

# **‘Dark matter’ in the external sector of the United States<sup>1</sup>**

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**Abstract:** The aim of this paper is to examine the ‘dark matter’ assets in the external sector of the United States in the period 1999:Q1-2018:Q3. The paper investigates data on the balance of payments and international investment position for the US and a group of 18 economies. The research reveals that the US is a privileged economy with respect to foreign income on international investments. The rates of return on its foreign assets are relatively higher, and the costs incurred on its foreign liabilities relatively lower, as compared with the benchmark group. This special privilege of the US relates to equity investments, especially foreign direct investments. Based on prevailing income differentials substantial ‘dark matter’ assets of the US are estimated. Recognising such ‘dark matter’ leads to the conclusion that the US is a foreign creditor, not debtor. The findings shed light on the puzzle as to why the US has a continuing ability to sustain its external position despite mounting foreign liabilities.

**Keywords:** international finance, balance of payments, income account, international investment position, ‘dark matter’ hypothesis.

**JEL codes:** F36, F41, F62, G15.

## **Introduction<sup>3</sup>**

An imbalance between foreign liabilities and foreign assets leads to either a deficit or a surplus in an economy’s income account. Economies with a significantly negative net international investment position (IIP) naturally have a deficit in their investment income account as the cost of servicing foreign liabilities exceeds the income generated on foreign assets. The United States (US) is an important exception in this respect. In the US balance of payments

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<sup>1</sup> Article received 11 January 2019, accepted 10 April 2019.

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<sup>3</sup> This is an extended and revised version of a conference paper entitled “Estimation of ‘Dark Matter’ in the External Sector of the United States After the Outbreak of the World Economic Crisis in 2009”. The conference paper was presented at the 23rd Eurasia Business and Economics Society Conference, Madrid, Spain, September 27-29, 2017, and has been accepted for publication in the Proceedings of the 23rd EBES Conference.

(BoP) there is a surplus in the income account despite a deeply negative net IIP. In other words, for the United States, relatively smaller foreign assets generate a higher income as compared with the servicing costs incurred on relatively larger foreign liabilities. Hausmann and Sturzenegger (2006, 2007) explain this phenomenon using a concept of 'dark matter' in the external sector. The concept assumes that US net foreign assets are underestimated in official BoP statistics. This underestimation results from the inadequacy of the methods applied to evaluate foreign investments as they do not take into account all the elements of the attractiveness of an investment.

This paper estimates 'dark matter' assets in the external sector of the United States in the period from the first quarter of 1999 (1999:Q1) to the third quarter of 2018 (2018:Q3). The following hypotheses are verified:

- the United States is a privileged economy with respect to foreign income on international investment,
- the income privilege of the United States is investment-type specific because it relates to equity investments as opposed to debt investments,
- the United States is a foreign creditor as its 'dark matter' assets are large.

To verify the hypotheses a statistical analysis using a time series on BoP (foreign income flows) and IIP data for the United States and other economies for the period 1999:Q1-2018:Q3 is conducted. The data are from the International Monetary Fund (Balance of Payments Statistics—BoPS, Coordinated Direct Investment Survey—CDIS, Coordinated Portfolio Investment Survey—CPIS), the Bank for International Settlements (Locational Banking Statistics—LBS), and the Bureau of Economic Analysis (BEA). The research method applied is based on the concept of 'dark matter' by Hausmann and Sturzenegger (2006, 2007) and the commonly used accounting framework for BoP and IIP. Based on a comparison of rates of return between the United States and a group of eighteen countries hypothetical income streams on US foreign assets and liabilities are calculated. Then 'dark matter' net assets and an economic net IIP, as opposed to an official net IIP, for the United States are estimated. The study contributes to the literature in three ways. Firstly, it extends Hausmann and Sturzenegger's concept of 'dark matter' by analysing it separately for each type of investment (foreign direct investment, portfolio debt, portfolio equity and other investments<sup>4</sup>). Secondly, unlike Hausmann and Sturzenegger (HS), this paper does not use an arbitrary assumed capitalization rate but applies empirical rates of return and implements a concept of hypothetical income. Thirdly, the HS analysis of 'dark matter' is extended by covering the post-crisis period.

The structure of the paper is as follows. In the first section stylised facts on the income account and the IIP of the United States are presented. The second

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<sup>4</sup> Other investment is a residual category in the financial account and international investment position. It comprises all investments not included under other categories. The major element of other investment category is debt investment in the form of loans and deposits (IMF, 2009).

section depicts methodological aspects related to measuring returns on foreign investments and estimating 'dark matter' assets. In the third section the returns on foreign investments in the United States and the benchmark group of countries are compared and a hypothetical income on US foreign assets and liabilities is calculated. In this section an estimate of 'dark matter' in the US external sector is presented. Conclusions are presented in the final section.

## **1. Stylised facts about the US foreign investment position**

The external position of the United States has been continuously characterized for many decades by a current account deficit and thus a deteriorating net international investment position. In the years preceding the outbreak of the world economic crisis in 2009 the United States witnessed a rising current account deficit (reaching 6.1% of GDP in 2006:Q3) and a negative net IIP (decreasing to 22.0% of GDP at the end of 2002).<sup>5</sup> At the same time, despite mounting foreign liabilities that far exceeded foreign assets, the US economy was surprisingly able to persistently generate positive net foreign income flows (ranging from 0.1% to 0.7% of GDP in the period 1999:Q1-2007:Q4). This phenomenon has been called an 'income puzzle' in the literature (see Figure 1).

Based on this perplexing picture economists prepared very diverging scenarios for the United States.<sup>6</sup> On the one hand some forecast a severe external crisis for the US economy that played a central role in the so called 'global imbalances' phenomenon.<sup>7</sup> They expect an unprecedented adjustment of the US dollar and a forced unravelling of the disequilibrium in the US external position (Ahearne et al., 2007; Edwards, 2005; Gourinchas & Rey, 2007; Ito & McCauley, 2018; Obstfeld & Rogoff, 2000, 2004, 2005; Roubini, 2006; Roubini & Setser, 2005; Wolf, 2004). On the other hand some researchers believe that the US external position is sustainable as it is at the centre of a revived Bretton Woods system which is beneficial to all the parties involved in this new informal international financial architecture (Dooley, Folkerts-Landau, & Garber, 2003, 2004, 2009).

