Toolkit for the Analysis of Current Account Imbalances

November 2013
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Acknowledgments

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The years preceding the 2008 global financial crisis were marked by prosperity, strong economic growth, and expanding trade and credit (Obstfeld and Rogoff 2009). Economies in the developing world performed better than could have been predicted from the previous decade. Current account surpluses developed in emerging economies, whereas many developing and developed countries ran current account deficits. Supporting the surpluses were exchange rate policies aimed at promoting export-led growth. Savings in the emerging world also played a role by supporting credit and consumption booms, which led to widening current account deficits in the rest of the world.

The financial crisis led to reduced capital flows, tight credit, subdued domestic demand, and import contraction. Consequently, current account imbalances narrowed. Exports decreased, although not as much as imports, which helped shrink current account deficits. However, the rebalancing process was not enough and many countries are currently running current account deficits.

One example is Turkey which, after a decade of robust economic performance, faced the 2008–09 crises with strong fundamentals and was able to rebound quickly. However, after a period of persistent but moderate current account deficits, the deficit expanded to over 6 percent in 2010 and to nearly 10 percent in 2011, reverting modestly in 2012. These developments may to some degree reflect recent global challenges, but they are mainly the cumulative effects of Turkey’s growth model of the past decade. Economic growth was marked by a large decline in private sector savings that more than offset the improved public sector balance. There was also growing import substitution, which reflected real exchange rate appreciation. Recent credit expansion, financed partially by the large short-term capital inflows, contributed to further current account deterioration.

In Vietnam, the roots of the persistent and large trade deficit are somewhat analogous to the situation in Turkey. The worsening current account balance was partly a consequence of structural distortions in the economy, including the high import dependency of exports and low domestic value addition. More account deterioration was the
result of rapidly growing investment, which was fostered by a high-growth economic policies and accommodative fiscal (before 2010) and monetary policy.

Indonesia also returned to a current account deficit following the 1997–98 crisis, after a period predominantly of surpluses. As in Turkey and Vietnam, this can be attributed to strong growth of the domestic economy relative to external demand, as well as potential overheating of the economy. Falling commodity prices and subdued external demand help explain more recent deterioration (World Bank 2011). In Indonesia, the income account remains a negative component of the current account balance. This is largely a result of increased profit repatriation connected to foreign direct investment (FDI), particularly in the mining and mineral sector (World Bank 2011).

The latter is analogous to the experience of advanced Eastern European countries (the Czech Republic, Hungary, and the Slovak Republic) where recent current account deficits are mainly due to large income outflows. The dynamics of the current account balance in Poland before the crisis were mainly driven by the relative income convergence process, credit growth, and cyclical domestic demand shocks. The crisis improved the trade balance but, analogous to other Eastern European countries, growing income outflows created new deficits. While the current account deficit narrowed recently, its financing shifted to more volatile sources. Although it is still mostly financed by European Union transfers and net FDI inflows, the relative importance of portfolio inflows has increased. Portfolio financing of the current account deficit is also increasing in countries like Romania and Serbia. Portfolio flow sustainability depends on international investors’ appetite for risk. Investor flight in the face of negative shocks could simultaneously increase borrowing costs and put downward pressure on the foreign exchange market, thus constraining future current account financing.

Overall, the different experiences of countries point to a complex network of possible influences. Policy makers’ concerns arising from increased deficits are well founded. Persistent current account deficits and exchange rate misalignments frequently presage disruptive economic trends. The result can be external crises, exchange rate collapses, vulnerability to sudden stops, current account reversals, and economic slowdowns. Moreover, even moderate deficits can pose significant risks if their source of financing is unsustainable or imposes large costs on the economy. Finally, changes in one country’s current account balance can create negative spillovers via trade and financial channels.

When a growing number of countries run external deficits, investigation of the causes is warranted. It is crucial to understand the drivers of persistent current account deficits; the relative importance of cyclical and structural factors; conditions that imply external sustainability; sources of sustainable financing for the deficit; and steps governments can take to narrow the imbalance. This toolkit presents a framework that analysts can use to assess a country’s external situation through the lens of the current and financial accounts. The framework is divided into three components: Current Account Outcome Analysis, Current Account Diagnostic, and Economic Policy.
Current Account Outcome Analysis

The Current Account Outcome Analysis provides a descriptive analysis of the evolution of the current account balance, financial account balance, their components, and a set of macro-financial variables. The objective of the section is to provide analysts with the data and the basic understanding they need to start examining the problem. In particular, the analysis consists of: (i) collecting key economic data that will be also used in subsequent modules; (ii) qualitative and quantitative review of the past dynamics of the current account balance, financial account balance, their components, and macro-financial variables; and (iii) comparison of the observed dynamics with benchmark countries.

Current Account Diagnostic

The Current Account Diagnostic employs econometric techniques to identify current account determinants, evaluate external sustainability, decompose cyclical and structural factors, and analyze components of the financial account.

Current Account Determinants

Effective policy depends on knowing the variables and mechanisms that affect the current account balance. Until the current account deficit is in a self-correcting state, government interventions will be needed to restore the balance. Governments need to identify the drivers of the imbalance before taking action. Thus, the first step of the analysis focuses on the underlying drivers of savings, investments, and foreign trade. This includes fiscal imbalance, economic growth, relative income convergence, demographics, terms of trade, institutional environment, macroeconomic and global uncertainty, accumulated net foreign assets (NFA), real exchange rate, FDI, foreign exchange reserves, oil balance, and financial development. Three methodologies are proposed: (i) model averaging, (ii) panel data techniques, and (iii) seemingly unrelated models. In addition to assessing the individual contribution of each factor to the observed current account deficit, the analysis explores the role of policy gaps.

External Sustainability

Although there is no universally accepted definition, in general, a current account balance is sustainable when it generates no economic forces of its own to change its trajectory. In particular, a current account balance is sustainable when the economy can satisfy its long-run intertemporal budget constraint without big policy shifts or a large change in private agents’ behavior (Milesi-Ferreti and Razin 1996). To analyze external sustainability, the toolkit proposes two methodologies: i) an accounting approach which calculates the current account balance that stabilizes the NFA position at the current level, and ii) a “mixed” methodology which combines the accounting framework with the observed empirical relationship between...
drivers and current account balance and simulates the future path of NFA and the current account under different scenarios for macroeconomic variables.

**Cyclical versus Structural Factors**
The above analysis of key drivers of sustainability does not distinguish whether each driver’s impact is cyclical or structural. Identification of the cyclical and long-term structural factors that shape the current account balance thus requires separate analysis. If economic fluctuations reflect cyclical factors, then the current account balance would likely revert to the levels prior to the change in the medium term, without policy intervention. If policy distortions are responsible for cyclical movements, then the perception of market participants with respect to the sustainability may change. The result can be increasing short-term risk of currency and/or sovereign crises. Analogously, when current account fluctuations reflect the influence of structural factors, these movements will likely persist in the medium term, and counteracting policy interventions could be justified. Therefore, understanding the relative importance of cyclical and structural factors on external balances is important for anticipating the likely evolution of the balance in the medium term, and for assessing the need for and impact of policy actions. To identify key cyclical and structural drivers, the toolkit proposes the estimation of single-country models using model averaging and/or the estimation of state-space models.

**Financial Account**
The sustainability analysis explicitly includes assessment of the structure of the financial account and the associated capital gains. However, the analysis takes capital flows as exogenous, based on the past and projected dynamics. The volume, dynamics, and the relative structure of the flows may have important consequences on: (i) the riskiness of observed deficits, (ii) the required policy responses, and (iii) the future current account dynamics. Thus, a central part of this section examines the persistence of individual components of the capital flows and the associated determinants. The examination is important for two reasons. First, identification of the importance of the cyclical dynamics in the overall dynamics and the role that individual drivers play allows assessment of the likely evolution of the inflows. Second, determination of the appropriate policy instruments to deal with the inflows depends on the particularities of the case. The analysis will identify two groups of drivers of capital flows: local or “pull” and global or “push” factors. Pull factors are related to macroeconomic fundamentals, economic policies, institutions, and the degree of market imperfections. Push factors include variables affecting global liquidity, such as interest rates and economic performance in advanced economies, risk aversion, and commodity prices.

**Economic Policy**
Economic theory suggests that countries should be able to deploy a wide range of policies to reduce current account deficits. However, in practice, most nations are bound by a complex
network of rights and obligations in regard to international relations. Not everything is allowed, and not everything that is allowed is convenient. This section analyzes three different policies that countries can use to narrow the current account deficit: (i) trade policy, (ii) exchange rate management, and (iii) fiscal policy. We discuss the benefits and costs of taking corrective actions, and the conditions under which the policies are effective.

The rest of this toolkit is structured as follows: Section I presents the Current Account Outcome Analysis; Section II presents the Current Account Diagnostic; and Section III presents Economic Policy.
Current Account Outcome Analysis

The Current Account Outcome Analysis provides a descriptive analysis of the evolution of the current account balance, financial account balance, their components, and a set of macro-financial variables. The objective of the module is to provide analysts with the data and the basic intuition they need to start examining the problem. In particular, this includes:

1. Collecting key economic data that will be also used in subsequent modules
2. Qualitative and quantitative review of the past dynamics of the current account balance, financial account balance, their components, and macro-financial variables
3. Comparison of the observed dynamics with benchmark countries

The Current Account Outcome Analysis is a desk-based assessment of a series of indicators; no econometric analysis is performed at this stage. However, developing sound knowledge of the observed patterns is the key to success at later stages, where this information is combined with formal econometric analysis.

The Current Account Outcome Analysis consists of three steps: (i) download and compile data, (ii) analyze and interpret the observed dynamics, and (iii) select peer countries.

Step 1: Download and Compile Data

The Current Account Outcome Analysis focuses on time series data. Although detailed and useful data may be available from national statistical sources, the preference for comparison purposes is given to data from international sources. In cases when the relevant data are only available from local sources the care must be taken to ensure that the definition of the data conforms to international standards. Table 1 shows a few standardized sources. Annual frequency is suggested for preliminary data analysis. This allows observation of cyclical as well as structural movements (to a certain extent) in
Table 1  | **Main Data Sources for Toolkit**

<table>
<thead>
<tr>
<th>Source/location</th>
<th>Description and main use</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Integrated Trade Solution (WITS)</td>
<td>Available online: <a href="http://wits.worldbank.org/wits">http://wits.worldbank.org/wits</a> (registration required) Provides detailed time-series data on imports and exports by country and trade partner based on a range of statistical classifications. Used for selection of peer countries in current account determinants analysis.</td>
</tr>
<tr>
<td>Doing Business Indicators</td>
<td>Available online: <a href="http://www.doingbusiness.org/data">http://www.doingbusiness.org/data</a> Provides detailed data on business conditions used in structural current account analysis.</td>
</tr>
<tr>
<td>IMF International Financial Statistics</td>
<td>Available online: <a href="http://elibrary-data.imf.org/">http://elibrary-data.imf.org/</a> Provides detailed data on wide range of macroeconomic variables.</td>
</tr>
<tr>
<td>IMF International Balance of Payments Statistics</td>
<td>Available online: <a href="http://elibrary-data.imf.org/">http://elibrary-data.imf.org/</a> Provides detailed data on capital flows and international investment positions.</td>
</tr>
<tr>
<td>IMF World Economic Outlook database</td>
<td>Available online: <a href="http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/index.aspx">http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/index.aspx</a> Provides a detailed set of time-series macroeconomic data across all countries. Used also for projections of key macroeconomic developments in the current account sustainability analysis.</td>
</tr>
<tr>
<td>IMF Annual Report on Exchange Rate Arrangements and Exchange Restrictions</td>
<td>Available online: <a href="http://www.elibrary.imf.org/page/AREAER/www.imfareaer.org">http://www.elibrary.imf.org/page/AREAER/www.imfareaer.org</a> Provides data on different types of capital controls used by countries.</td>
</tr>
<tr>
<td>ILO Social Expenditure Database</td>
<td>Available online: <a href="http://www.ilo.org/dyn/sesame/ifpses.socialdbexp">http://www.ilo.org/dyn/sesame/ifpses.socialdbexp</a> Provides data on social expenditures for structural current account analysis.</td>
</tr>
<tr>
<td>ILO Employment Protection Legislation Database</td>
<td>Available online: <a href="http://www.ilo.org/dyn/eplex/termmain.home">http://www.ilo.org/dyn/eplex/termmain.home</a> Provides data on labor market policies for structural current account analysis.</td>
</tr>
<tr>
<td>OECD Statistics</td>
<td>Available online: <a href="http://stats.oecd.org/">http://stats.oecd.org/</a> Provides wide range of indicators for OECD and a small number of other countries.</td>
</tr>
<tr>
<td>Penn World table</td>
<td>Available online: <a href="https://pwt.sas.upenn.edu/php_site/pwt_index.php">https://pwt.sas.upenn.edu/php_site/pwt_index.php</a> Provides worldwide data on key macroeconomic variables.</td>
</tr>
<tr>
<td>BIS/IMF/World Bank Joint External Debt Hub</td>
<td>Available online: <a href="http://www.jedh.org/">http://www.jedh.org/</a> Provides worldwide data on various indicators of external debt.</td>
</tr>
<tr>
<td>Bank for International Settlements Statistics</td>
<td>Available online: <a href="http://www.bis.org/statistics/index.htm">http://www.bis.org/statistics/index.htm</a> Provides data on the cross-border lending and borrowing of banks and indicators of credit and house prices.</td>
</tr>
<tr>
<td>Others</td>
<td>Credit Market Regulation Index, Fraser Institute Available online: <a href="http://www.freetheworld.com">http://www.freetheworld.com</a> Index consisting of four components measuring the degree of public ownership of the banking system, control of interest rates, percentage of credit extended to private sector, and competition from foreign banks. Used for structural current account analysis.</td>
</tr>
</tbody>
</table>
the variables without introducing additional levels of noise that can be found at quarterly or higher frequency.

**Step 2: Analyze and Interpret**

Collected data can be divided into the several groups listed below. For each variable within the group we analyze its evolution in terms of growth rates, trend(s), average, deviations from historical average, and volatility. In addition, in group 4, deviations from the average during identified current account deficit periods can be analyzed for selected macro-financial variables.

**Group 1: Current account balance and its components**

The analysis starts by examining the evolution of the current account balance as a percentage of the gross domestic product (GDP). The analyst may focus on specific developments. For example, some standard questions include: (i) Are there any strong trends in the data? (ii) Are there any episodes of large reversals (a current account balance improvement of at least a few percentage points following a prolonged deterioration)? (iii) How volatile is the current account balance?

Similar dynamics are analyzed for the current account components, including: (i) trade balance in goods; (ii) trade balance in services; (iii) income balance; and (iv) transfers. The evolution of the latter two components may be of significant interest, especially for emerging and developing countries. Additional questions one can ask include: (i) Does the income balance worsen following (in time) large FDI inflows? (ii) What is the share of remittances in

### Table 1: Main Data Sources for Toolkit (Continued)

<table>
<thead>
<tr>
<th>Source/location</th>
<th>Description and main use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinn and Ito index <a href="http://web.pdx.edu/~ito/Chinn-Ito_website.htm">http://web.pdx.edu/~ito/Chinn-Ito_website.htm</a></td>
<td>Provides data used to study the effect of financial deepening on structural savings and investments and on current account determinants.</td>
</tr>
<tr>
<td>External Wealth of Nations database Available online: <a href="http://www.philiplane.org/EWN.html">http://www.philiplane.org/EWN.html</a></td>
<td>Extensive dataset covering 178 countries providing data on gross foreign assets and liabilities and NFA.</td>
</tr>
</tbody>
</table>

total transfers and how persistent are their movements? The first question addresses the empirical observation that countries that received large FDI inflows tend to experience relatively large income outflows through profit repatriations—which in some cases (such as the Czech Republic, Hungary, and the Slovak Republic over the last decade) may be the key component of the current account deficit. The second question is related to the experience of many developing countries where highly persistent transfers finance a relatively large trade deficit.

**Table 2 lists the variables from this subset.**

**Group 2: Financial account balance, and its components**

The balance of payments (BOP) identity implies¹ that the current account balance is equal to the sum of the change in official reserves and the financial account balance. While we focus on the determinants of the financial account balance in the subsequent modules, it is useful to analyze dynamics of the financial account balance and its component at this stage. A good understanding of individual components, their dynamics, and their relative importance is the necessary input for the external sustainability assessment, which is conducted in Section 2.2. Analysis of the evolution of the official reserves also plays an important role in the sustainability exercise (perhaps less so for explaining the dynamics of the current account per se). Milesi-Ferretti and Razin (2000), Gourinchas and Obstfeld (2012), inter alia discuss the role of reserve accumulation for decreasing the probability of systemic crises (currency and/or sovereign).

**Table 3 lists the variables from this subset.**

### Table 2

**Summary of Indicators and Issues: The Current Account and Its Components**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Questions</th>
</tr>
</thead>
</table>
| Current account balance (total and in % of GDP) | 1. Are there any strong trends in the data?  
2. Are there any episodes of large reversals?  
3. How volatile is the current account balance? |
| Export of goods (total and in % of GDP)  
Export of services (total and in % of GDP)  
Import of goods (total and in % of GDP)  
Import of services (total and in % of GDP) | 4. Growth rates (also for export/import volumes)  
5. Any trends?  
6. Volatility  
7. Exports over imports coverage  
8. Any observed changes (in trend) that can be associated in time with structural reforms? With FDI inflows?  
9. Trends in export diversification (top 15 export destinations) |
| Income credits (total and in % of GDP)  
Income debits (total and in % of GDP) | 10. Averages (over subperiods if necessary)  
11. Any trends?  
12. Volatility  
13. Any observed changes (in trend/deviation from the average) that can be associated with FDI inflows? |
| Official current transfers (total and in % of GDP)  
Private current transfers (total and in % of GDP) | 14. Averages (over subperiods if necessary)  
15. Any trends?  
16. Ratio of private transfers to trade balance |

¹ Throughout this document it is assumed that the balance of payments errors and omissions sum to zero.
Group 3: Macro-financial variables—underlying movers

This group includes macro-financial variables that are directly related to the observed dynamics in the current account. From the national accounting identity, the current account balance represents the difference between the national savings and investments. For a given size of the current account balance, the relative behavior of the two segments may impose different challenges for external sustainability. A deficit caused by a reduction in savings is likely to be more dangerous than one fueled by a surge in investments, as investments contribute to future growth and a country’s ability to repay debt. Hence, analysis of the evolution of these variables and their components—private and public savings and investments—sheds more light on the evolution of the current account and the associated risks. Timing the observed changes in the dynamics of the savings and investments and relating this to the introduction of structural policy changes is an additional exercise.

Movements in the real exchange rate, its components (nominal exchange rate and inflation rate), and in terms of trade affect exports and imports of goods and services. The exact mechanism at work is discussed in Section 2.1, but here it is useful to explore the dynamics of the variables, with special attention to observed volatility. Similarly, the oil balance as a percentage of GDP has persistent effects on the current account balance.

Table 4 lists the variables from this subset.

---

2 The terms of trade changes also affect the savings and investments, the relation is discussed in section 2.1.
Group 4: Macro-financial variables—the key indicators

This group includes macro-financial variables that may contribute to the current account dynamics, but its importance arises primarily in the external sustainability assessment. Following a large empirical literature on the current account reversals and indicators of financial crises, the variables considered may provide additional information on the riskiness of the external imbalances. Note that this is not an attempt to define a threshold value for an early warning signal variable(s). Despite various attempts at such a definition, the literature yields no agreement about exact thresholds, or how they might differ across time and across countries. Rather, the intention here is to trace the dynamics of a large set of variables that under some conditions may lead to crises, for a given economy, without defining exact thresholds. This information is used to form realistic scenarios in the external sustainability assessment in Section 2.2, as well as for evaluating the obtained results. For example, excessive credit growth and the real exchange rate appreciation may signal risky movements if accompanied by persistent (or rising) current account deficits over the most recent period. The external sustainability analysis should therefore control for these observations by using them to form different scenarios explicitly for these two variables and tracing their effects in the future.

Table 5 lists the variables from this subset.

---

Table 4  Summary of Indicators and Issues: Macro-financial Variables—Underlying Movers

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross national savings in % of GDP Private savings in % of GDP Gross government savings in % of GDP Fiscal balance in % of GDP</td>
<td>1. Averages (over subperiods if necessary) 2. Any trends? 3. Deviation from the trends/averages 4. Any significant changes in magnitude that can be associated in time with structural reforms? 5. Past importance (average) of privatization revenues (if applicable)</td>
</tr>
<tr>
<td>Total investment in % of GDP Private investment in % of GDP Public investment in % of GDP</td>
<td>6. Any trends? 7. Volatility 8. Deviation from the trends/averages 9. Any significant changes in magnitude that can be associated in time with structural reforms?</td>
</tr>
<tr>
<td>Real effective exchange rate Inflation rate Nominal effective exchange rate Terms of trade</td>
<td>10. Averages (over subperiods if necessary) 11. Any trends (especially for the recent period)? 12. Deviation from the average (5 or 10 year) 13. Volatility</td>
</tr>
<tr>
<td>Oil balance in % of GDP Oil consumption volume per capita (if importer) Oil production per GDP (if producer)</td>
<td>14. Averages (over subperiods if necessary) 15. Any trends (especially over the recent period)? 16. Persistence of the oil balance 17. Growth rates of production/consumption</td>
</tr>
</tbody>
</table>

---

The final group of variables captures global movements. The importance of global factors arises in two dimensions. First, a vast literature (see Fratzscher 2012, Ghosh et al. 2012, and references therein) on the determinants of capital flows seems to support the idea that global factors are more important than local conditions in determining the timing and magnitude of capital flows from industrial to developing countries. Second, the riskiness of the observed and/or expected external imbalances may be perceived differently in times of global distress, as the recent financial crises demonstrated. Therefore, analysis of the dynamics of global factors is used as an input for explaining the observed patterns in capital flows in Section 2.5, as well as for evaluating the results from the sustainability assessment in Section 2.2.

Table 6 lists the variables from this subset.

### Group 5: Global factors

Analysts should investigate whether the observed dynamics are specific to the country, or whether other economies, outside and inside the country’s region, have experienced the same pattern at the same stage of development (Farole and Reis 2012). The idea is to set the
country’s performance in relative context with appropriate comparators. A set of potential variables can be used to select the comparators, including, but not limited to, variables such as GDP per capita, oil importer/exporter, commodity importer/exporter, exchange rate regime, export platform, and import platform.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global yields (United States or the average rate on long-term government bonds for the United States, Japan and Euro area)</td>
<td>1. Averages (over subperiods)</td>
</tr>
<tr>
<td>Global liquidity (TED spread, Libor-OIS)</td>
<td>2. Volatility</td>
</tr>
<tr>
<td>Global risk (VIX)</td>
<td>3. Any direct or reverse co-movements (contemporaneous or with lead) with the current account balance (especially for identified reversals)?</td>
</tr>
<tr>
<td>Commodity prices</td>
<td></td>
</tr>
<tr>
<td>Crude oil price</td>
<td></td>
</tr>
<tr>
<td>Average growth rate in developed countries (G7)</td>
<td></td>
</tr>
<tr>
<td>Global stock returns</td>
<td></td>
</tr>
</tbody>
</table>
The Current Account Diagnostic explores current account determinants, external sustainability, cyclical versus structural factors, and the role of the financial account.

2.1 Estimating the Current Account Balance

Understanding the determinants of the current account balance and the mechanisms through which they affect it is crucial from a policy perspective. As long as the current account imbalance is not self-correcting, government interventions will be required to restore the equilibrium. In order to take the appropriate actions, governments need to identify the variables that explain the imbalance, and their contribution to the observed result. Thus, the first step of the analysis involves the identification of potential determinants.

