagged)	**-0.08 (1.00)**	**0.17 (0.98)**	0.00 (0.00)	0.00 (0.00)	-0.01 (0.03)	**-0.25 (0.90)**
Old-age dependency ratio	**0.06 (1.00)**	-0.24 (0.79)	0.00 (0.01)	0.00 (0.00)	0.01 (0.01)	0.00 (0.00)
Ageing speed	**0.68 (1.00)**	-0.01 (0.05)	**-0.05 (0.96)**	0.35 (0.46)	**-1.83 (0.99)**	0.00 (0.00)
Population growth HP-filtered (lagged)	-0.06 (0.15)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Oil & gas balance / GDP 5Y-mov.av., if positive	**0.83 (1.00)**	**-0.57 (0.86)**	0.00 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Mining products exports as % of total exports (lagged)	0.00 (0.17)	0.00 (0.01)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Share of manufacturing in value added, instrumented	**0.21 (1.00)**	0.00 (0.00)	0.00 (0.00)	0.30 (0.18)	0.00 (0.00)	0.25 (0.18)
Domestic currency % use in world FX reserves	**0.00 (1.00)**	-0.01 (0.02)	0.00 (0.01)	0.00 (0.00)	0.00 (0.01)	-0.02 (0.09)
Financial centre dummy	**0.30 (0.99)**	-0.30 (0.78)	0.00 (0.00)	0.01 (0.05)	0.00 (0.01)	**0.17 (0.84)**
NIIP / GDP (lagged, in USD terms)	**0.09 (1.00)**	**-0.07 (0.93)**	0.00 (0.12)	0.00 (0.01)	-0.01 (0.14)	0.00 (0.00)
NIIP exceeding -60% of GDP (lagged)	**-0.08 (1.00)**	0.00 (0.01)	0.00 (0.04)	0.00 (0.01)	-0.01 (0.04)	**0.32 (0.90)**
VIX index (dev. from sample mean, lagged)	**0.07 (1.00)**	0.00 (0.01)	0.00 (0.00)	-0.04 (0.07)	0.00 (0.01)	0.00 (0.01)
Annual real GDP growth expected 5 years ahead	**-0.12 (0.99)**	0.00 (0.01)	0.00 (0.00)	0.00 (0.00)	-1.37 (0.40)	0.13 (0.04)
Public health expenditure / GDP (lagged)	**-2.10 (1.00)**	-0.02 (0.02)	0.00 (0.01)	-0.02 (0.01)	**5.84 (1.00)**	0.01 (0.01)
(FX reserve change)/GDP * capital closedness, instrumented	0.20 (0.62)	-0.03 (0.02)	0.07 (0.33)	-0.02 (0.01)	-1.11 (0.19)	0.01 (0.00)
Structural fiscal balance, instrumented	**-0.46 (1.00)**	0.00 (0.00)	0.00 (0.04)	0.11 (0.07)	**2.42 (1.00)**	0.19 (0.15)
Change of private debt in pp. of GDP (over 3 years, lagged)	**-0.01 (1.00)**	0.00 (0.01)	0.00 (0.00)	0.00 (0.00)	-0.13 (0.45)	0.00 (0.01)
Private debt stock/GDP (demeaned by country historical average)	**0.01 (0.96)**	0.00 (0.00)	0.00 (0.01)	**-0.27 (0.83)**	0.00 (0.02)	-0.02 (0.09)
Construction investment / GDP (lagged)	**-0.38 (1.00)**	0.00 (0.00)	**0.07 (0.99)**	0.04 (0.04)	-0.03 (0.03)	0.04 (0.03)
REER growth (over 3 years, lagged)	**-0.08 (1.00)**	0.00 (0.00)	0.00 (0.00)	0.00 (0.01)	0.00 (0.00)	0.00 (0.01)
Output gap / potential GDP	**-0.41 (1.00)**	0.00 (0.00)	0.00 (0.01)	0.00 (0.00)	0.01 (0.01)	0.07 (0.06)
Chinn & Ito capital account openness	**-0.01 (1.00)**	0.00 (0.01)	**0.02 (0.98)**	0.00 (0.00)	-0.02 (0.08)	-0.02 (0.06)
Posterior model size	38.9		MCMC-likelihood correlation	0.99		
Nb. Observations	1589		R-squared	0.72		
Posterior shrinkage factor (av.)	0.989		Pseudo adjusted R-squared	0.71		
Nb. MC3 draws	10 million					

Results from Bayesian Model Averaging (BMA), weighting models by individual posterior model probabilities. Figures represents the posterior expected value of coefficients, i.e. the weighted average of the coefficients over all models, included the models that do not contain this particular parameter. Posterior inclusion probabilities (PIP) are included in parentheses, and represent the sum of posterior weights where the respective term is present. A high PIP indicates strong empirical support for an indicator. Correspondingly, PIPs above 0.8 are highlighted in bold.

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