The outbreak of the crisis proved that none of the economic forecasts are fully correct. Admittedly the world economic crisis itself magnified the legitimacy of raising a question about the role of the US external position and global imbalances in generating financial turbulence. However the course of

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<sup>5</sup> Balance of payments flows for a given quarter are measured on an annualised basis (for last four quarters).

<sup>6</sup> See Sobanski (2010) for an overview of opinions on the sustainability of global imbalances and the US current account deficit. Recently Altman and Kuehne (2016) indicate that an inflating credit bubble is building in the United States. They are also concerned with the possibility of a global credit bubble and the implications of a burst in that bubble.

<sup>7</sup> Current account imbalances are also analysed in the literature on a regional level. For instance Pera (2016) analyses a diverging pattern in trade balances of the eurozone countries.

the crisis was not of the kind foreseen by economists. There was no drastic depreciation of the US currency and a forced current account reversal into surplus. Although the US current account improved as compared with the pre-crisis level it is still in deficit, ranging from 2.0% to 2.9% of GDP in the period 2010:Q1-2018:Q3. More importantly the deterioration of net IIP continued systematically. The net position reached a historic minimum of -47.6% of GDP at the end of 2018:Q3. Surprisingly at the same time there was a positive trend in foreign income. Despite rising net foreign liabilities net investment income significantly increased and has stayed over 1.0% of GDP since 2010.<sup>8</sup> It proves the special privilege of the US economy in the international economic environment: although it is becoming a larger foreign creditor it has the continuing ability to keep servicing its liabilities below the income generated abroad.

A closer look at net investment income shows that the major source of this privilege is international equity investments, especially foreign direct investments (FDIs). In the period 1999:Q1-2008:Q4 average annual net income on foreign direct investment amounted to 1.1% of GDP. After the crisis (2009:Q1-2018:Q3) the annual net FDI income increased further to 1.7% of GDP. Similarly net income on portfolio equity investments was positive throughout the period 1999:Q1-2018:Q3 and rose from 0.2% of GDP (annual average for 1999:Q1-2008:Q4) to 0.4% of GDP (for 2009:Q1-2018:Q3). The positive net equity income prevailed despite large fluctuations in net IIP in FDI and portfolio equity investments. The net stock for these two types of equity investments was lower than 0.5 trillion USD between 1999:Q1-2003:Q3. Then it rose significantly and at the end of 2007 reached 3.7 trillion USD. Afterwards the net position ranged between 0.4 and 3.3 trillion USD until the end of the third quarter of 2018 when it turned negative.

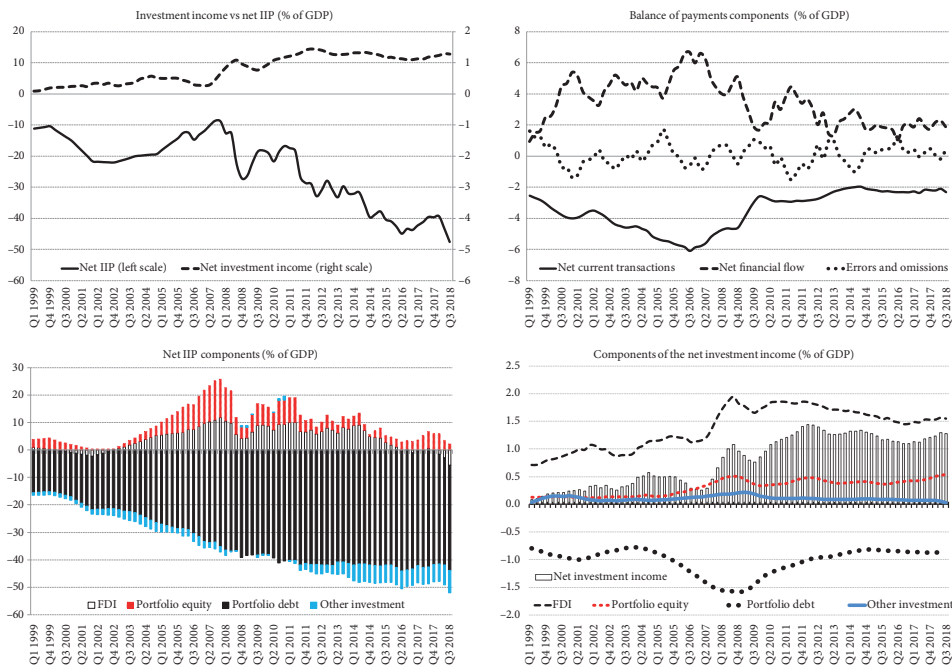
The high ratio of income to the stock of equity investments and the low correlation of these two variables indicate that the crucial driver for the income surplus is the relatively high effectiveness of US residents' equity investments abroad as compared to those of non-residents investing in the US.

Contrary to equity investments income on debt securities was negative throughout the period 1999:Q1-2018:Q3 ranging annually from 0.8% to 1.6% of GDP. This is not surprising if one takes into account the deeply negative net IIP in portfolio debt. Negative net stock of international debt securities in the US economy increased steadily from 1.4 trillion USD (15.5% of GDP) at the end of the first quarter of 1999 to 7.7 trillion USD (38.4% of GDP) at the end of the third quarter of 2018. However it should be noted that despite a negative net position in other investments,<sup>9</sup> the US economy was able to generate posi-

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<sup>8</sup> Whereas the annualised net investment income amounts to 0.4% of GDP on average for the period 1999:Q1-2008:Q4, it rises to 1.2% of GDP for the period 2009:Q1-2018:Q3.

<sup>9</sup> In all quarters of the period 1999:Q1-2018:Q3 except for the periods 2008:Q4-2009:Q2 and 2010:Q2-2010:Q4.



**Figure 1. The foreign income puzzle in the US economy for the period 1999:Q1-2018:Q3**

Source: Based on data provided by the International Monetary Fund (Balance of Payments Statistics, BoPS) and the Bureau of Economic Analysis.

Other remarks: The top left-hand figure depicts the net international investment position and net investment income (expressed as a percentage of GDP). The top right-hand figure depicts components of the balance of payments expressed as a percentage of GDP (capital account is included in current transactions). The bottom left-hand figure depicts components of the net international investment position expressed as a percentage of GDP (reserve assets and the net position in derivatives provided since 2005 are excluded). The bottom right-hand figure depicts major components of net foreign investment income expressed as a percentage of GDP. Balance of payments flows for a given quarter are measured on an annualised basis (for the last four quarters). Quarterly stocks of US foreign assets and liabilities for 1999:Q1-2005:Q3 (for the end of the first, second and third quarters) are estimated based on end-year stocks, assuming their linear change within a year.

tive income flows on these types of debt instruments, hovering around 0.1% of GDP on an annual basis.

