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On the dynamics of the investment income balance

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Non-technical summary

Research Question

The last decades have been characterised by a large increase in international financial integration resulting in a vast build-up of countries' gross positions of external assets and liabilities by far exceeding net foreign assets. In some countries the investment income balance has become a major factor in determining both the magnitude and the dynamics of the current account balance. While the question of why the United States receives net investment income payments despite its net foreign liability position has received a lot of attention in the literature, a systematic framework for empirically analysing *changes* in the investment income balance is still lacking at the current juncture.

Contribution

In this paper, we propose a comprehensive decomposition framework for the dynamics of the investment income balance that allows us to quantify the contribution of five distinct factors that have previously been highlighted in different theoretical and empirical contributions in the literature. First, changes in the stock of external assets and liabilities mechanically impact net investment income through a level effect. Second, fluctuations in the international interest rate environment can be either beneficial or detrimental to countries' net investment income depending on whether they are net foreign debtors or creditors. Third, changes in the relative yield of external assets and liabilities can have sizable effects on the investment income balance in the presence of large gross positions. Fourth, compositional changes on both the asset and liability side can affect the investment income balance if yield differences exist between different investment classes. Fifth, given that the composition of foreign assets differs strongly from that of foreign liabilities, changes in international interest rates translate into changes in the investment income balance even in the presence of balanced net foreign asset positions. Disentangling the contribution of these five factors may be conducive to answering the question as to what extent investment income facilitates international risk sharing.

Results

We apply our decomposition framework to a rich German dataset spanning 11 different investment classes and provide a forensic account of the emergence and increase in the German investment income balance between 1999 and 2014. Focusing exclusively on the aggregate development of external assets and liabilities falls short of explaining the growth in German net investment income and around 40% of the increase is explained by changes in yields. In this regard, the reversal of the aggregate yield spread was the most important factor of the increase. By contrast, the fall in international interest rates after the global financial crisis actually stunted net investment income growth in line with Germany's net creditor position. Besides changes in aggregate yields, our results highlight the importance of considering the composition of external assets and liabilities as well as portfolio changes in order to understand the dynamics of the investment income balance.

Nichttechnische Zusammenfassung

Fragestellung

In den letzten Jahrzehnten haben sich die internationalen Finanzmärkte stark integriert. Viele Länder haben erhebliche Bruttobestände an Auslandsvermögen und -verbindlichkeiten aufgebaut. Diese übersteigen die jeweiligen Nettovermögenspositionen bei Weitem. Der Saldo der grenzüberschreitenden Vermögenseinkommen hat sich bei einigen Ländern zu einem Faktor entwickelt, der sowohl Umfang als auch Veränderung der Leistungsbilanz wesentlich bestimmt. Während die Frage, warum die USA trotz ihrer Nettoschuldnerposition einen Aktivsaldo in der Vermögenseinkommensbilanz erzielen, in der Literatur breit diskutiert wird, fehlt es zum gegenwärtigen Zeitpunkt noch an einem systematischen Rahmen für die empirische Analyse von *Veränderungen* der Vermögenseinkommensbilanz.

Beitrag

In diesem Papier wird ein Konzept für eine umfassende Zerlegung der Veränderung des Vermögenseinkommenssaldos vorgeschlagen. Dadurch wird es möglich, die Beiträge fünf verschiedener Einflusskanäle zu quantifizieren, welche in unterschiedlichen theoretischen und empirischen Arbeiten bereits hervorgehoben werden. Erstens beeinflussen die aktiv- und passivseitigen Bestände des Auslandsvermögensstatus die Nettovermögenseinkommen durch einen Niveaueffekt. Zweitens können sich Schwankungen im internationalen Zinsumfeld abhängig davon, ob die Länder Nettogläubiger oder -schuldner sind, entweder vorteilhaft oder nachteilig auf die Nettovermögenseinkommen niederschlagen. Bei hohen Bruttobeständen können drittens Veränderungen im Differenzial zwischen Aktiv- und Passivrendite beträchtliche Wirkungen auf den Vermögeneinkommenssaldo haben. Viertens kann es im Fall, dass es Renditeunterschiede zwischen einzelnen Anlageklassen gibt, zu Kompositionseffekten kommen. Fünftens können sich Veränderungen bei den internationalen Zinsen – selbst im Fall eines Nettoauslandsvermögens von Null – im Vermögenseinkommenssaldo niederschlagen, sofern sich die Auslandsforderungen deutlich anders zusammensetzen als die Verbindlichkeiten. Die rechnerischen Beiträge dieser fünf Faktoren zu ermitteln, dürfte hilfreich sein bei der Beantwortung der Frage, in welchem Umfang das Vermögenseinkommen die internationale Risikoteilung erleichtert.

Ergebnisse

Auf Basis eines recht detaillierten Datensatzes, der elf verschiedene Anlageklassen umfasst, lässt sich für Deutschland mit der Zerlegungsmethode das Entstehen und Anwachsen des Vermögenseinkommensüberschusses im Zeitraum zwischen 1999 und 2014 eingehend analysieren. Allein auf die Entwicklungslinien der aggregierten Aktiv- und Passivbestände abzustellen, erweist sich als unzureichend, das Wachstum der Nettovermögenseinkommen zu erklären; denn rund 40% der Zunahme ist auf Renditeveränderungen zurückzuführen. In dieser Hinsicht spielte die Umkehr des aggregierten Renditedifferenzials die wichtigste Rolle. Demgegenüber hemmte der allgemeine Zinsrückgang nach der globalen Finanzkrise vor dem Hintergrund der Nettogläuberposition Deutschlands den Zuwachs des Vermögenseinkommenssaldos. Abgesehen von den Veränderungen in den Durchschnittsrenditen sind auch die Zusammensetzung der Auslandsforderungen und -verbindlichkeiten und Portfolioumschichtungen von Bedeutung, um Veränderungen im Vermögenseinkommenssaldo zu verstehen.

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Abstract

While the positive return differential of the United States has attracted a lot of attention in the literature, the factors underlying the dynamics of the investment income balance have so far not been systematically investigated. Here, we propose a novel decomposition framework that accounts for the changes in net investment income. This allows us to disentangle contributions of changes in yield level and yield spread from those of changes in stocks as well as composition and portfolio effects. The analysis contributes conceptually to the question of how investment income might facilitate international risk sharing. We apply our decomposition framework to a rich German dataset spanning 11 different investment classes and provide a forensic account of the increase in the German investment income balance between 1999 and 2014. Focusing exclusively on the aggregate development of external assets and liabilities falls short of explaining the growth in German net investment income and around 40% of the increase is explained by changes in yields. Furthermore, our results highlight the importance of considering the composition of external assets and liabilities as well as portfolio changes in order to understand the dynamics of the investment income balance.

Keywords: Investment income balance, Return differential, Exorbitant privilege, International risk sharing

JEL classification: E50, F36, F45, G15

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1 Introduction

The last decades have been characterised by a large increase in international financial integration resulting in a vast build-up of countries' gross positions of external assets and liabilities by far exceeding net foreign assets (Lane and Milesi-Ferretti, 2001, 2003, 2007b). As a consequence, the investment income balance has become a major factor in determining both the magnitude and the dynamics of the current account balance. For example, between 1999 and 2014, the investment income balance accounted for an average of around one third of the median current account balance of OECD countries. Similarly, around one sixth of the variation in the median current account of OECD countries was explained by the investment income balance, making it the second most important factor after the goods trade balance. While the proximate factors influencing the *level* of the investment income balance have been highlighted in separate empirical and theoretical contributions in the literature (see below), a systematic framework for empirically analysing *changes* in the investment income balance is still lacking at the current juncture.

Changes in the investment income balance can, in principle, derive from (i) the accumulation of external assets and liabilities, (ii) changes in the overall yield level in the presence of a nonzero net foreign asset position, (iii) changes in the return differential originating from genuine yield spreads in individual investment classes, (iv) composition changes and (v) differences in the portfolio of assets and liabilities against the background of changing yields.

First, a country running current account surpluses – for example, due to a temporary shock to output or a comparatively high intertemporal elasticity of substitution in intertemporal models of the current account (Obstfeld and Rogoff, 1995) – accumulates net foreign assets, which, *ceteris paribus*, reward investors with an increased future stream of interest income from their internationally held assets.[1] A temporary accumulation of net foreign assets can also be related to population aging, which is eventually reversed when older cohorts dissave in retirement (Brooks, 2003; Kim and Lee, 2007).[2]

Second, a decline in the international interest rate environment is beneficial (detrimental) to net debtor (creditor) countries. As a result, changes in the overall yield level provide one potential transmission channel by which investment income flows may contribute to international risk sharing and consumption smoothing (Lane, 2001). Due to large positive and negative net foreign asset positions (Lane and Milesi-Ferretti, 2007b), even small changes in international interest rates can have sizable effects on the investment income balance. For example, net foreign liabilities in euro-area countries that received financial assistance at some point in the past five years[3] stood at an average of roughly 80% of GDP at the end of 2008 (Task Force of the Monetary Policy Committee of the ESCB, Rodriguez-Palenzuela, and Dées, 2016). Even a 1 percentage point drop in the

[1] Given the current magnitude of gross external positions in many countries, valuation effects can, in some instances, dwarf the changes in net foreign assets deriving from the current account (Obstfeld, 2012; Devereux and Sutherland, 2010). In Section 4.2, we discuss the interpretation of valuation effects in our decomposition framework.

[2] Demographic changes are thought to be one important factor explaining the increase in Germany's net international investment position (Busl, Jokisch, and Schleer, 2012), which will form the focus of the empirical part of this paper.

[3] Cyprus, Greece, Ireland, Portugal and Spain.

yield level would have resulted in a 0.8 percentage point improvement in the investment income balance (and hence the current accout balance) relative to GDP.[4]

Third, research on the "exorbitant privilege" of the United States[5] highlights the importance of differentiating between the overall yield level and return differentials when analysing a country's investment income balance. In the past decades, the United States has paid foreign investors less than it received on its foreign investments, resulting in a positive investment income balance in the presence of a net liability position (Obstfeld and Rogoff, 2005; Meissner and Taylor, 2006; Lane and Milesi-Ferretti, 2007a; Curcuru, Thomas, and Warnock, 2013). The existence of the yield spread in the United States has been attributed to persistent differentials in direct investment yields (Curcuru et al., 2013), amongst other factors. Similarly, long-term positive yield differentials have been documented for Japan and Switzerland as well as France and the United Kingdom, whereas the euro area as a whole does not appear to have a yield privilege (Habib, 2010; Meissner and Taylor, 2006). While the previous literature has focused mainly on the existence or absence of significant yield differentials over the long run, the dynamics of yield differentials and its impact on the investment income balance of individual countries have not been investigated. This is particularly important since the leverage resulting from large gross positions (Milesi-Ferretti and Lane, 2005; Lane and Milesi-Ferretti, 2007a) implies that the emergence of even small yield differentials can have a sizable impact on the investment income balance. For example, with French gross claims and liabilities standing at roughly 210% of GDP each in 2005 (Lane and Milesi-Ferretti, 2007b), a 0.5 percentage point improvement in the yield spread would have resulted in a more than 1 percentage point increase in its net investment income relative to GDP.

Fourth, in the last decades, the composition of countries' international investment position has changed substantially – for example, displaying an increase in the importance of equity financing for emerging markets (Lane and Milesi-Ferretti, 2007b). Insofar as different investment classes vary in their yield, this may also have repercussions for the investment income balance. For example, part of the positive return differential of the United States has been attributed to poor timing of foreign investors when reshuffling their US portfolios (Curcuru, Dvorak, and Warnock, 2010).

Fifth, given that the composition of foreign assets differs strongly from that of foreign liabilities, changes in the international interest rate environment can impact the investment income balance even in the presence of a balanced net foreign asset position. For example, advanced economies usually hold long positions in risky assets such as equity and short positions in safe assets such as debt (Lane and Milesi-Ferretti, 2007b; Gourinchas and Rey, 2007). As a consequence, in the event of a fall in the yield on debt, the investment income balance of advanced economies would be boosted.

In this paper, we propose a comprehensive decomposition framework, that allows us to quantify the contribution of the aforementioned factors determining the dynamics of the investment income balance. Our decomposition framework is implemented in discrete time using an index decomposition analysis (Ang, Liu, and Chew, 2003). We apply

[4]Note that all the variables considered in this paper are in nominal terms. In order to assess the welfare consequences of changes in the investment income balance, it would be necessary to also take the contemporaneous inflation dynamics into account.

[5]This sometimes also refers to the presumed benefit of the United States deriving from the US dollar being an international reserve currency.

our decomposition framework to a rich German dataset spanning 11 different investment classes between 1999 and 2014, during which the German investment income balance turned from a deficit of EUR 17.2 bn to a sizeable surplus of EUR 61.3 bn. We show that focusing exclusively on the development of external assets and liabilities falls short of explaining the change in the German investment income balance and that around 40% of the increase is explained by changes in aggregate yields. In this regard, the reversal of the aggregate yield spread from −0.75% in 1999 to +0.47% in 2014 was the most important factor, accounting for around 50% of the increase in mathematical terms. By contrast, the fall in international interest rates after the global financial crisis stunted growth in the investment income given Germany's net creditor position, which, in mathematical terms, reduced net German investment income by about 10% of the total change over the time period under consideration. The remainder of roughly 60% was accounted for by the accumulation of net foreign assets as a consequence of Germany's sustained current account surpluses during this period. Besides changes in aggregate yields, our results highlight the importance of considering the composition of external assets and liabilities as well as portfolio changes in order to understand the dynamics of the investment income balance. Both domestic and foreign investors shifted their portfolios towards higher-yielding investment classes, accounting for plus and minus one quarter of the increase in the investment income balance respectively. Netting the two suggests that, overall, Germany gained from compositional changes in its international investment position. Domestic investors appear to have been more sensitive to yield developments, which may be partially explained by safe haven flows into low-yielding German assets such as government bonds during the global financial and sovereign debt crisis in the euro area (De Santis, 2012). Falling yields in investment classes in which German investors held long positions decreased German net investment income by around 4% over the time period under consideration.

This article can inform several strands of literature. First of all, research on the exorbitant privilege has mainly focused on the structural return differential of the United States and has been aimed at identifying its main determinants. This has led others to look for similarly persistent return differentials in other countries (Habib, 2010; Meissner and Taylor, 2006). Our paper complements this literature by highlighting the importance of considering *changes* in the yield spread between external assets and liabilities in explaining the short-run dynamics of the investment income balance. The emergence of yield spreads in individual investment classes can be traced back to economic phenomena such as changes in fundamentals and contagion as, for example, in the case of long-term debt securities in the German international investment position (Beirne and Fratzscher, 2013; Bernoth, von Hagen, and Schuknecht, 2012). Furthermore, we show that changes in the composition of assets and liabilities as well as differences in the portfolio of assets and liabilities can also play a big role in accounting for changes in the aggregate yield spread.