The following analysis is based on the national accounting identity, which defines the current account balance as the difference between the national savings and investments:

\[
CA = S_p(X_S) - I_p(X_I) + S_g - I_g
\]

where total savings and investments are decomposed into private and government. The term \(X_S\) denotes private consumption/savings shifters, \(X_I\) denotes factors that affect private investments and \(X_{CA}\) denotes factors that may influence the current account outside the underlying movement in savings and investment (for example, export/import shifters, or past FDI inflows). Assuming exogeneity of the trade drivers \(X_{CA}\), the current account balance is defined via the reduced-form equation (2):

\[
CA = g(X_S, X_I, S_g, I_g, X_{CA})
\]

where in econometric specification, it is assumed that the function \(g(\cdot)\) is linear. The reduced-form equation (2) is related to a large empirical literature that uses various econometric techniques to identify
the relationships between the current account and a set of macro- and socioeconomic variables. (See Debelle and Faruqee (1996), Calderon et al. (2002), and Chinn and Prasad (2003) for early applications in the growing literature, and references below for recent contributions).

By focusing on the underlying determinants of savings and investments, the specification is partially related to the intertemporal approach to the current account (Sachs 1981; Obstfeld and Rogoff 1996). The intertemporal model treats the current account as an outcome of consumption and investment decisions made over a long-term horizon under forward-looking expectations. Assuming free capital movements, the current account will absorb any temporary shocks to the net national cash flow, thus allowing domestic agents to smooth their consumption over time. Although theoretically rigorous, intertemporal models tend to exhibit a poor empirical fit—while the model-predicted and the actual series were usually positively correlated, the actual series were substantially more volatile (see, among others, Sheffrin and Woo (1990) and Otto (1992) for early applications). In addition, with their focus on the long run, intertemporal models have limited applicability for assessing current account sustainability, at least over the short to medium term.

The specification in equation (2) therefore does not aim to discriminate between competing intertemporal models by choosing a limited number of variables in the reduced form that corresponds to a particular model in empirical exercise (example in this direction are Lee and Chinn, 2006, Bussière et al, 2010). Rather, the idea is to capture as many potential influences on the current account as possible using a large number of variables in empirical analysis.

Following the empirical evidence from a large number of studies of emerging and developing countries, below we outline the main prospective determinants of current account behavior.

**Explanatory and Dependent Variables**

The dependent variable is the ratio of current account to GDP. If interested, one can also use a relevant subset of variables to identify the determinants of national savings and investment, expressed as a share of GDP. The following set of explanatory variables is considered:

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4 Recent research moved to relaxing some of the models’ assumptions through incorporating endogenous investments (Glick and Rogoff, 1995), allowing for real exchange rate and interest rate variability (Bergin and Sheffrin, 2000, Campa and Gavilan, 2011), incorporating consumption habits (Gruber, 2004), introducing capital market imperfections that limit the consumption smoothing (Bussière et al., 2006) or adding an exogenous world real interest rate shock (Nason and Rogers, 2006). Overall, although relaxation of some of the assumptions improves the models’ fit, the obtained results are sensitive to the maintained assumptions and the choice of variables.

5 For an interesting application of the present value testing of intertemporal models to current account sustainability although under relatively strong assumptions see Engel and Rogers (2006) and Campa and Gavilan (2011).

1. **Fiscal Imbalance**: Reduction of taxes and higher debt issuance may increase consumption and worsen the current account balance, unless the costs of future government debt repayment are internalized by the current generation (Obstfeld and Rogoff 1996). Rising government expenditures will increase aggregate demand that will be in part satisfied by additional imports (Ahmed 1996). In addition, government purchases of nontradable goods can increase prices, leading to real exchange rate appreciation and more current account imbalance (Abbas et al. 2010).

**Proxies**: Ratios of government budget balance to GDP, government expenditures to GDP, and government investment to GDP. If required, all variables may be cyclically adjusted and instrumented.7

2. **Stock of net foreign assets (NFA)**: Net foreign assets can affect the current account balance in two opposing ways. First, a large stock of foreign liabilities will require a country to run current account surpluses to pay them off. Second, the country will still pay interest on those liabilities, and thus the current account will become more imbalanced.

**Proxies**: In order to avoid any reverse link with the current account balance, the value of NFAs is taken at the beginning of each period e.g., lagged level of NFA/GDP. For panel data models with averaged variables, the variable is the first year of the x-year period over which the dependent and independent variables are averaged. Interaction variable; the stock of NFA*dummy for high NFA level (above 60% of GDP, IMF EBA, 2012) may be included in order to capture a potentially different slope for higher accumulated levels of the NFA.

3. **Dependency and youth ratios**: Higher dependency and youth ratios will likely reduce national saving and worsen the current account balance. Conversely, increased economically active population will have a positive effect.

**Proxies**: youth ratio (population under 15 years old/population between 15 and 65 years old); old-age ratio (population over 65 years old/population between 15 and 65 years old); dependency ratio (population under 15 years old + population over 65 years old/population between 15 and 65 years old); projected change in the dependency ratio; population growth rate.

4. **GDP growth**: The impact of the GDP growth on the savings and the current account depends on the agent’s expectations about the implications of the observed growth for future income. If agents consider GDP growth as a signal of increases in permanent income, then saving rates could decline, worsening the current account imbalance. By contrast, if the change is perceived as temporary, savings will increase and the current account balance will improve. Obstfeld and Rogoff (1996) argue that the ability to run

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7 Following the methodology employed by the IMF (2012), the instruments may include lagged fiscal balance, a time trend, lagged world GDP growth, lagged domestic and world output gaps, a measure of global risk (VXO/US corporate credit spreads), foreign exchange (FX) regime, the polity index, and the average fiscal balance in peer countries.
current account deficits or surpluses depends on the relationship between a country’s growth rate and the world’s growth rate. The country’s ability and willingness to borrow from the world capital markets will be reduced when the country’s growth rate converges to the world growth rate, thus leading to improvements in the current account balance. **Proxies:** real GDP growth rate; real GDP per capita growth rate; expected (5 years ahead) real GDP growth rate. All variables are expressed as deviation from the relevant world counterpart (see below for the definition of the world counterpart).

5. **Relative income:** Small, developing economies will run current account deficits as they accumulate capital goods. Eventually, the country will be sufficiently developed to pay its debts by running current account surpluses. Moreover, as the country reaches mature stages of the development, its current account should improve since the country that expects to see its relative income diminishing in the future, should have a higher current savings rate (Engel and Rogers, 2006). **Proxies:** real GDP per capita in purchasing power parity (PPP) terms as deviation from the relevant world counterpart.

6. **Terms of trade (ToT):** Terms of trade volatility can stand as a proxy for uncertainty. Agents may undertake precautionary saving in a volatile economy, improving the current account balance (Chinn and Prasad 2003). ToT shocks also work through savings and investment channels to directly affect the current account balance. Other things being equal, positive ToT shocks can improve the current account via increased savings due to larger current income relative to permanent income (the Harberger-Laursen-Metzler effect). However, ToT changes may also affect the optimal capital stock and hence the investment plans, leading to more current account deficit. The greater the persistence of ToT shocks, the more dominant is the investment effect. **Proxies:** terms of trade volatility; terms of trade (in levels); terms of trade shocks (residuals from ordinary least squares (OLS) regression of the terms of trade on its own lags).

7. **Financial deepening:** Financial deepening may grow or reduce private savings. Relaxed borrowing constraints can reduce private savings and increase current account imbalances. Alternatively, private savings can be encouraged by reducing transaction costs, improving risk management, and improving security (including effective regulation) for investors. Analogously, financial market deepening should stimulate investment by increasing the available sources of financing and lowering the cost of acquiring and evaluating information on prospective projects. However, to the extent that the deepening results in higher interest rates, the effect on investments may be negative. **Proxies:** ratio of monetary aggregates such as M2 to GDP; credit/GDP; stock market capitalization/GDP; financial center dummy (for panel studies); credit market regulation index (Fraser Institute); borrowers from commercial banks (per 1,000 inhabitants); depositors with commercial banks (per 1,000 inhabitants). The last four variables aim to capture purely structural and exogenous improvements in the financial infrastructure. The first three proxies may need to be instrumented due to potential endogeneity.
8. **Business and legal environment**: Good law enforcement signals to investors that a country is committed to protecting property rights, thus encouraging investments and savings.
   - **Proxies**: A measure of quality of institutions and business environment, including: composite indicators constructed by Political Risk Services; World Bank Doing Business indicators. The variable is used only in panel analysis due to relatively low annual variation. It can be included alone and/or interacted with variables that capture financial development.

9. **Capital controls**: When capital controls keep domestic interest rates above world levels, present consumption is more expensive than future consumption. (Reinhart and Smith 1998). As long as the intertemporal elasticity of substitution is high, pricier present consumption improves the current account (Chinn and Prasad 2003).
   - **Proxies**: (i) Quinn’s (1997) index on overall capital controls on the private sector (CAP 100). Quinn’s index is a composite measure of financial regulation that ranges from 0 to 100, with 100 representing the least-regulated and most-open regime. (ii) Gruber-Lloyd index of financial openness (Obstfeld 2004, 2012):
     \[ 1 - \frac{|A-L|}{A+L} \]
     where \( A \) denotes country’s gross foreign assets and \( L \) denotes gross foreign liabilities. Higher values of the index imply higher financial openness. (iii) Index that is the principle component of the binary variables pertaining to cross-border financial transactions, based upon the IMF’s categorical enumeration in *Annual Report on Exchange Arrangements and Exchange Restriction (AREAER)* (Chinn and Ito 2005). This last variable is used only in panel analysis due to low annual variation.

10. **Oil balance and degree of maturity of oil production; food prices**: Oil wealth can support a country’s high current account deficits. In many developing countries, food represents a dominant part of imports (relative to the oil) and the consumption basket. Therefore, changes in food prices may directly impact the current account balance.
    - **Proxies**: oil trade balance/GDP; oil production volume/GDP, oil consumption volume per capita; Food and Agriculture Organization (FAO) food price indices; World Bank commodity price indices.

11. **Openness**: Trade openness can improve or deteriorate the current account balance. Less-open countries with lower imports may improve the current account. But the same countries may also have difficulties servicing external liabilities, resulting in higher debt service costs and more account imbalance. In the opposite direction, higher openness often allows countries to undertake more investment and to finance the resulting current account deficits with capitals from abroad since their better ability to service the external debt makes them more attractive for foreign capital. Conversely, international trade often serves as an important vehicle for the transfer of technology, thereby improving the current account balance.
    - **Proxies**: exports plus imports/GDP (as deviation from the relevant world counterpart).
12. **Reserves**: Large reserve accumulation in the previous period may improve or deteriorate the current account balance. Precautionary reserve accumulation may make external borrowing easier for the country (Jeanne and Ranciere 2011), thus supporting larger current account deficits. On the other hand, the combination of reserve accumulation and financial account restrictions may improve the current account balance (Bayoumi and Saborowski 2012; Gagnon 2012) as a part of the export-led growth strategy (Bacchetta et al. 2012; Benigno and Fornaro 2012).

**Proxies**: lagged value of the stock of reserves as international reserve holding and current account balances are simultaneously determined; change in the stock of reserves (in level or multiplied by the capital controls index); change in the reserves instrumented with its lagged values and the CBOE OEX Volatility Index (VXO) index if required.

13. **Public social spending**: Higher social spending tends to be associated with lower saving rates since the improvements in the coverage and/or quality of social welfare schemes reduce the need for precautionary savings. Recent empirical studies (for example, Maynard and Qiu 2009; Kerdrain et al. 2011) suggest that the effect is stronger for low initial levels of social spending.

**Proxies**: public health spending as a share of GDP; total public social spending as a share of GDP. Both variables can be instrumented if necessary.

14. **Foreign direct investment (FDI)**: FDI has ambiguous effects on private domestic investment and the current account (Mody and Murshid 2005). Foreign investment can crowd out domestic investment when local and offshore firms compete for scarce domestic resources like skilled labor or finance (Jansen and Schulze 1996). FDI may also generate local economic spillovers that “crowd in” domestic investment. Gross FDI may also worsen the current account, depending on import content and the amount of profits repatriated.

**Proxies**: lagged (1 to 5 years) gross FDI as a share of GDP; the stock of FDI inflows at the beginning of the period.

15. **Real exchange rate (RER)**: RER fluctuations may help or hinder investments in the short run (Campa and Goldberg 2001; Landon and Smith 2009). A real currency appreciation reduces the domestic currency value of exports. This may trigger reduced production for export, leading in turn to lower demand for all inputs, including capital, and less investment. But RER appreciation also decreases the domestic currency price of imported capital and intermediate inputs, reducing the firms’ costs. Moreover, if a firm has substantial foreign currency liabilities, RER appreciation improves balance sheets, thus facilitating borrowing and investment. The total impact of appreciation on investment will reflect the substitutability (or complementarity) between inputs and capital and the degree of foreign currency liabilities. Moreover, use of the RER as an indicator of overall export competitiveness may have a direct impact on the current account balance.

**Proxies**: real effective exchange rate (level or the change) in the same period or lagged (1 to 3 years); real effective exchange rate*liability dollarization. Instrumented if required.
16. **Macroeconomic and global uncertainty**: Macroeconomic uncertainty is expected to increase the savings and reduce the investments. Increased global uncertainty or risk aversion may restrict access to external financing and improve the current account balances. Conversely, if the country is in a strong growth phase, then global uncertainty may lead to large income outflows and lower compression of imports relative to trading partners. This negative outcome would mirror the experience of several emerging market countries over the most recent period.

*Proxies:* expected inflation, inflation volatility, average inflation over the past 3(5) years, exchange rate volatility, unemployment volatility, terms of trade volatility, stock market volatility—all these individually or a first principal component of the set of estimated individual volatilities; global volatility (VXO/VIX).

17. **Asset prices**: Evidence from the past decade suggests that asset price dynamics may have a significant effect on savings and investment patterns in the short run, and consequently on the current account balance (Fratzscher et al. 2010; Laibson and Mollerstrom 2010; Jordà et al. 2011). A rise in equity prices or housing prices (particularly if expected to be permanent) increases expected income of households and thus consumption. The rise in asset prices also increases the borrowing capacity of the debtors, allowing them to spend and invest more.

*Proxies:* residential property prices; real housing price index; stock market turnover/GDP, change in stock market capitalization; change in public bond market capitalization; change in private bond market capitalization; change in stock market index; change in credit to private sector/GDP ratio. All variables can be instrumented if required.

18. **Current account persistence**: Current account balances tend to show a high level of persistence, notably at the annual frequency. Theoretically, this can be related to habit formation in consumption and savings or agglomeration effects in investment, which suggests a certain degree of inertia in the current account.

*Proxies:* lagged value of the current account balance to GDP ratio.

19. **Time dummies**: In order to control for potential outliers in the data that may bias the parameter estimates, time dummies are included for the known crises episodes. Their influence is excluded when the fitted values are computed.

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8 Individual volatilities can be obtained as: (i) an average of monthly or weekly squared changes (realized volatility); (ii) $x$ month (for example 24 month) rolling standard deviation; or (iii) or by estimating a parametric model for volatility (ARCH/GARCH).

9 A potential problem with inclusion of the lagged current account as an explanatory variable is that it may capture the effect of sustained distortions that are not part of the specification, thus giving a false significance of the model (and a smaller measure of the gap discussed later). However, exclusion of the variable may introduce the omitted variable bias to the estimates of the other parameters if the current account persistence arises due to behavior of agents as discussed above (especially if the habit formation in consumption can be linked to persistent levels of remittances).
As discussed above, some of these variables are measured as a country’s deviation from a relevant world counterpart. The basket of countries and country weights within the basket are chosen according to a country’s (i) GDP-weighted world average and (ii) trade partners. Thus, a movement of a variable affects the current account only to the extent that the variable does not move in the same amount for the rest of the countries. Considering each country’s characteristics relative to the GDP-weighted world counterpart (IMF, 2012) highlights the importance of a country’s relative economic size for the way how the current account to GDP ratio will respond to a given domestic shock. Selection of trade partners to the basket of countries brings a trade perspective, where relative movements with respect to trade partners may influence current account developments. UN Comtrade (via WITS) data are used to select the countries to and within the trade basket. To the extent that the developed countries are the most important trading partners for a country, the two definitions may show similar results.

**Estimations**

Once the set of potential determinants have been identified, the next step is to estimate the partial correlations between the current account and the determinants. Note that due to the reduced-form type of specification, causal interpretation of the estimates relies on the assumption of exogeneity of the underlying determinants. The analyst should consider whether the assumption is satisfied for the particular variable (instrumented if required) in a particular country under the analysis and correspondingly attribute the findings to causal relationships. Otherwise, using partial correlations still provides a rich set of stylized characterizations that can be used as the basis for defining and probing more subtle hypotheses.

Before proceeding to the estimation stage, the order of integration of the individual series is examined, because the methodologies provide consistent estimates and/or inference only for stationary variables. For individual time series, two kinds of tests can be used: the Kwiatkowski et al. (1992) KPSS test of a null hypothesis that an observable time series is stationary, or unit root tests that allow for structural breaks (see, for example, Perron 1989; Zivot and Andrews 1992; Lanne, Lütkepohl, and Saikkonen 2003). Panel unit root tests (Bai and Ng 2010; see also references in Pesaran 2012) are applied if the employed methodology is panel data.10

Estimation of the parameters can be performed using three different methodologies. The choice of the methodology depends primarily on the data availability and data characteristics. We briefly review all three methodologies, highlighting their advantages and limitations.

Provided that the data are available, single-country estimation is the preferred choice. Since annual data are used, estimation of single-country determinants puts relatively strong limits on the number of variables to be included in standard OLS regression, even in the first step of the general-to-specific exercise. Along the lines of Haddad and Nedeljkovic (2012), a preferable solution for confronting parametric model uncertainty and a limited number of

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10 In order to be used in the analysis, nonstationary series are transformed either via log transformation or as a first difference, provided that the transformed series maintain the underlying economic intuition.
Current Account Diagnostic

observations is model averaging. Model averaging in the present context means that the different combinations of the potential current account determinants (not all at once) are used as particular models and each combination is estimated by OLS. The final estimate is obtained by averaging across all the estimated regressions using a suitable criterion to select individual model weights. We use recently proposed the Jackknife Model Averaging (JMA) estimator for nonnested and heteroscedastic models (Hansen and Racine 2012), where the weights are chosen by minimizing a leave-one-out cross-validation criterion (see Appendix A for a detailed description). In this way, a large number of variables can be included, while only single-country estimation is performed. An alternative in the single-country framework is to use a factor-augmented approach (Bai and Ng 2006), where the analyst would select one or several “core” variables and use factors extracted from a rich set of potential determinants to eliminate the omitted variable bias from the estimates of parameters for “core” variables. The limitation of this approach is the necessity to a priori select the core variables and, at the end, only the influences of the core variables are obtained, since factors do not have a direct economic meaning.

The previously established methodology still requires at least 25 years of data (data points) for estimation with a meaningful level of precision. If this is not available, then the analyst has to rely on combining the data from different countries. A common method in the empirical literature is to use pooled panel data estimators. Estimates can be obtained using pooled OLS or one can allow for country fixed effects or time fixed effects. Inclusion of the latter effects aims to capture the influence of the additional (unobserved) factors in explaining cross-country and over-time variation, respectively. If the lagged dependent variable is included in the specification, the aforementioned panel estimators are inconsistent due to correlation between the transformed lagged dependent variable and the within transformed error in finite samples. In such cases, Arellano and Bond (1991) difference GMM estimators and/or Arellano and Bover (1995) and Blundell and Bond (1998) system GMM estimators can be used in estimation. If the time dimension of the sample is small, Roodman (2008) procedure for collapsing the set of instruments can be applied in order to reduce the small-sample bias in standard errors due to the imprecise estimates of the optimal weighting matrix when large number of instruments is included. In addition, Windmeijer (2005) small sample correction of the standard error estimates can be used to reduce the bias in standard errors. A potential limitation with using panel techniques in this context is that they provide common estimated coefficients for all the countries, while the significance of potential determinants may differ across the countries. This heterogeneity may also bias the resulting parameter estimates (Robertson and Symons 1992; Pesaran and Smith 1995). A simple way to control for this is the formation of the panel sample. The analyst should include only countries that have experienced similar (current account or savings and investments) dynamics over the period of analysis. Analysis of the peer countries from the previous section can help in the selection.

An alternative methodology that directly takes into account the parameter heterogeneity is seemingly unrelated regressions (SURE). The advantage of SURE is that it requires a lower number of observations at the country level compared to estimating a single-country
model. At the same time, it allows for heterogeneity of the coefficients across countries, thus reducing the need to carefully select the countries in the panel. The limitation is that SURE demands more observations relative to panel data techniques. In addition, the number of countries included always needs to be significantly less than the number of observation. In practice, if the aim is to include a large number of determinants (say 10), then using SURE requires at least 20 observations per country (and a maximum of 10 countries).

**Robustness checks**

To explore the robustness of the results, different type of exercises can be performed. First, if panel data estimation is used, the analyst can split the sample into developing and developed countries, and oil importers and oil exports. Second, alternative proxies of the key variables can be used and separate estimations performed. In case of obtaining conflicting results, the preference is given to the specification that minimizes information criteria.

**Presentation of the results**

There are two different ways to present the results. A conventional way is to show the estimated coefficients, which is a useful manner to examine the contribution of each factor to the observed outcome. The obtained estimates naturally depend on the scale of the dependent variable and the regressor. An alternative way is to present the coefficients standardized to measure in how many standard deviations the dependent variable will move if one of the explanatory variables changes by one standard deviation. Suppose that the obtained estimate is 0.5, the empirical standard deviation of the dependent variable is 1.5, and the standard deviation of the regressor is 0.75. The predicted change in the dependent variable is equal to 0.5*0.75 = 0.375 and this represents an increase of 0.375/1.5 = 0.25 standard deviations of the dependent variable. The alternative form thus allows assessing the relative importance of each factor.

### 2.2 External Sustainability

The second part of the analysis is devoted to the study of external sustainability. Following Frenkel and Razin (1996), two different but interrelated concepts can be distinguished—a country’s solvency and current account sustainability. Countries are solvent when the present discounted value of future trade surpluses is sufficient to repay the existing debt. However, the concept has relatively limited use for policy analysis since it implies very weak criterion for assessing a country’s vulnerability. For example, a country can remain solvent even with persistent high current account deficits as long as at some point in the future it runs a persistent trade balance surpluses.

A more restrictive criterion is the concept of current account sustainability. Although there is no universally accepted definition, in general, current account sustainability is related to the stable state in which the current account balance generates no economic forces of its
The current account is sustainable if the economy is able to satisfy its long-run intertemporal budget constraints without a substantial change in private agents’ behavior or policy shifts.

As is apparent from its definition, the notion of the sustainability does not provide a clear criterion for assessing a country’s external vulnerability, because it incorporates agents’ expectations of future policies rather than the policies themselves. Empirical literature therefore moved in three strands, briefly reviewed next. Two methodologies that are employed in the assessment are discussed afterward.

Following the analysis of Trehan and Walsh (1991) on the sustainability of fiscal deficits, a large body of the literature examines statistical properties of the current time series for the ratio of account balance to GDP. The idea is that current account stationarity is a sufficient condition for the intertemporal budget constraint to hold. Therefore, evidence of unit roots in the current account to GDP time series would imply unsustainability of the current account. A variety of statistical methods have been employed in investigating stationarity of the series (for a detailed survey see Chen 2011). They include: conventional unit root and cointegration tests, panel unit root tests, and, more recently, unit root tests robust to structural breaks, and regime switching unit root tests. Another strand of the literature has exploited a direct link between persistent current account deficits and the NFA or external debt position of a country, and tests for sustainability via stationarity of the latter series. A purely statistical approach to the current account sustainability has several limitations. First, Bohn (2007) shows that the evidence of unit roots or no cointegration is not sufficient for the rejection of sustainability. The intertemporal budget constraint may still be satisfied even if the components of the current account are not cointegrated, and even if neither debts nor deficits are difference-stationary. Second, although available samples should reflect the true data-generating process, the obtained results in practice are in-sample phenomenon and do not necessarily reflect the out-of-sample character of the current account.