Generally one concludes that the US economy is consistently short in debt instruments and long in equity instruments (Gourinchas & Rey, 2007). This picture of the US economy as a world venture capitalist is even sharper after the outbreak of the crisis than it was before. The special privilege of the US economy clearly continues in the post-crisis period.

What does this tell us about the 'dark matter' concept proposed by Hausmann and Sturzenegger (2006, 2007)? Empirical evidence in the post-crisis period

provides support for their view that the actual net IIP of the United States is not negative but positive. The continuing positive net income flow of the US economy might prove that net foreign assets exist that are not accounted for in the official statistics.<sup>10</sup> In this context any attempt to measure and estimate 'dark matter' in the external sector of the United States seems justified.

## 2. Methodology of the research

The BoP data are very useful when assessing the economic situation of a country. However the shortcomings associated with BoP preparation make it necessary to use this information with caution. It is not just about the balance of so-called 'errors and omissions' but also about the methods of recognizing, valuing and presenting recorded foreign transactions.

The fundamental framework for this research is the concept of 'dark matter' by Hausmann and Sturzenegger (2006, 2007). Stressing that official statistics do not fully reflect the actual economic position they argue that the current account deficit and the negative net IIP of the US economy are purely of a statistical nature and the phenomenon of so called 'global imbalances' is illusory. Official statistics may misreport the standing of an economy for two reasons. First, difficulties in valuing foreign direct investments can distort the true economic picture. Second, not all economic transactions between residents and non-residents are included in BoP statistics due to data collection issues.

Hausmann and Sturzenegger (2006, 2007) assume that measuring the stocks of foreign assets and liabilities is more problematic than measuring the income flows on these assets and liabilities. Therefore they propose an alternative method for estimating net foreign assets based on the capitalization of foreign income streams.<sup>11</sup> The valuation of net foreign assets is based on total net foreign investment income ( $NI_t$ ) and capitalization rate ( $r$ ):

$$NFA_t^{DM} = \frac{NI_t}{r}, \quad (1)$$

<sup>10</sup> Ayres (2018) explicitly supports the concept by Hausmann and Sturzenegger (2006, 2007) by estimating a large flow of knowledge within multinational corporations in the United States and European Union. He claims that US multinationals produce knowledge in the United States that is further used by its subsidiaries in the European Union. He indicates that this explains the observed income privilege of the US economy.

<sup>11</sup> The concept of calculating net IIP as capitalized income is also used by Cline (2005). He uses the term 'capitalised net capital income' to describe net IIP valuation.

Based on an estimate of net IIP, Hausmann and Sturzenegger (2006, 2007) further calculate the economic current account balance. According to the BoP identity, the current account for a given period equals to a change in net IIP. In this simplified approach the valuation adjustment (on foreign assets and liabilities) is omitted from the analysis. For a definition of valuation adjustment see Sobanski (2015) and Kristinsson (2016).

where:

$NFA_t^{DM}$  –net foreign asset position adjusted for valuation of the ‘dark matter’ at the end of period  $t$  (actual net IIP).

The difference between the official net IIP and the position estimated by capitalizing the net income (the actual net IIP) is called ‘dark matter’ (DM), as shown in the following formula:

$$DM_t = NFA_t^{DM} - NFA_t, \quad (2)$$

where:

$NFA_t$  –net foreign asset position (net IIP) according to official statistics, with the rest of the notation as presented above.

The major issue of the approach applied by Hausmann and Sturzenegger (2006, 2007) is that it estimates the ‘missing wealth’, based on total net income and does not recognise any valuation differences among equity investments, bonds and bank loans on both asset and liability sides of the international balance sheet (see Economist, 2006).

This paper extends the concept of ‘dark matter’ by estimating it separately for FDIs, portfolio debt, portfolio equity and other investments rather than on an aggregate level. Additionally ‘dark matter’ is estimated on a gross basis, i.e. separately for foreign assets and foreign liabilities. Unlike Hausmann and Sturzenegger this paper does not apply an arbitrary assumed capitalization rate but employs empirical rates of return.<sup>12</sup> Such an approach is based on the presumption that assets exposed to different risks have different returns. The rates of return (income yields<sup>13</sup>) are estimated as a ratio of income to asset stock or liability stock measured at the end of the previous period (quarter)<sup>14</sup>:

$$r_t = \frac{INC_t}{A_{t-1}}, \quad (3)$$

where:

$r_t$  –rate of return on a given investment (asset or liability) in the period  $t$ ,

$INC_t$  –foreign income (earnings, interest or dividends) on assets or liabilities in the period  $t$ ,

$A_{t-1}$  –stock of assets or liabilities at the end of the preceding period.

The HS analysis of ‘dark matter’ is also extended by implementing a concept of hypothetical income (see below) and by covering the post-crisis period. The time span of the analysis covers quarterly data from the first quarter of 1999 (1999:Q1) to the third quarter of 2018 (2018:Q3).

<sup>12</sup> Hausmann and Sturzenegger (2006) apply 5% as the capitalization rate.

<sup>13</sup> Contrary to Curcuro, Thomas and Warnock (2013), this paper excludes the valuation adjustment (capital gain) in the calculation of returns.

<sup>14</sup> The same approach is applied by Higgins, Klitgaard and Tille (2005) amongst others.



This paper compares the rates of return generated on US foreign assets and liabilities with returns generated on the international investment positions among a group of eighteen economies (benchmark group). The benchmark group is formed of countries having material investment relations with the US economy as measured by their share in US foreign assets or liabilities. Economies having a share of at least 1% in US foreign assets or liabilities are included, either in the form of FDI, portfolio investment or loans.<sup>15</sup> However countries that are regarded as tax havens are excluded.<sup>16</sup> The benchmark group consists of Australia, Belgium, Brazil, Canada, Denmark, France, Germany, India, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Spain, Sweden, and United Kingdom.<sup>17</sup>

The data on balance of payments, international investment position and national accounts are from the International Monetary Fund (Balance of Payments Statistics) and the Bureau of Economic Analysis. Data on geographic distribution of FDI and foreign portfolio investment stocks provided by the International Monetary Fund are also used (Coordinated Direct Investment Survey and Coordinated Portfolio Investment Survey respectively) as well as data on geographic distribution of foreign loans and deposits of US reporting banks provided by the Bank of International Settlements (Locational Banking Statistics).

