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The Role of International Reserves and FDI in Offsetting External Debt Risk [*]

Juan Jose Battaglia[†]

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Abstract

This paper investigates the relationship between sovereign spreads and external assets and liabilities. To address potential endogeneity concerns, we employ a panel VAR model within a generalized method of moments (GMM) framework on a sample of 59 countries, encompassing 18 advanced economies and 41 emerging markets, over the period from 1996 to 2021. The findings reveal that a positive shock to international reserves (IIRR) assets (measured as a ratio to GDP) leads to a significant decrease in sovereign spreads. Conversely, a positive shock to the external debt to GDP ratio leads to a significant increase in sovereign spreads. Both effects are stronger in emerging markets. The responses of spreads to shocks in foreign direct investment (FDI) liabilities are less clear, highlighting that not all foreign liabilities have the same effect on the cost of international credit. We corroborate the robustness of the results using the local projection method and a variety of additional tests.

JEL Codes: E44, G15, H63.

Keywords: Sovereign spread; External asset and liabilities; Panel VAR.

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1. Introduction

A large economic literature has studied the determinants of sovereign bond spreads in advanced and emerging countries. This literature examines whether several macroeconomic variables, such as fiscal balance, public and external debt, international reserves, global interest rates, market sentiment, and economic growth, play a significant role in explaining sovereign bond spreads (see, for instance, Eichengreen and Mody 1998, Baldacci et al. 2008, Bellas et al. 2010 and Hantzsche 2022). Among other studies, Ferrucci (2003) incorporates additional fundamentals related to the external sector, such as the external debt to GDP ratio, the degree of openness, the current account balance, and the debt amortizations to reserves ratio, to explain sovereign spreads. Dachraoui et al. (2020) focus on identifying the drivers of sovereign spreads, placing a specific emphasis on the role of capital flight, which includes variations in international reserves, debt, and external deficits.

On the other hand, several papers analyse the roles of countries' external financial assets and liabilities and the net international investment position (NIIP) on external or balance of payment crises (see, for example, Frankel and Rose 1996, Catão and Milesi-Ferretti 2013 and Presbitero et al. 2015). Catão and Milesi-Ferretti (2013) investigate whether the size and composition of a country's net external liabilities can predict an external debt crisis and find that net external debt and current account deficits are the strongest predictors, whereas higher international reserve and per capita national income help reduce that risk. To the extent that sovereign spreads reflect the risk of an external default, one should expect that those indicators (net external debt, current account deficits, international reserves and relative per capita income) help determine spreads.[‡]

Presbitero et al. (2015) examine the ability of low-income developing countries to issue bonds in international capital markets and what explains the spreads on these bonds. They find that spreads on sovereign bonds are lower for countries with a strong external position, including robust external reserves and a favorable current account balance. Regarding global factors, it was observed that bond spreads are lower during periods of declining global market volatility, as measured by the VIX. As defined by the Chicago Board Options Exchange, the index calculation creates a measure of the constant, 30-day expected volatility of U.S. stock market mid-quote prices for S&P 500 options (both calls and puts). It is

[‡] To understand the theoretical relationship between default and sovereign spreads, assume (to simplify) that the foreign investor is risk-neutral. Therefore, the interest charged to hold a sovereign bond of value D can be determined by equating the risk-free interest rate r* to that of holding a sovereign bond paying r if the debtor repays but paying q (with Dq<1) if the debtor defaults. Algebraically: (1+r*)D = (1-fi) (1+r) D + fi * D * q, where fi is the probability of default. It follows that r-r* = sovereign spread = fi * [(1+r) -q]. So, the sovereign spread is positively related to the probability of default (i.e. default risk broadly defined) and the risk-free interest rate, and negatively related to the percentage q of debt that the investor expects to be repaid.

one of the most widely recognized measures of volatility, commonly reported by financial media and closely monitored by various market participants.

This paper seeks to contribute to the existing literature by examining the relationship between sovereign bond spreads and a country's external financial position. Specifically, it focuses on the roles of FDI and IIRR in mitigating country risk. Additionally, the paper examines the direct effects of real GDP growth on sovereign spreads.

Theory and empirical evidence suggest that foreign liabilities are linked to foreign risk exposure, leading to higher sovereign bond spreads, insofar as it requires a country to make payments to external creditors that are beyond its means broadly defined to include an array of economic, social and political considerations that determine the capacity and/or willingness to repay. Specifically, external debt is narrowly tied to elevated external risk exposure because a debt contract is typically structured in terms of a fixed or indexed interest rate and principal amounts, without contingencies for different states of nature that can make those scheduled payments difficult or unfeasible for the debtor. In contrast, equity liabilities – like FDI – allow some considerable flexibility as it allows for higher or lower disbursements to the foreign investor that are commensurate to swings in economic conditions of the host country.

Finally, sizeable foreign exchange reserves in the central bank increases the resilience to default risk to the extent that it is a self-insurance against bad states of nature in the debtor country, though it is also costly because holding reserves carries an opportunity cost of not investing those funds in higher-yield assets. Still, because of the typically high economic and social cost of debt defaults, countries that are more vulnerable to economic and political instability often choose to hold sizeable international reserves relative to GDP. Such reserve holdings have been shown to reduce vulnerability to sudden stops in capital inflows and associated default risk (Calvo et al. 2013).