The second strand of the literature uses a macroeconomic balance approach to external sustainability. This approach has been developed by the External Balance Assessment of the IMF, and proposes to evaluate sustainability by comparing the projected value of the current account balance with the current account balance of equilibrium or “norm.” To calculate the norm, one employs the estimated coefficients from the panel regressions of the previous section and evaluates the explanatory (policy) variables at their (desirable) equilibrium levels. In general, the equilibrium values of the explanatory variables are medium-term projections, most generally those elaborated by the IMF (World Economic Outlook database). The difference between the projected current account balance and the norm is considered a measure of excessiveness of imbalance. The approach also has some limitations. First, following the discussion in previous section, the use of panel econometrics for

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Cointegration tests investigate the existence of a stationary long-run relationship between exports and imports or investments and savings, which should imply stationarity of the current account.
calculating individual country norms may produce inaccurate results. This happens because potential determinants may differ across a large number of countries and this heterogeneity may bias the resulting parameter estimates for individual countries. Second, the methodology does not take into account different valuation properties of the components on the assets and liabilities side of the international position of a country (Gourinchas and Rey 2007; Tille 2008; Nguyen 2011). Third, the macroeconomic balance approach implicitly assumes that the economy has reached its steady state in the sample and therefore the established relationships between the fundamentals and the current account can be used for calculating the current account norms. Although this assumption may be appropriate for developed countries, it is unclear whether the same holds for the set of emerging and developing countries.

The third strand of the literature starting from Milesi-Ferretti and Razin (1996) employs an accounting framework to derive current account benchmarks that would stabilize country’s external debt or NFA (Lane and Milesi-Ferretti 2007) at the observed level so that the country’s intertemporal budget constraint is satisfied. The difference between the present current account balance and the obtained benchmark, or between the projected current account and the benchmark, represents a measure of imbalance excessiveness and the signal for policy makers. Since no econometric estimation is required, the approach imposes fewer assumptions than the previous two.

Methodology
Considering the advantages and limitations from the literature, the assessment of external sustainability in this toolkit is performed using two methodologies. The first applies the accounting framework discussed in more detail below. The second aims to combine the accounting framework with the observed empirical relationships between the current account balance and its determinants.

To analyze the external sustainability of a country, Milesi-Ferretti and Razin (1996) propose to employ an accounting framework, and to evaluate how far the current and projected current account balance is from an optimal benchmark, which, for example, stabilizes the NFA position of a country at a particular level. The methodology has been presented in detail in “Methodology for CGER Exchange Rate Assessments” (IMF 2006); the derivation shown below borrows from the theoretical background prepared for this note by the Research Department of the IMF. To derive an optimal benchmark, we start with the accumulation equation for NFA:

\[ B_t - B_{t-1} = CA_t + KG_t + E_t \]

where \( B_t \) are NFA, \( CA_t \) is the current account balance, \( KG_t \) are capital gains arising from valuation changes, and \( E_t \) includes factors such as capital account transfers and errors and omissions. If we divide the expression by nominal GDP, and we denote ratios to GDP by lower-case letters, we can rewrite the equation as follows:
\[ b_t - b_{t-1} = ca_t + kg_t + e_t - \frac{g_t + \pi_t}{(1+g_t)(1+\pi_t)} b_{t-1}, \]

where \( g_t \) is the growth rate of real GDP and \( \pi_t \) is the inflation rate. If it is assumed that there are no capital gains, capital account transfers, and omissions, and that the benchmark level of NFA is denoted by \( b^* \), then the current account that stabilizes the NFA position at \( b^* \) is as follows:

\[ ca^* = \frac{g + \pi}{(1+g)(1+\pi)} b^*. \]

If we use the same approach, and we assume that the real interest rates of return on external assets and liabilities are the same \( (r) \), then the level of trade balance inclusive of services and transfers that stabilizes the NFA position at the level \( b^* \) is:

\[ tb^* = -\frac{r-g}{(1+g)} b^*. \]

As the equation shows, current account and trade balances change in proportion to the benchmark level of NFA and also depend on the growth rate. Interest rates also matter: higher rates require larger trade surpluses to stabilize \( b^* \).

There is no an established criterion for setting the level of \( b^* \). Most research literature employs current levels as a benchmark. An alternative approach (Lane and Milesi-Ferreti 2001; IMF 2006) suggests using the estimated level of NFA as the benchmark. The estimated level is obtained by regressing NFA on a set of macro-financial determinants analogously to the analysis of the current account determinants in the previous section of the toolkit. In applications, given the knowledge of past dynamics in the economy and its peers, the analyst can use a variety of benchmark values to obtain the range of potential scenarios and assess their risk implications.

The second methodology follows Haddad and Nedeljkovic (2012), who recently proposed a framework that does not impose any steady-state assumptions on the evolution of variables when considering the valuation effects from the accounting framework. Instead of defining a benchmark for the current account balance, the authors propose to ask a different question: “given the identified influences of macro-variables on the current account and the current stock of foreign assets and liabilities of a country, what will be the future paths of net foreign assets under different scenarios?” Focus on NFA represents the other side of the sustainability coin—the current account may be sustainable as long as foreigners are willing to finance it, which is ultimately connected to the accumulated level of NFA. Moreover, given the experience from the recent crises, market perceptions of what constitutes a sustainable level of NFA (debt) may change in the short run, which signals the importance of focusing on the near-term horizon.

The procedure consists of four steps:

1. Using (i) the estimated coefficients from the current account determinants analysis and (ii) the projected values of determinants, generate projections of the current account...
balance at the end of the current year (say, 2013) (assuming that the data sample finishes in the previous year, say, 2012).

2. Given (i) the current account projection from the step 1, (ii) the stock of foreign assets, liabilities, and debts at the end of the sample (2012), and (iii) projections of the relative movements in capital inflows and outflows and calibrated rates of return on foreign assets and liabilities for the current year (2013), generate the future stock of NFA (for 2013) using the assumed law of motion.

3. Using the calculated stock of NFA at the end of 2013, steps 1 and 2 are recursively repeated, thereby generating the paths of the current account and NFA in the future.

4. Some of the calibrated parameters and/or projections of policy variables can be alternated to obtain the range of potential scenarios and assess the risk implications.

The future path of NFA is generated using the accounting approach to the current account:

\[ B_t - B_{t-1} = CA_t + KG_t + E_t \]

where the variables are as explained before. Denoting each variable deflated by nominal GDP by lower-case letters, the accumulation equation can be rearranged as follows:

\[ b_t = \frac{1}{1 + \gamma_t} b_{t-1} + c_a_t + k_g_t + e_t. \]

where \( \gamma_t \) is the nominal GDP growth rate and, as before, the difference between net capital gains on portfolio and FDI stock is established (see below). Assuming that the forecasted errors and omissions as well as capital account transfers are equal to zero, such that \( e_t = 0 \), the method requires several inputs:

1. Projected nominal GDP growth rate, for example, as provided by the IMF’s World Economic Outlook (WEO).

\[ 12 \] A simple example taken from Tille (2008) illustrates the importance of considering valuation effects explicitly. Consider a country with the balanced trade and constant GDP. Suppose the country holds equity assets amounting to 100 percent of GDP has bond liabilities of the equal relative amount, and let both types of assets earn the same annual return of 5 percent of GDP. The current account deficit of 5 percent of GDP then does not deteriorate the NFA position of the country. The key idea here is the difference in recording and valuation of returns on different types of assets. While the returns on bonds take the form of the interest payments that enter the current account, the gains on equity do not enter the current account, but offset the interest outflows in NFA. Similarly, a country that is growing may see its external position deteriorate more than shown by the accumulated current account deficits, because of equity price inflation in the country relative to its debtors.

\[ 13 \] If the non-zero capital account transfers and errors and omissions are expected, then their projection can be included directly into the specification.

2. Projection of the explanatory variables in the current account regression, where in addition to projections of the country’s variables, projections for other countries used in defining relative variables are required (for example, WEO). For cases where projections are not available, one can assume different scenarios and evaluate the sensitivity of the results.

3. Initial stock of NFA, which includes FDI, portfolio investment, other investment, and foreign reserves.

4. Capital gains per component. No capital gains on reserves, other investment assets and liabilities, and portfolio debt assets and liabilities are assumed, as their returns enter the current account directly. Therefore, capital gains, \( k_{g,t} \), will be related to FDI and portfolio equity investment valuation effects, such that:

\[
 k_{g,t} = q_{t}^{FDI,L} \frac{F_{t}^{FDI,L}}{Y_{t}} + q_{t}^{Equity,L} \frac{P_{t}^{Equity,L}}{Y_{t}},
\]

where \( q_{t}^{FDI,L} \) and \( q_{t}^{Equity,L} \) are the growth rate of FDI and equity prices in home country (hence the subscript \( L \) denoting that this is the liability side), respectively, and \( F_{t}^{FDI,L} \) and \( P_{t}^{Equity,L} \) are the stock of inward FDI and portfolio equity investment in the previous period, respectively. Following Tille (2008), \( q_{t}^{FDI,L} \) is calculated as:

\[
 q_{t}^{FDI,L} = i_{t} - (i_{t}^{L} - i_{t}^{Equity,L}) \frac{\text{reinv}}{\text{dist}},
\]

where \( i_{t} \) is the nominal interest rate on government debt, and \( \frac{\text{reinv}}{\text{dist}} \) is the ratio of reinvested to distributed earnings on FDI, which could be set equal to 1 as in Tille (2008). An analogous specification is applied to capital gains on the asset side using the stock of outward FDI and portfolio equity investment. Therefore, the analyst needs to specify six parameters: (i) expected growth rates of equity prices; (ii) expected nominal interest rates; (iii) the ratio of reinvested to distributed earnings on FDI; in the country and abroad.

5. Projection of the flow part of each component (FDI, portfolio investment, other investment inflows and outflows, and change in the official reserves) in a given year. Given the model’s projection of the current account in a given year, the WEO projection of the relative structure of the components of the financial account for that year can be used to allocate the projected flows between the components of assets and liabilities.

Finally, while both methodologies generate a set of possible outcomes for the external position of the country, it is worth noting potential limitations of the approach, which may be addressed on individual basis. First, within the portfolio assets and liabilities, the ratio between the stock of equity and debt holdings is assumed to be constant over the forecasting period. This is clearly an oversimplifying assumption, but it is imposed because WEO data does not treat the two types of holdings separately in the financial accounts.

\[15\] See the Appendix B for an explanation on how to derive this equation.
such data are available at the country level, separate growth rates can be applied. Second, the influence of the exchange rate movements on the stock of assets and liabilities is not considered (outside its influence on the current account). Specifying different returns across various assets and currencies would be more appealing. However, such an exercise requires a detailed estimate of the currency composition of assets and liabilities, together with several assumptions on relative returns between the countries. Nevertheless, even though it is reasonable to expect a positive impact of the exchange rate depreciation on NFA in advanced countries (Gourinchas and Rey 2007), the effect is ambiguous for emerging markets (depending on the share of liabilities denominated in foreign currency), thus giving some support for the aggregate approach presently employed. Third, and common to other available methodologies, the projections implicitly impose no feedback effects from the previous current account dynamics to other macro variables in the future. Incorporating feedback effects requires estimation of separate reaction function(s) for these variables and separate conditional projections.

2.3 Cyclical and Structural Factors

The third part of the toolkit separately analyzes cyclical and structural dynamics of the current account. Although the analysis of the current account determinants identifies key drivers of the current account it does not distinguish whether their impact is on cyclical or on long-term movements in the current account. To the extent that the determinants can be grouped into cyclical and structural drivers the results provide only an approximation of the cyclical and structural dynamics of the current account.

Therefore, identification of the cyclical and structural factors shaping the evolution of the current account balance requires separate analysis. If economic fluctuations are reflecting cyclical factors, then the current account will likely rebalance to levels prior to the medium-term fluctuation and no policy intervention will be required. If cyclical movements are in fact the result of policy-induced distortions (Blanchard and Milesi-Ferretti 2012; Servén and Nguyen 2013), then market participants’ perception of the observed pattern’s sustainability may change, leading to increasing short-run risk of currency and/or sovereign crises. Analogously, when structural factors are implicated in current account fluctuations, movements will likely persist in the medium term. In this case, policy interventions could be justified to counteract the effect of structural distortions. Therefore, it is important to understand the degree to which cyclical and structural factors affect external balances, both to anticipate likely medium-term fluctuations and to assess the need for and impact of policy actions.

Analysis of cyclical and structural factors should be viewed as complementary to the results of the previous sections. Although quantitative differences in the results can be expected given the differences in econometric methodologies, qualitatively the results should point toward the common roots of the imbalances. Evidence from the empirical literature suggests that both cyclical and structural factors affect the external balance. Most research reviewed in
the previous two sections\textsuperscript{16} concludes that the current account responds to structural factors such as macro fundamentals, demographics, uncertainty, financial and trade development, liberalization, and structural policies. However, other research\textsuperscript{17} points to cyclical factors to explain short-term current account movement which are often counter-cyclical in nature (Mendoza 1991; Freund 2005). Cheung et al. (2010) and Chinn et al. (2011) also refer to cyclical factors to explain some of the narrowing in current account balances since the financial crisis.

**Dependent and explanatory variables**

The analysis is based on the assumption that the variable $Y$ can be decomposed into structural and cyclical components:

$$Y = Y^s + Y^c,$$

One choice for the variable $Y$ is the current account balance as a percentage of GDP. Alternatively, decompositions of the savings and investments as percentages of GDP can be obtained; then, the structural and cyclical component of the current account are calculated as the differences of the corresponding components:

$$CA^s = S^s - I^s; CA^c = S^c - I^c.$$  

Further decomposition can be performed by considering separately cyclical and structural components of private and public savings and investments or some combination of them.

The cyclical and structural components are linked with the set of explanatory variables via reduced-form specification, analogous to the analysis of the current account determinants. Only the determinants of the private savings and investment are analyzed below. To obtain the structural current account balance, the cyclically adjusted government balance can be added to the estimate of the structural part of private savings and investments. The following variables are considered, where the distinction between their structural and cyclical effects on the dependent variables is made. In addition, we outline whether the variable impacts all dependent variables (private savings, investment, current account) or only one of them.

**Structural determinants:**

\textbf{i) Macro fundamentals:}

1. **Productivity growth:** Productivity growth could signal increasing permanent income to agents, leading to a declining savings rates and a growing negative current account balance. But if the change appears temporary to agents, savings will increase (Obstfeld and Rogoff 1996). The magnitude of the effect also depends on the size of the labor force since the productivity increases are likely to benefit the workers.

\textsuperscript{16} For a recent overview, see Kerdrain et al. (2011) and Chinn et al. (2011).

\textsuperscript{17} See, for example, Debelle and Faruqee (1996), Kandil and Greene (2002), and, more recently, Laibson and Mollerstrom (2010) and Jordà et al. (2011).
who have a higher propensity to save relative to retirees. In case of investments, both permanent and transitory productivity changes affect the firms’ profit expectations and consequently the investment demand.

**Proxies**: output per worker measured at international prices; real GDP per capita growth rate; total factor productivity (Solow residual). Variables cyclically adjusted if required.

2. **Long-run real interest rate/user cost of capital**: The association between the real interest rates and savings is a priori ambiguous, since the income and substitution effects may work in opposite directions. An increase in the real rate of interest tends to encourage individuals to postpone consumption and increase savings in the present period in order to achieve higher consumption levels later (substitution effect). On the other hand, direction of the income effect depends on whether the individual is a net lender or borrower. A net lender receives more in investment income than he has to pay to service his debt. In that case, higher interest rates increase net investment income, thus encouraging present consumption and lessening the need to save in order to finance future consumption. Additional indirect effects on savings may work in the opposite direction. A higher real interest rate results in a fall in the real value of financial assets since, for example, the income flows of equities typically do not rise proportionately with the real interest rate. Moreover, a higher real interest rate also results in lower value of current and future after-tax labor income and public sector transfers. These two indirect effects reduce present consumption and increase saving in order to maintain constant the real value of the stock of wealth.

For investments, following the neoclassical investment model, a higher user cost of capital directly reduces investments. While the firm-level data studies provide the evidence in favor of the cost effects (see Gilchrist, Natalucci, and Zakrajsek 2007 and references therein), empirical evidence for the cost effect at the macroeconomic level is relatively weak. The latter finding may be related to the presence of endogeneity between monetary policy actions and the economy. This is because long-term interest rates (through monetary policy actions) are often lowered when investment spending is weak, leading to a positive relationship between investment expenditures and the user cost of capital.

**Proxies**: long-term real interest rate on government bonds or deposits (CPI deflated); long-term real interest rate*relative price of capital (investment deflator over GDP deflator); long-term real interest rate*relative price of capital (investment deflator over GDP deflator)*capital stock scrapping rate. All variables instrumented if required.

3. **Fiscal balance**: As discussed earlier, reducing taxes will increase consumption and reduce the savings unless the costs of future government debt repayment are internalized by the current generation. (Obstfeld and Rogoff 1996). Rising government expenditures will increase demand, that will be in part satisfied by additional imports (Ahmed 1996). In addition, government purchases of nontradable goods can increase
prices, leading to real exchange rate appreciation and more current account negative imbalance (Abbas et al. 2010). The relationship between the government budget balance and investments is less clear. The view that private and public investments are complementary suggests that an increase in public investment could stimulate private investment (see Schmidt-Hebbel et al., 1996). Conversely, an increase in public borrowing could crowd out private investments and signal a lack of fiscal policy sustainability that deters private investment. The size of the effects may also depend on the composition of fiscal revenues and expenditures. Alesina et al. (2002) show that increase in labor taxes (government saving) has negative impact on profits and investment due to an increase in labor costs. Conversely, higher government spending on wages may negatively affect the firm's profits and investments via wage spillovers between the public and private sectors.

**Proxy:**
- government budget balance/GDP, government expenditures/GDP, government investment/GDP. Additional variables in the investments equation: direct taxes on business/nominal GDP, labor taxes/GDP. All variables cyclically adjusted and instrumented if required.

4. **Foreign aid:** Foreign resource inflows in general are more relevant for low-income and financially distressed middle-income countries. There is no consensus in the literature on whether foreign saving crowds national saving in or out. In one direction, foreign aid supplements domestic savings, therefore increasing national savings and supporting the higher level of investments (Chenery and Strout 1966; Dalgaard et al. 2004; Irandoust and Ericsson 2005). On the other hand, (Weisskoff 1972; Loayza et al. 2000) because the smoothing is more difficult in low-income countries, the consumption is the variable that adjusts more to the shocks and the foreign aid may be fully consumed. In this context, additional foreign savings is likely to lead to higher consumption and lower national savings.

**Proxy:**
- foreign aid inflows/GDP (instrumented).

5. **Labor dynamics:** Labor costs generally represent a significant component of the production costs. Increases in wages cause a fall in the firm's cash flow and may lead to a decline in investment. Downward wage rigidity implies that the effect is stronger in the long run (Alesina et al. 2002; Landon and Smith 2009). An increase in the labor force growth on the other hand implies that more investment is required to equip the labor force with capital. However, the impact on investment is less significant when the production process is already labor intensive or if capital becomes appropriated (Caballero and Hammour 1998).

**Proxy:**
- real wage rate: average hourly wage in manufacturing; compensation per employee in the business sector; growth rate of working force (change in population aged 15–64).

6. **Foreign direct investment (lagged):** FDI effects on private domestic investment are ambiguous (Mody and Murshid 2005). On the outflow side, if residual domestic
investment opportunities offer low returns, domestic savings may be channeled out of the country in search of higher returns or lower risk. FDI inflows may also crowd out domestic investment if foreign firms compete with local firms for the use of domestic scarce resources such as skilled labor or financial resources (Jansen and Schulze 1996). Foreign investment may also “crowd in” domestic investment where it generates spillovers to the domestic economy.

**Proxies:** lagged FDI/GDP inflows; lagged stock of FDI.

The channels of influence of the following variables were discussed in Section 2.1:

7. **Terms of trade**
8. **Real income per capita**
9. **Oil consumption and degree of maturity of oil production**
10. **Net foreign assets**
11. **Remittances**

The last two variables are expected to affect only the current account balance as the dependent variable. In the analysis of the current account real income, fiscal balance and the productivity growth are defined relative to the basket of countries as in Section 2.1.

**ii) Uncertainty:**

Higher macroeconomic uncertainty naturally leads to a rise in savings since risk-averse households set aside resources as a precaution against possible adverse changes in income (Skinner 1988; Zeldes 1989). The buffer stock theory of consumption (Carroll 1992) also suggests that agents facing incomplete markets and borrowing constraints respond to changes in labor market conditions by altering their stock of precautionary wealth. As for investments, the asymmetric nature of adjustment costs (Abel and Eberly 1994) makes downside uncertainty more important than upside uncertainty: since disinvestment is costlier than investment, favorable shocks have a smaller effect on profitability than adverse shocks. In order to reduce the risk of being locked into unprofitable irreversible projects, firms facing macroeconomic uncertainty may become reluctant to invest (Dixit and Pindyck 1994; Servén 1998). Therefore, macroeconomic uncertainty is expected to increase the savings and reduces the investments.18

**Proxies:** expected inflation, inflation volatility, exchange rate volatility, unemployment volatility, terms of trade volatility, stock market volatility, global volatility (VXO)—individually or a first-principal component of the set of estimated individual volatilities.

18 The level of uncertainty (or some aspects, related for example to prices) may also affect the cyclical movements in investment.
iii) Demographics:

1. **The age-income profile**: Higher dependency and youth ratios will likely reduce national saving and worsen the current account imbalance. Conversely, a larger share of economically active population will have a positive effect.

   **Proxies**: youth ratio: \((\text{population under 15 years old} / \text{population between 15 and 65 years old})\); old-age ratio: \((\text{population over 65 years old} / \text{population between 15 and 65 years old})\); dependency ratio: \(((\text{population under 15 years old} + \text{population over 65 years old}) / \text{population between 15 and 65 years old})\); projected change in the dependency ratio; population growth rate; aging speed; expected length of retirement age (life expectancy—average retirement age).

2. **Urbanization**: Rural incomes tend to be relatively more uncertain than urban incomes. In the absence of financial markets through which the risks can be diversified, rural residents would save a greater fraction of their income (Edwards 1995; Loayza et al. 2000). Therefore, urbanization is typically expected to have a negative impact on savings.

   **Proxies**: urban population/total population.

iv) Financial and trade development and liberalization

The channels of influence of the following variables were discussed in Section 2.1:

1. **Financial deepening**
2. **Capital controls**
3. **Openness**

v) Structural policies

Structural policies may influence savings, investment, and the current account balance in two ways: either directly or through their impact on the macroeconomic conditions (defined in the first group). Below we review the direct impact of the structural policies. Various interaction variables\(^{19}\) can be constructed to analyze the indirect impact of policies on the dependent variables\(^{20}\).

1. **Social security programs**: Higher social spending on health tends to be associated with lower saving rates since the improvements in the coverage and/or quality of social welfare schemes reduce the need for precautionary savings. Recent empirical

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\(^{19}\) For example, finding a positive coefficient for interaction variable (the ratio of minimum wage to average wage)*previous GDP growth in the investments regression implies that in the fast growing economy increase in minimum wages may in fact lead to increase in investment (rather than to decrease as expected).

\(^{20}\) Analysis of the effects of tax policies on the savings is not included, given the difficulties with obtaining a consistent data source. Moreover, empirical evidence on the effectiveness of tax incentives granted to private savers is ambiguous, in line with the offsetting substitution, income, and human-capital effects. The effect of tax changes on investment is related to discussion of fiscal balances, where the proxies are defined.
studies (for example, Maynard and Qiu 2009; Kerdrain et al. 2011) suggest that the effect may be stronger for low initial levels of social spending. Proxies: total public social spending over GDP; public health spending over GDP.

2. **Labor market policies:** The labor market policies may directly affect both savings and investments and the effect can go in both directions. Like the increase in uncertainty, lower employment protection may lead to higher savings for precautionary reasons. However, the effect can be the opposite if lower employment protection implies a shorter expected period of unemployment. A similar intuition holds for other measures of labor market flexibility, such as a lower minimum wage or unemployment benefits. In case of investment, by increasing the costs, higher employment protection may have a direct negative effect. However, if domestic firms respond to the changes in labor market conditions by substituting capital for labor, the effect may be positive (Kerdrain et al. 2011).