The rates of return on FDIs, portfolio equity, portfolio debt and other investments for the benchmark group ( $r_t^B$ ) are calculated as the weighted averages of returns for the respective countries (with stocks of assets or liabilities as weights)<sup>18</sup>:

$$r_t^B = r_t^i \cdot \frac{A_{t-1}^i}{\sum_{i=1}^n A_{t-1}^i}, \quad (4)$$

where:

- $r_t^i$  –rate of return on a given investment (asset or liability) in country  $i$  in the period  $t$ , where  $i = 1, \dots, n$  ( $n = 18$ ),
- $A_{t-1}^i$  –stock of assets or liabilities in country  $i$  at the end of the preceding period.

<sup>15</sup> Data on geographic distribution of stocks for FDI, portfolio investment, loans and deposits provided by the International Monetary Fund and the Bank of International Settlements as of the end of 2017 is used.

<sup>16</sup> To define a country as tax haven a list of 30 non-cooperative tax jurisdictions is applied that featured on at least 10 Member States' national blacklists, issued by the European Commission in June 2015 and the list of tax havens issued by the European Commission in December 2017 (EC, 2015, 2018). Based on them Bahamas, Bermuda, Cayman Islands, Hong Kong Special Administrative Region, Jersey, South Korea, Switzerland, Taiwan are excluded.

<sup>17</sup> China and Singapore meet the selection criteria but are excluded due to the lack of quarterly data.

<sup>18</sup> If for a given quarter there are no data to calculate return for a given country from the benchmark group, the weight applied to this country is 0.



Any difference between rates of return on a given asset or liability in the US and the benchmark group is evaluated with regard to its statistical significance in the period analysed. The statistical significance is evaluated based on a parametric *t*-test and nonparametric tests (Mann-Whitney *U*-test, Kolmogorov-Smirnov test). In the case of statistically significant differences (either positive for assets or negative for liabilities) a hypothetical income on a given asset or liability is then estimated.

The hypothetical income is estimated by applying the benchmark returns to actual stocks of US foreign assets and liabilities ( $A_{t-1}^{US}$ ):

$$INC_t^{hUS} = r_t^B \cdot A_{t-1}^{US}, \quad (5)$$

Assume that positive/negative differences between the actual and the hypothetical incomes for a given asset / liability are attributable to unrecognized assets/liabilities and constitute 'dark matter' income. The valuation of 'dark matter' for a given type of asset or liability is based on the capitalization of 'dark matter' income using empirical yields for this type of asset or liability in the benchmark group.

Finally the actual net IIP for the United States is estimated by adjusting the official position with an estimate of 'dark matter' net assets:

$$NFA_t^{DM} = NFA_t + DM_t, \quad (6)$$

### 3. Income differential and 'dark matter' estimates

An informal analysis of rates of return proves that in the period 1999:Q1-2018:Q3 the United States was able to generate higher rates of return on equity assets and incur lower cost of capital on equity liabilities (both FDI and portfolio) on average as compared with the benchmark group (see Figure 2). Whereas average annual rate of return on FDI assets in the benchmark group is 5.1%, the return generated by the United States is higher by 2.1 percentage points (p.p.). This advantage increases over time. Whereas the average excess return for the US is 0.9 p.p. for 1999:Q1-2008:Q4 (pre-crisis period) it rises to 3.3 p.p. after the outbreak of the global economic crisis. In turn the rate of return (cost of capital) on FDI liabilities for the United States amounts to 3.3% in the period analysed, which is lower by 1.3 p.p. than for the benchmark group. The average cost for the US is relatively lower both in the pre-crisis and post-crisis periods (by 2.0 and 0.6 p.p., respectively). For portfolio equity investments the average annual return generated on US assets in the period 1999:Q1-2018:Q3 is 2.7%, exceeding that for the benchmark group by 0.3 p.p. Likewise the average cost incurred on US liabilities is 1.9%, which is lower by 1.0 p.p. compared with the benchmark group. Whereas the average return differential on portfo-

lio equity assets is larger in the post-crisis period than in the pre-crisis period the opposite is true for portfolio equity liabilities. The statistical analysis confirms that the quarterly return differences between the United States and the benchmark group are significant at a  $p$  level below 0.01 (Table 5 in Appendix).<sup>19</sup>

The aforementioned results support the findings of other economists that US companies generate higher returns on their direct investments abroad than foreign entities generate on their FDI assets in the United States (Ali, 2016; Bosworth, Collins, & Chodorow-Reich, 2007; Curcuro & Thomas, 2015; Gros, 2006a; Kitchen, 2007; McGrattan & Prescott, 2010). However it should be noted that the results go beyond this finding by additionally proving that US companies are able to generate higher FDI and portfolio equity returns than companies from other countries earn on their equity investments abroad, not just in the US. Furthermore the US economy incurs lower costs on equity capital provided by foreign investors as compared to costs incurred by other economies. Among the factors responsible for the US return advantage the above mentioned economists cite the following: unique US know-how, different risk characteristics of US and foreign projects and transfer pricing (reporting extra income in low tax jurisdictions of US affiliates and reduced income by foreign affiliates in the United States).

For portfolio debt investments only returns on assets are statistically different between the two groups (at a  $p$ -value below 0.01). In the whole of the period analysed (1999:Q1-2018:Q3) the United States generated an average annual return of 4.8%, which was 0.8 p.p. higher than for the benchmark countries. As expected the return on US portfolio debt assets is higher in the pre-crisis period (5.7%) as compared with the post-crisis period (4.0%).<sup>20</sup> However the excess return of the US economy is 0.8 p.p. for both periods. In the case of other investment assets and liabilities the null hypothesis that the return distributions in the United States and the benchmark group are the same is not rejected.<sup>21</sup>