Standard economic models predict that international financial integration leads to perfect cross-country consumption smoothing, as international investments generate a higher return when the domestic economy is performing less well vis-á-vis the rest of the world (Backus, Kehoe, and Kydland, 1992; Obstfeld, Rogoff, and Wren-Lewis, 1996). Empirically, the extent of international risk sharing is usually assessed by focusing on the properties of consumption growth across countries (Lewis, 1996) or, alternatively, by directly looking at the effect of international investment income flows on income smooth-

ing (Lane, 2001; Balli, Basher, and Balli, 2013). Overall, the evidence suggests a limited degree of international risk sharing, but has also highlighted a marked increased in the last two decades (Giannone and Reichlin, 2006; Artis and Hoffmann, 2006; Sörensen, Wu, Yosha, and Zhu, 2007; Kose, Prasad, and Terrones, 2009). The results in our paper emphasise that changes in the investment income balance can derive from a range of different effects. In principle, the prediction of standard economic models applies exclusively to changes in the yield spread across the business cycle. While some of the remaining effects may be favourable to income smoothing – such as the yield level for a net debtor country during a global crisis with a concomitant decline in international interest rates – others may set the bar very high for detecting an aggregate effect. From this vantage point, it appears beneficial to take the heterogeneity of the effects on the investment income balance into account when conducting future studies on international risk sharing.

The paper is organised as follows. Section 2 outlines our decomposition framework. Section 3 describes our German investment income balance dataset and its salient features over time. Section 4.1 provides an overview of the decomposition results for Germany as well as a detailed discussion of the results for different sub-periods. Section 4.2 examines the role of valuation effects in our decomposition framework and Section 4.3 evaluates the sensitivity of our results to a range of methodological choices. Section 5 concludes.

2 Empirical Methodology

The investment income balance, IIB, of a given country is the difference between the earnings from foreign assets held by domestic residents, II^A, and the payments to foreigners holding domestic liabilities, II^L. The latter can be expressed as the difference between the product of gross foreign assets, A, and gross foreign liabilities, L, with their corresponding yields i^A and i^L:

$$IIB = II^A - II^L = i^A A - i^L L. \tag{1}$$

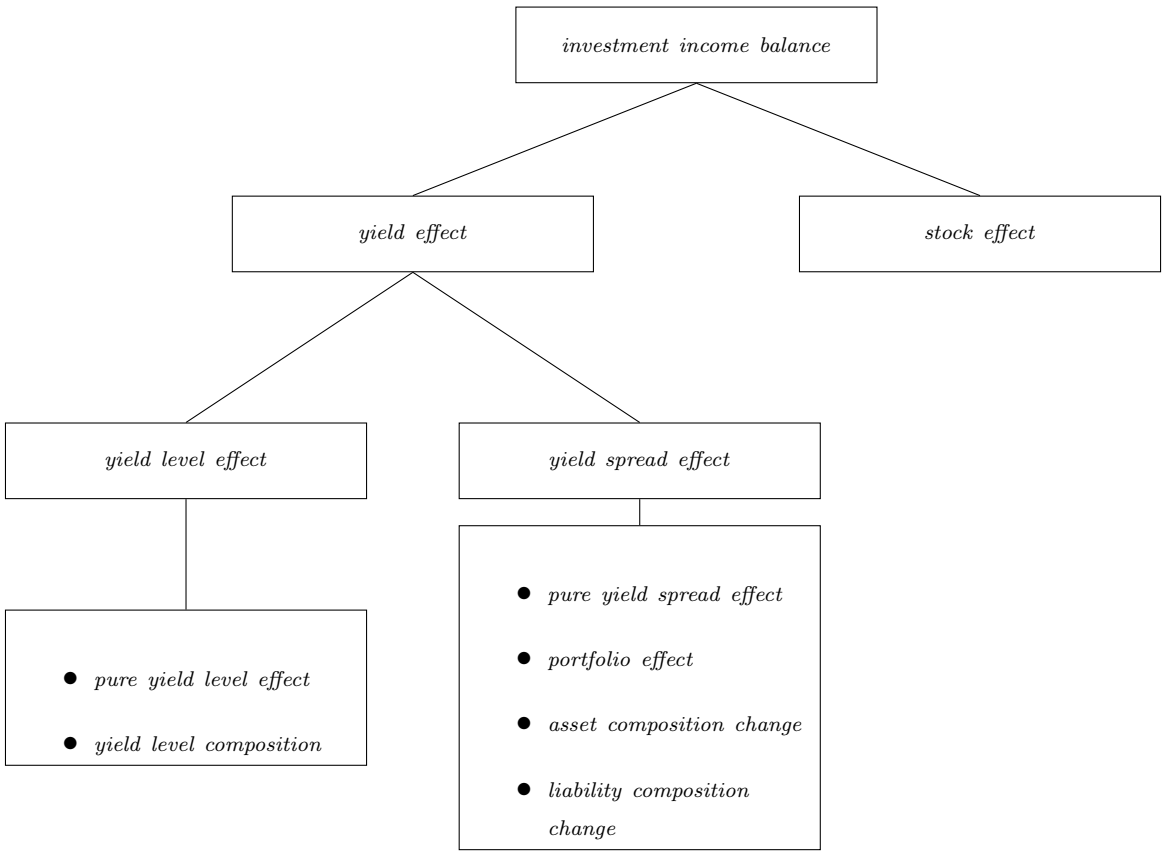
A country's external position usually consists of different asset classes such as foreign direct investment and debt, whose individual weights in a country's investment portfolio, together with their respective yield, determine the overall macroeconomic profitability of a country's external assets. In order to take these composition effects into account, the aggregate yield on foreign assets, i^A, is expressed as the weighted sum of the yields of the individual investment categories available to domestic residents,

$$i^A = \sum_j^J \frac{II_j^A}{A} = \sum_j^J \frac{A_j}{A}\frac{II_j^A}{A_j} = \sum_j^J w_j^A i_j^A, \tag{2}$$

where A_j denotes the value of assets of investment category j, II_j^A and i_j^A are the corresponding investment income and yield, w_j^A is the weight of investment category j in total assets and J captures the total number of different investment categories. The aggregate yield on foreign liabilities, i^L, is defined analogously, which allows us to write the investment income balance of a country compactly as

$$IIB = \sum_j^J w_j^A i_j^A A - \sum_j^J w_j^L i_j^L L. \tag{3}$$

Figure 1: Tree Structure Showing the Different Levels of the Decomposition.



2.1 Decomposition Framework

In continuous time, the change in the investment income balance in Equation (1) can be computed by calculating its total derivative with respect to time:

$$\begin{aligned} d(IIB) = (i^A dA - i^L dL) & \qquad (\textit{stock effect}) \\ + (di^A A - di^L L). & \qquad (\textit{yield effect}) \end{aligned}$$

Two factors emerge that determine changes in the investment income balance. The *stock effect* captures the impact of increases or decreases in the stock of assets and liabilities on the country's international investment position.[6] The *yield effect* measures any changes in the investment income balance that are due to fluctuations in the aggregate yield of both assets and liabilities.

The literature on international financial integration has highlighted the importance of return differentials between external assets and liabilities (Curcuru, Dvorak, and Warnock, 2008; Curcuru et al., 2013). Hence, in a second step, the *yield effect* is expressed with reference to the yield spread ($s = i^A - i^L$) and the country's net foreign assets ($N = A - L$). This renders it possible to differentiate between a *yield level effect* and a *yield spread*

[6]Note that changes in assets and liabilities can, in principle, derive from current account surpluses or deficits, and/or valuation effects and other changes in volume (see Section 4.2 for a detailed discussion of this point).

effect[7]:

$$
\begin{aligned}
(di^A A - di^L L) &= di^A A + (ds - di^A)L \\
&= \frac{1}{2}(di^A + di^L)N && \textit{(yield level effect)} \\
&+ \frac{1}{2}ds(A + L). && \textit{(yield spread effect)}
\end{aligned}
$$

The *yield level effect* captures the effect that changes in the international interest rate environment[8] have on the investment income balance. Note that changes in the yield level only have an impact on the investment income balance if the net foreign assets of a country are different from zero. The *yield spread effect* quantifies the impact that changes in the relative yield on foreign assets and liabilities have on the investment income balance. Note that, in the presence of large gross positions, even small fluctuations in the yield differential can have sizeable effects on the investment income balance since the return differential is multiplied with the arithmetic mean of the gross asset and liability position of a country.

So far, we have focused exclusively on aggregate yields taking the composition across investment categories as given. However, a change in the yield on assets and liabilities can derive from actual changes in the yields of individual investment classes as well as simply from changes in the weights of the investment classes that compose the overall portfolio (cf. Equation (3)). Accordingly, the *yield level effect* is split into a *yield level composition effect* that is due to changes in the portfolio composition of a country's assets and liabilities and a *pure yield level effect* that is entirely due to genuine changes in the yield of individual investment classes:

$$
\begin{aligned}
\frac{1}{2}N(di^A + di^L) &= \frac{1}{2}N\sum_j^J (w_j^A di_j^A + w_j^L di_j^L) && \textit{(pure yield level effect)} \\
&+ \frac{1}{2}N\sum_j^J (dw_j^A i_j^A + dw_j^L i_j^L). && \textit{(yield level composition effect)}
\end{aligned}
$$

A similar distinction can be introduced for the *yield spread effect*. On the one hand, changes in the composition of assets and liabilities are captured by an *asset composition change effect* and a *liability composition change effect*. On the other hand, we need to differentiate between changes in the yield spread arising solely from the difference in the composition of assets and liabilities in the presence of varying yields (*portfolio effect*)[9] and those arising from genuine changes in the yield spread of a given investment category

[7] See Section A.1 for a derivation.

[8] The yield level is proxied by the arithmetic mean of a country's yield on foreign assets and liabilities. Alternative definitions – such as using the yield on assets as a reference point (Section A.2) – are conceivable, but do not change the results appreciably. These additional results are available upon request.

[9] For example, *ceteris paribus*, the aggregate yield spread increases if the yields on assets and liabilities of a given investment category both increase by the same amount if this particular investment class has a higher weight in a country's foreign assets than its foreign liabilities (see Section A.4 for an example).

(*pure yield spread effects*)[10]:

$$\begin{aligned}
\frac{1}{2}(A+L)ds = &\frac{1}{4}(A+L)\sum_j^J (w_j^A + w_j^L)(di_j^A - di_j^L) && (\textit{pure yield spread effect})\\
&+\frac{1}{4}(A+L)\sum_j^J (w_j^A - w_j^L)(di_j^A + di_j^L) && (\textit{portfolio effect})\\
&+\frac{1}{2}(A+L)\sum_j^J dw_j^A i_j^A && (\textit{asset composition change effect})\\
&-\frac{1}{2}(A+L)\sum_j^J dw_j^L i_j^L. && (\textit{liability composition change effect})
\end{aligned}$$

The overall structure of the decomposition of the investment income balance into the three main effects and the additional sub-divisions described above is depicted in Figure 1. In Section A.4 we provide a range of examples of the individual effects of the decomposition in order to help build intuition. Furthermore, Section A.5 details the technicalities of implementing the decomposition in discrete time.

3 Data and Descriptive Statistics

3.1 Data

The decomposition into the three main effects – *stock effect*, *yield level effect* and *yield spread effect* – can be obtained by merely using aggregate data on external assets and liabilities as well as investment income expenditure and receipts. However, in order to take the sub-divisions of the *yield level effect* and *yield spread effect* into account, a finer-grained breakdown is required. Here, we use a rich dataset for Germany that differentiates between 11 different investment categories for the time period 1999 to 2014. For stocks, end-of-year values are considered, while we use the cumulated annual total for flows. The three functional categories (1) direct investment, (2) portfolio investment and (3) other investment[11] are split into (1a) equity and (1b) debt instruments; (2a) shares, (2b) investment fund shares, (2c) long-term debt securities and (2d) short-term debt securities; and (3a) monetary financial institutions, (3b) enterprises and households, (3c) general government, (3d) Bundesbank[12] and (3e) TARGET2 balance. The latter form part of the Bundesbank's external position but are treated as a separate category in the analysis due

[10] See Section A.3 for a derivation. Note that similar to the division of the *yield effect* we take the arithmetic mean of the weights on the asset and liability side for the *pure yield spread effect* and the arithmetic mean of the yields on assets and liabilities for the *portfolio effect*.

[11] Financial derivatives are excluded from our analysis since no primary income accrues on them (International Monetary Fund, 2009). Cross-border holdings of euro currency, which are recorded in the international investment position according to the 6th edition of the Balance of Payments Manual, were excluded for the same reason (Deutsche Bundesbank, 2015). Interest-bearing reserve assets are accounted for in the sub-category Bundesbank.

[12] The payments on Bundesbank liabilities for the years 1999 and 2000 in the official statistics were adjusted downwards in order to avoid implausibly high yield estimates.

to their special nature and dynamics during the European sovereign debt crisis.[13] The implicit yield of investment category i in year t is computed by scaling the investment income (expenditure) by the average asset (liability) position in year $t-1$ and t.[14]

3.2 Descriptive Statistics and Stylised Facts

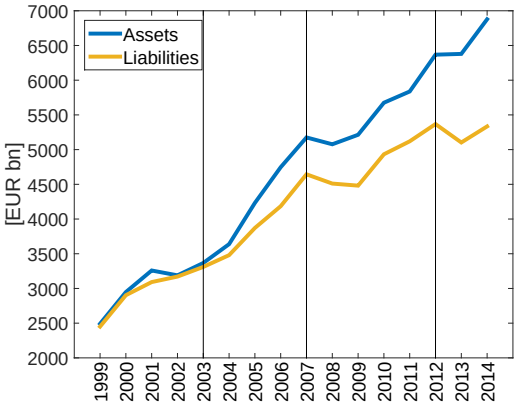
During the time period 1999 to 2014, Germany's international investment position and its yield underwent several fundamental changes, which, on the whole, contributed to a substantial increase in the German investment income balance. Similar to other advanced economies and in line with the trend of deepened international financial integration, Germany's foreign assets (and liabilities) have grown rapidly in the past 16 years and their value has almost tripled (more than doubled) since 1999 (Figure 2a). After a decade of current account deficits related to the economic ramifications of German reunification, Germany started to record current account surpluses from 2002 onwards, which were reflected in a strong increase in Germany's net foreign asset position (Figure 2b). The overall yield that international investors obtained from their investments took a dip after the bursting of the dot-com bubble, and steeply declined after the onset of the international financial crisis in 2007 (Figure 2c). While German debtors initially paid relatively more on their liabilities than German creditors received for their assets, the return differential turned positive after 2003 and became even more pronounced as the sovereign debt crisis in the euro area neared its peak in 2011 (Figure 2d). As a consequence of the changes in stocks and their respective yields, the German investment income balance turned from a deficit of EUR 17.2 bn in 1999 to a surplus of EUR 61.3 bn in 2014 (Figure 2f).