Proxies: employment protection legislation (EPL); gross unemployment replacement rate; ratio of minimum wage to average wage.

3. **Business and product market environment:** Business and product market reform can influence investments in several conflicting ways (Alesina et al. 2005). In one direction, reductions in red tape and other forms of regulatory burdens can lower the costs of expanding the capital stock (notably for incumbent firms). Moreover, reductions in entry barriers may increase output and capital accumulation by reducing the markup of prices over marginal costs. On the other hand, product market deregulation may alter the sectoral specialization of the economy toward sectors that are less capital intensive or rely less on investment goods. In the presence of information asymmetries, reductions in mark-ups may depress investment if the internal and external sources of financing are not perfectly substitutable. Finally, if the reform leads to privatization of public companies that were relatively large investors, investment may fall directly.

Proxies: days required to start a business; cost of starting a business as percent of GNI; other doing business indicators; first principal component of law and order, corruption, and bureaucracy quality.

**Cyclical determinants**

i) **Macro fundamentals:**

1. **Real exchange rate:** The movements in the real exchange rate may have opposite effects on investments in the short run (Campa and Goldberg 2001; Landon and Smith 2009). A real currency appreciation reduces the domestic currency value of domestic exports and consequently may lead to a decrease in production for export. This, in turn, may lead to a decrease in domestic savings and, therefore, a decrease in investment. Conversely, a real depreciation may lead to an increase in domestic savings and investment.

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2¹ An additional policy to consider is pension reform. However, empirical modeling of the channel of influence is difficult. The impact of pension reform on savings is not directly observable. It depends on both the way the transition deficit is financed and on the reform’s efficiency gains.
Current Account Diagnostic

turn, may lead to a fall in the demand for all inputs, including capital, and a fall in investments. Conversely, a real currency appreciation decreases the domestic currency price of imported capital and intermediate inputs, reducing firms’ costs. Moreover, if a large percentage of a firm’s liabilities is in foreign currency, appreciation improves balance sheets, thus relaxing borrowing constraints and increasing investments. The overall impact on investment depends on the degree of substitutability (or complementarity) between inputs and capital and the degree of foreign currency liabilities. Moreover, as a measure of overall export competitiveness, the real effective exchange rate (REER) may have a direct impact on the trade balance.

**Proxies.** real effective exchange rate; real effective exchange rate*liability dollarization.

2. **Oil and food prices:** Cyclical dynamics in oil prices have a direct negative effect on the investments and the current account. Analogously, cyclical dynamics in food prices have a direct negative effect on the current account.

**Proxies.** crude oil prices; food price indices.

3. **Asset prices:** Evidence from the past decade shows that asset price dynamics may have a significant effect on savings and investment patterns in the short run, and consequently on the current account balance (Fratzscher et al. 2010; Laibson and Mollerstrom 2010; Jordà et al. 2011). A rise in equity prices or housing prices (particularly if expected to be permanent) increases the expected income of households and thus consumption. The rise in asset prices also increases the borrowing capacity of debtors, allowing them to spend and invest more.

**Proxies.** residential property prices; real housing price index; stock market turnover/GDP; change in stock market capitalization; change in public bond market capitalization; change in private bond market capitalization; change in stock market index.

4. **Credit expansions:** Like asset price inflation, credit expansions affect savings by increasing access to borrowing, thereby boosting consumption. For investment, bank credit is a key source of external finance, notably for small firms for which the problem of asymmetric information is important and/or when directed credit programs exist for selected industrial sectors. The effect of the quantity of credit on investment thus goes beyond the conventional interest rates channel of the monetary transmission mechanism (see the literature starting from Stiglitz and Weiss 1981; Bernanke et al. 1999; and later extensions) and differs over the business cycle (Bordo and Haubrich 2010; Jordà et al. 2011).

**Proxies.** growth in credit to private sector/GDP ratio; non-financial companies’ debt/equity; non-financial companies’ debt/GDP. All variables instrumented if required.

5. **Cyclical demand shocks:** Changes in aggregate demand play an important role in driving private investment in the short run through the standard flexible accelerator

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22 Due to extensive credit rationing in financial markets of the developing countries the effect on investment may also be structural (measured in that case by credit to GDP ratio).
specification. Moreover, even though investment series are procyclical, they tend to follow output dynamics with a lag (Stock and Watson 1999). Hence, output cycles may allow a significant improvement in forecasts (identification) of the cyclical movements in investment series.

**Proxies**: change in capacity utilization; output gap.

The channels of influence of the following variables were discussed in Section 2.1:

6. **Terms of trade shocks**

   ii) **Policies**:
   1. **Cyclical component of the fiscal balance and short-term interest rates.**
      **Proxies**: short-term interest rate; bank lending rate; cyclical government budget balance/GDP (direct estimate or the fitted value from the regression of the government budget balance on the output gap). All variables instrumented if required.

**Estimations**

Once the set of potential determinants have been identified, the next step is to obtain the estimates of: (i) the structural and cyclical part of the current account, and (ii) the partial correlations between the components and the determinants. Note again that due to the reduced-form type of specification, causal interpretation of the parameter estimates relies on the assumption of exogeneity of the underlying determinants. The analyst should consider whether the assumption is satisfied for the particular variable (instrumented if required) in a particular country under the analysis, and correspondingly attribute the findings to causal relationships.

Estimation of the parameters can be performed using three different methodologies. The choice of the methodologies depends primarily on the data availability and data characteristics. We briefly review all three methodologies, highlighting their advantages and limitations. Let \( X^s, X^c, \) and \( Z \) denote variables that affect only the structural component of the variable \( Y \), only the cyclical component, or both, respectively.

Provided that the data are available, **single-country estimation** is the preferred choice. The **first** methodology applies a two-step procedure: (i) in the first step, estimates of the cyclical and structural component are obtained using a Kalman filter; (ii) in the second step estimates, from the first step are used as dependent variables in separate regressions on potential determinants.\(^{23}\)

In particular, in the first step the following linear state space is estimated via a Kalman filter (see Appendix C for details):

\(^{23}\) Similar methodology is applied in estimation and analysis of the natural rate of unemployment (Laubach 2001; Gianella et al. 2008), natural rate of interest (Laubach and Williams 2003; Messonier and Renne 2007), and fundamental movements in the real exchange rates (Berger and Kampa 2010; Chen and MacDonald 2010).
\[ Y_t = Y_t^S + Y_t^C \]
\[ Y_t^S = \rho Y_{t-1}^S + \varepsilon_t^S \]
\[ Y_t^C = \theta Y_{t-1}^C + \theta \varepsilon_t^C + \varepsilon_t^S \]

where \( \varepsilon_t^S, \varepsilon_t^C \) are structural and cyclical shocks that are assumed to be zero mean, normally distributed, and serially and cross uncorrelated. The benchmark specification above can be modified along several dimensions given the analyst’s preference: (i) The structural part can be assumed to be nonstationary by setting the parameter \( \rho \) equal to one; in the present specification it is left to data to estimate the level of persistence. (ii) Various processes other than AR(2) can be assumed for the cyclical component. The preferred model in that case can be selected by comparing different information criteria. (iii) The drift (intercept) or additional unobserved persistent component can be included in the structural equation if the data exhibits a strong trend or behaves similar to the I(2) process. (iv) The intercept can be included in the cyclical equation if there is a priori economic intuition for average nonzero cyclical movements in the variable of interest. (v) An additional purely temporary random component, \( \varepsilon_t \), can be included in the specification to capture additional noise in the series.

In the second step, the obtained estimates \( \hat{Y}_t^S, \hat{Y}_t^C \) are regressed on the determinants, \( \{X_t^S, Z_t\}, \{X_t^C, Z_t\} \) respectively. Regression estimation can be performed using the same methodology from the current account analysis, that is, using model averaging or panel-wide estimation, depending on the available sample size. Using the estimates of the two components as dependent variables in the second-step regressions induces heteroscedasticity in the error term (if the sampling uncertainty in the dependent variable is not constant across observations). Robust (heteroscedastic consistent) standard-error estimates should be used in this case. Moreover, if the structural component is found to be nonstationary (that is, \( \rho \) is equal to one), then it is necessary to test for the existence of cointegrating relationship between the structural component and its determinants. If the cointegration hypothesis is rejected, the obtained parameter estimates may indicate spurious relationships.

The outlined methodology applies purely statistical estimation of the cyclical and structural component while allowing for a large number of potential drivers, which are estimated separately. Moreover, by using the country-level data only it allows for different dynamics across countries. A potential limitation of the approach is the fact that the two components are estimated using purely statistical method and the resulting estimates may not capture the true structural and cyclical dynamics in the variable.

The second methodology is tailored toward solving the identification problem. By using more information embedded in the structural and cyclical determinants within the state space, the estimates \( \hat{Y}_t^S, \hat{Y}_t^C \) should be closer to the underlying economic movements in the variable. Hence, the methodology is based on incorporating the observed determinants into the state-space model and estimating the structural and cyclical components jointly with the parameters of the reduced-form regression.
More concretely, start from two reduced-form equations (estimated in the second step of the previous methodology):

\[ Y_t^C = \theta Y_{t-1}^C + \beta X_t^C + \gamma W_t + \epsilon_t^C \]
\[ Y_t^S = \rho Y_{t-1}^S + \delta X_t^S + \vartheta W_t + \epsilon_t^S \]

Since the cyclical component is just the difference between the observed variable and its structural component, the reduced form above can be rearranged as a linear state-space model in one observed and one state equation:

\[ Y_t = Y_t^S + \theta(Y_{t-1}^S - Y_{t-1}^C) + \beta X_t^C + \gamma W_t + \epsilon_t^C \]
\[ Y_t^S = \rho Y_{t-1}^S + \delta X_t^S + \vartheta W_t + \epsilon_t^S \]

The model is triangular by construction; hence all the parameters are identified. The estimate of the structural component \( Y_t^C \) can be obtained via a Kalman filter, whereas the estimate of the cyclical component is simply \( Y_t^S = Y_t - \hat{Y}_t^C \). The estimates of the parameters are obtained via maximum likelihood (see Appendix C).

The benchmark specification can be modified along several dimensions. Analogous to the previous methodology, the changes can be made with respect to the persistence of structural component, memory in the cyclical component and the presence of drifts in both components and/or additional temporary component. If the structural component is found to be non-stationary (i.e., \( \rho \) is equal to one) it is again necessary to test for the existence of cointegrating relationship between the structural component and its determinants. A potential limitation of the methodology is the number of parameters that needs to be estimated in the state space, which in small samples may lead to inflated variance of the estimates. State space estimation of the parameters also puts a limit on the number of determinants that can be included simultaneously. In samples with 30 data points, only up to 5 or 6 determinants can be included, and the preferred specification is selected by comparing different information criteria (AIC, BIC).

The third methodology uses panel data estimators. Panel data estimators can be applied in two directions. First, if the sample size is large enough to obtain the structural and cyclical estimates for a set of countries using the first methodology reviewed above, the second-step reduced-form regressions can be estimated using pooled panel estimators or SURE (for the choice between the two see the discussion in Section 2.1). Second, if the sample size is small, nonoverlapping five-year averages of the variables are used to approximate the structural movements. Pooled panel estimators are used for estimation of the reduced-form specification based on the calculated averages. The cyclical dynamics are obtained as the deviations from the averages and the reduced-form specification is analogously estimated. A potential limitation of this approach represents the possibility that simple nonoverlapping five-year averages may not capture the underlying structural dynamics, in line with recent evidence of financial cycles of unusually large size (Gourinchas and Obstfeld 2012; Serven and Nguyen 2013). Moreover, following the discussion in Section 2.1, the significance of potential
Determinants may differ across countries, leading to biased parameter estimates from pooled estimation.

Robustness checks

In order to explore the robustness of the results, different types of exercises can be performed. First, various modeling options in the state space framework discussed above can be used to investigate the robustness of the obtained results. Second, if the panel data estimation is used, one can split the sample into developing and developed countries, and oil importers and oil exporters.

Presentation of the results

Two sets of the results can be presented. First, the focus is on the estimates of the structural and cyclical components. Plots of the estimates (and their confidence intervals), together with the original series (current account, savings, and investment, if the latter two are included), provide a useful description of the evolution of the original series. In addition, volatility of the estimated series, the amplitude of the cycle in crises and non-crisis periods, and the correlation between the estimated current account cycle and the cycle of explanatory variables can be analyzed. Second, estimated partial correlation coefficients are presented. Analogously to Section 2.1, the estimates are shown either directly or standardized to measure in how many standard deviations the dependent variable will move if an explanatory variable changes by one standard deviation.

2.4 Financial Account

The sustainability assessment conducted in Section 2.3 includes explicitly the structure of the financial account and the associated capital gains. The analysis, however, takes the capital flows as exogenous, based on the past and projected dynamics. The volume, dynamics, and the relative structure of the flows may have important effects on: (i) the riskiness of the observed imbalances, (ii) the required policy responses, and (iii) the future current account dynamics. A large literature (see, for example, Frankel and Rose 1996; Rodrik and Velasco 1999; and Reinhart and Reinhart 2009 for an overview of episodes over the last five decades) documents that capital flow surges tend to be associated with a higher likelihood of economic crises (such as debt defaults, or banking, inflation, and currency crashes), notably when the portfolio inflows constitute the largest share of the inflow. Required policy responses also differ, depending on the permanence and the volume of the flows. If the flows have a large procyclical component (Broner et al. 2013), then countercyclical fiscal and unorthodox monetary

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24 The estimates of the two components are obtained directly from the Kalman filter procedure in the first two methodologies, while if the panel methodology is employed these are the fitted values from two regressions.
policy measures (such as capital controls) may be required. Moreover, and when the flows are small or decreasing, structural measures aimed at increasing the competitiveness of the economy and improving the business conditions may be warranted. The future dynamics of the current account balances also depend on the composition of the past flows to the extent that the inflows may later generate large outflows in the current account. Large debt inflows lead directly to income outflows through debt services. FDI inflows may deteriorate the current account in the short term via additional capital imports and in the long term through profit repatriations. This section of the toolkit therefore studies the dynamics of the components of the financial account, their persistence, and the variables that may explain these dynamics.

The first step of the analysis involves reviewing the evolution of the volume of the gross capital flows from Section 1 (Tables 3 and 6) where the key outcomes are summarized. The analysis also includes the components: foreign direct investment (FDI), foreign portfolio investment (FPI, equity and bond), and cross-border debt flows (bank loans). FDI generally leads to significant influence in or outright control of a firm, and thus is a long-term collaboration. In contrast, portfolio investors delegate decisions to the managers, and can liquidate their assets at a lower cost. Several authors document that the volatility of FDI flows is, in general, lower than that of portfolio investment (Goldstein and Razin, 2005). Wei (2000) looks at the differences in the volatility of various types of capital flows, and he shows that for a subset of OECD countries, the volatility of the FDI-to-GDP ratio is substantially smaller than that of the PI-to-GDP ratio and the bank borrowing-to-GDP ratio. Albuquerque (2002) shows that in a sample of 111 countries, 89 percent of them have lower coefficient of variation of FDI than non-FDI flows, during the 1975–1997 period. The median (average) coefficient of variation is 0.77 (1.11) for FDI and 1.88 (8.81) for non-FDI flows.

A central part of the analysis is therefore devoted to studying the degree of persistence of individual components of the flows and the associated determinants. The examination is important for two reasons. First, identification of the importance of the cyclical dynamics in the overall dynamics and the role that individual factors (determinants) play in the observed movements allows assessment of the likely evolution of the inflows. Second, determination of the appropriate policy instruments to deal with the inflows depends on the particularities of each case. The potential drivers of the individual components and the empirical methodology are reviewed next.

**Dependent and explanatory variables**

Dependent variables in all specifications below are the components of capital flows (provided that the relevant disaggregated data are available): (1) foreign direct investment (FDI), and (2) foreign portfolio investment (FPI, equity and debt). Determinants of cross-border credit flows are not analyzed at the current stage of the project due to the lack of consistent data for the majority of emerging and developing countries. In general, a large number of FDI and FPI drivers also tend to be important for cross-border credit flows. However, data for additional variables related to banks is less available.
Within each component, the analyst can use gross and net inflows. Gross inflow is the net of foreign purchases of domestic assets and foreign sales of domestic assets in a given period. Gross outflows are the net of domestic residents’ purchases of foreign assets and domestic residents’ sales of foreign assets. The net flow is the difference between gross inflow (related to behavior of foreign agents) and gross outflow (related to behavior of domestic agents). The literature in the past mostly used a measure of net flows due to a relatively close co-movement between the net and the gross inflows (since capital flows of domestic investors in developing countries were small). However, given a relatively large increase in gross flows in emerging markets over the last decade (Obstfeld 2012; Forbes and Warnock 2012), the differentiation between gross inflows and gross outflows has become more important. Dynamics of the gross flows may have different implications for the policy to the extent that the behavior of foreign and domestic agents is driven by different factors, and/or they differ in their response to the policy measures. Moreover, the importance of capital flows in explaining and predicting credit booms may differ depending on the type of flow under analysis. While the earlier literature (see, for example, Reinhart and Reinhart 2009; Caballero 2012; and references therein) analyzed the dynamics of the net flows in credit episodes, recent literature (Borio and Disyatat 2011; Calderon and Kubota 2012; Shin 2012) emphasizes the role of gross flows in fueling credit expansions, showing that the gross capital flows may be an important determinant even when the associated net flows are small, as in the case of United States and European countries in the first decade of the 2000s. Lane and McQuade (2012), on the other hand, find that it is the net debt flows rather than the gross flows that are the determinant of the domestic credit growth in their sample of 30 European countries. This finding may be related to the nature of international trade in debt instruments, wherein many types of inflows and outflows essentially cancel each other out. Overall, depending on the observed differences in evolution of the gross and net flows for a particular country and the data availability, the analysts can choose their preferred variable bearing in mind the aforementioned differences.

Theoretical and empirical research identifies two groups of drivers of capital flows: local or “pull” and global or “push” factors. The pull view suggests that an improved domestic policy environment attracts capital. The push view emphasizes the role of opportunity costs. Push factors affect global liquidity; they include interest rates and economic performance in advanced economies, risk aversion, and commodity prices. Pull factors include local macroeconomic conditions, economic policies, institutions, and the degree of market imperfections.

Overall, the literature seems to support the idea that global factors are more important than local conditions in determining the timing and magnitude of capital flows from industrial to developing countries. The geographic distribution of the flows across developing countries however is mainly explained by local factors. Therefore, in order to examine the likely

25 Early theoretical models with two types of factors include, among others, Dooley et al.(1996) and Albuquerque, et al. (2005).
evolution of capital inflows, the analyst has to examine the performance of both external and domestic factors. We next review the determinants of the individual flows.

**Component 1: Foreign direct investment**

The importance of external factors for FDI flows stems from the characteristics of multinational firms. Empirical evidence (see, for example, Caves (1996) for an overview) documents that investment and financial decisions in multinational companies tend to be made at the parent-company level. Economic developments in the parent markets therefore directly influence the opportunity cost of capital for investment.

**Growth in advanced economies** affects FDI through two different channels (Dabla-Noris et al. 2010). In one direction, lower profitability at the parent level influences companies to lower their investment during recession, both in domestic and destination countries (income effect). On the other hand, if firms allocate their resources according to relative rates of return, then the higher differential (substitution effect) influences FDI decisions. Therefore, an economic downturn in advanced economies may lead to more FDI flows toward developing economies if the substitution effect is stronger (Levy Yeyati et al. 2008). In addition to these cyclical effects, lower interest rates in developed countries reduce borrowing costs for FDI projects. Thus, as many FDI projects are financed in developed-country financial markets, countercyclical monetary policy in advanced economies and lower interest rates lead to more FDI inflows in developing economies (Alburquerque et al. 2005; Levy Yeyati et al. 2008). A study by the World Bank (2010) suggests that low financing costs significantly contributed to high FDI flows before the 2008 economic crisis.

The recent global downturn highlighted the roles of **borrowing constraints and risk aversion** as global FDI factors. Several recent papers analyze the impact of changes in global liquidity and global risk on shifts in international capital flows (see Forbes and Warnock 2012 for more details). Although Tong and Wei (2011) show that during the recent crisis FDI flows were less affected by the liquidity shocks that other types of capital flows, Arbatli (2011) found some evidence that increased global uncertainty led to lower FDI flows.

The factors discussed above are expected to have cyclical influences on FDI flows (the only possible exception is productivity growth in advanced countries). However, changes in the **financial structure** of developed economies and the trend of financial globalization have a long-term (structural) influence on promoting FDI flows. Finally, regional patterns can be included in the analysis by defining a measure of **regional attractiveness or contagion** (Ghosh et al. 2012).

The following set of external determinants of FDI is proposed:

26 Lagged values of the variables can also be included in the analysis to capture the long-term character of FDI decisions.
Growth and profitability:
1. Growth rate of world GDP per capita
2. Weighted average of stock returns in the United States, core euro area, and Japan (GDP-weighted or simple average)

Interest rates:
1. Weighted average of the three-month money market rate in the United States, core euro area, and Japan
2. Weighted average of interest rate on long-term government bonds in the United States, core euro area, and Japan.
3. Slope of the U.S. yield curve

Risk aversion:
1. Credit spread: the difference between Moody’s Baa and Aaa corporate bond yields in the United States
2. High yield spread in the United States
3. VIX/VXO
4. Residual from regression of VIX on TED (eliminating liquidity risk from the VIX estimate)

Borrowing constraints and liquidity:
1. Growth in the global money supply (the sum of M2 in the United States, core euro area and Japan, all converted into US dollars)
2. Private credit growth in the United States, core euro area and Japan
3. TED spread (three month LIBOR—three month Treasury bill rate) in the United States

Financial structure developments:
1. Sum of portfolio equity and FDI assets and liabilities in percentage of GDP in the United States, core euro area and Japan
2. Liquid liabilities in percentage of GDP in the United States, euro zone, and Japan

Regional attractiveness:
3. Average FDI flow (in percent of GDP) to other countries in the region

Local determinants of FDI include variables that affect the anticipated profitability from investing in the host country as well as the associated risks. The following set of explanatory variables is considered:

Market size and market potential drive expected profitability (Rodrik 1999; Lim 2001). Thus, increments in variables such as real GDP or real GDP per capita of the host country attract FDI and investors looking for high returns. The exchange rate is another driver (Froot and Stein 1991). Domestic currency depreciation lowers the relative wealth of domestic
agents and encourages foreign acquisition of domestic assets. **Corporate tax reductions and tax treaties** can attract FDI. (Razin and Sadka 2007) show that the source-country tax rate affects the extensive decision of whether or not to conduct FDI. But the host-country tax rate sways intensive decisions about the magnitude of FDI, once it occurs.

A **country’s productivity** is another indicator that investors consider when allocating their capital abroad. Razin et al. (2008) in an international capital flows’ model show two aspects of a positive productivity shock in the host country: desired FDI flows to the host country may increase, but new FDI flows from the source country may be less likely. A related issue is the importance of the **local wages** which tend to discourage the FDI flows due to an increase in local costs (Alburquerque, et al, 2005).

**Financial risk and macroeconomic uncertainty** can discourage investment in a country (Razin et al. 2008). Higher GDP volatility also discourages investment (Alburquerque et al. 2005). **Regional trade agreements (RTAs) and preferential trade agreements (PTAs)** can facilitate FDI. They provide reassurance to foreign investors about the treatment of their assets (Baltagi et al. 2007; Petroulas 2007; Buthe and Milner 2008). Basic **natural resources** comprise inputs in the international production chain. They also can drive capital flows, especially FDI (Faria and Mauro 2009).