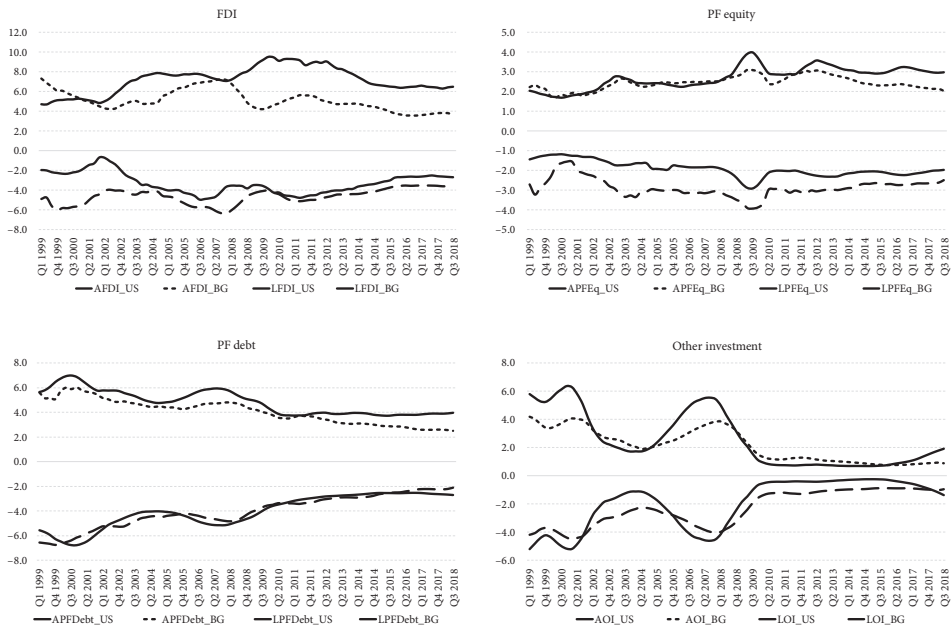
In order to differentiate between rates of return on assets (inflow returns) and rates of return on liabilities (outflow returns) the former are presented in figures as positive numbers and the latter as negative ones.

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<sup>19</sup> For most investment types the formal requirements for application of parametric tests in this research are not met, i.e. returns prove not to be normally distributed and homoscedasticity assumption is not met (see Tables 3 and 4 in Appendix). Therefore this paper employs non-parametric tests to evaluate the difference between distributions of returns in the United States and the benchmark group (see Table 5 in Appendix). However as parametric tests are considered appropriate for large samples (in this study  $n = 79$ ), even if the respective variable is not normally distributed, the results of both parametric and nonparametric tests are considered in order to draw final conclusions. A conservative stance is adopted, i.e. the null hypothesis is rejected only if the all tests employed indicate so at the same time.

<sup>20</sup> After the outbreak of global economic crisis there was a decrease in interest rates for major global currencies.

<sup>21</sup> Although nonparametric tests suggest a difference in rates of return for other investment liabilities it was considered prudent to also take into account the opposite indications of the parametric  $t$ -test.



**Figure 2. Rates of return on foreign assets and liabilities of the United States and the benchmark group for the period 1999:Q1-2018:Q3 (in %)**

Source: Own calculations based on data provided by the International Monetary Fund (BoPS) and the Bureau of Economic Analysis.

Other remarks: the figures depict rates of return on respective foreign assets or liabilities of the United States and the benchmark group, i.e.:

AFDI\_US / AFDI\_BG—on foreign direct investment assets of the United States / the benchmark group countries,

LFDI\_US / LFDI\_BG—on foreign direct investment liabilities of the United States / the benchmark group countries,

APFEq\_US / APFEq\_BG—on portfolio equity investment assets of the United States / the benchmark group countries,

LPFEq\_US / LPFEq\_BG—on portfolio equity investment liabilities of the United States / the benchmark group countries,

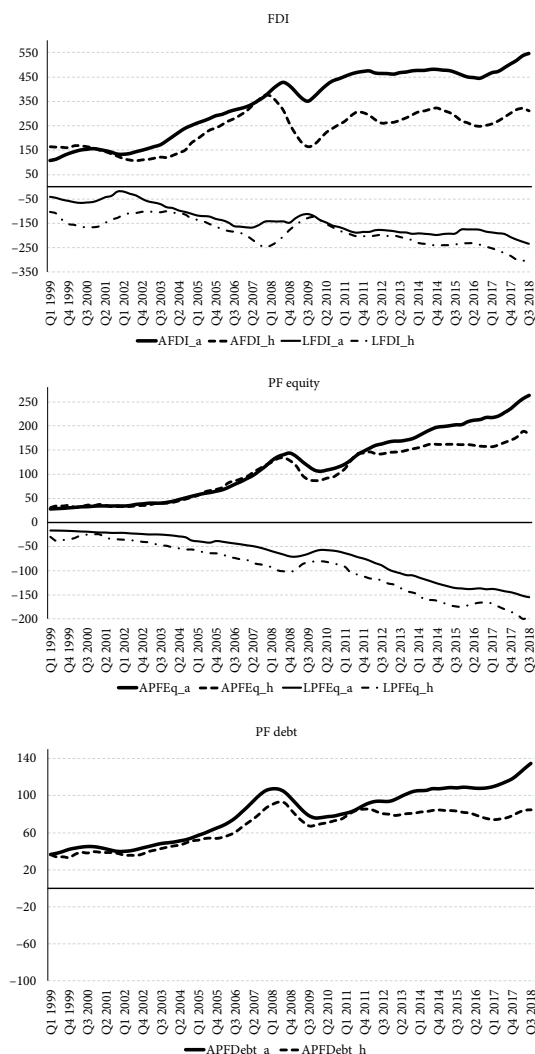
APFDebt\_US / APFDebt\_BG—on portfolio debt investment assets of the United States / the benchmark group countries,

LPFDebt\_US / LPFDebt\_BG—on portfolio debt investment liabilities of the United States / the benchmark group countries,

AOI\_US / AOI\_BG—on other investment assets of the United States / the benchmark group countries,

LOI\_US / LOI\_BG—on other investment liabilities of the United States / the benchmark group countries.

Next the actual and hypothetical incomes on US foreign assets and liabilities are compared for which rates of return can be observed that are significantly different than for the benchmark group (see Figure 3). For the period 1999:Q1-2018:Q3 actual average income on FDI assets of the United States amounts to 343.4 billion USD per annum, whereas the hypothetical amount



**Figure 3: Actual vs hypothetical incomes on foreign assets and liabilities of the United States for the period 1999:Q1-2018:Q3 (in billion USD)**

Source: Own calculations based on data provided by the International Monetary Fund (BoPS) and the Bureau of Economic Analysis.