At the same time, the composition of the German international investment position changed substantially (Table 1). For both assets and liabilities, direct investment and long-term debt securities gained weight to the detriment of shares as well as other investment by monetary financial institutions (and enterprises and households on the asset side). The reverberations of the sovereign debt crisis in the euro area were reflected in a large rise in the Bundesbank's TARGET2 position. Structurally, Germany has a long position in risky assets such as direct investment and shares (at least at the beginning

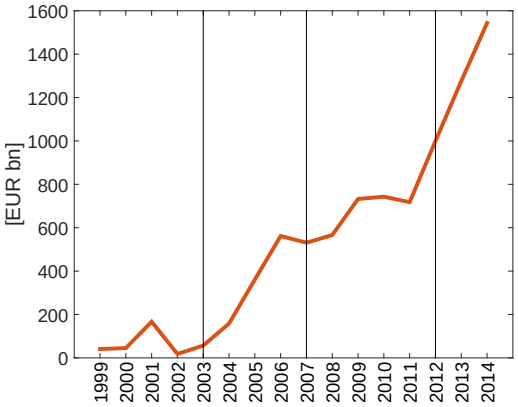
[13] The TARGET2 balance differs from the other investment categories in that it is a net concept, i.e. either the asset or the liability side is positive with the counterpart being equal to zero for every point in time. The same holds for the income and payments that result from the TARGET2 balance. Initially, the TARGET2 balance generates interest income in accordance with the ECB's main refinancing operations, which is recorded as investment income in the participating countries' balance of payment statistics. However, all revenue and expenditure of individual central banks in the Eurosystem related to monetary policy operations is cleared at the end of each year and distributed according to the official capital key of the ECB. As the TARGET2 system as a whole does not generate any revenue, national central banks effectively make (receive) a payment in the amount of the initial interest receipt (payment), which is recorded as secondary income in the balance of payments. Since the initial investment income is offset by a flow of the same absolute magnitude but opposite sign in the secondary income account, TARGET2 balances do not generate any income from the perspective of the current account as a whole (Ulbrich and Lipponer, 2012). See Section 4.3 for an additional analysis considering the robustness of our results regarding the allocation of TARGET2 income towards the investment income balance.

[14] For TARGET2 balances, we use daily data instead in order to avoid implausible yield estimates in the initial years of the sample when the balance fluctuated at around zero. The results using end-of-year values are available upon request. For the years 2008 to 2014, the yield on TARGET2 liabilities was set to the one for TARGET2 assets since no implied yields could be calculated given that both TARGET2 liabilities and expenditure was equal to zero in those years.

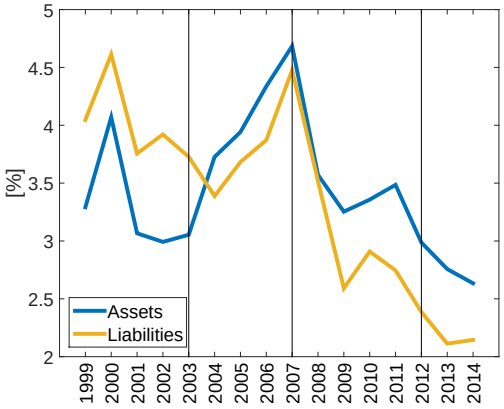
Figure 2: Key Indicators for the German Investment Income Balance



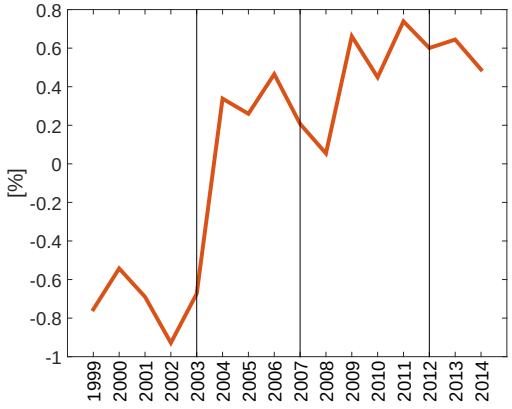
(a) Foreign Assets and Liabilities



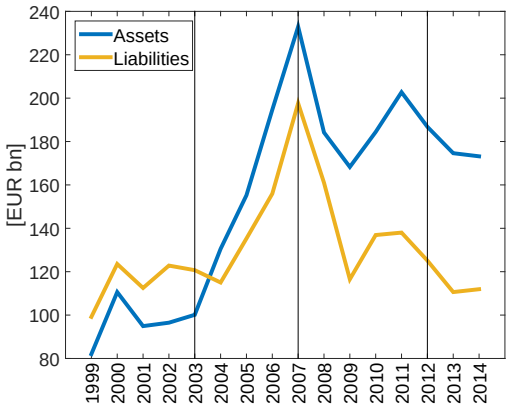
(b) Net Foreign Assets



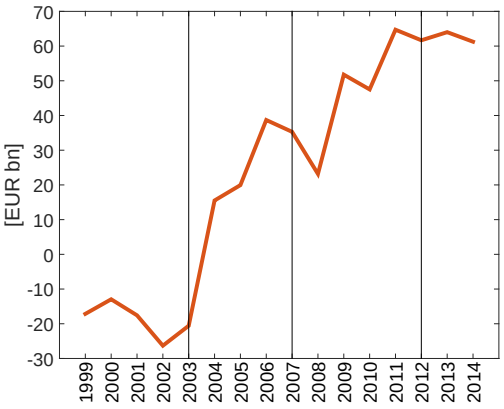
(c) Yield on Assets and Liabilities



(d) Yield Spread



(e) Income/Expenditure on Assets/Liabilities



(f) Investment Income Balance

of the sample) and a short position in debt in line with other advanced economies (Lane and Milesi-Ferretti, 2007b). In addition, at the end of the sample, Germany was also long in the TARGET2 position, which was not an active investment decision of German residents, but is linked to cross-border payment transaction in the euro area.

Table 1: Share of Different Investment Classes in Total German Foreign Assets and Liabilities (as a Percentage).

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Assets																
Direct investment																
Equity	14.4	15.3	16.9	17.5	17.2	16.7	16.4	16.6	16.9	16.8	16.9	17.2	17.5	17.4	17.9	18.3
Debt instruments	4.0	4.0	4.2	4.3	4.0	3.6	3.5	3.3	3.1	3.5	4.0	4.1	4.3	4.8	5.5	5.7
Portfolio investment																
Shares	16.3	16.4	14.6	11.0	9.2	9.1	9.6	9.1	7.0	4.5	3.3	3.7	3.5	3.3	4.0	4.7
Investment fund shares	4.0	4.2	4.3	4.1	4.2	4.4	4.9	5.7	6.2	5.9	5.6	5.8	5.5	5.2	5.7	6.3
Long-term debt securities	15.0	15.0	15.9	17.6	18.6	19.1	20.1	21.0	21.2	21.0	22.3	23.4	22.8	22.5	24.0	24.9
Short-term debt securities	0.5	0.4	0.3	0.4	0.5	0.5	0.6	0.5	0.8	0.8	0.6	0.4	0.4	0.4	0.4	0.4
Other investment																
Monetary financial institutions	25.1	25.0	25.9	28.3	30.1	30.7	30.2	29.8	30.5	31.7	30.2	25.7	23.1	20.7	19.3	19.1
Enterprises and households	14.0	13.2	12.5	12.1	12.0	12.2	11.3	10.8	11.0	11.3	11.4	11.4	11.6	9.7	8.4	8.3
General government	1.7	2.0	1.9	1.5	1.3	1.0	0.8	0.8	0.6	0.4	0.5	1.1	1.7	2.1	2.5	2.6
Bundesbank	4.3	3.9	3.5	3.2	2.9	2.5	2.3	2.2	2.1	2.1	2.4	2.8	3.2	3.2	2.8	2.5
TARGET2	0.8	0.6	0.0	0.1	0.1	0.1	0.3	0.2	0.6	1.8	2.9	4.5	6.3	10.7	9.3	7.3
Liabilities																
Direct investment																
Equity	5.6	7.5	7.9	7.2	8.0	8.7	8.9	9.1	9.4	9.3	9.1	9.0	8.9	8.9	9.2	9.6
Debt instruments	8.1	9.3	10.8	11.6	11.7	10.5	9.4	9.2	9.0	8.9	9.3	9.5	9.7	10.8	12.2	12.5
Portfolio investment																
Shares	14.9	12.5	10.3	7.9	7.0	7.9	8.4	9.7	11.5	9.6	7.4	8.2	7.3	7.0	8.6	9.5
Investment fund shares	0.4	0.6	0.7	0.7	0.6	0.6	0.7	0.8	0.9	0.8	1.3	1.9	2.0	2.2	2.4	2.5
Long-term debt securities	26.0	25.6	25.8	28.3	30.1	31.6	33.9	33.4	31.7	32.3	33.0	31.9	32.6	33.9	33.5	33.9
Short-term debt securities	2.7	2.5	2.0	2.2	2.7	2.6	2.2	1.9	2.6	3.7	4.4	4.4	4.0	3.6	3.3	3.0
Other investment																
Monetary financial institutions	31.7	31.4	31.4	30.5	28.4	26.8	25.7	24.5	23.2	22.3	20.9	19.7	18.6	17.4	16.5	15.6
Enterprises and households	9.3	9.5	10.0	10.1	9.8	9.6	9.3	9.7	9.8	10.4	11.5	11.5	11.5	10.0	8.4	8.4
General government	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5	0.6	1.5	2.6	2.4	2.2	2.2
Bundesbank	0.3	0.3	0.3	0.8	1.2	1.0	1.0	1.1	1.4	2.1	2.4	2.3	2.8	3.7	3.8	2.9
TARGET2	0.3	0.4	0.2	0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Similar to the developments in the composition of Germany's international investment position, there was a plethora of changes in the yield of individual investment classes. On the plus side, the yield on direct investment equity as well as on shares rose slightly on the whole, particularly in the run-up to the international financial crisis. The decline in the international interest rate environment, however, resulted in a general deterioration of yields of debt securities and "other investment" across all investment classes with the exception of those of enterprises and households.[15] On balance, this resulted in the decrease of yields at the aggregate level towards the end of the sample period.

[15]Note that differences in the yield on TARGET2 assets and liabilities are not due to any actual interest rate differentials, but a consequence of fluctuations of assets and liabilities during the year against the backdrop of changes in the ECB's main refinancing operation.

Table 2: Yield of Different Investment Classes of German Foreign Assets and Liabilities (as a Percentage).

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Assets																
Direct investment																
Equity	3.5	3.4	0.3	1.4	2.8	7.0	7.6	8.2	7.8	2.3	5.8	7.0	7.5	6.1	6.1	5.8
Debt instruments	2.8	4.7	3.0	1.7	1.2	1.8	2.1	2.7	4.1	4.0	3.4	3.4	2.9	2.2	1.9	1.7
Portfolio investment																
Shares	1.2	2.0	2.1	2.4	2.3	3.0	2.5	2.7	3.5	5.1	3.2	2.9	3.2	3.1	3.1	2.8
Investment fund shares	4.5	4.7	4.6	4.6	3.8	3.4	2.9	2.8	2.6	3.1	2.4	2.0	2.2	2.0	2.0	1.6
Long-term debt securities	5.3	6.0	6.0	5.5	5.2	4.8	4.4	4.2	4.7	4.9	5.1	4.6	4.7	4.4	3.2	3.0
Short-term debt securities	3.9	9.6	6.3	3.8	2.0	1.7	1.8	4.1	4.2	6.3	1.8	0.8	2.0	0.9	1.0	1.0
Other investment																
Monetary financial institutions	3.7	4.9	3.7	3.0	2.6	2.5	2.9	3.8	4.5	3.3	1.4	1.3	1.5	1.1	1.0	1.0
Enterprises and households	2.2	2.7	2.1	1.9	2.3	2.5	2.8	3.0	3.1	2.6	1.9	2.1	2.2	2.5	3.0	3.1
General government	2.3	3.5	3.4	3.8	3.8	5.4	9.9	8.6	3.1	2.0	2.2	6.4	2.4	1.8	1.6	1.4
Bundesbank	4.3	5.5	3.7	2.9	1.9	1.2	1.9	2.0	3.0	4.1	2.9	0.9	0.2	0.4	0.2	0.2
TARGET2	2.6	4.0	4.8	3.3	2.2	2.0	2.1	2.8	4.1	4.8	1.5	1.0	1.3	0.9	0.6	0.2
Liabilities																
Direct investment																
Equity	4.3	2.2	-3.5	3.0	3.7	3.4	6.2	5.4	7.4	0.2	1.5	5.7	4.8	5.1	3.7	4.4
Debt instruments	2.2	4.3	4.4	4.0	3.7	3.3	3.5	3.9	4.4	4.0	3.8	4.2	3.7	3.0	2.7	2.5
Portfolio investment																
Shares	1.8	1.8	2.2	2.1	2.6	2.3	2.4	3.0	3.6	4.4	4.7	3.6	5.2	4.5	3.7	3.8
Investment fund shares	15.1	11.3	7.6	9.4	11.5	10.6	7.4	6.4	5.4	4.9	2.8	1.8	1.8	1.6	1.3	1.5
Long-term debt securities	5.2	5.8	5.6	5.1	4.6	4.1	3.6	3.5	3.8	3.8	2.8	3.0	2.7	2.4	2.1	2.0
Short-term debt securities	2.3	5.0	4.4	4.1	3.6	2.6	2.0	3.3	3.7	4.4	2.1	1.2	2.2	1.1	0.4	0.4
Other investment																
Monetary financial institutions	5.1	5.9	4.8	4.0	3.2	3.0	3.6	4.3	4.9	3.5	1.7	1.6	1.5	1.1	0.9	0.9
Enterprises and households	2.4	2.5	2.2	2.3	3.3	2.8	2.8	3.2	3.7	3.2	1.9	1.9	1.7	1.6	1.9	1.7
General government	3.4	2.9	2.1	1.6	2.3	2.2	2.4	2.5	3.1	2.4	1.9	4.5	1.1	0.7	1.4	1.1
Bundesbank	5.5	7.0	5.7	1.8	3.0	3.1	5.7	6.2	8.2	8.2	4.0	1.6	1.9	0.9	0.6	0.3
TARGET2	2.3	4.5	4.2	3.3	2.4	2.1	2.1	2.8	4.1	4.8	1.5	1.0	1.3	0.9	0.6	0.2

4 Decomposing Changes in the Investment Income Balance

In order to fix ideas, we mainly focus in the following on changes between four time periods (1999–2003, 2003–2007, 2007–2012, 2012–2014), which we determined on the basis of global economic conditions and changes in both the German investment income balance and net foreign assets and aggregate yield developments.[16] Section 4.1 presents our

[16]The first period (1999 to 2003) spans the global slowdown in the aftermath of the bursting of the dot-com bubble. During this time, the German economy faced a persistent economic slump resulting from structural problems primarily in the labour market. Germany's external position was characterised by a small negative investment income balance as well as a negligible net foreign asset position and a negative return differential. From 2003 to 2007 (second period), the world economy experienced an economic upswing from which the German economy benefited due to an export-oriented industrial sector whose competitiveness was restored, inter alia, owing to wage moderation. This and the implementation of structural reforms, however, held back internal demand during this period. As a consequence, Germany experienced current account surpluses. The resulting steady increase in Germany's net foreign assets turned the investment income balance positive. In addition, the yield differential also entered positive territory. The third period (2007 to 2012) comprises the international financial crisis as well as the subsequent sovereign debt crises in the euro area, which led to a general decline in the international yield level. The spread between German government bonds and those of crisis countries widened, with changes in investors' risk sensitivity resulting in a further increase in the German return differential. The German economy was strongly hit by the deep slump in global demand during the Great Recession but recovered quickly thanks to the absence of internal adjustment needs and renascent demand for its exports particularly in emerging markets. As a consequence, Germany's net foreign assets and its investment income balance continued to increase. In the fourth period (2012 to 2014), the most acute crisis symptoms were beginning to subside, bringing about no further increase in either the yield spread or

baseline results.[17] We begin with an overview detailing annual results as well as factors determining the overall change in the German investment income balance between 1999 and 2014. We then proceed with detailed results for the sub-periods highlighted above. Section 4.2 discusses the interpretation of valuation effects in our framework and their impact on the decomposition results. Finally, in Section 4.3 we perform a variety of robustness tests in order to evaluate the sensitivity of our results to a range of methodological choices.