**Trade openness** in goods markets can make market participants more willing to conduct cross-border financial transactions (a “familiarity” effect). **Investment climate** can strongly affect FDI flows. It includes efficiency of bureaucracy (time to enforce contracts, time to register a property, time to start a business, and time to resolve insolvency), quality of laws and regulations, investor protection, corruption avoidance, and contract enforcement. FDI flowing through international capital markets can be expropriated, as there is imperfect enforceability of international contracts. This risk reduces the return from investing abroad (Loayza et al. 2004). The **FDI promotion agency** has the job of increasing FDI flows. According to Harding and Javorcik (2011), the agency’s presence tends to reduce transaction costs for foreign investors by providing information on business opportunities, prevailing laws, and regulations.

Thus, from the analysis previously presented, we propose the following set of variables to be explored when examining the sustainability of the current account balance from an FDI perspective. The analysis can be conducted separately, for the country of analysis, or in comparative terms, with a group of countries that, for example, are located in the same region, have the same comparative advantages, and a similar level of development. The former approach is in line with the view that countries have to compete with each other to become an attractive territory for FDI.

**Indicators:**

27 Lagged values of the variables can also be included in the analysis in order to capture the long-term character of FDI decisions. Moreover, if the data are at quarterly or higher frequency, the vulnerability and uncertainty indicators may be computed as four- or eight-quarter averages to capture the medium-run behavior of investors, who may base their decisions on the exhibited trends in the vulnerability indicators, rather than on the one-quarter realization of the variables.
Market size and growth potential:
1. Real GDP
2. Real GDP per capita

Exchange rate:
1. REER and NEER (nominal effective exchange rate)
2. Exchange rate volatility

Tax policy:
1. Corporate tax
2. Is the country considered a tax heaven by the OECD?
3. Tax treaties
4. Public consumption in percentage of GDP

Productivity and labor cost:
1. Output per labor
2. TFP (total factor productivity)
3. Real GDP growth rate
4. Wages in manufacturing (the level or change in)
5. Output gap

Financial risk rating:
1. Foreign debt as a percentage of GDP
2. Foreign debt service as percentage of exports of goods and services
3. Net international liquidity as months of import cover
4. Public debt as a percentage of GDP
5. Domestic credit by banking sector as share of GDP
6. Exchange rate volatility
7. Terms of trade volatility
8. Inflation volatility

Regional trade agreements:
1. Number of RTAs and PTAs
2. Coverage of trade agreements in terms of FDI

Natural resources:
1. Percentage of ore, metals, and fuels in total exports

Trade openness:
1. Sum of exports and imports as a share of GDP (instrumented if required)
Investment climate:
1. Strength of legal right index
2. Political rights index
3. Corruption
4. Quality of institutions (World Bank political indicators)
5. International Country Risk Guide (ICRG) index (composite, political, and institutional)

Dummy variable for privatization years if required

Component 2: Foreign portfolio investment
External (push) factors in FPI reflect external conditions related to the opportunity cost of investing, the supply of global liquidity, and the risk attitude of the global investors. In essence, some of the factors are analogous to the drivers of FDI, but others reflect a shorter time horizon for portfolio inflows.

Early papers in the literature, Calvo et al. (1993, 1996), Fernandez-Arias (1996), Chuhan et al. (1998) suggest the role of low interest rates or low stock market returns in the industrial countries (Griffin et al, 2003) in explaining capital flows to emerging markets. Chuhan et al. (1998) confirm that about half of the explained increase in the flows to the Latin American countries in the 1990s can be attributed to the drop in U.S interest rates and the slowdown in the U.S economy. The role of the interest rates however goes beyond simple portfolio effects and carries trade strategies. Dooley et al. (1996) emphasize the benign impacts of low real rates on default probabilities and hence lower overall risks, while Frankel (2006, 2008) argues that an underlying impetus to increasing world commodity prices is low or negative world interest rates. Higher commodity prices itself can increase capital flows. Successful commodity exporters may repatriate their profits on the assets side or invest in other countries. Additional global liquidity may derive from expansionary monetary policies and/or growth of private credit in developed countries (Forbes and Warnock 2012). Both tend to increase capital flows. Higher global uncertainty and risk is likely to reduce capital flows to emerging and developing countries since uncertainty tends to drive capital into the government bonds of advanced economies (Fratzscher 2012; Ghosh et al. 2012). Regional effects may also play a role in FPI flows. Finally, the state of developed countries’ financial structure may have a long-term effect on FPI. The increased role of institutional lenders such as mutual and pension funds as well as the increased scale of securitization may represent a change that supports higher capital flows to emerging markets for portfolio diversification reasons.

The following set of external determinants of FPI is proposed:28

Growth and profitability:
1. Growth rate of world GDP per capita (cyclically adjusted if required)
2. Weighted average of stock returns in the United States, core euro area, and Japan

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28 Lagged values of the variables can also be included in the analysis to capture the learning dynamics on the financial market if the data are at a quarterly or higher frequency.
**Interest rates:**
1. Weighted average of the three-month interest rates in the United States, core euro area, and Japan

**Commodity prices:**
1. Reuters-Jefferies Commodity Research Bureau (CRB) Index
2. Crude oil price (Brent)

**Risk aversion:**
1. Credit spread: the difference between Moody’s Baa and Aaa corporate bond yields in the United States
2. High yield spread in the United States
3. VIX
4. Residual from the regression of VIX on TED spread (eliminating liquidity risk from the VIX estimate)

**Borrowing constraints and liquidity:**
1. Growth in the global money supply (the sum of M2 in the United States, core euro area, and Japan, cyclically adjusted if required)
2. Private credit growth (weighted average for the United States, core euro area, and Japan)
3. TED spread (three month LIBOR—three month Treasury bill rate) in the United States
4. LIBOR—OIS spread in the United States

**Changes in financial structure:**
1. Sum of foreign assets and liabilities in percentage of GDP in the United States, core euro area, and Japan
2. Liquid liabilities in percentage of GDP in the United States, core euro area, and Japan

**Regional attractiveness:**
1. Average portfolio flows (in percent of GDP) to other countries in the region

Local factors **in the host country** include variables that affect the anticipated profitability from investing in the country as well as the associated risks. Froot, O’Connell, and Seasholes (2001) reveal an increase in FPI flows following unexpectedly **high returns** in the host market. Ghosh et al. (2012) discuss the significance of host-country **interest rates** (with and without correction for the expected depreciation under the uncovered interest rate parity condition).

**Macroeconomic fundamentals** can also explain a large share of the heterogeneity of capital flows across developing countries. Fratzscher (2012) shows that countries with sound fundamentals could attract capital during the recent crisis, as safety came to dominate
investment decisions. Given the short time horizon of FPI, a country’s **external exposure** may significantly affect investor’s perception of local risk. Analogously, higher **exchange rate volatility and low liquidity** in local markets may also indicate high absolute and relative (with respect to comparator countries) risk.

**Financial sector development** facilitates international capital flows as deeper domestic financial markets and a more sophisticated financial infrastructure offer a broader array of channels and instruments through which the capital can be allocated (e.g., Martin and Rey, 2000, 2004, Lane and Milesi-Ferretti, 2003). Empirical research (e.g., Dell’Ariccia et al., 2008) shows that international portfolio diversification is present mostly in advanced countries due to more developed financial institutions. Moreover, as stressed by Caballero (2006) and Caballero et al. (2008), financial market imperfections and lack of investment opportunities in emerging and developing countries may explain why these countries received lower capital inflows.

Similarly, **trade openness** in goods markets can make cross-border financial transactions more acceptable to market participants (a “familiarity” effect). This reduces financial home bias and stimulates international capital flows (Lane and Milesi-Ferretti 2003). And, as noted earlier, **capital controls** can change the volume and composition of flows to favor less vulnerable, long-term investment. **Sound institutions** and good governance encourage capital inflows, as they can insulate a country from negative external shocks. Political stability and law and order encourage investment, because they signal a country’s commitment to protect property rights and minimize corruption (Alfaro et al. 2007, 2008; Faria and Mauro 2009). Finally, the effect of **demographics** on capital flows has been analyzed (Domeij and Flodén 2006; Krueger and Ludwig 2007). De Santis and Luhrmann (2009) empirically investigate how demographic cross-country differences may create incentives to invest in younger economies with high capital requirements and high expected asset returns.

**Indicators:**

1. **Local returns and growth potential:**
   1. Stock returns
   2. Three-month interest rate
   3. Real GDP (cyclically adjusted if required)
   4. Real GDP growth rate (cyclically adjusted if required)

2. **Macroeconomic fundamentals:**
   1. Government budget balance/GDP (cyclically adjusted if required)
   2. FX reserve holdings/GDP

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29 Lagged values of the variables can also be included in the analysis to capture the learning dynamics on the financial market if the data are at quarterly or higher frequency. Moreover, if the data are at quarterly or higher frequency, the vulnerability and uncertainty indicators may be computed as four- or eight-quarter averages to capture the medium-run behavior of investors, who may base their decisions on the exhibited trends in the vulnerability indicators, rather than on one-quarter realizations of the variables.
3. Inflation rate
4. Current account/GDP (lagged)

**External exposure and risks:**
1. Short-term external debt as a percentage of GDP
2. Foreign debt as a percentage of GDP
3. External portfolio liabilities as a percentage of GDP
4. Public debt as a percentage of GDP

**Local market uncertainty:**
1. Volatility of the foreign exchange rate
2. Average daily turnover in the stock market (instrumented if required)
3. Average daily turnover in the secondary bond market for government securities (instrumented if required)

**Financial development:**
1. Stock market capitalization as a percentage of GDP (instrumented if required)
2. Sum of stock market capitalization, along with private and public bond market capitalization, as a percentage of GDP (instrumented if required)
3. Private credit/GDP (instrumented if required)

**Trade openness:**
1. Sum of exports and imports as a share of GDP (instrumented if required)

**Capital controls:**
1. One (1) minus share of capitalization of domestic bond market that is available to foreign investors in total domestic bond market capitalization (Edison and Warnock 2003)
2. Chinn and Ito (2008) capital controls index

\[ 1 - \frac{|A - L|}{A + L}, \]

where $A$ denotes country’s foreign assets and $L$ denotes foreign liabilities. Higher values of the index imply higher financial openness.

**Investment climate:**
1. Strength of legal right index
2. Political rights index
3. Corruption
4. Quality of institutions (World Bank political indicators)
5. ICRG index (composite, political, and institutional)
Demographics:
1. Youth ratio
2. Old-age ratio
3. Dependency ratio

Estimation methodology
Once the set of potential determinants has been identified, the next step is to obtain estimates of (i) the structural and cyclical part of the individual capital flows, and (ii) the partial correlations between the components and the determinants. Claessens et al. (1995) used balance-of-payments financial account data from a range of developing countries to show that the accounting labels ‘short-term’ and ‘long-term’ as traditionally applied to capital flows do not reliably indicate the persistence of flows, and may generate potentially misleading results for policy. Moreover, Sarno and Taylor (1999) argue in favor of studying the actual time series properties of capital flows instead of relying on the accounting label.

Therefore, estimation of the components and the parameters is performed using the same econometric methodology as in Section 2.3: forming a state space and applying either a two-stage or joint estimation of components and partial correlations. Investment sentiment can change relatively fast and lead to a change in flows, and quarterly data can be used (provided its availability) to capture such dynamics. The analyst can group the previously reviewed variables into structural and cyclical drivers of individual flows $X_t^S$, $X_t^C$, and $Z_t$ depending on the expected influence.

Presentation of the results
Analogously to the discussion in Section 2.3, two sets of the results can be presented. First, the focus is on estimates of the structural and cyclical components. Plots of the estimates (and their confidence intervals) together with the original series provide a useful description of the evolution of the original series. In addition, volatility of the estimated series and the correlation between the estimated capital flows cycle and the cycle of explanatory variables can be analyzed. Second, estimated partial correlation coefficients are presented. As in Section 2.1, the estimates are shown either directly or standardized to measure in how many standard deviations the dependent variable will move if an explanatory variable changes by one standard deviation.
Economic theory suggests that countries should be able to deploy a wide range of policies to reduce current account deficits. However, in practice, most nations are bound by a complex network of rights and obligations that regulates international relations. Not everything is allowed, and not everything that is allowed is convenient. This section analyzes three different types of policy that countries can use to narrow the current account deficit: (i) trade policy, (ii) exchange rate management, and (iii) fiscal policy.

3.1 Trade Policy

There is a longstanding debate about the consequences of using trade policy to reduce current account deficits. Most contentious is the basic choice of trade protection or trade liberalization, especially in regard to countries with fragile external positions. Advocates of protectionism suggest using tariffs and quantitative restrictions to constrain imports in the short term, but these methods create economic distortions. Producers end up producing too much importable product, while consumers end up consuming too little of the goods. Import restrictions also generate anti-export bias. They lead to reallocation of factors of production from the exporting to domestic sectors, which drives up production costs for new tradable goods. Trade barriers to the importation of cheap intermediate inputs may also reduce export margins. Alternatively, countries can employ export subsidies to improve the external imbalance, but these lead to distortions like other trade measures. Domestic consumers buy less of the subsidized products, while producers produce too much of them. These subsidies may also incur losses for the government.

PTAs may be an option to foster exports, but they may also increase imports. Lower preferential tariffs give PTA country exporters improved market access and access to cheap intermediate inputs, which relaxes technological constraints, raises productivity, and reinforces the pro-competitive effects of PTAs (Klenow and Rodriguez-Claire 1997; Goldberg et al. 2010). Furthermore, PTAs boost a
country’s capacity to sustain a trade imbalance. As trade and investment become more interconnected, PTAs have grown to incorporate investment provisions and encourage FDI. This improves access to less-volatile capital flows to finance the external imbalance (Buthe and Milner 2008; Medvedev 2006; Goldar and Banga 2007; Pham 2011).

Trade facilitation can also be used to reduce long-run current account imbalances. Bureaucratic border clearance processes and poor infrastructure development are now seen as greater barriers to trade than tariffs. The trade facilitation agenda should focus on (i) reforming and modernizing customs and border management institutions, (ii) changing transport regulation policy, and (iii) investing in infrastructure. As Farole and Reis (2010) explain, customs modernization includes reforming procedures and improving border management. Reform of transport regulation policy could include the integration of trade logistics services. Finally, investment in infrastructure would include improving and expanding road networks.

3.2 Exchange Rate Policy

Real exchange rate depreciations are one of the most-used tools by policy makers to boost export sector performance and narrow current account deficits. They enhance domestic competitiveness and alleviate the consequences of government and market failures, which affect disproportionately the tradable sector (Rodrik 2008). Various policies have been pursued to depreciate the real exchange rate and narrow external deficits. Currency manipulation—large-scale intervention in exchange markets—has been the most controversial approach. Advocates argue that foreign reserve accumulation is a form of precautionary savings against future country-specific shocks. Critics say that currency manipulation is deployed for competitive advantage. As pointed out by Korinek and Serven (2010), “it has been difficult to reconcile the massive amounts of reserves observed in practice, with realistic magnitudes of shocks that a country might want to insure against.”

Currency manipulation affects aggregate demand by changing the real exchange rate. The policy’s effectiveness depends on several factors, including the presence of nominal rigidities and elasticities. If prices or wages are sticky, generally in the short run, then an unanticipated nominal depreciation can affect the real exchange rate and, therefore, exports and imports. In contrast, if prices are fully flexible, generally in the long run, then money is neutral, and nominal exchange rate changes play no role. However, competitive depreciations that are not fully passed on to prices can have a limited effect on exports and imports, even in the presence of nominal rigidities. This can occur, for example, if the demand for exports and imports is inelastic.

Currency manipulation has potential pitfalls. Persistent nominal depreciations can cause (i) accumulation of low-yielding foreign reserves; (ii) high and destabilizing liquidity growth, which fuels credit booms and feeds into inflation; (iii) currency substitution, which dampens the independence of the monetary policy; (iv) vulnerabilities due to currency mismatches in the balance sheets of firms and households; (v) fiscal unsustainability if a large chunk of
the public debt is denominated in foreign currency; and (vi) distortions in the relative price of traded to nontraded goods, leading to suboptimal allocation of resources across sectors. The policy can be ineffective if there is herding behavior. Other policies can depreciate the real exchange rate in a more sustainable way, including fiscal consolidation, anti-inflationary initiatives, capital inflows controls, and capital outflows liberalization. Fiscal contraction can alleviate demand pressures, which translates into higher prices for nontradable products.

3.3 Fiscal Policy

Reductions in government spending usually move the current account toward balance. Thus, fiscal contraction is often considered as a way to narrow external deficits. In an open economy, with a flexible exchange rate regime and sticky prices, contractionary fiscal policy affects the current account through two different channels. First, import demand can be reduced through less private consumption or less government expenditure. Alternatively, fiscal contraction reduces the demand for nontradable goods, inducing a real depreciation through the reduction in domestic prices, which crowds in net exports. The second channel is through the depreciation of the nominal exchange rate. Contractionary fiscal policy reduces domestic interest rates in comparison to international interest rates. If the financial account is open, there are capital outflows. Excess demand for foreign currency depreciates the nominal exchange rate and boosts exports. In an open economy, with a fixed exchange rate regime, fiscal contraction will affect the current account by generating real depreciation, which requires downwardly flexible prices. Note that fiscal retrenchment has pitfalls of its own, as it reduces consumption and, therefore, a country’s economic activity.


Appendix A. Model Averaging

In this appendix we briefly review model averaging methodology. Model averaging, unlike model selection, deals with model uncertainty by averaging over the set of candidate models in a particular manner, rather than selecting one model according to some criterion. By the nature of the average, model averaging is more robust than model selection as the averaging estimator considers the uncertainty across different models together with the model bias from each candidate model.\(^{30}\)

Model averaging in the present context means that the different combinations of the potential current account determinants (not all at once) are used as particular models and each combination is estimated by OLS. The final estimate is obtained by averaging across all the estimated regressions using a suitable criterion to select individual model’s weights. In this way, a large number of variables can be included, while, at the same time, only single-country estimation is performed.

The key element in empirical model averaging is the choice of the criterion for selecting the weights for individual models. Both Bayesian and frequentist approaches have been proposed in the literature. Bayesian model averaging attaches probabilities to each individual model and then averages the models based on these probabilities. As common in Bayesian methods, application of the Bayesian averaging approach requires determination of prior probabilities for each model. This requirement can be transferred to specification of only one hyper-parameter—the expected model size (number of variables in regression in our context). However, the choice of this parameter may have a significant influence on posterior (final) probabilities for individual models (Ley and Steel 2009).

Frequentist model averaging in turn selects models’ weights using a suitable well-defined criterion. Different criteria have been

\(^{30}\) Hansen (2007) showed that the frequentist averaging estimator can achieve lower mean-squared error than any individual estimator.
proposed in the literature. (See Buckland, Burnham, and Augustin 1997; Yang 2001; Hjort and Claeskens 2003; Yuan and Yang 2005; Hansen 2007; and Liang et al. 2010.) Most of the methods exclude heteroscedasticity and/or consider nested setup,\textsuperscript{31} which limits their applicability to the current account analysis. Recently, Hansen and Racine (2012) proposed the Jackknife Model Averaging (JMA) estimator for nonnested and heteroscedastic models where the weights are chosen by minimizing a leave-one-out cross-validation criterion. Liu (2012) extended their results to the time series data and derived the asymptotic distribution of the estimator (see also Zhang, Wan, and Zou 2013). In addition, Liu (2012) proposed alternative plug-in estimator which can be applied for robustness checks.\textsuperscript{32}

In particular, let $y_t$ denotes the current account to GDP ratio (the dependent variable), while $X_t$ is the $d$-dimensional vector of explanatory variables (see Section 2.1). We are interested in estimating a following simple regression model:

$$Y_t = X_t \beta + u_t$$

$$E(u_t | X_t) = 0$$

$$E(u_t^2 | X_t) = \sigma^2 (X_t)$$

where $u_t$ is random error term that is allowed to be heteroskedastic and no assumption on the distribution of the error term is imposed. Let $M$ be the number of models where each model $m = 1...M$ represents a particular subset of the explanatory variables $X_{t,m}$ whose dimension is smaller than $d$. The OLS parameter estimate for the $m^{th}$ model is, simply:

$$\tilde{\beta}_m = (X_{t,m}'X_{t,m})^{-1}X_{t,m}'y$$

The averaging estimator for the full regression model is:

$$\tilde{\beta} = \sum_{m=1}^{M} w_m \tilde{\beta}_m$$

where the weights $w_m$ are assumed to be non-negative and sum up to one.

The JMA estimator selects the weights by minimizing a leave-one-out cross-validation criterion. Hansen and Racine (2012) showed that the average squared error of the JMA estimator asymptotically attains the lowest average squared error among all feasible weight vectors. The leave-one-out estimate of the expected square error is:

\textsuperscript{31} Nested in the present context means that one starts with a simple 2-variable regression (include variables $X$ and $Z$ for example), and then all subsequent candidate regressions (models) include expanding number of explanatory variables ($X$, $Z$, $W$), then ($X$, $Z$, $W$, $P$) and so forth. Nonnested setup implies that one can also include combinations of variables that do not coincide, for example ($X$, $Z$, $W$, ($P$, $Q$, $V$) and so on.

\textsuperscript{32} Plug in estimator selects the weights by minimizing the sample analog of the asymptotic mean-squared error.
where $\tilde{u}_{-i} = (\tilde{u}_{-i,1}, ..., \tilde{u}_{-i,M})$ is a $T \times M$ matrix of leave-one-out residuals and $\tilde{u}_{-i,M}$ are the residuals from the $m^{th}$ model estimated by least squares, excluding the $j^{th}$ observation. The jackknife choice of vector $w_m$ is the value of $w_m$ which minimizes $CV_i(w)$. 

$$CV_i(w) = \frac{1}{T} w' \tilde{u}_{-i}' \tilde{u}_{-i} w$$
Appendix B. External Sustainability: Capital Gains for FDI

Estimating the growth rate of FDI prices is less straightforward than estimating the growth rate of equity prices, which is easily observed in the data. As portfolio equity and FDI are similar claims, one can assume that their rates of capital gains are the same:

\[ q_{\text{fdi}} = r_{\text{reinv}} + q_{\text{equity}} \]

where \( r_{\text{reinv}} \) is reinvested earnings. Along the balance growth path, all assets have to earn the same return. Thus, denoting the interest rate on nominal bonds by \( i \), and the distributed earnings yield on equity and FDI by \( \text{dist} \), one can write \( i \) in the following way:

\[
i = q_{\text{equity}} + \text{dist} + q_{\text{fdi}} + r_{\text{reinv}} = q_{\text{fdi}} + \text{dist} \left[ 1 + \frac{r_{\text{reinv}}}{\text{dist}} \right].\]

which can be employed to express \( q_{\text{fdi}} \) in the following manner:

\[
q_{\text{fdi}} = q_{\text{equity}} - (i - q_{\text{equity}}) \frac{r_{\text{reinv}}}{\text{dist}}.
\]
Appendix C. Kalman Filter Estimation of the State Space Model

In order to apply the Kalman filter, the system of equations is placed in the state space form with a measurement (or “signal”) equation that describes the dynamics of the observed variable, and state (or “transition”) equation(s) that provide the law of motion of the unobserved variables. The system used in the first methodology is directly translated to the state space form. The system of equations in the second methodology has the following state space form, where the variables are denoted in small letters to represent their sample realizations:

\[ y_t = y_{t-1}^s - \theta \mu_t + \theta y_{t-1} + \beta x_t^c + \gamma w_t + \varepsilon_t^c \]
\[ \mu_t = y_{t-1}^s \]
\[ y_t^s = \rho y_{t-1}^s + \delta x_t^c + \vartheta w_t + \varepsilon_t^s \]

The state space in matrix form is defined as:

\[ y_t = \begin{bmatrix} -\theta \\
\rho \end{bmatrix} \begin{bmatrix} \mu_t \\
y_t^s \end{bmatrix} + A' z_t^c + \varepsilon_t^c \]

where exogenous determinants (including the lagged observed dependent variable) are grouped in two vectors \( z_t^s \) and \( z_t^c \).