Other remarks:

AFDI\_a / LFDI\_a—actual income on foreign direct investment assets / liabilities of the United States

AFDI\_h / LFDI\_h—hypothetical income on foreign direct investment assets / liabilities of the United States

APFEq\_a / LPFEq\_a—actual foreign income on portfolio equity assets / liabilities of the United States

APFEq\_h / LPFEq\_h—hypothetical foreign income on portfolio equity assets / liabilities of the United States

APFDebt\_a / APFDebt\_h—actual/hypothetical income on portfolio debt investment assets of the United States

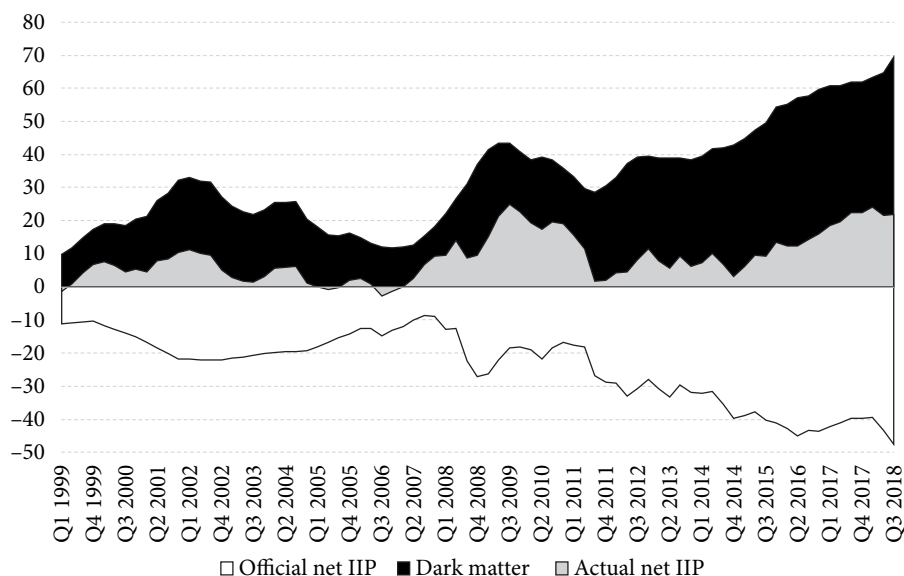
is 234.3 billion USD. The differential increases significantly in the post-crisis period (to 189.9 billion USD in 2009:Q1-2018:Q3) as compared with the pre-crisis one (30.5 billion USD in 1999:Q1-2008:Q4). In the case of FDI liabilities the average actual cost incurred by the United States in the period analysed is 135.4 billion USD, i.e. 48.2 billion less than expected, based on the benchmark group. A significant excess of hypothetical over actual cost prevails both in the pre-crisis and post-crisis periods (59.2 and 36.9 billion USD, respectively).

For portfolio equity investments the differences are much lower. Actual annual income on US portfolio equity assets is 117.4 billion USD (16.3 billion USD more than the hypothetical income). This result is driven by the post-crisis trend. In turn the annual cost on US portfolio equity liabilities for the whole period analysed is 69.1 billion USD (27.8 billion USD less than the hypothetical cost). The differential between hypothetical and actual costs is higher in the post-crisis than in the pre-crisis period (33.5 vs 22.3 billion USD, respectively).

In turn average annual income generated on portfolio debt assets of the US economy for 1999:Q1-2018:Q3 is 79.7 billion USD, which is 14.4 billion USD more than the hypothetical income. The income expected, based on the benchmark group, is lower than the actual amount by 8.3 billion USD in the pre-crisis period and by 20.6 billion USD in the post-crisis period. However it should be noted that favourable income differentials on US portfolio debt assets are accompanied frequently throughout the period analysed by unfavourable income differentials on US portfolio debt liabilities. Therefore the excess income on portfolio debt assets is excluded from 'dark matter' estimates for reasons of prudence.

This paper calculates 'dark matter' in the external sector of the United States by capitalizing the income differential using the empirical rates of return (Table 1). The estimate of 'dark matter' amounts to 0.9 trillion USD at the end of the first quarter of 1999 and increases to 14.0 trillion USD at the end of the third quarter of 2018. The largest part of 'dark matter' relates to FDIs as the largest relative income benefits for the US economy are attributable to this type of foreign investment. At the end of 2018:Q3 the 'dark matter' on FDIs is estimated to be at a level of 8.4 trillion USD (of which 6.5 trillion USD relates to assets and 1.9 trillion USD relates to liabilities). 'Dark matter' stemming from the valuation of portfolio equity investments amounts to 5.6 trillion USD (of which approximately 70% relates to assets and the rest to liabilities).

The official net IIP indicates that the US economy is an international debtor. In the period analysed the net IIP of the United States is negative and increasing, going from -1.0 trillion USD at the end of the first quarter of 1999 (-11.2% of GDP) to -9.6 trillion USD at the end of the third quarter of 2018 (-47.6% of GDP). However, after adjustment using the estimate of 'dark matter' it becomes positive for almost all quarters. The 'dark matter' in the external balance sheet seems significant (exceeding 0.9 trillion USD in the pre-crisis period and 4.4 trillion USD in the post-crisis period). Recognising these 'dark matter' net



**Figure 4. Official vs actual net international investment position of the United States for the period 1999:Q1-2018:Q3 (as % of GDP)**

Source: Own calculations based on data provided by the International Monetary Fund (BoPS) and the Bureau of Economic Analysis.

assets leads to the conclusion that for most of the period analysed the United States is a foreign creditor, not debtor (Table 2). The actual net IIP (official net IIP adjusted by the 'dark matter') ranges from -0.4 to 4.7 trillion USD, or in relative terms, from -2.7% to 24.9% of GDP (Figure 4).

## Conclusions

This research indicates that the United States is a privileged economy with respect to foreign income on international investment. Rates of return on its foreign assets are relatively higher and the costs incurred on its foreign liabilities relatively lower as compared to the benchmark group of countries. The special privilege of the United States relates to equity investments. The major excess return and income streams are generated on FDIs abroad. At the same time major cost savings are realised on FDI liabilities. Relative benefits are also observable in the case of portfolio equity assets and liabilities. The favourable income differential for equity investments of the United States is larger in the post-crisis period than in the pre-crisis one.