4.1 Baseline Results

4.1.1 Overview

Between 1999 and 2014, the German investment income balance turned from a deficit of EUR 17.2 bn to a sizable surplus of EUR 61.3 bn, corresponding to an average increase of EUR 5.2 bn per year. Table 3 shows the contribution of changes in the stock of foreign assets and liabilities (*stock effect*), changes in the yield level (*yield level effect*) and changes in the yield spread (*yield spread effect*) to the overall change in the German investment income balance between 1999 and 2014.[18]

Table 3: Decomposition of the Change in the German Investment Income Balance (EUR bn).

	1999 – 2000	2000 – 2001	2001 – 2002	2002 – 2003	2003 – 2004	2004 – 2005	2005 – 2006	2006 – 2007	2007 – 2008	2008 – 2009	2009 – 2010	2010 – 2011	2011 – 2012	2012 – 2013	2013 – 2014	⌀ period
Stock effect	**-1.4**	**0.3**	**-1.5**	**-2.5**	**2.1**	**6.7**	**9.6**	**5.2**	**0.3**	**3.2**	**4.2**	**1.7**	**5.8**	**8.1**	**7.2**	**3.3**
Yield level effect	**0.3**	**-0.7**	**0.1**	**-0.0**	**0.1**	**0.5**	**1.0**	**2.4**	**-5.6**	**-3.7**	**1.5**	**-0.1**	**-3.3**	**-3.0**	**-0.6**	**-0.7**
Pure yield level effect	0.3	-0.7	-0.0	-0.1	0.1	0.4	1.0	2.4	-5.7	-3.8	1.1	-0.2	-3.3	-3.4	-1.4	-0.9
Yield level composition effect	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.4	0.1	0.1	0.4	0.8	0.1
Yield spread effect	**5.3**	**-4.2**	**-7.3**	**8.3**	**33.8**	**-2.7**	**8.1**	**-11.0**	**-6.8**	**29.2**	**-9.9**	**15.6**	**-5.6**	**-2.7**	**-9.3**	**2.7**
Pure yield spread effect	16.2	5.3	-21.4	-0.3	27.2	-7.9	8.0	-10.1	24.3	24.1	-24.2	15.4	-5.3	0.6	-10.6	2.8
Portfolio effect	-10.1	-9.6	15.3	8.2	6.9	5.7	-0.7	-1.9	-30.9	2.6	10.9	-1.1	1.4	-0.4	0.7	-0.2
Asset composition effect	0.1	1.0	2.1	1.3	0.2	0.1	0.7	1.1	0.7	2.1	4.6	1.1	-0.4	1.0	3.8	1.3
Liability composition effect	-0.8	-0.9	-3.2	-0.8	-0.4	-0.7	0.1	-0.2	-0.9	0.4	-1.3	0.1	-1.3	-3.9	-3.2	-1.1

The accumulation of net foreign assets accounted for about 60% or an average of EUR 3.3 bn per year of the increase in the German investment income balance between 1999 and 2014. While the *stock effect* was initially negative, since 2003, German current account surpluses have always been sufficiently large – given the prevailing yields on assets and liabilities – to augment Germany's net investment income. By contrast, the developments of the overall yield level at large were detrimental to Germany's investment income balance. The *yield level effect* reduced net investment income by EUR 0.7 bn every year, which is about 10% of the total change over the time period under consideration. This is in line with Germany's net creditor position and the overall decline in yields observed between 1999 and 2014. However, note also that Germany benefited from the

the German investment income balance, although the overall yield level continued to decline. Germany's net foreign assets kept building up as a consequence of its steady current account surpluses, fueled by favourable exchange rate and terms of trade developments.

[17] In the following, we focus on the results using the Shapley-Siegel decomposition (Section A.5) and present the results using the logarithmic mean Divisia index decomposition as a robustness check in Section 4.3.

[18] The decomposition framework can also be applied to changes in the investment income balance relative to GDP (Section A.6).

temporary rise in international interest rates prior to the global financial crisis, although the gains were small in comparison to the losses incurred since 2007. On the whole, the second most important factor was a favourable change in the return differential. The *yield spread effect* accounted for around 50% or EUR 2.7 bn annually of the overall change in the investment income balance. From year to year, the *yield spread effect* was extremely volatile, with both positive and negative contributions occurring demonstrating the fact that small fluctuations in yields can have sizeable effects in the presence of large gross positions. These results highlight the importance of taking into account not just changes in net foreign assets but also the prevailing yield level and yield differential when analysing changes in a country's investment income balance.

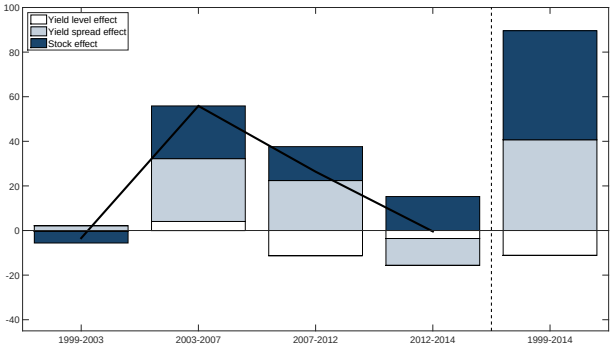
Table 3 demonstrates that the *pure yield level effect* accounts essentially for the entirety of the changes in the aggregate yield level and that composition effects played a negligible role. In particular, the drop in the yield level of direct investment, long-term debt securities and other investment by MFIs was crucial in accounting for aggregate developments.[19] Furthermore, Table 3 shows that the *pure yield spread effect* contributed an average of EUR 2.8 bn per year towards the increase in the German investment income balance. With respect to aggregate developments, emerging return differentials of other investment by MFIs, investment fund shares, long-term debt securities and other investments of enterprises and households were key. On the whole, between 1999 and 2014, investment classes in which German investors had a long position declined more than those in which they were short, which is reflected in the negative contribution of EUR 0.2 bn per year of the *portfolio effect*. This was particularly true for investment fund shares and other investment by MFIs as well as the Bundesbank's external position including the TARGET2 balance. The overall impact of the effect was slightly mitigated by declines in the yield level of short positions (long and short-term debt securities) as well as a small rise in the yield level of long positions (direct investment equity and debt instruments). Both domestic and foreign investors shifted their portfolios towards higher-yielding investment classes such as foreign direct investment in the time period under consideration, which resulted in a positive *asset composition change effect* of EUR 1.3 bn EUR per year and a negative *liability composition change effect* of EUR 1.1 bn per year. Netting the two suggests that, overall, Germany gained from compositional changes in its international investment position. Domestic investors appear to have been more sensitive to yield developments, which may be partially explained by safe haven flows into low-yielding German assets during the crisis (De Santis, 2012). Overall, our results highlight that it is necessary to consider the composition of external assets and liabilities as well as portfolio changes in order to understand changes in aggregate yields and their impact on the investment income balance of a country.

4.1.2 Sub-Period Results

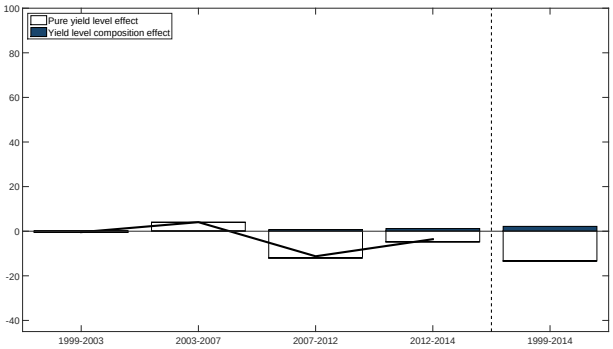
The four sub-periods identified above each display characteristic differences in the factors that contributed to changes in the German investment income balance (Figure 3). Between 1999 and 2003, the investment income balance recorded an average annual deficit

[19] The interested reader is referred to Table A.4 and Table A.5 in which contributions of individual investment classes towards the sub-divisions of the *yield level effect* and the *yield spread effect* respectively are detailed.

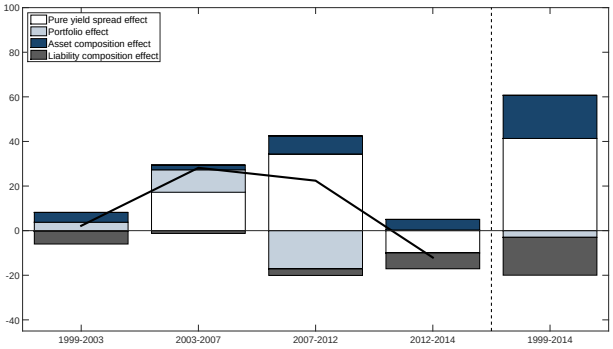
Figure 3: Decomposition of Changes in the German Investment Income Balance from 1999 to 2014 (EUR bn).



(a) Main Decomposition of Changes in the Investment Income Balances.



(b) Further Decomposition of *Yield Level Effect*.



(c) Further Decomposition of *Yield Spread Effect*.

of EUR 18.9 bn. This deficit arose because, on average, a higher yield was paid on liabilities to non-residents than German investors received for their holdings of foreign assets of practically equivalent value. The relatively minor change in the investment income balance of EUR 3.4 bn was almost exclusively attributable to a slightly negative *stock effect* in line with the current account deficits recorded during this period. On balance,

yield changes had no notable effect.

Between 2003 and 2007, German investment income rose by EUR 55.9 bn to EUR +35.3 bn in 2007. The biggest contribution, of EUR 28.2 bn, was provided by the improvement in the return differential. A crucial factor here was that the profitability of both direct investment and investment fund shares as well as long-term loans held by German investors improved compared with those of non-residents in Germany. Also of importance was the fact that the yield level for asset classes in which the German economy as a whole had entered into a net creditor position (such as equity capital for direct investment) tended to rise more sharply than others (EUR +10.1 bn). As the increasing German current account surpluses were also reflected in constantly growing net foreign assets (a rise of EUR 474 bn between 2003 and 2007), the *stock effect* played a significant role in the increase in German investment income, adding EUR 23.6 bn. The slightly higher yield level was of little consequence compared with the other factors, contributing EUR +4.1 bn.

German net investment income increased once again between 2007 and 2012, rising by EUR 26.4 bn to EUR +61.6 bn in 2012 despite a temporary slump in 2008. To some extent, there were countervailing contributions from stock and yield effects. The *stock effect* made a positive contribution of EUR +15.2 bn. In spite of the larger current account surpluses in comparison with the previous period, the *stock effect* was smaller, since Germany's net external assets did not grow to the same extent as the cumulative current account balances owing to valuation effects and other adjustments (Frey, Grosch, and Lipponer, 2014). The *yield level effect* continued to put a drag on the increase in investment income, reducing the figure by EUR 11.2 bn, as the international interest rate level declined considerably following the expansionary monetary policy measures implemented in response to the global recession. A crucial factor here was that all asset classes, but particularly other investment by MFIs, generated distinctly lower income than before. By contrast, the *yield spread effect* boosted Germany's investment income balance after the onset of the crisis (EUR +22.4 bn), primarily owing to safe haven flows as part of investors' altered risk perception. The most important factor was price effects of safe haven flows, which were reflected in the increase in the *pure yield spread effect* (EUR +34.4 bn). This was mainly attributable to yield changes in the bond market, in which the effective interest rate decreased from 3.8% to 2.7% on the liability side between 2007 and 2012, while there was no reduction on the asset side (4.7%). The return differential was adversely affected, however, because the yield level of German net creditor positions, such as other investment by MFIs and investment fund shares, was lower than in the previous period (EUR −17.2 bn). The significant portfolio shifts after the onset of the crisis had no negative influence on the investment income balance. On the asset side, the items that primarily gained in importance were TARGET2 claims, other investment by general government, long-term debt securities and direct investment, especially at the expense of other investment by MFIs and of shares. The institutional mechanisms within the euro area and the process of combating the crisis implied that the private sector's share in external assets shifted in favour of public sector entities – particularly the Bundesbank's TARGET2 claims. However, the effect on the total balance of the rise in TARGET2 claims was more than offset in mathematical terms by the reduction in low-interest-bearing asset classes, such as other investment by MFIs, in

favour of more profitable ones, such as direct investment and long-term loans.[20]

Preliminary results using the same decomposition framework for euro-area countries during the global financial crisis corroborate the findings on the importance of yield changes in explaining the dynamics of the investment income balance for a larger group of countries (Task Force of the Monetary Policy Committee of the ESCB et al., 2016). As one would expect, net debtor countries benefited from the decline in international interest rates during the crisis years. Interestingly, similar to Germany, most programme countries (Cyprus, Greece, Ireland and Spain) and Italy also benefited from a more favourable yield spread. Improvements in the spreads of these countries may have been partially due to shifts in the composition of their foreign liabilities from high-yield private debt to lower-yield liabilities of the public sector, such as programme loans, which (temporarily) alleviated the strain of high investment income payments.