More compactly the state space is written as:

\[ y_t = B' \varphi_t + A' z_t^c + \varepsilon_t^c \]
\[ \varphi_t = F \varphi_{t-1} + D z_t^s + \varepsilon_t^s \]

where \( A \) and \( D \) are vector and matrix of the parameters of interest (partial correlations), \( B \) and \( F \) are vector and matrix of the parameters that describe the persistence in the original components, and \( \varphi_t \) is the unobserved state vector. Two error terms are assumed to be zero mean, normally distributed, serially and cross uncorrelated with variances \( R \) and \( Q \).

Denote data observable up to time \( t \) as:

\[ Y_t = \{ y_1, \ldots, y_t, z_1^c, \ldots, z_{t-1}^c, z_1^s, z_2^s, \ldots, z_t^s \} \]

The Kalman filter allows estimation of the conditional distribution of \( \varphi_{t+1} \) given \( Y_t \) for \( t=1..T \). Since all distributions are normal, conditional distributions of subsets of variables given other
subsets are also normal and the required distribution is described through the knowledge of its conditional mean and conditional variance. Once the conditional moments are known, the likelihood can be constructed and the estimates of the unknown parameters are obtained.

Assuming for the moment that the values of the parameter matrices are known, the Kalman filter consists of several steps.

1. Using the information up to time \( t - 1 \), calculate the optimal forecast of the state vector:

\[
\hat{\varphi}_{t|t-1} = E\left( \varphi_t \mid y_{t-1}, z_t^s \right) = F \hat{\varphi}_{t-1|t-1} + Dz_t^s
\]

where \( \hat{\varphi}_{t-1|t-1} \) denotes that the value of the vector that is obtained from the previous iteration. The first point in time (\( t = 1 \)) is initialized either to be zero or is assumed a value.

2. The mean squared error matrix for the forecast is:

\[
P_{t|t-1} = E\left[ (\varphi_t - \hat{\varphi}_{t-1|t-1}) (\varphi_t - \hat{\varphi}_{t-1|t-1})' \right] = FP_{t-1|t-1} F' + Q
\]

where \( P_{t-1|t-1} \) analogously denotes values from the previous iteration.

3. Using the results from the first step compute the forecast of the observed variable:

\[
\hat{y}_{t|t-1} = E\left( y_t \mid Y_{t-1}, z_t^c, z_t^s \right) = B' \hat{\varphi}_{t-1|t-1} + A' z_t^c
\]

4. Calculate the residual and mean squared error matrix of the forecast error in the observed variable:

\[
\hat{v}_t = y_t - \hat{y}_{t|t-1} = y_t - B' \hat{\varphi}_{t-1|t-1} + A' z_t^c
\]

\[
\sum_t = B' P_{t-1|t-1} B + R
\]

5. Given the implied forecast error in the dependent variable, update the forecast of the state vector to include information from time \( t \) and obtain the mean squared error of this forecast (using the properties of multivariate normal distribution):

\[
\hat{\varphi}_{t|t} = E\left( \varphi_t \mid y_t, Y_{t-1}, z_t^c, z_t^s \right) = \hat{\varphi}_{t|t-1} + P_{t|t-1} B' \sum_t^{-1} \hat{v}_t
\]

\[
P_{t|t} = P_{t|t-1} - P_{t|t-1} B' \sum_t^{-1} BP_{t|t-1}
\]

6. The estimates of the conditional moments are obtained using information from step 5 in updating step 1:

\[
\hat{\varphi}_{t+1|t} = E\left( \varphi_{t+1} \mid y_t, z_{t+1}^s \right) = FE\left( \varphi_t \mid y_t, Y_{t-1}, z_t^c, z_t^s \right) + Dz_{t+1}^s = F \hat{\varphi}_{t|t-1} + K_t \hat{v}_t + Dz_{t+1}^s
\]

\[
P_{t+1|t} = FP_{t|t} F' + Q
\]

where matrix \( K_t \) is known as the gain matrix.

\[
K_t = FP_{t|t} B' \sum_t^{-1}
\]

Given the independence and normality of the errors, the log likelihood function is the sum of the log conditional normal densities:
\[ L = \ln f(y_t) + \sum_{t=2}^{T} \ln f(y_t | Y_{t-1}) \]

where the conditional densities are:

\[ y_t | Y_{t-1} \sim N(B' \hat{\varphi}_{t-1} + A' z_t, B' P_{t-1} B + R) \]

The parameter estimates are obtained by maximizing the likelihood with respect to unknown parameters.

So far, inference about the value of the state vector \( \varphi_t \) has been based on observations through date \( t \). In applications where the state vector is of interest itself, it might be preferential to use information on the full data set. Such an estimate is called the smoothed estimate of \( \varphi_t \). It is obtained through a backward recursion starting with the estimate \( \hat{\varphi}_{T|T} \) and iterating backwards to calculate \( \hat{\varphi}_{T-1|T}, \hat{\varphi}_{T-2|T}, \ldots, \hat{\varphi}_{1|T} \) together with the associated mean square error (MSE) matrices.
Appendix D. Case Study—Turkey

This section illustrates an example of the analysis that the toolkit proposes. Its purpose is not to illustrate all methodologies discussed in the main text. The focus instead is on several new techniques (model averaging, “mixed” approach to sustainability, regressor state space estimation of the structural and cyclical component), while the more standard methodologies (panel analysis, “accounting” approach to sustainability) are left to the reader to explore.

After a decade of robust economic performance, Turkey faced the 2008–09 crises with strong fundamentals and was able to rebound quickly. In the wake of the 2010–11 crises, Turkey established a new economic framework, focusing on fiscal consolidation, inflation targeting, and tighter banking regulations. This framework delivered results—rapid growth, single-digit inflation, a large fiscal primary surplus, and strong reserve buildup. However, it also attracted large capital inflows, dominated by less reliable and potentially volatile short-term debt and interest sensitive portfolio flows, as investment opportunities in traditional global markets deflated.

The net import intensity of GDP rose to an all-time high as nominal import growth accelerated to around 40 percent—about twice the rate of exports. As a result, the current account deficit expanded from over 6 percent in 2010 to nearly 10 percent in 2011. Although energy accounts for the largest part of the trade deficit, (around 5 percent of GDP on average in recent years), the non-energy balance contributed three-quarters of the deterioration. These developments reflect the recent global challenges but are mainly the culmination of the growth model of the past decade. The model was marked by a large decline in the private sector saving-investment balance that more than offset the improved public sector balance, in addition to the continued substitution toward imports, reflecting the real appreciation of the exchange rate (until recently).

1. Current Account Outcome Analysis

The past dynamics of the current account balance, financial account balance, their components, and macro-financial variables are reviewed below. Brazil, India, and Poland are used as peer countries, given their similarity in the size of the domestic market and its importance for the economy, oil dependence, and no close counterparts in the region.

Group 1: Current account balance and its components

Figure D.1 shows the evolution of the current account balance in Turkey over the past three decades. Turkey ran a relatively modest current account deficit throughout 1980–2000, with a few surplus episodes. The deficit widened in 2000 prior to the financial crisis, while the crisis resulted in short-term current account improvements in 2001–02. The deficit continued to expand over 2003–06 and following a temporary stabilization and reversal over 2007–09.

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34 A part of the analysis is based on the work by Haddad and Nedeljkovic (2012).
Appendix

it expanded again in 2010 and 2011, reaching approximately 9.9 percent of GDP in 2011. In 2012 the current account balance improved relative to 2011, although it was still expected to remain (at the time of writing of this section) at a relatively high level of 7.5 percent (IMF, WEO October 2012). Analysis from Figure D.1 thus suggests that Turkish current account position exhibited moderate volatility over the past three decades, with a relatively strong negative trend only over the last decade. The last two periods of significant improvements are associated with crises episodes—the Turkish 2001 crises and the 2008–09 global financial crises.

Looking at the current account components, we can see that the dynamics of the trade balance explain a large part of the current account volatility (Figure D.2), while the other components contribute only marginally. Growth rates of both exports and imports were volatile over the 1980–2000 period (Figures D.5 and D.6). Exports and imports growth continued to be high but less volatile between 2002 and the 2008 global crisis. Although exports continued to grow after the beginning of the 2010–11 crisis, imports grew even higher (annual nominal growth rates at the period were above 30 percent) and reached all time high of almost 35 percent of GDP for combined goods and services (Figure D.4). In 2012 exports continued to grow in real and nominal terms, which, with stagnating imports, narrowed the trade balance deficit and reversed the declining current account balance. The balance on services, on the other hand, was relatively more persistent and positive over the entire period (Figures D.3 and D.4).

Exports over imports coverage broadly followed trade and current account developments (Figure D.2). With relatively balanced trade in 1980s, the coverage ratio was raised from 40 percent in 1980 to almost 110 percent in 1988. Deterioration of the trade balance over the post-2002 period drove down the coverage ratio to its 20-year low in 2011. Exports growth in 2012 reversed the trend, although the coverage ratio of 83 percent remains smaller relative to its peers (97 percent in Brazil and Poland in 2011).

Over the last decade Turkey diversified its export market destinations by reducing its reliance on the United States and Germany, while increasing ties with the Middle East and North Africa (MENA) region and European countries that are not part of the European Union (World Bank 2011). The change accelerated after 2007 when the MENA region gained importance as Turkey’s second export destination (Table D.1), thus providing additional demand that compensated the slowdown on European markets. The EU-27 share of exports declined by almost 10 percentage points (from 59 percent to approximately 48 percent) between 2007 and 2010. The United States also continued to lose importance as one of the Turkey’s main exports markets. On the other hand, the share of other regions, mainly MENA (from 16.7 to 25.1 percent) and Asia (from 6.5 to 9.4 percent) increased.

Europe (both the EU-27 and the Rest of Europe) accounted for about 70 percent of the export growth during the 2000–2007 period but only for 50 percent in 2010 (Table D.2). In contrast, half of the export growth in 2010 came from outside of Europe, mainly from Asia.

The trend continued recently and EU market exports constituted approximately 40 percent of total exports in 2012, while the MENA exports reached 32 percent.
Figure D.1 | Current Account Balance

![Graph showing Current Account Balance from 1980 to 2012.](image1)

- **CA (bn USD) r.h.s.**
- **CA (in % of GDP) l.h.s.**

Figure D.2 | Trade Balance and Imports Coverage

![Graph showing Trade Balance and Imports Coverage from 1980 to 2012.](image2)

- **Trade balance (bn USD), r.h.s.**
- **Exports over imports coverage (in %), l.h.s.**

Figure D.3 | Exports

![Graph showing Exports from 1980 to 2012.](image3)

- **Exports of goods (in % of GDP) l.h.s.**
- **Exports of services (in % of GDP) l.h.s.**
- **Exports of goods (bn USD) r.h.s.**
- **Exports of services (bn USD) r.h.s.**

Sources: IMF WEO, October 2012; World Bank; Central Bank of Turkey.
Figure D.4 | Imports

Figure D.5 | Exports and Imports of Goods: Annual Growth Rates

Figure D.6 | Exports and Imports of Goods: Annual Volume Growth Rates

Sources: IMF WEO, October 2012; World Bank; Central Bank of Turkey.
(16.8 percent) and MENA (30.8 percent). Although this is mainly because exports to Europe have not recovered to precrisis levels, the persistent growth of exports to MENA and Asia implies that export growth in the future will be more balanced in terms of regional coverage.

Income credits and debits (Figures 7 and 8) as a share of GDP have been on a declining path over the past decade. This is attributed to reduction of the Turkey’s external debt (discussed later) and is in line with the lower levels of FDI inflows relative to advanced Eastern European countries, as the profit repatriations are still not a significant source of income outflows. From 1997, private current transfers started to lose importance as a source of current account deficit financing. Since 2002, their share has fluctuated around levels of only 0.2 percent of GDP (Figure D.9). Consistent with the modest but persistent current account deficits, the NFA position shows a slow but continuous downward trend (with an increase in 2009 and then 2011), reaching 52 percent of GDP in 2012 (Figure D.10).

Overall, the analysis suggests: (i) the Turkish current account position has exhibited moderate volatility over the past three decades, with a relatively strong negative trend only

### Table D.1. Turkey’s Exports by Region (% total exports)

<table>
<thead>
<tr>
<th>Region</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU-27</td>
<td>60.4</td>
<td>60.2</td>
<td>61.0</td>
<td>61.8</td>
<td>61.4</td>
<td>60.1</td>
<td>59.5</td>
<td>59.0</td>
<td>50.1</td>
<td>47.9</td>
<td>48.2</td>
</tr>
<tr>
<td>MENA</td>
<td>12.3</td>
<td>13.6</td>
<td>12.8</td>
<td>14.5</td>
<td>15.6</td>
<td>16.9</td>
<td>16.0</td>
<td>16.7</td>
<td>22.2</td>
<td>24.5</td>
<td>25.1</td>
</tr>
<tr>
<td>Asia</td>
<td>6.2</td>
<td>5.6</td>
<td>5.9</td>
<td>5.7</td>
<td>5.0</td>
<td>5.2</td>
<td>5.9</td>
<td>6.5</td>
<td>7.4</td>
<td>8.5</td>
<td>9.4</td>
</tr>
<tr>
<td>United States</td>
<td>11.7</td>
<td>10.6</td>
<td>9.9</td>
<td>8.4</td>
<td>8.0</td>
<td>6.9</td>
<td>6.1</td>
<td>3.9</td>
<td>3.3</td>
<td>3.2</td>
<td>3.3</td>
</tr>
<tr>
<td>Rest of Europe</td>
<td>6.1</td>
<td>6.4</td>
<td>7.0</td>
<td>6.7</td>
<td>6.5</td>
<td>7.2</td>
<td>8.3</td>
<td>9.4</td>
<td>11.4</td>
<td>10.5</td>
<td>9.3</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>1.1</td>
<td>1.3</td>
<td>1.3</td>
<td>1.2</td>
<td>1.3</td>
<td>1.5</td>
<td>1.8</td>
<td>1.9</td>
<td>2.5</td>
<td>2.7</td>
<td>2.0</td>
</tr>
<tr>
<td>Other</td>
<td>2.3</td>
<td>2.3</td>
<td>2.2</td>
<td>1.6</td>
<td>2.2</td>
<td>2.1</td>
<td>2.4</td>
<td>2.6</td>
<td>3.1</td>
<td>2.7</td>
<td>2.7</td>
</tr>
</tbody>
</table>

Source: COMTRADE.

### Table D.2. Turkey’s Exports by Region (annual growth rates)

<table>
<thead>
<tr>
<th>Region</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU-27</td>
<td>12.8</td>
<td>15.3</td>
<td>35.5</td>
<td>33.8</td>
<td>33.6</td>
<td>16.0</td>
<td>25.6</td>
<td>5.1</td>
<td>−26.1</td>
<td>12.5</td>
<td></td>
</tr>
<tr>
<td>MENA</td>
<td>25.3</td>
<td>6.9</td>
<td>52.2</td>
<td>44.5</td>
<td>26.1</td>
<td>11.0</td>
<td>31.3</td>
<td>65.1</td>
<td>−14.8</td>
<td>14.5</td>
<td></td>
</tr>
<tr>
<td>Asia</td>
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<td>19.8</td>
<td>29.2</td>
<td>18.6</td>
<td>20.4</td>
<td>32.5</td>
<td>38.5</td>
<td>41.1</td>
<td>−10.3</td>
<td>23.2</td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>2.1</td>
<td>7.1</td>
<td>12.4</td>
<td>29.0</td>
<td>−0.4</td>
<td>3.6</td>
<td>−17.8</td>
<td>2.9</td>
<td>−24.6</td>
<td>15.4</td>
<td></td>
</tr>
<tr>
<td>Rest of Europe</td>
<td>19.8</td>
<td>23.9</td>
<td>27.9</td>
<td>31.3</td>
<td>28.8</td>
<td>35.3</td>
<td>43.0</td>
<td>49.0</td>
<td>−28.3</td>
<td>−1.9</td>
<td></td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>32.1</td>
<td>14.4</td>
<td>30.0</td>
<td>37.8</td>
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<td>34.8</td>
<td>31.9</td>
<td>64.9</td>
<td>−14.0</td>
<td>−17.8</td>
<td></td>
</tr>
<tr>
<td>Other</td>
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<td>4.6</td>
<td>2.0</td>
<td>76.8</td>
<td>12.7</td>
<td>31.7</td>
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<td>−33.6</td>
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<td>17.2</td>
<td>26.5</td>
<td>23.8</td>
<td>−22.6</td>
<td>11.6</td>
<td></td>
</tr>
</tbody>
</table>

Source: COMTRADE.
Figure D.7 | Income Credits

Figure D.8 | Income Debits

Figure D.9 | Remittances

Sources: Central Bank of Turkey, World Bank.
over the last decade, raising concerns about sustainability of the recent path; (ii) evolution of the trade balance explains a large part of the current account volatility as the share of income flows and private transfers is significantly reduced over the last decade; (iii) despite strong export growth and successful market diversification, the high import content of exports may continue to put pressure on the current account balance.

**Group 2: Financial account balance, official reserves and its components**

Before 2004 (with the exception of 2001) Turkey attracted relatively small FDI inflows (Figure D.11). Improvements in macro-fundamentals and reduced uncertainty following the 2001 reforms, together with the growing world liquidity, resulted in a strong increase in FDI inflows, reaching almost 4 percent of GDP in 2006 against 0.5 percent in 2004. The global financial crisis halved the inflows and increased their volatility. FDI inflows in the crisis period fluctuated between 1.5 and 2.0 percent of GDP. The structure of the FDI inflows improved recently despite the reduction in the magnitude (Figure D.13). The share of FDI in the manufacturing sector increased to almost 50 percent in 2012, while the share of FDI in services (notably financial sector) decreased. The structure of FDI originating countries (Figure D.14) remains skewed toward European countries, thus partially explaining why the FDI inflows still did not fully recover. FDI outflows (Figure D.12) increased in 2012 (after a slowdown over 2009–11), reaching historical high of 0.5 percent of GDP.

Portfolio inflows (Figure D.15) increased strongly over the post-2008 period, reaching a peak in 2012 at the levels almost two times higher than the precrisis period (5 percent of GDP). The increase was driven largely by high global liquidity, low yields in developed markets, and strong macro fundamentals in Turkey. As expected, the inflows are more volatile relative to FDI and the episodes of sudden stops in 1998, 2001, and 2008 are clearly marked. Portfolio investment outflows (Figure D.16) were relatively smaller and less volatile than the inflows over the 1992–2010 period (with the exception of few episodes, 2002, 2006, and 2010). Recently, low global yields in 2011 and 2012 brought a reduction in Turkish investor’s global portfolio. Portfolio debt represents the dominant part of the inflows (Figure D.19). Portfolio

![Figure D.10 Net Foreign Assets](image)

*Sources: Central Bank of Turkey, World Bank.*
Figure D.11 | Foreign Direct Investment Inflows

Figure D.12 | Foreign Direct Investment Outflows

Figure D.13 | Sectors Targeted by Foreign Direct Investment Inflows in 2007–2012

Sources: Central Bank of Turkey, World Bank.
equity inflows were relatively high only in 2005, 2007, and 2012, which corresponded to the increase of the stock market (ISE) indices.

Bank loan inflows fluctuated between 1 and 2 percent of GDP in the 1992–2009 period, with episodes of strong capital withdrawals in 1994, 2001, and to a smaller extent in 2007 and 2009. The credit growth rebounded in 2010 reaching the peak at 4 percent of GDP (Figure D.17). In order to reduce both inflationary pressures and widening external imbalances stemming from high credit growth, the Central Bank of Turkey (CBT) increased reserve requirements and announced an implicit credit growth target in 2011. These measures along with declining domestic demand resulted in lower credit growth and bank loan inflows in 2011 and 2012. With the exception of the 2004–07 period, short-term bank inflows were the dominant part of the bank inflows (Figure D.20). The episodes of reversals in bank loan inflows (1994, 2001, 2007, and 2009) were characterized by large short-term outflows. The new CBT framework from late 2010 put more emphasis on financial stability and should stimulate a shift from short-term to long-term finance, as well as from debt to more equity sources of financing (reserve requirement rates are differentiated by currency and from 2011 by maturity). However, in 2012 the majority of the inflows were still short term. Bank loan outflows on the other hand were more volatile than inflows (Figure D.18). The increasing trend of bank loan outflows was reversed after 2008, with strong return of the capital in 2010, thus contributing further to the domestic credit expansion.

Similar to other types of capital flows, corporate loan inflows fluctuated between 1–2 percent of GDP over the 1992–2003 period (Figure D.21). The inflows increased sharply prior to the global crises, reaching a maximum of approximately 5 percent of GDP in 2007. The

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36 The introduction of the new policy framework was conducted in several phases, starting from October 2010.
global crises reduced flows significantly. More recently, they fluctuated around 1 percent of GDP in 2011 and 2012. Corporate loan outflows were relatively stable until 2009, when both their size and volatility increased significantly (Figure D.22).

Both net and gross reserves exhibited similar dynamics (Figure D.23 and D.24). Analogously to other emerging markets, high capital inflows led to reserve assets buildup. The gross reserves peaked in 2012 at US$140 billion (net reserves US$100 billion). The short-term vulnerability indicators also improved. The coverage of external debt by the reserve assets (Figure D.25) increased from 13 percent in 1994 to 31 percent in 2005. It has fluctuated between 25 and 30 percent since then. The coverage of imports by reserves improved slightly from 3.4 months in 1994 to around 5 months in the late 2000s (notwithstanding strong import growth, which reduced the indicator in 2011). The share of short-term debt in reserves decreased considerably from more than 200 percent in 1992 to slightly above 50 percent in 2007 (Figure D.26). However, recent growth in short-term capital inflows increased the share of short-term debt in reserves to 95 percent in 2011, which can pose a significant challenge for external debt sustainability. Despite the increase in reserves, the stock of the reserves is still relatively low by international standards. The external debt coverage is significantly lower relative to the peers (Brazil and India, around 90 percent), while the share of short-term debt is higher (10 percent and 25 percent in Brazil and India, respectively).

Overall, the analysis suggests the following: (i) recent trends in FDI inflows should contribute positively to the external sustainability and the country should continue implementing measures to attract further FDI inflows (recent levels of FDI inflows are still lower than 2.5 percent of GDP for the G20 average) and reduce their current volatility; (ii) short-term capital inflows, however, remain the main source of funding the current account deficit; (iii) a recent surge in portfolio inflows presents a significant risk for external sustainability, especially due to the short-term debt character of the flows. The sustainability of the flows depends on the international investors’ shifting risk appetite, which may result in a simultaneous increase in the borrowing costs and the downward pressure on the foreign exchange market in the event of negative shocks; (iv) analogously, cross-border bank loans, which peaked in 2010, still remain predominantly short term driven, which provides an additional source of uncertainty; (v) despite the strong buildup of the reserves, the stock of reserves remains low relative to the recent debt accumulation.

Group 3: Macro-financial variables—underlying movers

Gross national savings and investment moved in relatively close levels until 2003, when the behavior diverged. Savings went on a continuous downward trend while investments expanded over 2003–07 and subsequently 2010–11 (Figure D.27).

Gross national savings have decreased continuously over the past 15 years, from 23 percent in 1998 to below 13 percent in 2012. The decline in savings mainly reflected the decrease in the private savings, which were also more volatile compared to the national savings. Recent increases in private savings (2009–11) partially stem from the new reform
**Figure D.15**  Portfolio Investment Inflows

![Portfolio Investment Inflows Graph](image1)

**Figure D.16**  Portfolio Investment Outflows

![Portfolio Investment Outflows Graph](image2)

**Figure D.17**  Bank Loan Inflows

![Bank Loan Inflows Graph](image3)

Source: Central Bank of Turkey.
Figure D.18  |  Bank Loan Outflows

Bank credit outflows (ln USD) r.h.s.  
Bank credit outflows (in % of GDP) l.h.s.

Figure D.19  |  Type of Portfolio Inflows

Debt  
Equity

Figure D.20  |  Maturity Structure of Bank Loans Inflows

Source: Central Bank of Turkey.
of the private pension system.\textsuperscript{37} Public sector balance significantly improved in the precrisis period (Figures D.28 and D.29).\textsuperscript{38} Since the majority of tax revenue comes from indirect taxes and excise duties, it can be argued that improvement of fiscal balance was a consequence of high import growth in period prior to the crisis. Aside from the countercyclical policy during the crisis, the public savings-investment balance improved again more recently.