Based on prevailing income differentials this paper estimates substantial 'dark matter' net assets in the external sector of the United States. Consequently the actual net IIP deviates significantly from that officially reported. Recognising

**Table 1. 'Dark matter' estimate for the United States for the period 1999:Q1-2018:Q3 (in trillion USD)**

Type of investment	1999: Q1	2000: Q4	2001: Q4	2002: Q4	2003: Q4	2004: Q4	2005: Q4	2006: Q4	2007: Q4	2008: Q4	2009: Q4	2010: Q4	2011: Q4	2012: Q4	2013: Q4	2014: Q4	2015: Q4	2016: Q4	2017: Q4	2018: Q3
FDI assets	-0.8	0.0	0.2	0.9	1.5	1.3	0.8	0.4	-0.1	3.3	4.5	3.6	3.1	4.2	3.8	3.6	5.1	5.8	5.4	6.5
FDI liabilities	1.3	1.8	2.5	1.3	0.4	0.4	0.6	0.5	1.7	0.6	0.1	0.3	0.3	0.5	0.6	1.1	1.6	1.7	2.2	1.9
FDI net	0.5	1.8	2.7	2.2	1.9	1.7	1.4	0.8	1.6	3.9	4.6	3.9	3.4	4.7	4.4	4.6	6.7	7.5	7.5	8.4
PF equity assets	-0.1	-0.1	0.1	0.2	0.1	0.1	-0.1	-0.2	-0.1	0.6	0.7	0.5	0.1	0.7	0.8	1.5	1.8	2.6	3.0	4.0
PF equity liabilities	0.5	0.4	0.7	0.6	0.7	0.7	0.9	1.0	1.1	0.9	0.6	1.0	1.2	1.0	1.2	1.4	1.4	1.0	1.5	1.6
PF equity net	0.4	0.3	0.7	0.8	0.8	0.8	0.7	0.8	1.0	1.5	1.3	1.5	1.3	1.7	2.0	2.9	3.2	3.6	4.6	5.6
Total 'dark matter'	0.9	2.1	3.4	3.0	2.7	2.5	2.1	1.6	2.6	5.4	5.9	5.4	4.7	6.4	6.4	7.5	9.9	11.2	12.1	14.0

Source: Own calculations based on data provided by the International Monetary Fund (BoPS) and the Bureau of Economic Analysis.

Other remarks: Data as of the end of the quarter. 'Dark matter' for FDI assets and PF equity assets is positive for most of the analysed period. However, it turns occasionally negative in the pre-crisis period, due to the fact that the return differential is negative in some selected quarters of this period.

**Table 2. Official vs actual net international investment position of the United States for the period 1999:Q1-2018:Q3 (in trillion USD)**

Type of investment	1999: Q1	2000: Q4	2001: Q4	2002: Q4	2003: Q4	2004: Q4	2005: Q4	2006: Q4	2007: Q4	2008: Q4	2009: Q4	2010: Q4	2011: Q4	2012: Q4	2013: Q4	2014: Q4	2015: Q4	2016: Q4	2017: Q4	2018: Q3
Official net IIP	-1.0	-1.5	-2.3	-2.4	-2.3	-2.4	-1.9	-1.8	-1.3	-4.0	-2.6	-2.5	-4.5	-4.5	-5.4	-6.9	-7.5	-8.2	-7.7	-9.6
'Dark matter'	0.9	2.1	3.4	3.0	2.7	2.5	2.1	1.6	2.6	5.4	5.9	5.4	4.7	6.4	6.4	7.5	9.9	11.2	12.1	14.0
Actual net IIP	-0.1	0.6	1.1	0.6	0.4	0.1	0.3	-0.2	1.4	1.4	3.3	2.9	0.3	1.9	1.1	0.6	2.4	3.0	4.4	4.4

Source: Own calculations based on data provided by the International Monetary Fund (BoPS) and the Bureau of Economic Analysis.

Other remarks: Data as of the end of the quarter.



such 'dark matter' leads to the conclusion that for most of the period analysed the United States is a foreign creditor, not debtor. At the end of the third quarter of 2018 actual net IIP of the United States is 21.7% of GDP as compared with the official one amounting to -47.6% of GDP.

The findings of the study shed light on the puzzle as to why the United States has a continuing ability to keep servicing costs below the income generated abroad and to sustain its external position despite mounting foreign liabilities. This might also explain why the severe external adjustment forecast by many economists (Edwards, 2005; Gros, 2006b; Heath, 2007; Higgins et al., 2005; Obstfeld & Rogoff, 2005; Roubini, 2006) has not occurred in the United States. The fact that the US income privilege has not evaporated so far, despite the world economic crisis, supports the 'dark matter' hypothesis. The external position of the US economy is more sustainable than might be expected based on the officially reported data.

As every method of valuing financial instruments, including the 'dark matter' valuation model, has inherent drawbacks and is therefore subject to criticism, it should be stressed that the results of the study have several limitations.

First, the inherent assumption of the model that income flows are measured reliably in official statistics is not always justified. This can be sometimes observed when comparing initially released official BoP income statistics with their further revisions. For example Heath (2007) indicates large discrepancies for the United States in the 1990s between first published data and the most recent data at the time of her analysis (i.e. data for the second quarter of 2006).<sup>22</sup>

Second, as Curcuru and others (2013) indicate there are many technical problems when comparing return differentials across a range of countries, including differences in BoP and IIP definitions, statistical series breaks, inconsistent data collection systems and out-of-sync revision policies. All of this influences the final results of cross-country comparisons.

Third, 'dark matter' estimates are sensitive to changes in the assumed capitalization rate. As the capitalization rate is actually unknown 'dark matter' estimates may vary significantly depending on the assumption. Fluctuations in 'dark matter' estimates from quarter to quarter mean they should be interpreted as rough approximations rather than exact valuations.

Last but not least the income privilege for the United States could certainly evaporate in the future, which would undermine the 'dark matter' hypothesis. Forecasts that going forward the income balance will decrease might finally materialize concomitant with rising world interest rates on debt and increasing US foreign liabilities (Heath, 2007). This scenario would support the view of Hausmann and Sturzenegger's opponents that the positive income balance is of second-order importance with regard to sustainability of the US exter-

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<sup>22</sup> For many quarters in the 1990s initially presented net income deficits were ultimately revised into net income surpluses. These discrepancies reached several billion US dollars.

nal position. However at the moment the reverse is true—the net income of the US is positive and has been rising steadily since the outbreak of the global economic crisis. The persistence of positive income balances justifies a revised look at their importance for the external sustainability of the US economy.

This study suggests certain areas for future research. One obvious extension is to verify all the results by taking into account differences with respect to the industrial breakdown of foreign equity investment between the US economy and the benchmark group which would allow a better understanding of persistent yield differentials. Another would be to take into account the differences in portfolio composition between the United States and the benchmark group with regard to the country mix for equity investments and the currency mix for debt investments.