From 2012 to 2014, the German investment income balance actually declined very slightly by EUR 0.4 bn according to current figures. In line with the German net external position recording clear increases (EUR +544 bn), the *stock effect* was again considerable in this period (EUR +15.2 bn). However, dampening effects were felt due to the continued drop in the yield level (EUR −3.6 bn) and the deterioration in the return differential (EUR −12.1 bn). The latter was primarily attributable to a partial reversal of crisis-related developments in the bond market, which was reflected in a negative *pure yield spread effect* (EUR −10 bn). By contrast, the effects of portfolio shifts from assets (EUR +4.7 bn) and liabilities (EUR −7.1 bn) towards equities and, on the asset side, towards long-term debt securities more or less offset each other.

4.2 Valuation Effects

Changes in the net international investment position resulting from valuation effects have gained in importance in recent years due to the magnitude of gross external positions (Obstfeld, 2012; Lane and Milesi-Ferretti, 2001). Often, these "valuation effects" are derived as the residual of the changes in stocks that cannot be reconciled with net financial flows recorded in the balance of payments. Here, it is necessary to be more precise and differentiate between (i) valuation effects explained by exchange rates, (ii) valuation effects explained by market prices and (iii) other statistical factors that may result, for example, from the fact that the two accounting systems used for the balance of payments and the international investment position are based on different primary statistics. Each of these factors can have a different effect on yield estimates and, consequently, on the results of our decomposition framework. Below, we first discuss each of the three effects from a theoretical point of view and then evaluate their impact empirically using a German dataset for the years 2004 to 2013.

The most innocuous of the three are valuation effects explained by exchange rates. For example, a depreciation of the domestic currency relative to the foreign currency, in which an investor holds a portfolio of assets, results in an increase in the value of those assets in the domestic currency. However, since the income deriving from these assets – which is also paid in the foreign currency – grows by the same rate, the yield of the asset

[20] In order to assess the overall impact of the TARGET2 position on the German investment income balance, it is also necessary to consider the negative *portfolio effect* resulting from the net TARGET2 claims against the background of falling interest rates in the euro area.

remains the same. As a consequence, valuation effects explained by exchange rates are observationally equivalent to purchases of assets and liabilities of the same amount and therefore pose no threat to the results of our decomposition framework.[21]

The situation is a little more complex for valuation effects explained by fluctuations in market prices. We can establish observational equivalence with stock changes only if market prices change by the same factor as the corresponding income. For example, this is true if the present value of an asset corresponds to a constant cash flow in the presence of a constant discount factor. In this case, an increase in the value of the asset by $x\%$ is the outcome of a gain in current and future income payments by $x\%$. More formally, the present value PV of an asset equals the sum of future cash flows R_t in period t discounted by the constant discount rate i. In addition, we assume that the cash flow is constant over time, i.e. $R_t = R$:

$$PV = \sum_{t=0}^{T} \frac{R_t}{(1+i)^t} = \sum_{t=0}^{T} \frac{R}{(1+i)^t} = R\left(\frac{1+i}{i}\right). \tag{4}$$

The yield of the asset is computed as the ratio of income to the value of the asset:

$$yield = \frac{R}{PV} = \frac{R}{R(\frac{1+i}{i})} = \frac{i}{1+i}. \tag{5}$$

As argued above,the yield is constant in this case and not affected by changes in market prices, which, by definition, can only derive from variations in income payments. More complex examples are conceivable but, in general, market prices do not always move in unison with income payments for instance when dividend payments are expected to follow a time-varying path. Consequently, in some cases, valuation effects related to market price movements may affect our yield estimates and can no longer be considered equivalent to purchases of assets and liabilities.

Finally, other statistical changes are not a concern if the assets or liabilities that are added or removed have the same yield as existing stocks and, in addition, the corresponding income or expenditure enters or drops out of official statistics at the same time as the changes in stocks. By contrast, the decomposition results may change if the yield differs, for example, due to composition effects or genuine differences in yields or the corresponding income or expenditure was already included in the balance of payment statistics prior to adding the stock information.

In the following, we assess the empirical importance of valuation effects due to market price fluctuations and other statistical factors[22] for the three main effects of the decomposition using a German dataset for the years 2004 to 2013.[23] While in Section 4.1 we

[21] Note that small discrepancies may nevertheless arise in practice due to differences in the time of recording stock and flow information.

[22] Valuation effects due to exchange rate movements are treated as genuine stock changes due to the equivalence result discussed above.

[23] The valuation effect dataset is described in detail in Frey et al. (2014). For investment income, we use historical data dating from May 2014 in accordance with the compilation of the stock dataset. While the stock dataset contains information on valuation effects of individual asset classes, these do not correspond to those for investment income since both were still compiled in accordance with the 5th edition of the Balance of Payments Manual. This precludes us from looking at the sub-divisions of the *yield level effect* and *yield spread effect* respectively.

assumed that valuation effects had no impact on yields, here we aim to provide an upper bound of their distorting impact on the results of the decomposition. In order to do so, we treat valuation effects (and other statistical changes) as being entirely unrelated to income payments by completely discounting changes in assets and liabilities between $t-1$ and t deriving from valuation effects (and other statistical changes) and only consider those due to balance of payment transactions.

Table 4: Decomposition of the Change in the German Investment Income Balance Corrected for Valuation Effects and Other Changes in the International Investment Position (EUR bn).

	2004 – 2005	2005 – 2006	2006 – 2007	2007 – 2008	2008 – 2009	2009 – 2010	2010 – 2011	2011 – 2012	2012 – 2013	∅ period	min(Δ)	max(Δ)	mean(Δ)
(1) Baseline specification													
Stock effect	**5.1**	**10.3**	**5.9**	**-0.0**	**1.8**	**4.5**	**2.4**	**4.8**	**7.2**	**4.7**	-	-	-
Yield level effect	**0.7**	**1.1**	**2.5**	**-5.8**	**-3.5**	**1.2**	**-0.2**	**-2.1**	**-2.0**	**-0.9**	-	-	-
Yield spread effect	**-1.1**	**8.1**	**-11.0**	**-5.0**	**28.0**	**-10.9**	**13.3**	**2.3**	**-4.2**	**2.2**	-	-	-
(2) Corrected for market price valuation effects													
Stock effect	**4.7**	**9.6**	**7.8**	**2.2**	**0.8**	**5.0**	**4.2**	**4.3**	**6.1**	**5.0**	**-1.1**	**2.2**	**0.3**
Yield level effect	**0.8**	**1.1**	**2.6**	**-6.5**	**-3.3**	**1.3**	**-0.3**	**-1.9**	**-1.9**	**-0.9**	**-0.7**	**0.2**	**0.0**
Yield spread effect	**-0.8**	**8.8**	**-13.0**	**-6.6**	**28.8**	**-11.5**	**11.6**	**2.6**	**-3.1**	**1.9**	**-2.1**	**1.0**	**-0.3**
(3) Corrected for other statistical factors													
Stock effect	**4.9**	**9.4**	**5.5**	**0.8**	**3.1**	**5.9**	**3.5**	**5.0**	**7.1**	**5.0**	**-0.9**	**1.4**	**0.3**
Yield level effect	**0.7**	**1.1**	**2.5**	**-6.0**	**-3.6**	**1.2**	**-0.2**	**-2.1**	**-2.0**	**-0.9**	**-0.2**	**0.1**	**-0.0**
Yield spread effect	**-0.8**	**9.0**	**-10.6**	**-5.7**	**26.9**	**-12.3**	**12.2**	**2.1**	**-4.1**	**1.9**	**-1.4**	**0.9**	**-0.3**
(4) Corrected for both market price valuation effects and other statistical factors													
Stock effect	**4.6**	**8.6**	**7.5**	**3.0**	**2.0**	**6.4**	**5.2**	**4.5**	**6.0**	**5.3**	**-1.6**	**3.0**	**0.6**
Yield level effect	**0.8**	**1.1**	**2.6**	**-6.7**	**-3.4**	**1.3**	**-0.3**	**-1.8**	**-1.9**	**-0.9**	**-0.9**	**0.3**	**-0.0**
Yield spread effect	**-0.6**	**9.7**	**-12.7**	**-7.2**	**27.7**	**-12.9**	**10.6**	**2.4**	**-3.0**	**1.5**	**-2.7**	**1.5**	**-0.6**
For information only: Market price valuation effects													
Assets	**71.7**	**50.1**	**-33.7**	**-254.4**	**118.3**	**23.2**	**-84.7**	**132.3**	**44.4**	**7.5**			
Liabilities	**60.1**	**15.8**	**60.4**	**-158.2**	**72.0**	**69.3**	**25.4**	**137.0**	**-37.1**	**27.2**			
For information only: Other statistical factors													
Assets	**-14.7**	**71.8**	**15.6**	**-49.8**	**-43.8**	**-60.7**	**-30.7**	**3.6**	**12.1**	**-10.7**			
Liabilities	**-27.0**	**28.8**	**-0.5**	**-12.6**	**33.4**	**31.7**	**39.9**	**20.0**	**5.5**	**13.3**			

The two bottom panels of Table 4 show both the valuation effect due to market price fluctuations as well as changes in assets and liabilities due to other statistical factors for Germany for the years 2004 to 2013. Both are very volatile and can be extremely large as, for example, during the global financial crisis. On average, assets increased by EUR 7.5 bn and liabilities by EUR 27.2 bn per year due to market price valuation effects resulting, on balance, in a deterioration of the German net foreign asset position. The net effect of other statistical factors was similar, although German assets did actually decline for this category over the time period under consideration.

Panels (2) to (4) of Table 4 show the results of our main decomposition corrected for market price valuation effects and other statistical factors as well as both effects. On average, relative to the baseline specification, both effects increase the *stock effect* by about EUR 0.3 bn per year and decrease the *yield spread effect* by the same amount. First, this is due to the fact that, in both cases, liabilities increase more than assets, which puts a drag on the *stock effect* in the baseline specification. Second, since stocks also appear in the denominator when computing yields, this results in a relatively stronger decline of the yield on liabilities than the yield on assets, driving up the return differential and consequently the *yield spread effect* in the baseline specification. In conclusion, if one

considers an extreme scenario in which valuation effects are unrelated to income payments, the importance of the *yield spread effect* is somewhat reduced to the benefit of the *stock effect*. However, even in this case, the *yield spread effect* would be the second most important factor.[24] In all likelihood, we would expect the actual results to lie somewhere between the baseline specification and the upper bound considered in this robustness analysis.

4.3 Robustness

In this section, we consider the robustness of our results with respect to the level of disaggregation of the data across investment categories (Section 4.3.1) and across time (Section 4.3.2) as well as regarding our choice of the Shapley-Siegel index decomposition (Section 4.3.3) and our assumptions concerning income deriving from the TARGET2 balance (Section 4.3.4). All results of the subsequent robustness exercises are detailed in Table 5 for the four main sub-periods described above together with three measures capturing the difference with the baseline specification.

4.3.1 Level of Disaggregation

In this section, we evaluate the impact of the level of disaggregation across investment classes on our results. Data on the international investment position and the income balance is often not available at the same level of detail as for Germany, making the use of the broader categories "direct investment", "portfolio investment" and "other investment" necessary. Panel (2) of Table 5 shows the results of the decomposition using these three more aggregated investment categories. First, note that the *stock effect* as well as the *yield level effect* and the *yield spread effect* are identical to the baseline decomposition since they exclusively depend on aggregate quantities. The only differences therefore affect the sub-divisions of the *yield level effect* and the *yield spread effect*. In general, both composition change effects are substantially smaller (in absolute magnitude) since all compositional changes within the three aggregate categories are no longer recorded as such, rather they are attributed to actual changes in yields. In conclusion, our decomposition framework can also be used with broader investment classes, but care should be taken when interpreting the sub-divisions of the three main effects. Whenever more detailed data is available, it should be used in order to fully capture composition and portfolio effects.

4.3.2 Year-to-Year versus Period-to-Period Decomposition

When implementing the decomposition between t and $t+n$ for $n > 1$ years, two different approaches are conceivable. First, the decomposition could be performed from year to year, with the results being summed up to arrive at the total change between t and $t+n$ as was done in the remainder of this paper. Alternatively, the decomposition could be applied *directly* to the change between the year t and year $t+n$. Panel (3) of Table 5 lists the results using this period-to-period decomposition. Overall, the differences with the baseline specification are relatively minor for most periods and effects. A noticeable

[24] In addition, note that the time period under consideration excludes the largest increase of EUR 33.9 bn of the *yield spread effect* between 2003 and 2004, which by itself translates into another EUR 2.3 bn increase per year over a 15-year time period.

Table 5: Decomposition of the Change in the German Investment Income Balance (EUR bn per year).