The gross national investment rate averaged at around 20 percent of GDP over the last three decades. Private investment fluctuated around 15 percent of GDP, corresponding to the

\textsuperscript{37} The authorities recently replaced existing tax advantages with matching government contributions. The vesting period is extended and penalties for early withdrawals were introduced. Overall, part of the reform is aimed toward increasing the base of the private pension users through introduction of additional incentives for those with lower incomes and savings and including those who do not pay taxes.

\textsuperscript{38} Data on government balance and the components of public saving and investment is only available from 2003.
Figure D.23 | Gross Reserve Assets

- Gross reserve assets (bn USD) r.h.s
- Gross reserve assets (in % of GDP) l.h.s

Figure D.24 | Net Reserve Assets

- Net reserve assets (bn USD) r.h.s
- Net reserve assets (in % of GDP) l.h.s

Figure D.25 | Coverage by Reserve Assets

- Reserve assets (in months of imports) r.h.s
- Reserve assets (in % of external debt) l.h.s

**Sources**: World Bank, Central Bank of Turkey.
cycle with two episodes of reduction in rates in 2001 and 2009. The divergence between the savings and investment led to stronger relation between the investments and the current account as the capital flows provided additional sources of financing booming investments (2002–07 and 2010–2012). However, higher correlation between the growth and the cyclical capital flows imposes risk for the economy, since shifts in international investor sentiment may have negative effects on output volatility.

The continued appreciation of the real exchange rate (REER) since the 2001 reforms plays an important role in determining Turkey’s competitiveness. The REER computed using relative CPI prices shows a clear upward trend prior to 2001 crisis, appreciating by 42 percent in total over 1994–2000 (Figure D.31). Following a temporary reversal due to the 2001 crisis and abandonment of the fixed exchange rate regime, the REER continued to appreciate from

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**Figure D.26**  
*Short Term Debt Share in Reserve Assets*

![Graph showing short-term debt share in reserve assets from 1992 to 2012.]

Sources: World Bank, Central Bank of Turkey.

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**Figure D.27**  
*Savings vs. Investments*

![Graph showing gross national savings and total investment as a percentage of GDP from 1980 to 2012.]

Source: WEO October 2012.
Figure D.28 | **Private Savings vs. Private Investments**

![Graph showing private savings and private investments as a percentage of GDP from 1990 to 2012.](image)

- Blue line: Private savings in % of GDP
- Orange line: Private investment in % of GDP

Figure D.29 | **Public Savings vs. Public Investments**

![Graph showing public savings and public investments as a percentage of GDP from 2002 to 2012.](image)

- Blue line: Public savings in % of GDP
- Orange line: Public investment in % of GDP

Figure D.30 | **Fiscal Balance**

![Graph showing fiscal balance as a percentage of GDP from 2002 to 2012.](image)

- Orange line: Fiscal balance in % of GDP

*Source: WEO October 2012.*
2002 to 2008, although with smaller rates of growth between 2005 and 2008. The cumulative appreciation over 2001–2008 period was 61 percent. The REER then fluctuated extensively over the recent period, depreciating in 2009 by nearly 6 percent compared to 2008, and then appreciating in 2010 on a yearly basis by an additional 10 percent. The REER depreciated at the end of 2011 by 12 percent on a yearly basis, reaching the level from 2005. Unit labor cost (ULC)–based REER analogously appreciated over the post-2004 period, while recently reverting to the level from 2005 in 2011. The scale of appreciation was lower relative to the CPI-based REER. The recent nominal depreciation of the lira might help Turkey’s competitiveness, but is less clear whether the depreciation can be sustained, given the large current account deficit and the projected deterioration in the NFA position over the medium term.

A high inflation rate in Turkey relative to its most important trading partners was behind the REER appreciation. The REER movement was driven by a clear upward trend in the price differential although, the slope of the trend decreased from 2003 following the introduction of the fully fledged inflation targeting regime, which drove down inflation rates in last decade to single digits (Figure D.32). The volatility of inflation, however, is still high, primarily due to pass-through effects from the exchange rate and a high share of food prices in the consumption basket (around one fourth).

Volatility of the terms of trade between 1980 and 2000 was relatively high. From 2000 onwards terms of trade became more persistent with a relatively strong declining trend, contributing negatively to the current account balance over the past decade. Although movements in the current account are more volatile over the period, recent worsening of the oil trade balance also contributed significantly to current account deterioration (Figure D.34). While oil balance remained relatively persistent at around 2 percent of GDP over 1990s, from 1998 rising world oil prices increased oil balance volatility and contributed to its worsening driving the peak in 2012 at almost 7 percent of GDP.

**Group 4: Macro-financial variables—the key indicators**

Real GDP growth in Turkey accelerated between 1980 and 1987, with a peak in 1987 of more than 10 percent (Figure D.35). Over the next decade, Turkey witnessed relatively short boom-bust cycles with very volatile real growth rates. This reflected both macroeconomic instability as well as lack of domestic policies and wide public sector imbalances, which resulted in 2001 crisis. Macroeconomic stabilization following the 2001 reforms resulted in high growth rates. Average real GDP growth over the 2002–07 period was around 6.8 percent. Relative to the previous decade output gap volatility was reduced (Figure D.36). Output gap in 2011 was positive at around 1 percent. Figure D.37 shows that the current account balance became more procyclical over the last decade, similar to the evidence for advanced countries. Despite the strong growth performance over the 2000s, unemployment did not significantly decrease prior to the global crises. Sharp real GDP contraction in 2009, (minus 4.8 percent a year) resulted in unemployment hitting the peak at 14 percent. High post-crisis real GDP growth rates in 2010 and 2011 (average growth rate was 8.8 percent) backed by recovery of capital
Figure D.31 | Real Effective Exchange Rate

Figure D.32 | Inflation Rate

Figure D.33 | Terms of Trade

Sources: OECD, WEO October 2012, World Bank.
inflows, reduced the unemployment to a 10-year low in 2012. The rate is still relatively high and reflects partially labor market rigidities (including a generous severance pay scheme, a large tax wedge on employment, increasing minimum wage, and low average education attainment) as well as strong employment in the informal sector.

Turkey experienced strong credit expansion over the last decade. While the share of credit in GDP fluctuated between 15 and 20 percent of GDP over the 1980–2002 period, credit growth has become stronger since then (Figure D.39). In only seven years (from 2005 to 2012) it more than doubled, reaching 53.6 percent of GDP from 22.2 percent in 2005. After strong credit growth rebound in 2010 (annual growth rate 44 percent), CBT introduced a set of policy measures aimed to reduce credit growth, including the active use of reserve
Figure D.36 | Real GDP vs Output Gap

Figure D.37 | Real GDP vs Current Account

Figure D.38 | Unemployment

Source: WEO October 2012.
requirements and declaring an implicit credit growth target. The measures along with deteriorating external conditions slowed domestic credit growth in 2011 and 2012. Despite the credit expansion the share of nonperforming loans (NPL) in total loans is continuously declining, in line with growing economy (Figure D.40). The level of NPLs (below 3 percent in 2012) is low relative to the peer countries; however, the effects of the recent credit expansion may materialize in the near future. Short-term interest rates remained high relative to the advanced economies despite the cut in money market rates following the CBT measures during the crisis period (the key policy rate was lowered by 1,050 basis points, Figure D.41). The high interest rate differential provides a strong pull factor for short-term debt capital inflows.

The stock market developed relatively strongly over the past three decades (Figures D.42 and 43). Stock market capitalization increased from 6 percent of GDP in 1989 to approximately 30 percent in 2012 (with peaks of 45 percent in 1997 and 2007). Analogously, the value of stocks traded increased from 0.7 percent in 1989 to 43.7 percent in 2012. The higher value of stocks traded compared to market capitalization implies relatively good liquidity of the market. Cyclical behavior of the stock market is clearly observed, with strong drops in the capitalization and the annual return (Figure D.44) in 1998, 2002, and 2008, preceded by periods of increasing returns. The improved overall macroeconomic environment lowered county’s risk premium from the beginning of the last decade, measured by the average Emerging Markets Bond Index (EMBI) (Figure D.45). After a temporary increase during the crisis, the risk premium was reduced by high global liquidity and investors’ low risk aversion. More recently (the end of 2012) the risk premium decreased to all-time low (less than 200 basis points), although the level is still higher relative to peer countries.

After a decade of strong debt accumulation, both debt sustainability indicators (Figures 46 and 48) were reduced over the 2000s. The ratio of public debt to GDP declined from 75 percent in 2002 to 38 percent in 2012, while the external debt was reduced to 46 percent of GNI (from 56 percent in 2002). Analogously, public debt services (Figure D.47) were reduced to less than 8 percent of GNI in 2012. The observed trends are positive and imply medium-term debt sustainability, notwithstanding large negative shocks. An increase in short-term external debt, however, poses more significant risk for the sustainability in the form of liquidity (roll-over) risk. The share of short-term debt in total external debt rose sharply by more than 10 percentage points over 2009–12 and reached the level of 30 percent (Figure D.49). In line with the increase in debt, the country’s external leverage (Figure D.50), measured by the ratio of total foreign assets to total foreign equity, increased over the recent period, although its level is still relatively small for international standards. Liability dollarization is on a declining trend (Figure D.51), but still poses a significant challenge for the financial stability. Therefore, any significant nominal exchange rate depreciation, while contributing positively

Motivated by financial stability risks, in 2011 the Banking Regulation and Supervision Agency (BRSA) increased risk weights for consumer loans and raised general provisioning requirements for banks with high levels of consumer and/or nonperforming consumer loans.
Figure D.39 | Domestic Credit and M2

Figure D.40 | Banking Sector

Figure D.41 | Interest Rates

Sources: Central Bank of Turkey, IMF International Financial Statistics (IFS), Eurostat, World Bank.
Figure D.42 | Stock Market

Stock market capitalization in % of GDP

Figure D.43 | Stock Market

Stocks traded, total value (% of GDP)

Figure D.44 | Asset Prices

Annual return on index, r.h.s.  ISE National-100, l.h.s.

Sources: Central Bank of Turkey, JP Morgan.
toward reduction of external imbalances, may have offsetting negative effects by increasing
the debt burden for the public and private sector.

**Group 5: Global factors**

Until 2001 global developments did not have a significant impact on capital flows in Turkey as
the inflows remained at relatively low levels. Cheap and plentiful external sources in the period
of great moderation (low interest rates, a fall in risk aversion and liquidity spreads, Figures
52–56) along with improving macroeconomic fundamentals eased precrisis financing of the
decreasing current account balance. Global economic activity contraction during the crisis fol-
lowed by a sharp increase in risk aversion and liquidity spreads constrained Turkey’s financial
balance. Investor confidence was regained during a period of low global growth coupled by

**Figure D.45** Risk Premium

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<th>2011</th>
<th>2012</th>
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<td>200</td>
<td>100</td>
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</table>

*Sources: Central Bank of Turkey, JP Morgan.*

**Figure D.46** Public Debt

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</thead>
<tbody>
<tr>
<td>Public debt in % of GDP</td>
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<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
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<td>140%</td>
<td>150%</td>
<td>160%</td>
<td>170%</td>
<td>180%</td>
<td>190%</td>
</tr>
</tbody>
</table>

*Sources: Central Bank of Turkey, WEO October 2012, World Bank, own calculation.*
Figure D.47  | Debt Service

Figure D.48  | External Debt

Figure D.49  | External Debt

Sources: Central Bank of Turkey, WEO October 2012, World Bank, own calculation.
high global liquidity. This led to low interest rates and more capital inflows for Turkey, which contributed to financing of the widening current account deficits in 2010 and 2011.

A rise in global oil and commodity prices on the other hand is highly negatively correlated with the current account balance in Turkey (Figures D.57 and D.58). Although volatile, commodity prices fluctuated in relatively narrow range (200–250 as measured by CRB index) during 1990s and 2000s. From 2000 the increase in commodity prices (with the exception of the global financial crisis period) contributed to deterioration of Turkey’s terms of trade and at the same time growing global liquidity. The period of relatively stable oil prices in the late 1980s and 1990s led to stable dynamics in the oil balance. From 2005, however, oil prices grew on average by 16.6 percent a year. The rise in world oil prices significantly contributed to oil balance deterioration, with the oil balance deficit widening from 3.3 percent in 2005 to almost 7 percent of GDP in 2012 (Figure D.57).
Figure D.52  Global Growth

Average growth rate in developed countries (G7)

Figure D.53  Global Interest Rates

Average rate on long-term government bonds for the United States, Japan and Euro area

Figure D.54  Global Liquidity

Source: Bloomberg.
Figure D.55 | Global Risk

Source: Bloomberg.

Figure D.56 | Global Asset Prices


Figure D.57 | Oil Prices
2. Estimation of the Current Account Balance

In this section we analyze the determinants of the current account balance over 1980–2011 period and apply model averaging to estimate the unknown parameters of the model.

The main prospective determinants of the current account behavior include: initial level of NFA, oil balance; real effective exchange rate; trade openness; relative economic growth; relative income; demographics; FDI (lagged); terms of trade changes; and credit to GDP ratio. We also include the lagged value of the current account (to capture the inertia) and the dummy for the 1994, 2001, and 2009 crises to control for structural breaks. The choice of variables reflects data availability and the discussion in the main text.

The majority of the annual data for compatibility reasons comes from the IMF’s WEO September 2011 edition database. In addition to the WEO data we use REER data from OECD MEI, while the data on the share of private sector credit in GDP is from the World Bank’s WEI database. The data on NFA before 1996 comes from Lane and Milesi-Feretti’s (2007) “External Wealth of Nations” database and we merge it with the IMF’s net international investment position (NIIP) data for the remaining period. Relative variables are defined using the basket of trading partners. The weights for trading partners are based on the average importance of each country as an export destination for Turkey and the weights are calculated using COM-TRADE data for the 1997–99 and 2007–09 periods. The final weights include the 30 largest trading partners, which constitute 88 and 79 percent of the value of overall nonoil exports.

Before applying the methodology to study the determinants of the current account movements, we check the order of integration of the individual series, as the methodology is valid only in case of stationary variables. Table D.3 presents the results from the Kwiatkowski et al. (1992) KPSS test of a null hypothesis that an observable time series is stationary.

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40 No series for fiscal variables were available prior to 2002.
Although the length of the sample is relatively short, the results suggest the stationarity of the current account series, giving also some support for the (in sample) current account sustainability. Among all other series, the null of stationarity can only be rejected at the 5 percent level for NFA. In line with the literature and since the short length of the sample may affect the test properties, we decided to keep the series in our final estimation.

Table D.4 presents the main results from this section. We estimated all possible models with four, five, and six variables included (2,211 models in total) and the obtained estimates are the weighted averages of the (non-zero weight) models. The first column in Table D.4 reports the estimated coefficients. The standardized estimates are given in the second column. All variables apart from the demographic variable are found to be significant with small standard errors and have expected signs and magnitudes mostly in line with the existing empirical literature:

Current account persistence is of relatively smaller magnitude (0.16) than the one typically found in the literature, implying a relatively faster speed of adjustment of the current account to transitory shocks. The result also provides further evidence on the stationarity of the current account balance.

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41 This is not surprising since the effect of demographic factors may be present in the long run and requires perhaps using lower than annual frequency of observations.

The NFA coefficient is positive and relatively small (0.018), which is typically found in the literature. The finding can be related to relatively moderate level of NFA in Turkey over the period of analysis as well as to the fact that income outflows still have a small contribution to the overall current account movements.

Gross FDI inflows from the previous period have negative influence on the current account. An increase in FDI of 1 percent of GDP decreases the current account balance by 0.18 percent of GDP, implying a high import content of FDI and possibly a small contribution to the existing capital stock.

In line with the Turkish dependence on oil imports, oil balance has a significant positive effect on the current account. Deterioration of the oil balance by 1 percent of GDP decreases the current account balance by 0.37 percent of GDP. The fact that the estimated coefficient is smaller than one implies that imports of other goods may compress as the oil prices increase.

Real effective exchange rate has expected negative effect on the current account, although of small magnitude. Semi-elasticity of −0.01 suggests that a one percent appreciation in the REER is related to a 0.01 percent decrease in the current account as a ratio to GDP, implying some role for the exchange rate policy in the external adjustment.

The real GDP growth has a negative effect on the current account in line with the basic predictions of the intertemporal approach. The coefficient estimate implies that 1

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43 See Table 1 and Table A2 in Beidas-Strom and Cashin (2011) for an overview of the literature.
44 An analogous result was found for comparator countries in Central and Eastern Europe (Rahman 2008).
percentage increase in relative growth leads to decline in the current account by 0.11 percent of GDP.

- Analogously, relative income has a positive effect on the current account. An increase in Turkish real GDP per capita in PPP terms relative to its trading partners by US$1,000 leads to 0.04 percent improvement in the current account as a ratio to GDP.

- Openness has positive effect (0.08) on the current account balance, which is in line with the findings in Gruber and Kamin (2007) and Chinn and Ito (2007), although the magnitude of the estimate is slightly higher. This implies that further trade integration of Turkey should have a beneficial effect on the current account.

- Terms of trade changes\(^45\) have a positive effect (0.01) on the current account balance, signaling the dominance of the savings channel (or at least very low investment effects) in this respect. The sign of the effect implies the perceived transitory character of the past terms of trade movements. The magnitude of the effect is relatively small, suggesting lower vulnerability of Turkey to commodity price shocks, which can be attributed to a relatively high export diversification.

- The credit to GDP ratio has a negative effect on the current account. This can be related to a recent credit boom and easing of the borrowing constraints, which consequently led to an increase in investment without a corresponding increase in savings, due to overall financial development. The coefficient estimate implies that an increase in credit of 10 percent of GDP lead to a decline in the current account by 0.58 percent of GDP.

In relative terms (column 2), domestic credit expansion, oil imports, and real GDP growth (relative to trading partners) were the key determinants of the current account over the entire sample. Figure D.59 shows that the model tracks the past current account movements quite well. It captures relative volatility of the current account prior to 2000 and the expanding deficit from 2000 onwards. Only the 2011 deficit is left partially unexplained as the model implies a moderate increase in the current account to −7.36 percent of GDP.

Domestic credit expansion and deterioration of the oil balance were major contributors to the worsening current account deficit in 2007–11 compared with 2001–06. The average contributions of each variable to the model-implied current account balance over the period show that only the terms of trade movements were improving the current account balance in some periods. Conversely, all other variables contributed negatively to the current account developments. This is the case even for variables where the positive sign is observed as Turkey’s level of openness and relative income were growing slower relative to its trading partners. Looking at the most recent period, cyclical factors exacerbated the current account deficit. The largest change in contributions is seen for domestic credit expansion, which contributed −2.23

\(^{45}\) Final specification includes terms of trade changes as the explanatory variable. We also separately estimated specifications with log level terms of trade and terms of trade shocks (obtained as residuals from the autoregressive model) and selected the specification that maximizes R\(^2\) (since we cannot include two terms of trade variables in the model averaging procedure).
percent to the deficit over 2007–11, compared to −1.06 percent on average before 2007. Moreover, the contribution of domestic credit expansion to the current account deficit rose by 110 percent between 2001–06 and 2007–11; the oil balance contribution rose 50 percent.

The results have several implications. First, the significance of real GDP growth, relative income convergence, and terms of trade for the current account movements and the observed fall in the savings rate over the past decade point to the importance of the savings-investment channel. This behavior of the current account balances is different from other Eastern European countries with relatively high savings rates such as the Czech Republic, whose current account deficit deteriorated mainly due to large income outflows, while the trade balance improved considerably over time. The policies aimed toward promoting economic growth as
well as improving the institutional environment\(^\text{46}\) should have a beneficial effect on private savings. The government savings on the other hand could be used in the form of a buffer against too wide external deficits and the related risks.

Second, the factor whose importance increased over the recent period is the private sector’s credit to GDP ratio. The credit to private sector ratio increased from 22.2 percent of GDP in 2005 to 50.1 percent in 2011. The increase in credits a priori does not represent a potential negative effect as the agents may be moving to a higher, equilibrium level of indebtedness. However, excessive credit growth can contribute significantly to expanding deficits. Moreover, the related asset price booms may contribute to a further decrease in savings as households tend to increase borrowing and reduce savings in asset inflation times. Regulatory financial policies aimed at restricting unsustainable credit growths may be very important. The CBT raised the reserve requirements in 2011 while lowering the interest rates in an effort to restrict credit growth and deter short-run capital inflows. Additional measures, such as a countercyclical loan-loss provisioning system or regulatory changes toward harder conditions for obtaining mortgages, may also be beneficial.

Third, trade integration has a positive effect on the current account balances. Although Turkey’s openness ratio changed little over the past decade (World Bank 2011), the difference in openness to trade partners (and comparator countries) increased, reflecting the rise in anti-dumping and safeguard measures that Turkey has increasingly been using over the past few years against specific trading partners. The increase in protectionism contributed negatively to the current account movements.\(^\text{47}\) Instead of relying on protectionist measures to reduce imports, a better alternative would be to put in place structural policies to improve productivity growth and overall competitiveness, related in particular to improvements in education, innovation, the business environment, product market regulation, and labor markets. A related policy option to improve competitiveness is through exchange rate management. However, changes in the exchange rate do not translate immediately to the current account improvements (as the evidence from the 2011 lira depreciation shows) and can only accompany structural measures.

Fourth, the (current) level of NFA stock does not contribute significantly to the current account balances. However, the accumulation of negative NFA stocks over the past decade and especially large foreign gross liabilities may have negative effects in the future. Turkey’s gross liabilities increased from US$179 billion in 2003 to US$500 billion in 2011, including an increase in FDI stock from US$33 to US$140 billion. While these developments are not negative per se since they imply further financial integration in addition to growth effects, the evidence of dominant income outflows from expanding FDI stocks in the current accounts

\(^{46}\) As measured by Kaufmann, Kraay, and Mastruzzi’s Worldwide Governance Indicators (2010), Turkey still performs significantly worse relative to comparator countries in Central And Eastern Europe and South-East Europe.

\(^{47}\) Increased openness can have a deteriorating effect on the trade balance in the short term.
of comparator countries suggests another potential source of current account deterioration. This again points to the importance of structural policies to improve export competitiveness since the bulk of the adjustment in the current account will most likely need to take place in the merchandise trade balance.

3. External Sustainability

In this section we use the second methodology to conduct the external sustainability exercise. At the end of 2011 equities and FDI constituted 35.8 percent of total liabilities in the net international investment position of Turkey (a fall from 45.4 percent in 2010). This fact highlights the importance of taking into account the composition of the net foreign position and differences in returns in evaluation of the external position. We proceed by calibrating the motion of components of gross foreign assets and liabilities: FDI, portfolio investment, other investment, and foreign reserves over 2012–16 as described in Section 2. We then sum the obtained results into an estimate of the future NFA position.

The method requires several inputs:

- The nominal GDP growth rate \( g \) for each year in the period 2012–16 is obtained from the WEO database, as we do not assume that the economy has reached the steady-state and hence a constant nominal GDP growth rate.
- The initial (2011) stock of each component is from the “International Investment Position,” a January 2012 report of the Central Bank of Turkey.
- We assume that capital account transfers will remain at zero over the period, while there are no forecasted errors and omissions, such that \( e_t = 0 \), in line with Tille (2008) and forecasts in WEO database.
- Capital gains per components: we assume no capital gains on reserves, other investment assets, and other investment liabilities as these are the fixed-income components whose returns enter the current account. Given the past three-year average return on the Istanbul national 100 index and Stoxx Europe 50, we set the growth rate of prices on portfolio liabilities and assets to be equal to 8 percent and 3 percent respectively. We assume 10 percent nominal interest rate on government debt for the liabilities side in line with the average cost of domestic borrowing data from the Central Bank of Turkey, while we use an average interest rate of 3 percent on the assets side in line with the average yield on German long-run bonds from the IMF International Financial Statistics (IFS) database.\(^48\) We set the ratio of reinvested to distributed earnings on FDI equal to 0.75 as in Tille (2008). In order to assess the sensitivity of the results to the calibrated parameters we vary the value of the nominal interest rate in Turkey between 6, 10 and 14 percent, the growth rate of prices on portfolio liabilities between 5, 8 and 11 percent, and the ratio of reinvested FDI earnings in Turkey between 0.25, 0.75 and 1.25.