## Appendix

**Table 3. Normality tests for the distribution of the rates of return**

Test	Doornik-Hansen <sup>a</sup>		Shapiro-Wilk <sup>b</sup>		Lilliefors <sup>c</sup>		Jarque-Bera <sup>d</sup>		Conclusions regarding the null hypothesis (NH)
Variable	Test statistic	p-value	Test statistic	p-value	Test statistic	p-value	Test statistic	p-value	
AFDI_US	0.40	0.82	0.98	0.25	0.08	0.31	0.76	0.68	Accept NH
AFDI_BG	6.83	0.03	0.96	0.02	0.09	0.11	3.92	0.14	Reject NH
APFEq_US	1.09	0.58	0.98	0.18	0.09	0.13	0.62	0.73	Accept NH
APFEq_BG	22.03	0.00	0.90	0.00	0.16	0.00	32.02	0.00	Reject NH
APFDebt_US	18.62	0.00	0.88	0.00	0.21	0.00	6.68	0.04	Reject NH
APFDebt_BG	3.07	0.22	0.96	0.02	0.10	0.06	2.37	0.31	Reject NH
AOI_US	43.67	0.00	0.83	0.00	0.17	0.00	10.58	0.01	Reject NH
AOI_BG	24.38	0.00	0.88	0.00	0.20	0.00	7.95	0.02	Reject NH
LFDI_US	6.30	0.04	0.96	0.02	0.09	0.10	8.36	0.02	Reject NH
LFDI_BG	7.51	0.02	0.96	0.01	0.10	0.04	4.08	0.13	Reject NH
LPFEq_US	4.27	0.12	0.96	0.02	0.08	0.21	3.30	0.19	Reject NH
LPFEq_BG	50.15	0.00	0.82	0.00	0.27	0.00	24.96	0.00	Reject NH
LPFDebt_US	16.77	0.00	0.90	0.00	0.16	0.00	6.36	0.04	Reject NH
LPFDebt_BG	7.13	0.03	0.95	0.01	0.10	0.05	3.87	0.14	Reject NH
LOI_US	45.19	0.00	0.83	0.00	0.18	0.00	10.60	0.01	Reject NH
LOI_BG	23.67	0.00	0.87	0.00	0.22	0.00	7.95	0.02	Reject NH

<sup>a</sup> See description for this test in Doornik and Hansen (2008).

<sup>b</sup> See description for this test in Shapiro and Wilk (1965).

<sup>c</sup> See description for this test in Lilliefors (1967, 1969).

<sup>d</sup> See description for this test in Jarque and Bera (1980).

Source: Own calculations based on data provided by the International Monetary Fund (BoPS) and the Bureau of Economic Analysis.

Null hypothesis: The population is normally distributed. Other remarks: Test statistics with *p*-values for four normality tests are presented. Assumed significance level for accepting/rejecting the null hypothesis 5%. Variables represent quarterly rates of return on respective foreign assets or liabilities of a given economy. For description see other remarks under Figure 2.

**Table 4. Homoscedasticity test for the rates of return**

Paired variables	F-test statistic <sup>a</sup>	p-value	Conclusions regarding the null hypothesis (NH)
AFDI_US vs AFDI_BG	1.51	0.07	Accept NH
APFEq_US vs APFEq_BG	1.55	0.06	Accept NH
APFDebt_US vs APFDebt_BG	1.05	0.83	Accept NH
AOI_US vs AOI_BG	2.65	0.00	Reject NH
LFDI_US vs LFDI_BG	1.64	0.03	Reject NH
LPFEq_US vs LPFEq_BG	10.27	0.00	Reject NH
LPFDebt_US vs LPFDebt_BG	1.01	0.96	Accept NH
LOI_US vs LOI_BG	1.74	0.02	Reject NH

<sup>a</sup> For description of F-test see Hill and Lewicki (2006).

Source: Own calculations based on data provided by the International Monetary Fund (BoPS) and the Bureau of Economic Analysis.

Null hypothesis: The population variances are equal. Other remarks: Assumed significance level for accepting/rejecting the null hypothesis 5%. Variables represent quarterly rates of return on respective foreign assets or liabilities of a given economy. For description see other remarks under Figure 2.

**Table 5. Tests for equality of rates of return**

Paired variables	T-test <sup>a</sup>		Mann-Whitney U-test		Kolmogorov-Smirnov two-sample test		Conclusions regarding the null hypothesis (NH)
	Test statistic	p-value	Test statistic	p-value	Test statistic	p-value	
AFDI_US vs AFDI_BG	11.29	0.00	8.51	0.00	4.06	0.00	Reject NH
APFEq_US vs APFEq_BG	2.83	0.01	3.60	0.00	2.31	0.00	Reject NH
APFDebt_US vs APFDebt_BG	4.94	0.00	4.30	0.00	2.63	0.00	Reject NH
AOI_US vs AOI_BG	1.58	0.12	-0.25	0.80	1.43	0.03	Accept NH
LFDI_US vs LFDI_BG	-8.00	0.00	-6.54	0.00	2.86	0.00	Reject NH
LPFEq_US vs LPFEq_BG	-5.91	0.00	-5.75	0.00	2.78	0.00	Reject NH
LPFDebt_US vs LPFDebt_BG	0.15	0.88	0.07	0.95	1.11	0.17	Accept NH
LOI_US vs LOI_BG	-1.60	0.11	-2.50	0.01	2.47	0.00	Accept NH

<sup>a</sup> For description of parametric *t*-test and nonparametric Mann-Whitney and Kolmogorov-Smirnov tests see Hill and Lewicki (2006).

Null hypothesis: Difference of means = 0 (for *t*-test). Both samples are from a population with the same distribution (for Mann-Whitney *U*-test and Kolmogorov-Smirnov two-sample test).

Other remarks: Assumed significance level for accepting/rejecting the null hypothesis 5%.

The independent-samples *t*-test evaluates the difference between the means of two independent or unrelated groups. For pairs of variables for which the assumption of homogeneity of variance is not met, the *t*-test with the Cochran-Cox adjustment for the standard error of the estimate is applied. The nonparametric Mann-Whitney and Kolmogorov-Smirnov two-sample tests evaluate the difference in distribution of two independent groups. Prudently, returns for the US and the benchmark group are considered different only if the null hypothesis is rejected by the three tests employed.

Variables represent quarterly rates of return on respective foreign assets or liabilities of a given economy. For description see other remarks under Figure 2.

Sample 1—quarterly rates of return for the United States; sample 2—quarterly rates of return for the benchmark group.

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