	∅ 1999-2003	∅ 2003-2007	∅ 2007-2012	∅ 2012-2014	∅ 1999-2014	min(Δ)	max(Δ)	mean(Δ)
(1) Baseline specification								
Stock effect	**-1.3**	**5.9**	**3.0**	**7.6**	**3.3**	-	-	-
Yield level effect	**-0.1**	**1.0**	**-2.2**	**-1.8**	**-0.7**	-	-	-
Pure yield level effect	-0.1	1.0	-2.4	-2.4	-0.9	-	-	-
Yield level composition effect	0.0	0.0	0.1	0.6	0.1	-	-	-
Yield spread effect	**0.5**	**7.0**	**4.5**	**-6.0**	**2.7**	-	-	-
Pure yield spread effect	-0.1	4.3	6.9	-5.0	2.8	-	-	-
Portfolio effect	0.9	2.5	-3.4	0.2	-0.2	-	-	-
Asset composition effect	1.1	0.5	1.6	2.4	1.3	-	-	-
Liability composition effect	-1.4	-0.3	-0.6	-3.5	-1.1	-	-	-
(2) Level of disaggregation								
Stock effect	**-1.3**	**5.9**	**3.0**	**7.6**	**3.3**	**-0.0**	**0.0**	**-0.0**
Yield level effect	**-0.1**	**1.0**	**-2.2**	**-1.8**	**-0.7**	**-0.0**	**0.0**	**0.0**
Pure yield level effect	-0.1	1.0	-2.3	-2.3	-0.8	-0.2	0.3	0.1
Yield level composition effect	-0.0	0.0	0.1	0.5	0.1	-0.3	0.2	-0.1
Yield spread effect	**0.5**	**7.0**	**4.5**	**-6.0**	**2.7**	**-0.0**	**0.0**	**0.0**
Pure yield spread effect	1.1	5.1	6.8	-8.9	2.7	-19.3	14.5	-0.0
Portfolio effect	-0.4	1.9	-2.6	2.1	-0.2	-14.5	19.9	0.0
Asset composition effect	-0.6	0.2	0.7	3.1	0.5	-3.3	2.3	-0.8
Liability composition effect	0.4	-0.1	-0.4	-2.3	-0.4	-1.0	3.2	0.8
(3) Period-to-period decomposition								
Stock effect	**-1.4**	**4.3**	**3.2**	**7.8**	**2.9**	**-1.6**	**0.1**	**-0.4**
Yield level effect	**-0.0**	**0.9**	**-2.6**	**-2.0**	**-0.9**	**-0.4**	**0.1**	**-0.2**
Pure yield level effect	-0.0	0.8	-2.7	-2.5	-1.0	-0.3	0.1	-0.1
Yield level composition effect	0.0	0.0	0.1	0.6	0.1	-0.1	-0.0	-0.0
Yield spread effect	**0.6**	**8.8**	**4.7**	**-6.0**	**3.3**	**0.0**	**1.7**	**0.5**
Pure yield spread effect	0.9	5.8	6.4	-4.7	3.3	-1.5	0.2	-0.3
Portfolio effect	-0.6	2.4	-3.3	0.3	-0.6	-1.5	0.2	-0.3
Asset composition effect	1.4	0.6	1.2	2.1	1.2	-0.4	0.3	-0.1
Liability composition effect	-1.1	-0.0	0.4	-3.7	-0.7	-0.2	1.0	0.4
(4) LMDI decomposition								
Stock effect	**-1.5**	**5.9**	**3.1**	**7.6**	**3.2**	**-0.6**	**0.1**	**-0.1**
Yield level effect	**-0.1**	**1.0**	**-2.2**	**-1.8**	**-0.7**	**-0.1**	**0.2**	**0.0**
Pure yield level effect	-0.1	1.0	-2.4	-2.3	-0.9	-0.1	0.2	0.0
Yield level composition effect	0.0	0.0	0.1	0.6	0.1	-0.0	0.0	-0.0
Yield spread effect	**0.7**	**7.1**	**4.4**	**-6.0**	**2.7**	**-7.8**	**8.6**	**0.0**
Pure yield spread effect	0.2	4.3	6.7	-5.0	2.8	-12.1	13.2	0.0
Portfolio effect	0.8	2.5	-3.3	0.2	-0.2	-5.0	4.6	0.0
Asset composition effect	1.1	0.6	1.5	2.4	1.3	-0.3	0.1	-0.0
Liability composition effect	-1.4	-0.3	-0.5	-3.5	-1.1	-0.1	0.2	0.0
(5) TARGET2 income and expenditure set to zero								
Stock effect	**-1.3**	**5.9**	**2.9**	**7.5**	**3.2**	**-0.3**	**0.0**	**-0.1**
Yield level effect	**-0.1**	**1.0**	**-2.3**	**-1.5**	**-0.7**	**-0.2**	**0.3**	**0.0**
Pure yield level effect	-0.1	1.0	-2.3	-2.1	-0.8	-0.0	0.3	0.1
Yield level composition effect	0.0	0.0	0.0	0.6	0.1	-0.2	0.0	-0.0
Yield spread effect	**0.6**	**6.8**	**3.7**	**-3.5**	**2.7**	**-2.9**	**2.6**	**0.0**
Pure yield spread effect	-0.0	4.2	7.1	-5.0	2.8	-0.5	1.1	0.1
Portfolio effect	0.9	2.5	-2.5	2.8	0.5	-1.5	4.6	0.7
Asset composition effect	1.2	0.4	-0.3	2.2	0.6	-2.6	0.4	-0.7
Liability composition effect	-1.5	-0.3	-0.6	-3.5	-1.1	-0.1	0.0	-0.0

discrepancy arises for the *stock effect* (a decrease by EUR 1.6 bn per year) and the *yield spread effect* (an increase of EUR 1.7 bn per year) in the period 2003 to 2007 as the within-period fluctuation in the yield spread is, by definition, not included. However, our main results regarding the importance of the three main effects and their sub-division holds when considering changes across longer time periods instead of annual changes. In case of availability, it is preferable to apply the decomposition directly to high-frequency data in order to capture within-period variation of individual factors that may otherwise be disregarded in the period-to-period decomposition.

4.3.3 Logarithmic Mean Divisia Index Decomposition

The LMDI decomposition provides an alternative way of implementing the decomposition of the investment income balance in discrete time (Section A.5.2). Panel (4) of Table 5 shows the results for the LMDI decomposition.[25] In general, the overlap of the LMDI results with those of the baseline specification is very high. The mean difference between the two specifications is essentially zero for all effects. In individual years, the deviation for those two effects can be relatively large also resulting in differences with the baseline specification for the *yield spread effect*. However, even when aggregating the results across three to four years – as for the sub-period results – those differences almost completely disappear. In conclusion, the overall results and the relative contributions of individual effects across time are robust to the use of the LMDI decomposition. However, caution should be exercised when considering year-to-year changes as, in some instances, noticeable differences appear to arise, in particular for the quantitatively large *pure yield spread effect* and *portfolio effect*.

4.3.4 TARGET2 Assumptions

As discussed in Section 3.1, the TARGET2 balance generates income from the perspective of the investment income balance, but it is neutral with regard to its overall effect on the current account balance due to offsetting payments recorded in the secondary income balance. As a consequence, the TARGET2 balance is a non-interest-bearing asset as far as the current account balance is concerned. Here, we attempt to gauge the overall impact of TARGET2 on the current account by assuming zero interest payments resulting from the TARGET2 balance. Discounting net income resulting from TARGET2 reduces the German investment income balances by an average of EUR 1.6 bn per year as well as the yield level by 0.02% and the yield spread by 0.03% between 1999 and 2014. As a result, the *stock effect* is slightly reduced, but due to the small magnitude of the yield changes, no discernible differences exist for the main yield effects. On the one hand, the *asset composition change effect* is more negative than in the baseline specification since portfolio shifts to TARGET2 are now even less favourable. On the other hand, the *portfolio effect* is more positive in this alternative scenario since, by definition, no additional losses due to declines in the yield level can be incurred from the long position in TARGET2 as the yield is zero throughout the sample period. Overall, the main conclusions of our results remain unaffected.

5 Conclusion

In this paper, we propose a novel decomposition framework that allows us to quantify the contribution of the proximate factors determining the dynamics of the investment income balance. We apply our decomposition framework to a rich German dataset spanning 11 different investment classes between 1999 and 2014. We show that focusing exclusively on the development of external assets and liabilities falls short of explaining the increase

[25] The negative yield for direct investment equity liabilities in 2001 was set to zero since the LMDI decomposition cannot deal with negative factors.

in the German investment income balance and that around 40% of the increase is explained by changes in aggregate yields. In this regard, the emergence of an aggregate yield spread was the most important factor of the increase. By contrast, the fall in international interest rates after the global financial crisis actually stunted net investment income growth in line with Germany's net creditor position. Besides changes in aggregate yields, our results highlight the importance of considering the composition of external assets and liabilities as well as portfolio changes in order to understand the dynamics of the investment income balance. Both domestic and foreign investors shifted their portfolios towards higher-yielding investment classes, accounting for plus and minus one quarter of the increase in the investment income balance respectively. Netting the two suggests that, overall, Germany gained from compositional changes in its international investment position. Domestic investors appear to have been more sensitive to yield developments, which may be partially explained by safe haven flows into low-yielding German assets such as government bonds during the global financial and sovereign debt crisis in the euro area (De Santis, 2012). Falling yields in investment classes in which German investors held long positions decreased German net investment income by around 4% over the time period under consideration.

Results using the same decomposition framework for euro-area countries during the global financial crisis corroborate the findings on the importance of yield changes in explaining the dynamics of the investment income balance for a larger group of countries (Task Force of the Monetary Policy Committee of the ESCB et al., 2016). As one would expect, net debtor countries benefited from the decline in international interest rates during the crisis years. Interestingly, similar to Germany, most programme countries (Cyprus, Greece, Ireland and Spain) and Italy also benefited from a more favourable yield spread. Improvements in the spreads of these countries may have been partially due to shifts in the composition of their foreign liabilities from high-yield private debt to lower-yield liabilities of the public sector, such as programme loans, which (temporarily) alleviated the strain of high investment income payments. Looking to the future, a quantitative assessment of both yield effects in facilitating international risk sharing using a cross-country study may be a promising area for future research. From a methodological point of view, a more comprehensive treatment of valuation effects in the decomposition at the level of individual asset classes would be desirable and should be feasible given recently released data.[26]

[26]From 2013 onwards, changes in individual asset classes in the German international investment position can be traced back to transactions, valuation effects and other statistical factors.

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A Appendix

A.1 Derivation of *Yield Spread Effect* and *Yield Level Effect*

In order to derive the *yield spread effect* and the *yield level effect*, we split the *yield effect* equally into two terms as well as add and subtract $\frac{1}{2}(di^A L - di^L A)$ (Equation (A.1)) in a first step. In a second step, the four are simply combined to yield the two sub-divisions of the *yield effect* (Equation (A.2)).

$$
\begin{aligned}
di^A A - di^L L = &+ \frac{1}{2}(di^A A - di^L L) + \frac{\mathbf{1}}{\mathbf{2}}\boldsymbol{(di^A L - di^L A)} && \text{(A.1)}\\
&+ \frac{1}{2}(di^A A - di^L L) - \frac{\mathbf{1}}{\mathbf{2}}\boldsymbol{(di^A L - di^L A)}\\
= &+ \frac{1}{2}(di^A - di^L)(A + L) && \text{(A.2)}\\
&+ \frac{1}{2}(di^A + di^L)(A - L).
\end{aligned}
$$

A.2 Alternative Decomposition of the Yield Effects

In this section, we detail the formula for the decomposition of the investment income balance using the yield on assets as a reference point for the yield level instead of the arithmetic mean of the yield on assets and liabilities that was used in the main text.

$$
\begin{aligned}
(di^A A - di^L L) &= di^A A + (ds - di^A)L\\
&= di^A N && \textit{(yield level effect)}\\
&\quad - dsL. && \textit{(yield spread effect)}
\end{aligned}
$$

$$
\begin{aligned}
N di^A &= N \sum_j^J (w_j^A di_j^A) && \textit{(pure yield level effect)}\\
&\quad + N \sum_j^J (dw_j^A i_j^A). && \textit{(yield level composition effect)}
\end{aligned}
$$

$$
\begin{aligned}
-dsL = &+L\sum_{j}^{J}\frac{1}{2}(w_j^L + w_j^A)(di_j^A - di_j^L) && (\textit{pure yield spread effect})\\
&+L\sum_{j}^{J}\frac{1}{2}(w_j^A - w_j^L)(di_j^L + di_j^A) && (\textit{portfolio effect})\\
&+L\sum_{j}^{J} dw_j^A i_j^A && (\textit{asset composition change effect})\\
&-L\sum_{j}^{J} dw_j^L i_j^L. && (\textit{liability composition change effect})
\end{aligned}
$$

A.3 Derivation of the Four Sub-components of the *Yield Spread Effect*

In order to derive the four sub-components of the *yield spread effect*, we express the aggregate yields on assets, i^A, and liabilities, i^L, as the weighted sum of the yields on individual investment classes (Equation (A.4)). Second, we take the total derivative of the expression as well as add and subtract $\frac{1}{2}(A+L)\sum_j^J \frac{1}{2}(w_j^L di_j^A - w_j^A di_j^L)$ (Equation (A.5)). Third, we rearrange terms (Equation (A.6)) and finally arrive at the expression for the four sub-components of the *yield spread effect* used in the main text (Equation (A.7)).

$$\frac{1}{2}(A+L)ds = +\frac{1}{2}(A+L)d(i^A - i^L) \tag{A.3}$$

$$= +\frac{1}{2}(A+L)d(\sum_j^J w_j^A i_j^A - w_j^L i_j^L) \tag{A.4}$$

$$= +\frac{1}{2}(A+L)(\sum_j^J dw_j^A i_j^A + w_j^A di_j^A - dw_j^L i_j^L - w_j^L di_j^L) \tag{A.5}$$

$$+\frac{\mathbf{1}}{\mathbf{2}}(\boldsymbol{A+L})\sum_{\boldsymbol{j}}^{\boldsymbol{J}}\frac{\mathbf{1}}{\mathbf{2}}(\boldsymbol{w_j^L di_j^A - w_j^A di_j^L})$$

$$-\frac{\mathbf{1}}{\mathbf{2}}(\boldsymbol{A+L})\sum_{\boldsymbol{j}}^{\boldsymbol{J}}\frac{\mathbf{1}}{\mathbf{2}}(\boldsymbol{w_j^L di_j^A - w_j^A di_j^L})$$

$$= +\frac{1}{4}(A+L)\sum_j^J(w_j^A di_j^A - w_j^L di_j^L - w_j^L di_j^A + w_j^A di_j^L) \tag{A.6}$$

$$+\frac{1}{4}(A+L)\sum_j^J(w_j^A di_j^A - w_j^L di_j^L + w_j^L di_j^A - w_j^A di_j^L)$$

$$+\frac{1}{2}(A+L)\sum_j^J dw_j^A i_j^A$$

$$-\frac{1}{2}(A+L)\sum_j^J dw_j^L i_j^L$$

$$= +\frac{1}{4}(A+L)\sum_j^J(w_j^A + w_j^L)(di_j^A - di_j^L) \tag{A.7}$$

$$+\frac{1}{4}(A+L)\sum_j^J(w_j^A - w_j^L)(di_j^L + di_j^A)$$

$$+\frac{1}{2}(A+L)\sum_j^J dw_j^A i_j^A$$

$$-\frac{1}{2}(A+L)\sum_j^J dw_j^L i_j^L.$$

A.4 Examples

This section provides some stylised examples of the different effects in the decomposition of changes in the investment income balance described in the previous section in order to help build intuition. First, we consider the three main effects – *stock effect*, *yield level effect* and *yield spread effect* – using scenarios based on a simple (representative) asset for both sides of the international investment position. The examples are summarised in

Table A.1.[27]

Table A.1: Stylised Examples Illustrating the Three Main Effects.

	A	L	i_A	i_L	II^A	II^L	IIB	ΔIIB
I *stock effect*								
$t-1$	100	100	1%	1%	1	1	0	-
t	200	100	1%	1%	2	1	1	1
II *yield level effect*								
$t-1$	200	100	1%	1%	2	1	1	-
t	200	100	2%	2%	4	2	2	1
III *yield spread effect*								
$t-1$	100	100	1%	1%	1	1	0	-
t	100	100	2%	0%	2	0	2	2

stock effect: Consider a country with EUR 100 of external assets and liabilities respectively in $t-1$ with a yield of 1% each (Table A.1). The country is running a current account surplus of EUR 100 in t and increases its assets to EUR 200, everything else being equal. As a consequence its investment income balance increases by EUR 1, which is entirely due to the *stock effect*.

yield level effect: Consider a country with EUR 200 in external assets and EUR 100 in external liabilities in $t-1$ with a yield of 1% each (Table A.1). Hence, the country has net foreign assets worth EUR 100 and an investment income balance of EUR 1. Imagine that the international interest rate environment becomes more benevolent to investors and that the yields of both assets and liabilities rise to 2%. Since the country is a net creditor, it gains from this development and its investment income balance increases by EUR 1, which is attributed to the *yield level effect* in our framework. Note that, in general, net creditors (debtors) gain (lose) from increases in the yield level, while there is no effect for countries with a balanced net international investment position.

yield spread effect: Let us reconsider the first case of a country with EUR 100 of external assets and liabilities respectively in $t-1$ with a yield of 1% each (Table A.1). Now suppose that a return differential emerges in t and the yield on assets increases to 2%, while the yield on liabilities declines to 0%. Consequently, the investment income balance expands by EUR 2, which is solely due to the *yield spread effect*. Note that the yield level – which we defined to be the arithmetic average of the yield on assets and liabilities – is unchanged and the *yield spread effect* is therefore the only factor contributing to the change in the investment income balance in this case.