The flow part of each component depends on the projected current account movements as we assume no errors and omissions in the balance of payments statistics. The projection of the current account is obtained using the estimated parameters and projections of the determinants. For those variables for which the data were available we use WEO forecasts. The WEO data does not include real effective exchange rate, domestic credit, and NFA. We simulate different paths of the current account using different scenarios for the first two variables. In particular, we set different growth rates of the real effective exchange change rate such that it reaches the minimum value 85 (slightly below the level in 2003) or the maximum value 115 (above the level in 2010) in 2016. The annual growth rates of domestic credit over GDP range from 1 to 10 percent. The level of NFA in 2011 is used to initiate the process and subsequent values of the current account and NFA levels are obtained recursively. Once we obtain the current account projection, we use the WEO projection of the relative structure of the components of the financial account for a particular year to allocate the projected flows between the assets and liabilities components. In particular, the forecasts of macro-variables from the WEO database were the following: (i) the nominal GDP growth of 5 percent in 2012, and around 9 percent thereafter; (ii) gradual improvement in oil balance to −4.2 percent in 2016; (iii) a slow increase in gross FDI inflows as percentage of GDP to 2.5 percent in 2016; (iv) real GDP growth of 2.2 percent in 2012 and 3.4 percent in 2013 and then annually increasing by 0.3 percent to 4.3 percent in 2016; (v) growing GDP per capita in PPP terms to US$17.321 in 2016; (vi) very small increase in openness from 0.552 in 2011 to 0.561 in 2016; and (vii) volatile but slightly improving terms of trade.

The choice of variables (credit and REER) for which the scenarios are analyzed represents their importance for recent current account dynamics. The reader can choose variables for the scenario analysis in line with their importance for the particular country of interest. Figure D.61 presents the range of potential movements in the current account, while Figure D.62 shows the associated movements in NFA. In the absence of measures to slow down credit expansion and REER appreciation, the current account balance deteriorates to −10 percent in 5 years; with measures it stabilizes at −7.5 percent (Figure D.61). The corresponding movements in the NFA position are more diverging (Figure D.62). In the relatively stable current account deficit scenarios, the NFA position tends to deteriorate to around −57 percent of GDP. However, in the extreme case scenarios NFA could worsen to almost −95 percent of GDP.

Looking at the individual scenarios a few patterns emerge:

- The obtained results are very sensitive to the assumed path of the domestic credit to GDP ratio. The scenarios with the lowest decline in the NFA position and relatively stable current account deficit are those when we assume the annual credit to GDP growth of 1 percent. Conversely, the scenarios in the other extreme tail are associated with the
annual credit to GDP growth of 10 percent, which implies reaching the credit to GDP level of 80.7 percent in 2016.

- The second most important variable for NFA dynamics is the assumed domestic equity price growth. Scenarios with highly negative NFA are associated with the equity price inflation of 11 percent, while all stabilizing scenarios are obtained with the equity price inflation of 5 percent, in line with our explicit consideration of the valuation effects of the gross assets and liabilities positions.

- Not surprisingly, the REER movements contribute differently to the observed patterns in the current account. Other things being equal, the higher the assumed REER depreciation, the lower the current account deficits and the NFA position.

- A higher share of reinvested FDI earnings also contributes to improvements in the current account and the NFA position, although their changes are of relatively low importance.

The difference between the best case scenario (the lowest credit growth and the equity price inflation and the highest REER depreciation) and the worst case scenario (the opposite
of the previous) and the case where the credit growth is 3 percent (with the lowest equity price inflation and the highest REER depreciation) is substantial. Relatively modest credit expansion (3 percent of GDP annually) leads to a difference (other things being equal) in the NFA position of 1 percent in 2016 (Figures 63 and 64). The results therefore suggest the importance of the aforementioned policies and especially those related to the limitation of the credit expansion, as well as improvements in productivity growth and overall competitiveness. The results also show that in the absence of such measures, the future path of the current account and the economy may lead to the accumulated levels of NFA, which may pose a significant risk to the external sustainability.
4. Cyclical and Structural Analysis

In this section we analyze structural and cyclical dynamics of the current account and its underlying movers. Given the importance of the declining trend in gross national and private savings and therefore the close cyclical relationship between investments and the current account balance, the focus of the analysis is on the cyclical and structural drivers of private savings and investment. However, consistent data on public investment and public savings is only available from 2002, which prevents any econometric analysis of their dynamics. We use the IMF’s estimates of the structural budget balance to construct measures of the structural and cyclical current account from the estimated series for private savings and investment.

We consider the following prospective determinants of the private savings: real GDP per capita growth rate, output per worker, real deposit rate, terms of trade and terms of trade shocks, real income per capita, demographic factors, urbanization, ratio of minimum to average wage, inflation and foreign exchange volatility, average inflation over the previous five years, change in credit to GDP ratio, and the output gap. The first two series were cyclically adjusted using the Hodrick-Prescott (HP) filter with parameter 100 (Gourinchas and Obstfeld 2012). Inflation volatility as a proxy for uncertainty is also cyclically adjusted in order to distinguish between the long-run and short-run effects of high inflation volatility in Turkey. We also include a dummy variable for the 2002, 2003, and 2009 crises episodes. The choice of variables reflects data availability and the discussion in section 3. Annual data from 1980–2011 comes from various sources, including the World Bank WDI, IMF WEO, IMF IFS, and OECD statistics.

We employ the second methodology and estimate jointly the structural component of the private savings and the parameters in the extended state-space specification. A Kalman filter with diffuse initialization is used for estimation of the state space. Application of the Kalman filter requires further assumptions on some parameters of the model. Following the literature on estimation of the natural rate of unemployment, we assume a “signal to noise ratio”—that is, a ratio of the variance of the structural component to the variance of cyclical component—of 0.1. Alternative specifications of the ratio (up to level of 0.4) do not change the results.

Due to the small length of the sample, different specifications were estimated. Those that reported estimates in line with the well-accepted theoretical priors (where applicable) were retained. The final specification chosen is the one which minimizes the Akaike (AIC) criterion. The obtained results (Table D.5) point to demographic changes, reduction of macroeconomic uncertainty (measured by inflation volatility), and growth in real income per capita as the key structural determinants of private savings. Improved macroeconomic stability reduced the precautionary motive for savings and along with an increase in the share of youth population relative to the working force led to reduction in savings. Conversely, a decline in

49 The ratio allows imposing a constraint on the smoothness of the structural component. Lower values of the ratio imply smaller volatility of the structural component.
the percentage of the aged, dependent population and growth in real income per capita provided structural impetus for an increase in private savings. The role of higher growth in income per capita is consistent with the empirical evidence for developing countries (Carroll and Weil 1994) that in growth-accelerating episodes, higher growth tends to precede and statistically cause higher savings, opposite to what is often found in developed countries. In addition, negative terms of trade changes and the process of urbanization contributed to the reduction of structural savings, although the order of their effect was smaller and in the case of urbanization not statistically significant.

Greater access to credit and recent credit expansion contributed to further reduction in savings over the cycle. A 3 percent change in the credit to GDP ratio led to a cyclical decrease in private savings to GDP ratio of around 1 percent, as the expansion allowed softening of household and corporate liquidity constraints. Greater macroeconomic stability and productivity growth contributed positively to private savings over the cycle.

Figure D.65 shows that the reduction in private savings over the past decade had a structural character. The estimated structural component continuously declined from the level of 18.5 percent in 1995 to 13.7 percent in 2011. Cyclical behavior over the past decade implies relatively short cycles of around three years. The cycles correspond to short-run effects of the greater macroeconomic uncertainty surrounding the 2002 crises; the short-term effects of the reforms and the credit expansion over 2005–07; the effects of the global crises in 2008–09; and the most recent credit expansion in 2010–11.

Next, structural and cyclical components of private investments were estimated. We consider the following prospective determinants of the private investments: real GDP per capita growth rate, output per worker, real deposit rate, terms of trade and terms of trade

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>Standardized coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lagged value</td>
<td>0.1356</td>
<td>0.1502</td>
<td>0.00</td>
</tr>
<tr>
<td>Real income per capita</td>
<td>0.0849</td>
<td>0.0511</td>
<td>1.81</td>
</tr>
<tr>
<td>Terms of trade</td>
<td>0.0651</td>
<td>0.0338</td>
<td>0.41</td>
</tr>
<tr>
<td>Inflation volatility (cyclically adjusted)</td>
<td>0.3809</td>
<td>0.0758</td>
<td>1.60</td>
</tr>
<tr>
<td>Dependancy—old</td>
<td>-6.3985</td>
<td>1.7956</td>
<td>-2.77</td>
</tr>
<tr>
<td>Dependancy—young</td>
<td>-0.6130</td>
<td>0.2375</td>
<td>-2.96</td>
</tr>
<tr>
<td>Urbanization</td>
<td>-0.0026</td>
<td>0.0042</td>
<td>-0.90</td>
</tr>
<tr>
<td>Cyclical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in credit to GDP</td>
<td>-0.3620</td>
<td>0.1097</td>
<td>-0.38</td>
</tr>
<tr>
<td>Dummy</td>
<td>0.0843</td>
<td>0.0226</td>
<td>0.00</td>
</tr>
<tr>
<td>Inflation volatility (cyclical)</td>
<td>0.0824</td>
<td>0.0563</td>
<td>0.12</td>
</tr>
<tr>
<td>Growth rate of the real GDP (cyclical)</td>
<td>0.2246</td>
<td>0.1040</td>
<td>0.34</td>
</tr>
</tbody>
</table>
shocks, labor force growth, lagged FDI inflows, ratio of minimum to average wage, inflation and foreign exchange volatility, average inflation over the previous 5 years, change in credit to GDP ratio, oil prices, lagged real effective exchange rate, and the output gap. Analogously to savings, the choice of variables reflects data availability and the discussion in section 3. Annual data from 1980–2011 comes from various sources, including World Bank WDI, IMF WEO, IMF IFS, and OECD statistics.

The results (Table D.6) imply that the productivity growth (measured by structural component of the output per worker) and reduction in macroeconomic uncertainty (measured by the average five-year inflation rate) contributed positively to the increase in the structural component of the private investment, in line with existing evidence in the literature. On the other hand, labor market dynamics and the real exchange rate appreciation\(^{50}\) had a negative effect on private investment through the increase in costs and lower export production. Credit and output expansion had a positive cyclical effect on investment. Figure D.66 shows that analogous to the private savings, estimated structural investment also declined from 1995 onwards. The trend was reversed following the 2002 reforms and the structural investment increased from 14.4 percent of GDP in 2004 to 16.3 percent in 2011. The actual investment series was more volatile and cyclical. Private investments were in a negative cycle between 1999 and 2004 and entered a positive cycle following the reforms and the booming economy.

What do the results imply for the current account dynamics? Since the data for structural public balance is only available for the last decade, we focus on this period. Estimated structural private balance (Figure D.67) shows a relatively persistent divergence from 2004, in line with the opposite trends in private savings and investment. The size of the private

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\(^{50}\) The real exchange rate is included in the structural determinants, given the relatively strong appreciation dynamics over the sample period.
Table D.6  Determinants of Private Investment

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>Standardized coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lagged value</td>
<td>0.7201</td>
<td>0.0791</td>
<td>0.00</td>
</tr>
<tr>
<td>Output per worker (cyclically adjusted)</td>
<td>0.0241</td>
<td>0.0053</td>
<td>0.40</td>
</tr>
<tr>
<td>Minimum to average wage</td>
<td>−0.1269</td>
<td>0.0254</td>
<td>−0.83</td>
</tr>
<tr>
<td>Inflation (five year average)</td>
<td>−0.0275</td>
<td>0.0082</td>
<td>−0.40</td>
</tr>
<tr>
<td>REER (lagged)</td>
<td>−0.0233</td>
<td>0.0079</td>
<td>−0.29</td>
</tr>
<tr>
<td>Cyclical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lagged value</td>
<td>0.0618</td>
<td>0.0918</td>
<td></td>
</tr>
<tr>
<td>Change in credit to GDP</td>
<td>0.1388</td>
<td>0.0691</td>
<td>0.21</td>
</tr>
<tr>
<td>Output gap</td>
<td>0.4558</td>
<td>0.0706</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Figure D.66  Components of Private Investment

Source: WEO, Author’s calculations.

Figure D.67  Private and Public Structural Balance

Source: WEO.
The structural gap is relatively small compared to the public structural balance, despite improvements in the public balance from 2007 onwards. The sum of the two balances provides a measure of the structural current account balance (Figure D.68). Over the recent period (abstracting from 2009), the actual current account balance is below the structural estimate. This signals the prevalence of cyclical factors in the recent evolution in line with the previous discussion in section 2.

5. Capital Flows

In this section we analyze structural and cyclical determinants of the capital flows. Following the discussion in section 1 on the different behavior of the components of the capital flows to Turkey over time, we separately analyze dynamics and determinants of FDI and portfolio gross inflows. Given a relatively small magnitude of capital outflows in Turkey, we focus on gross capital inflows since they represent more a significant and at the same time a more volatile component of the flows. The correlation between the gross and net inflows over the sample period is high—0.99 for FDI and 0.97 for the portfolio flows. Thus, an analogous intuition is expected to hold for the net flows.

We consider a large number of the prospective “push” determinants of the FDI flows: growth rate of the world GDP, average growth rate in the United States and EU, average of the three month money market rate in the United States and core euro area, average interest rate on long-term government bonds in the United States and core euro area, slope of the U.S. yield curve, credit spread (the difference between Moody’s Baa and Aaa corporate bond yields in the United States), VOX index, and annualized average growth rate in broad money in the United States and core euro area. The following “pull” factors are included in the analysis: real GDP growth rate, real GDP per capita, real exchange rate, inflation and exchange rate...
volatility, terms of trade volatility, lagged measure of trade openness, measures of quality of institutions, political risk and the business environment (composite ICRG index, political ICRG index, and institutional ICRG index), and the output gap.

Quarterly data over the 1999–2012 period are collected from various sources. Given a more volatile character of the capital flows relative to savings and investment, quarterly data appear to be suitable for the empirical analysis. The choice of variables and the sample reflects data availability. Analogously to the analysis of the cyclical and structural component of private savings and investment, we employ the second methodology and estimate jointly the structural component of the flows and the parameters in the extended state space specification. A Kalman filter with diffuse initialization is used for estimation of the state space and a “signal to noise ratio” equal to 0.1 is assumed.\textsuperscript{51} The final specification is the one that minimizes the AIC criterion.

Both global and local factors influenced FDI inflows (Table D.7) and the obtained results are mostly in line with the existing literature. Average global growth over the previous four quarters has a statistically significant and negative effect on the structural component of the FDI flows. This points to the prevalence of the substitution channel in the medium run, where FDI inflows tend to be allocated according to the relative rates of return. Moreover, post-2002 reforms and strong macroeconomic performance provided a positive stimulus for FDI inflows. This is evident from the statistically significant effect of the structural component of productivity growth, reduced inflation uncertainty, and improvements in the composite ICRG on the structural component of FDI flows. Among these variables, growth opportunities provided the strongest impetus for FDI inflows. Push factors contributed more to the cyclical movements in the FDI flows. A decrease in global liquidity, measured by the cyclical component of broad

| Table D.7 | Estimated Coefficients |
| --- | --- | --- | --- |
| Variable | Coefficient | Standard error | Standardized coefficient |
| **Structural** | | | |
| Lagged value | -0.3020 | 0.3090 | 0.00 |
| ICRG composite | 0.0005 | 0.0001 | 0.25 |
| Inflation uncertainty (cyclically adjusted) | -0.1052 | 0.0584 | -0.48 |
| Real GDP growth (cyclically adjusted) | 1.0580 | 0.4477 | 0.76 |
| Global GDP growth | -0.0033 | 0.0017 | -0.41 |
| **Cyclical** | | | |
| Money growth in EU and United States (cyclic) | 0.2129 | 0.0812 | 0.18 |
| Credit spread in United States | 0.5606 | 0.3494 | 0.20 |
| Output gap | 0.0799 | 0.0473 | 0.15 |
| Slope of the yield curve in United States | -0.7689 | 0.2338 | -0.73 |

\textsuperscript{51} Alternative specifications of the ratio (up to a level of 0.4) do not change the results.
money growth, improved growth prospects in the advanced economies as measured by the reduction in credit spread. Higher long-run opportunistic costs of investment, measured by the positive slope of the yield curve, had a negative effect on the cyclical part of FDI flows. Cyclical movements in local output also contributed to higher uncertainty.

Figure D.69 shows the evolution of the FDI inflows and the two components. The estimated structural component exhibits a clear upward trend, which slowed down during the first wave of the global crises and expanded again over the post-2009 period with hump dynamics. The estimated structural component exceeds the level of actual FDI inflows between 2002 and mid-2005 and again from the second quarter of 2009 onwards. This confirms that the level of FDI inflows Turkey received over this period is lower than could be expected given the characteristics of the economy, mainly captured in the structural determinants. A part of the explanation for the weaker performance in attracting FDI inflows can be attributed to growing (cyclical) opportunities around the world: while global liquidity increased prior to the crises and over the post-2009 period, so did the investment opportunities in other emerging and, prior to the crises, advanced economies. Additional measures for attracting FDI inflows thus seem warranted. Although the composite measure of country’s riskiness captures relative improvements achieved over the past decade, more specific policies are required in order to differentiate Turkey from its competitors and increase the level of FDI inflows to its structural levels. Further improvements in the business environment, reduction in labor market rigidities, as well as specific sectoral policies need to be introduced over the medium term. Some measures have been already introduced by the government, such as tax incentives for investments in advanced technology sector. However, their usefulness still needs to be evaluated.

Figure D.69 | Components of FDI Inflows

Source: Central Bank of Turkey, Author’s calculations.

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52 See, for example, Mody and Taylor (2003) and Eichengreen at al. (2012) for the usefulness of the credit spread as a predictor of economic prospects.
We consider a large number of the prospective “push” determinants of portfolio inflows: growth rate of the world GDP, average growth rate in the United States and EU, average of the three-month money market rate in the United States and core euro area; average stock return in the United States and core euro area, credit spread, VXO index, TED spread, residual from the regression of VXO index on the TED spread as a pure measure of risk (Fratzscher 2012), and annualized average growth rate in broad money in the United States and core euro area. The following “pull” factors are included in the analysis: real GDP growth rate, exchange rate volatility, lagged measure of trade openness, measures of quality of institutions, political risk and the business environment (composite ICRG index, political ICRG index, and institutional ICRG index), public debt to GDP ratio, public debt to GDP ratio averaged over previous four quarters, foreign debt to GDP ratio, external reserves to GDP ratio, average stock return, and three-month interest rate on foreign exchange deposits. Relative variables are constructed—the interest rate differential and the stock return differential. Lagged values of the variables entered the specifications in order to capture the learning effects. Since the data for Turkish interest rate on U.S. dollar deposits is used, no direct adjustment for the foreign exchange risk in the specification is required.

Both global and local factors influenced the portfolio inflows (Table D.8) and the obtained results are in line with the existing literature. An increase in global risk perception, captured by the cyclically filtered credit risk (residual from the VXO regression), reduces portfolio flows in the medium run. Conversely, strong trends of reserve accumulation and public debt reduction decreased the perceived riskiness of the country and provided stimulus for higher capital inflows over the period, although the latter variable is on the border of statistical significance. Changes in global liquidity, measured by the lagged value of the TED spread, have a strong negative effect on flows in the short run. A positive interest rate and the stock return differential increase the investment attractiveness with a lag, consistent with the evidence.

### Table D.8  Estimated Coefficients

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Standard error</th>
<th>Standardized coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structural</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lagged value</td>
<td>–0.3958</td>
<td>0.2820</td>
<td>0.00</td>
</tr>
<tr>
<td>Credit risk (cyclically adjusted)</td>
<td>–0.0559</td>
<td>0.0194</td>
<td>–1.08</td>
</tr>
<tr>
<td>Debt to GDP ratio</td>
<td>–0.0625</td>
<td>0.0421</td>
<td>–0.47</td>
</tr>
<tr>
<td>FX reserves to GDP ratio</td>
<td>0.0502</td>
<td>0.2856</td>
<td>0.04</td>
</tr>
<tr>
<td><strong>Cyclical</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FX reserves to GDP ratio</td>
<td>0.0502</td>
<td>0.2856</td>
<td>0.04</td>
</tr>
<tr>
<td>Lagged value</td>
<td>0.1452</td>
<td>0.1586</td>
<td>0.00</td>
</tr>
<tr>
<td>Three–month interest rate differential (lagged)</td>
<td>0.1864</td>
<td>0.1074</td>
<td>0.19</td>
</tr>
<tr>
<td>Stock return differential (lagged)</td>
<td>0.1208</td>
<td>0.0591</td>
<td>0.36</td>
</tr>
<tr>
<td>Ted spread (lagged)</td>
<td>–2.5093</td>
<td>0.9493</td>
<td>–0.44</td>
</tr>
</tbody>
</table>
of the wide application of momentum strategies in international financial markets (see, for example, Menkhoff et al. (2012) and references therein).

Portfolio inflows exhibited significant volatility over the sample period (Figure D.70). The estimated structural component shows relatively more persistence. Improved country fundamentals and reduction of external vulnerability along with lower global perception of risk led to an increase in the structural component of the flows over the 2003–07 period. The actual flows over this period were often larger than predicted, reflecting large global liquidity and relatively high returns despite the decrease in the country’s riskiness. The first wave of the global crises reduced flows more than can be explained by the medium-term prospects. However, from mid-2009 onward, both the actual and structural components increased. The growth of the actual flows is larger compared to its structural determinants and this was especially evident in 2012. The results thus suggest that the current surge of portfolio inflows represents the influence of the cyclical factors. Despite the expected increase in the flows over the medium term, the current growth of the portfolio flows is unsustainable and further measures discussed earlier toward reduction of external exposure are required.

6. Conclusions

Overall, the recent experience of Turkey in the strong-growth phase points to the following conclusions.

- Critical assessment of the past growth model is important. The model may lead to buildup of a persistent current account imbalance, driven by a large decline in the private sector saving-investment balance that more than offset the improved public sector
balance in addition to the continued substitution toward imports reflects structural and nominal inefficiencies.

- Persistent current account deficits have led to accumulation of negative NFA stocks over the past decade and especially large foreign gross liabilities. This may have potentially negative effects in the future. Turkey’s gross liabilities increased from US$179 billion in 2003 to US$500 billion in 2011, including an increase in FDI stock from US$33 to US$140 billion. These developments are not necessarily negative, since they imply further financial integration in addition to growth effects. However, the evidence of dominant income outflows from debt accumulation and expanding FDI stocks in the current accounts of comparator countries suggests another source of the potential future current account deterioration and increased risk of its sustainability.

- The recent surge in portfolio inflows as a source of financing current account deficit presents a significant risk for external sustainability, especially due to the short-term debt character of the flows.

- Turkey may need to move to a growth model that breaks the link between growth and the current account deficit. Policy measures needed to reduce the current account deficit include narrowing the domestic saving-investment gap by increasing private savings; restricting further credit expansion; and structural policies to improve overall competitiveness, including exchange rate management.

- Additional measures for attracting FDI inflows seem warranted. This conclusion reflects the importance of international capital flows for financing booming investment (in line with the catching-up phase of development) and the expected reduction in the gross portfolio inflows, driven mostly by the slowdown in the global liquidity/low risk cycle in the medium run. While, the composite measure of country’s riskiness captures relative improvements achieved over the past decade, more specific policies are required in order to differentiate Turkey from its competitors and increase the level of FDI inflows to its structural levels.