Second, we proceed with the sub-divisions of the *yield level effect* and *yield spread effect* by considering two types of assets on each side. These examples are presented in Table A.2.

pure yield level effect: Consider a country with EUR 200 in external assets and EUR 100 in external liabilities in $t-1$ equally spread across two investment classes in both cases (Table A.2). The yield on both investment classes is 1% for both assets and liabilities. Thus, the country receives net interest payments from abroad worth EUR 1 in

[27]The results in the examples are the same independent of whether the Shapley-Siegel or the logarithmic mean Divisia index decomposition is used since only one factor is changed at a given time.

Table A.2: Stylised Examples Illustrating the Sub-divisions of the *Yield Level Effect* and *Yield Spread Effect*.

	A	L	w_1^A	w_2^A	w_1^L	w_2^L	i_1^A	i_2^A	i_1^L	i_2^L	II^A	II^L	IIB	ΔIIB
II *pure yield level effect*														
$t-1$	200	100	0.5	0.5	0.5	0.5	1%	1%	1%	1%	2	1	1	-
t	200	100	0.5	0.5	0.5	0.5	2%	2%	2%	2%	4	2	2	1
II *yield level composition effect*														
$t-1$	200	100	0.5	0.5	0.5	0.5	2%	4%	2%	4%	6	3	3	-
t	200	100	0	1	0	1	2%	4%	2%	4%	8	4	4	1
III *pure yield spread effect*														
$t-1$	100	100	0.5	0.5	0.5	0.5	1%	1%	1%	1%	1	1	0	-
t	100	100	0.5	0.5	0.5	0.5	2%	2%	0%	0%	2	0	2	2
III *portfolio effect*														
$t-1$	100	100	1	0	0	1	1%	1%	1%	1%	1	1	0	-
t	100	100	1	0	0	1	2%	1%	2%	1%	2	1	1	1
III *asset composition change effect*														
$t-1$	100	100	0.5	0.5	0.5	0.5	3%	1%	3%	1%	2	2	0	-
t	100	100	1	0	0.5	0.5	3%	1%	3%	1%	3	2	1	1
III *liability composition change effect*														
$t-1$	100	100	0.5	0.5	0.5	0.5	3%	1%	3%	1%	2	2	0	-
t	100	100	0.5	0.5	1	0	3%	1%	3%	1%	2	3	-1	-1

$t-1$. In t, the yield on all investment classes rises to 2% and, as a result, the investment income balance increases by EUR 1. The change in the investment income balance is entirely due to the *pure yield level effect* in our framework since the composition of assets and liabilities remains unchanged. Note that this example is essentially equivalent to the one for the *yield level effect*, the only difference being the existence of two identical (in terms of yield and weight in the investment portfolio) investment classes.

yield level composition effect: Consider the same case as before but now investment category 1 yields 2% and investment category 2 yields 4% in $t-1$ (Table A.2). Hence, the investment income balance of the country stands at EUR 3. At time t, both domestic and foreign investors shift their entire portfolio towards the high-yielding investment category 2. Therefore the yield level – which is the arithmetic average of the aggregate yield on assets and liabilities – jumps from 3% in $t-1$ to 4% in t in the absence of any actual changes in the yield of individual investment classes purely due to composition effects. Since the country is a net creditor, it benefits from the increase in the aggregate yield level and its investment income balance rises by EUR 1, which is attributed to the *yield level composition effect* in our framework.[28]

pure yield spread effect: Consider a country with EUR 100 in external assets and liabilities equally spread across two investment classes each yielding 1% in $t-1$ (Table A.2). At time t, the yield of both assets jumps to 2% while the yield of both liabilities drops to 0%. Consequently, the investment income balance increases by EUR 2, which we attribute to the *pure yield spread effect*. Note that this example is essentially equivalent to the one for the *yield spread effect*, the only difference being the existence of two identical (in terms

[28]Note that, in this case, the *asset composition change effect* and the *liability composition change effect* are also nonzero, but since they are of the same absolute magnitude with opposite signs, they cancel each other out.

of yield and weight in the investment portfolio) investment classes.

portfolio effect: In $t-1$, a country has EUR 100 in external assets and liabilities (Table A.2). The assets are completely concentrated in investment category 1, while foreign debtors only hold investment category 2. The yield on all investment classes is 1%. At time t, the yield of investment category 1 goes up to 2%. As a result, the investment income balance increases by EUR 1. Note that the return differential for a given investment category is zero. However, the aggregate yield spread of the country increases from 0% in $t-1$ to 1% in t since the yield of investment class 1, in which the country is a net creditor, rises to 2% (both for assets and liabilities), while the yield of investment class 2, in which the country is a net debtor, remains unchanged. Hence, the rise in the net interest payments is attributed to the *portfolio effect* in our framework.

asset composition change effect: Consider a country with EUR 100 in external assets and liabilities equally spread across two investment classes. The first investment category yields 3% and the second investment category yields 1% in $t-1$ (Table A.2). At time t, domestic investors shift their entire portfolio towards the high-yielding investment category 1. As a result, the aggregate yield spread goes up from 0% in $t-1$ to 1% in t. Note that there is no actual yield spread for any of the investment categories and that the emergence of the aggregate yield spread is entirely due to a composition effect on the asset side. Consequently, the increase in the investment income balance by EUR 1 is attributed to the *asset composition change effect*.

liability composition change effect: This scenario is analogous to the previous one, but with a shift in the weights between investment categories on the liability instead of the asset side (Table A.2).

A.5 Implementing the Decomposition in Discrete Time

In discrete time, decomposing changes in a multi-factor product into additive contributions of changes in its individual factors usually yields residuals that cannot be attributed unambiguously to any of the factors in the product. The literature on index decomposition analysis describes two common methods – the Shapley-Siegel decomposition (Albrecht, Francois, and Schoors, 2002; Ang et al., 2003; Sun, 1998; Siegel, 1945; Shapley, 1953) and the logarithmic mean Divisia mndex decomposition (Ang and Liu, 2001; Boyd, McDonald, Ross, and Hanson, 1987; Divisia, 1925) – that yield residual-free decompositions. In our case, the objective is to attribute changes in product y between time $t-1$ and t to contributions, $\phi(x_i)$, of changes in its individual factors x_1 to x_3:

$$\begin{aligned} \Delta y &= y^t - y^{t-1} \\ &= x_1^t x_2^t x_3^t - x_1^{t-1} x_2^{t-1} x_3^{t-1} \\ &= \phi(x_1) + \phi(x_2) + \phi(x_3). \end{aligned} \tag{A.8}$$

A.5.1 Shapley-Siegel Index Decomposition

In order to derive the Shapley-Siegel decomposition (Albrecht et al., 2002; Ang et al., 2003; Sun, 1998; Siegel, 1945; Shapley, 1953), we express the factors in Equation (A.8)

like in a Laspeyres decomposition[29] with reference to $t-1$ and changes in individual factors Δx_i:

$$\begin{aligned}\Delta y &= (x_1^{t-1}+\Delta x_1)(x_2^{t-1}+\Delta x_2)(x_3^{t-1}+\Delta x_3) - x_1^{t-1}x_2^{t-1}x_3^{t-1} \\ &= \sum_i^3 \frac{y^{t-1}}{x_i^{t-1}}\Delta x_i + \sum_i^3\sum_{j\neq i}^3 \frac{y^{t-1}}{x_i^{t-1}x_j^{t-1}}\Delta x_i\Delta x_j + \Delta x_1\Delta x_2\Delta x_3. \end{aligned} \tag{A.9}$$

Equation (A.9) includes several mixed terms, i.e. products that include changes of more than one factor. In the Shapley-Siegel decomposition, these are split equally between the changing factors involved based on the concept of the Shapley value (Shapley, 1953). For a three-factor product,[30] the contribution, $\phi(x_i)$, of factor x_i to the overall change in y is computed as

$$\begin{aligned}\phi(x_i) = &\frac{y^{t-1}}{x_i^{t-1}}\Delta x_i \\ &+ \frac{1}{2}\sum_{j\neq i}^3 \frac{y^{t-1}}{x_i^{t-1}x_j^{t-1}}\Delta x_i\Delta x_j \\ &+ \frac{1}{3}\Delta x_1\Delta x_2\Delta x_3. \end{aligned} \tag{A.10}$$

A.5.2 Logarithmic Mean Divisia Index (LMDI) Decomposition

Applying the logarithmic mean Divisia index decomposition (Ang and Liu, 2001; Boyd et al., 1987; Divisia, 1925) to an N-factor product, the contribution of factor x_i to changes in y can be computed as

$$\phi(x_i) = \omega \ln \frac{x_i^t}{x_i^{t-1}}, \tag{A.11}$$

where

$$\omega = \frac{y^t - y^{t-1}}{\ln y^t - \ln y^{t-1}}. \tag{A.12}$$

Note that, in contrast to the Shapley-Siegel index decomposition, Equation (A.11) is independent of the number of factors. One caveat associated with the LMDI decomposition is that it does not allow for products and factors that are negative (cf. Section 4.3). In case any of the factors was equal to zero, a very small positive number was added in order for the natural logarithm to be defined (Ang and Liu, 2007).

A.6 Decomposition of Investment Income Balance Relative to GDP

It is not uncommon to express the investment income (current account) balance relative to the GDP level of a country for normalisation. In this section, we briefly sketch how

[29] Note that the final decomposition formula is identical irrespective of whether a Laspeyres, Paasche or Marshall-Edgeworth model is used for its derivation (Sun and Ang, 2000).

[30] The formula depends on the number of factors in the product. See Section A.6 for the formula decomposing a four-factor product.

to incorporate an additional factor into our decomposition and present the results of this additional decomposition.

A.6.1 Methodology

First, we include the GDP level, y, in the denominator as a normalisation constant,

$$IIB\, y^{-1} = II^A y^{-1} - II^L y^{-1} = i^A A\, y^{-1} - i^L L\, y^{-1}, \tag{A.13}$$

and then take the total derivate of the expression as before:

$$d(IIB\, y^{-1}) = di^A A\, y^{-1} + i^A dA\, y^{-1} + i^A A\, dy^{-1} - di^L L\, y^{-1} - i^L dL\, y^{-1} - i^L L\, dy^{-1}. \tag{A.14}$$

The resulting decomposition comprises the same effects as in the main text plus a *GDP effect* capturing variations in the GDP level of the country over time:

$$\begin{aligned}
d(IIB\, y^{-1}) = {} & (i^A dA\, y^{-1} - i^L dL\, y^{-1}) && (\textit{stock effect})\\
& + (i^A A - i^L L)\, dy^{-1} && (\textit{GDP effect})\\
& + \frac{1}{2} N\, y^{-1} \sum_j^J (w_j^A di_j^A + w_j^L di_j^L) && (\textit{yield level composition effect})\\
& + \frac{1}{2} N\, y^{-1} \sum_j^J (dw_j^A i_j^A + dw_j^L i_j^L) && (\textit{pure yield level effect})\\
& + \frac{1}{4} (A + L)\, y^{-1} \sum_j^J (w_j^A + w_j^L)(di_j^A - di_j^L) && (\textit{pure yield spread effect})\\
& + \frac{1}{4} (A + L)\, y^{-1} \sum_j^J (w_j^A - w_j^L)(di_j^A + di_j^L) && (\textit{portfolio effect})\\
& + \frac{1}{2} (A + L)\, y^{-1} \sum_j^J dw_j^A i_j^A && (\textit{asset composition change effect})\\
& - \frac{1}{2} (A + L)\, y^{-1} \sum_j^J dw_j^L i_j^L. && (\textit{liability composition change effect})
\end{aligned}$$

The formula of the Shapley-Siegel index decomposition depends on the number of factors. Now, we have four instead of three different factors and we would like to attribute changes in product y between time $t-1$ and t to contributions, $\phi(x_i)$, of changes in the factors x_1 to x_4:

$$\begin{aligned}
\Delta y &= y^t - y^{t-1}\\
&= x_1^t x_2^t x_3^t x_4^t - x_1^{t-1} x_2^{t-1} x_3^{t-1} x_4^{t-1}\\
&= \phi(x_1) + \phi(x_2) + \phi(x_3) + \phi(x_4).
\end{aligned} \tag{A.15}$$

As before, we can express the factors in equation (A.15) like in a Laspeyres decomposition with reference to $t-1$ and changes in individual factors Δx_i:

$$\begin{aligned}\Delta y &= (x_1^{t-1}+\Delta x_1)(x_2^{t-1}+\Delta x_2)(x_3^{t-1}+\Delta x_3)(x_4^{t-1}+\Delta x_4) - x_1^{t-1}x_2^{t-1}x_3^{t-1}x_4^{t-1} \\ &= \sum_i^4 \frac{y^{t-1}}{x_i^{t-1}}\Delta x_i + \sum_i^4\sum_{j>i}^4 \frac{y^{t-1}}{x_i^{t-1}x_j^{t-1}}\Delta x_i \Delta x_j \\ &+ \sum_i^4 x_i^{t-1}\prod_{j\neq i}^4 \Delta x_j + \prod_i^4 \Delta x_i. \end{aligned} \tag{A.16}$$

Subsequently, the contribution, $\phi(x_i)$, of factor x_i to the overall change in y can be computed as follows:

$$\begin{aligned}\phi(x_i) &= \frac{y^{t-1}}{x_i^{t-1}}\Delta x_i \\ &+ \frac{1}{2}\sum_{j\neq i}^4 \frac{y^{t-1}}{x_i^{t-1}x_j^{t-1}}\Delta x_i \Delta x_j \\ &+ \frac{1}{3}\sum_{j\neq i}^4 x_j^{t-1}\prod_{k\neq j}^4 \Delta x_k \qquad \text{(A.17)} \\ &+ \frac{1}{4}\prod_j^4 \Delta x_j. \qquad \text{(A.18)}\end{aligned}$$

A.6.2 Results

Table A.3: Decomposition of the Change in the German Investment Income Balance (as a Percentage of GDP).

	1999 – 2000	2000 – 2001	2001 – 2002	2002 – 2003	2003 – 2004	2004 – 2005	2005 – 2006	2006 – 2007	2007 – 2008	2008 – 2009	2009 – 2010	2010 – 2011	2011 – 2012	2012 – 2013	2013 – 2014	∅ period
Stock effect	**-0.1**	**0.0**	**-0.1**	**-0.1**	**0.1**	**0.3**	**0.4**	**0.2**	**0.0**	**0.1**	**0.2**	**0.1**	**0.2**	**0.3**	**0.3**	**0.1**
GDP effect	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**-0.0**	**-0.0**	**-0.1**	**-0.0**	**0.1**	**-0.1**	**-0.1**	**-0.0**	**-0.1**	**-0.1**	**-0.0**
Yield level effect	**0.0**	**-0.0**	**0.0**	**-0.0**	**0.0**	**0.0**	**0.0**	**0.1**	**-0.2**	**-0.1**	**0.1**	**-0.0**	**-0.1**	**-0.1**	**-0.0**	**-0.0**
Pure yield level effect	0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.1	-0.2	-0.2	0.0	-0.0	-0.1	-0.1	-0.0	-0.0
Yield level composition effect	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Yield spread effect	**0.3**	**-0.2**	**-0.3**	**0.4**	**1.5**	**-0.1**	**0.3**	**-0.4**	**-0.3**	**1.2**	**-0.4**	**0.6**	**-0.2**	**-0.1**	**-0.3**	**0.1**
Pure yield spread effect	0.8	0.2	-1.0	-0.0	1.2	-0.3	0.3	-0.4	1.0	1.0	-1.0	0.6	-0.2	0.0	-0.4	0.1
Portfolio effect	-0.5	-0.4	0.7	0.4	0.3	0.3	-0.0	-0.1	-1.2	0.1	0.4	-0.0	0.1	-0.0	0.0	-0.0
Asset composition effect	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	-0.0	0.0	0.1	0.1
Liability composition effect	-0.0	-0.0	-0.1	-0.0	-0.0	-0.0	0.0	-0.0	-0.0	0.0	-0.0	0.0	-0.0	-0.1	-0.1	-0.0

A.7 Disaggregated Results by Investment Class

Table A.4: Disaggregated Results by Investment Class for *Yield Level Effect* (EUR bn).

	1999 – 2000	2000 – 2001	2001 – 2002	2002 – 2003	2003 – 2004	2004 – 2005	2005 – 2006	2006 – 2007	2007 – 2008	2008 – 2009	2009 – 2010	2010 – 2011	2011 – 2012	2012 – 2013	2013 – 2014	∅ period
Pure yield level effect																
Direct investment																
Equity	-0.0	-0.4	0.3	0.1	0.2	0.3	0.0	0.3	-4.3	2.1	2.1	0.0	-0.9	-0.6	0.1	-0.0
Debt instruments	0.1	-0.0	-0.0	-0.0	-0.0	0.0	0.1	0.2	-0.1	-0.1	0.1	-0.2	-0.4	-0.2	-0.3	-0.1
Portfolio investment																
Shares	0.0	0.0	0.0	0.0	0.0	-0.0	0.1	0.3	0.5	-0.1	-0.3	0.5	-0.2	-0.3	-0.0	0.0
Investment fund shares	-0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.1	-0.2	-0.1	0.0	-0.0	-0.0	-0.2	-0.0
Long-term debt securities	0.1	-0.0	-0.1	-0.1	-0.1	-0.2	-0.2	0.5	0.2	-0.8	-0.2	-0.3	-0.7	-1.9	-0.5	-0.3
Short-term debt securities	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.1	0.0	0.1	-0.4	-0.2	0.2	-0.2	-0.1	-0.0	-0.0
Other investment																
Monetary financial institutions	0.1	-0.3	-0.2	-0.1	-0.0	0.3	0.8	0.9	-1.9	-3.0	-0.2	0.1	-0.6	-0.3	-0.1	-0.3
Enterprises and households	0.0	-0.0	-0.0	0.0	-0.0	0.0	0.1	0.1	-0.3	-0.7	0.1	-0.0	0.1	0.4	-0.1	-0.0
General government	0.0	-0.0	0.0	0.0	0.0	0.0	-0.0	-0.1	-0.0	-0.0	0.2	-0.5	-0.1	0.1	-0.1	-0.0
Bundesbank	0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.1	0.1	-0.4	-0.4	-0.1	-0.1	-0.1	-0.1	-0.1
TARGET2	0.0	-0.0	0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	-0.3	-0.1	0.0	-0.1	-0.3	-0.2	-0.1
Yield level composition effect																
Direct investment																
Equity	0.0	0.0	0.0	0.0	-0.0	-0.0	0.0	0.1	-0.0	-0.0	0.1	0.1	0.0	0.1	0.2	0.0
Debt instruments	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.1	0.0	0.0	0.2	0.3	0.1	0.0
Portfolio investment																
Shares	-0.0	-0.0	-0.1	-0.0	0.0	0.0	0.0	-0.0	-0.5	-0.5	0.2	-0.2	-0.1	0.4	0.3	-0.0
Investment fund shares	0.0	0.0	-0.0	-0.0	0.0	0.0	0.1	0.0	-0.0	0.0	0.1	-0.0	-0.0	0.0	0.1	0.0
Long-term debt securities	-0.0	0.0	0.1	0.0	0.0	0.1	0.0	-0.1	0.0	0.3	0.1	-0.0	0.1	0.1	0.2	0.1
Short-term debt securities	-0.0	-0.0	0.0	0.0	-0.0	-0.0	-0.0	0.1	0.1	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0
Other investment																
Monetary financial institutions	-0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.1	-0.1	0.0	-0.2	-0.3	-0.2	-0.2	-0.2	-0.1	-0.1
Enterprises and households	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.1	0.1	0.0	0.0	-0.3	-0.4	-0.0	-0.0
General government	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0
Bundesbank	-0.0	-0.0	0.0	0.0	-0.0	-0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.1	-0.0	-0.0	0.0
TARGET2	-0.0	-0.0	-0.0	0.0	-0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.1	0.2	0.1	-0.0	0.0

Table A.5: Disaggregated Results by Investment Class for *Yield Spread Effect* (EUR bn).

	1999 – 2000	2000 – 2001	2001 – 2002	2002 – 2003	2003 – 2004	2004 – 2005	2005 – 2006	2006 – 2007	2007 – 2008	2008 – 2009	2009 – 2010	2010 – 2011	2011 – 2012	2012 – 2013	2013 – 2014	∅ period
Pure yield spread effect																
Direct investment																
Equity	5.6	8.8	-20.6	2.8	18.6	-9.9	7.4	-14.1	10.8	13.4	-19.2	9.6	-12.2	10.9	-8.5	0.2
Debt instruments	-0.4	-3.8	-2.1	-0.4	2.2	0.4	0.6	2.5	1.1	-1.5	-1.5	0.2	-0.2	0.2	0.4	-0.2
Portfolio investment																
Shares	3.1	-1.1	1.2	-1.7	2.5	-1.8	-1.5	1.2	3.0	-6.9	2.4	-3.8	1.9	2.4	-1.3	-0.0
Investment fund shares	2.4	2.5	-1.3	-2.3	0.4	2.6	1.0	1.3	1.7	2.4	0.9	0.4	0.0	0.7	-1.5	0.8
Long-term debt securities	0.6	1.4	0.3	1.1	0.8	0.8	-0.5	2.0	3.3	14.5	-9.6	5.6	-0.0	-14.2	-2.0	0.3
Short-term debt securities	1.1	-1.0	-0.8	-0.6	0.3	0.4	0.5	-0.1	1.2	-2.5	-0.1	0.3	0.0	0.9	-0.0	-0.0
Other investment																
Monetary financial institutions	2.5	-0.6	0.7	4.6	-0.6	-1.3	2.2	0.7	3.3	-1.4	0.2	3.5	0.4	0.0	0.1	1.0
Enterprises and households	1.2	-0.7	-1.4	-2.2	3.0	0.7	-0.8	-1.5	0.0	2.8	1.4	1.7	2.9	0.7	1.5	0.6
General government	0.5	0.2	0.3	-0.2	0.5	1.2	-0.4	-1.6	-0.1	0.2	0.7	-0.5	-0.3	-1.2	0.2	-0.0
Bundesbank	-0.2	-0.3	1.9	-1.5	-0.5	-1.1	-0.3	-0.8	1.1	3.2	0.5	-1.4	2.2	0.1	0.7	0.2
TARGET2	-0.3	-0.1	0.3	-0.0	-0.0	0.1	-0.2	0.5	-1.1	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
Portfolio effect																
Direct investment																
Equity	-2.3	-10.5	11.3	3.3	5.7	4.8	-0.3	2.5	-22.7	8.8	10.9	-0.9	-2.9	-3.5	1.1	0.4
Debt instruments	-2.5	1.4	1.9	1.0	-0.2	-0.5	-1.2	-2.7	0.7	1.0	-0.5	1.3	2.3	0.9	0.9	0.3
Portfolio investment																
Shares	0.3	0.2	0.2	0.2	0.1	-0.1	0.0	-0.8	-2.6	1.8	1.4	-2.0	0.8	1.0	0.2	0.0
Investment fund shares	-1.7	-2.0	1.0	0.8	-0.8	-2.7	-1.1	-1.2	-0.1	-3.1	-1.5	0.2	-0.3	-0.3	-0.3	-0.9
Long-term debt securities	-1.9	0.4	1.6	1.4	1.9	1.9	1.1	-1.9	-0.8	2.1	0.7	0.4	1.8	4.3	0.8	0.9
Short-term debt securities	-2.3	1.1	0.8	0.8	0.4	0.2	-1.1	-0.1	-1.6	5.5	1.8	-2.1	1.9	0.6	0.0	0.4
Other investment																
Monetary financial institutions	-1.7	2.0	0.9	0.0	-0.1	0.8	1.6	1.8	-5.2	-8.6	-0.4	0.1	-1.0	-0.3	-0.1	-0.7
Enterprises and households	0.2	-0.4	-0.0	0.5	-0.1	0.2	0.2	0.2	-0.3	-0.2	-0.0	-0.0	0.0	-0.0	0.0	0.0
General government	0.1	-0.2	-0.0	0.1	0.2	0.3	-0.1	-0.2	0.0	0.0	-0.4	1.2	0.2	0.0	-0.1	0.1
Bundesbank	1.4	-1.6	-2.0	0.1	-0.2	0.8	0.1	0.6	0.1	-0.0	-0.3	-0.1	-0.0	0.1	0.1	-0.1
TARGET2	0.2	-0.1	-0.1	0.1	0.0	-0.0	0.1	0.1	1.5	-4.6	-0.9	0.6	-1.5	-3.3	-2.0	-0.7
Asset composition change effect																
Direct investment																
Equity	0.7	0.8	0.2	-0.2	-0.8	-0.6	0.4	1.2	0.1	0.0	1.1	1.5	0.4	-0.1	1.2	0.4
Debt instruments	0.1	0.1	0.1	-0.1	-0.2	-0.1	-0.2	-0.3	0.8	1.0	0.2	0.2	0.9	0.7	0.2	0.2
Portfolio investment																
Shares	0.0	-1.1	-2.5	-1.4	-0.1	0.5	-0.6	-2.8	-5.2	-2.4	0.7	-0.3	-0.3	1.1	1.2	-0.9
Investment fund shares	0.3	0.1	-0.3	0.1	0.3	0.6	0.9	0.7	-0.4	-0.5	0.3	-0.3	-0.3	0.4	0.5	0.2
Long-term debt securities	0.1	1.5	3.2	1.7	0.9	1.6	1.6	0.4	-0.2	3.2	2.7	-1.2	-0.0	1.7	1.5	1.2
Short-term debt securities	-0.1	-0.2	0.1	0.1	0.0	0.0	-0.1	0.4	0.2	-0.5	-0.1	-0.0	0.0	0.0	-0.0	-0.0
Other investment																
Monetary financial institutions	-0.1	1.1	2.5	1.6	0.5	-0.5	-0.5	1.3	2.5	-1.7	-3.0	-1.9	-1.6	-1.2	-0.2	-0.1
Enterprises and households	-0.6	-0.5	-0.2	-0.1	0.2	-0.9	-0.6	0.3	0.5	0.0	0.1	0.3	-2.4	-2.5	-0.3	-0.4
General government	0.2	-0.1	-0.5	-0.2	-0.4	-0.5	-0.3	-0.5	-0.2	0.1	1.4	1.4	0.5	0.3	0.1	0.1
Bundesbank	-0.4	-0.6	-0.3	-0.2	-0.2	-0.1	-0.1	-0.2	0.1	0.5	0.4	0.1	0.0	-0.1	-0.0	-0.1
TARGET2	-0.1	-0.2	-0.2	0.1	0.0	0.1	0.0	0.4	2.6	2.5	1.0	1.3	2.4	0.7	-0.4	0.7
Liabilities composition change effect																
Direct investment																
Equity	-1.6	0.1	-0.1	-0.9	-0.8	-0.3	-0.5	-1.0	0.2	0.1	0.2	0.3	0.0	-0.7	-1.0	-0.4
Debt instruments	-1.0	-1.9	-1.1	-0.0	1.4	1.4	0.3	0.3	0.3	-0.8	-0.5	-0.4	-2.0	-2.3	-0.5	-0.5
Portfolio investment																
Shares	1.1	1.3	1.6	0.7	-0.8	-0.4	-1.4	-2.6	3.5	4.8	-1.5	2.0	0.8	-3.8	-2.0	0.2
Investment fund shares	-0.6	-0.4	0.1	0.2	-0.0	-0.3	-0.3	-0.2	0.2	-1.0	-0.6	-0.1	-0.2	-0.1	-0.0	-0.2
Long-term debt securities	0.7	-0.4	-4.1	-2.7	-2.3	-3.2	0.7	2.8	-1.1	-1.2	1.6	-0.9	-1.9	0.5	-0.5	-0.8
Short-term debt securities	0.2	0.6	-0.2	-0.7	0.1	0.4	0.3	-1.1	-2.2	-1.0	-0.0	0.4	0.3	0.1	0.1	-0.2
Other investment																
Monetary financial institutions	0.5	0.1	1.1	2.5	1.6	1.3	1.9	2.7	1.8	1.8	0.9	0.9	0.8	0.6	0.5	1.3
Enterprises and households	-0.1	-0.3	-0.1	0.2	0.2	0.3	-0.5	-0.1	-1.0	-1.4	0.1	-0.1	1.4	1.7	0.0	0.0
General government	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	0.1	-0.1	-0.0	-1.5	-1.5	0.1	0.1	-0.0	-0.2
Bundesbank	0.0	-0.0	-0.5	-0.3	0.1	0.1	-0.4	-1.0	-2.6	-0.9	0.2	-0.4	-0.7	-0.1	0.2	-0.4
TARGET2	-0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0	0.0