Yet, and this is a key motivator of this study, not all foreign assets and foreign liabilities have similar effects on default risk and sovereign spreads. In particular, FDI and debt liabilities can have very different, and indeed opposed signs, when it comes to default risk. As highlighted in studies by Kaminsky et al. (1998) and Hausmann and Fernández-Arias (2010), FDI liabilities can even help reduce default risk and hence sovereign spreads – in analogy with the effects of 'good cholesterol' on countries external health (as opposed to bad cholesterol like external debt liabilities). Drawing on this analogy, we would expect reduced spreads with a higher level of FDI liabilities, so the greater the share of FDI liabilities in the total foreign liabilities, the lower we might anticipate the spreads to be. Likewise, countries with higher international reserves should be expected to have lower sovereign spreads. The question this chapter seeks to examine is how far higher FDI/GDP and IIRR/GDP can help offset the effects of higher external debt liabilities on sovereign spreads.

2. A First look at the data

Before embarking on the ensuing econometric analysis, it is instructive to plot the unconditional relationship between sovereign spreads and the external indicators mentioned above.

Figure 1 plots the changes in the ratio of gross external debt to GDP for each of the countries between the initial and final year of our sample (as shown in the horizontal axis) versus the concomitant change in sovereign spread (shown in the vertical axis). Higher external debt tends to raise spread. The fit (R^2=0.042) is poor, likely reflecting the influence of other factors highlighted in previous studies, but is nevertheless positive and consistent with the findings in Catão and Milesi-Ferretti (2014) that higher net external debt typically associated with a higher risk of a debt crisis, and hence to higher spreads to the extent that spreads reflect default risk. In contrast, Figure 2 shows that the relationship between FDI liabilities and spreads is, instead, negative and the fit of the regression line stronger (R^2=0.18), indicating that higher FDI foreign liabilities tend to reduce spreads unconditionally. Finally, Figure 3 shows that higher international reserves correlate positively with lower spreads, with an even tighter fit (R^2=0.23).

This first pass in the data is therefore consistent with the view that FDI liabilities appear 'good cholesterol' as opposed to the 'bad cholesterol' represented by debt liabilities; and also that international reserves help reduce country sovereign spreads.

Figure 1. Changes in Spreads vs. Changes in Gross Debt Liabilities in Emerging Countries[§]

§ Annualized growth rate for the Emerging Countries Sample (excluding Zambia, Venezuela and Lebanon) between 1996 and 2021.

Figure 2: Changes in Spreads vs. Changes in FDI Liabilities in Emerging Countries.

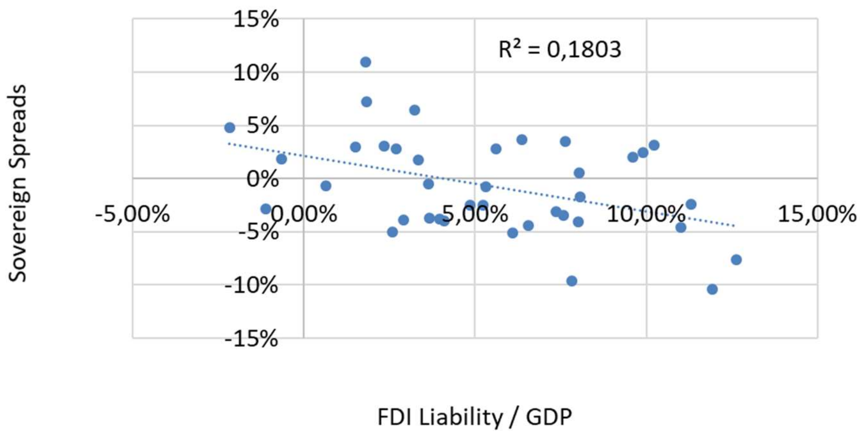
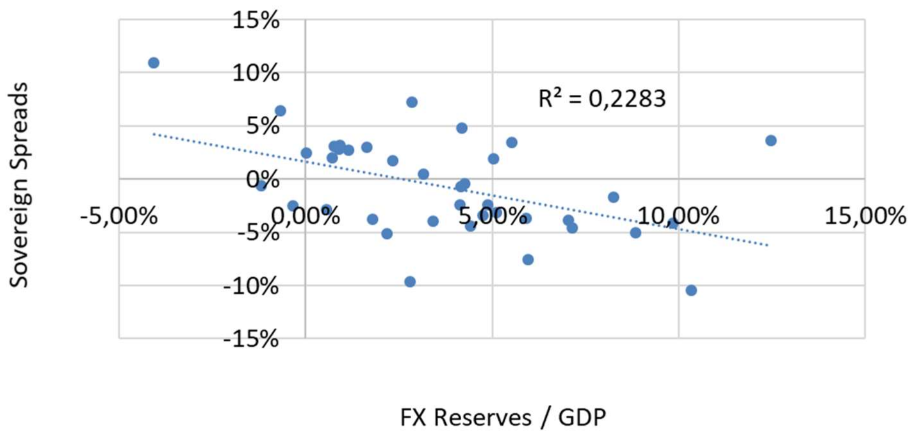


Figure 3: Changes in Spreads vs. Changes in International Reserves in Emerging Countries.



We slice further the raw data by looking at what one may call *unhealthy countries* (Figure 4 in the Appendix), defined as emerging market countries that experienced the highest and most volatile sovereign bond spreads in the sample. These countries have exhibited other signs of "poor" economic health, including high or increasing external debt levels, low or decreasing foreign exchange reserves and declining FDI liability to GDP ratios[**] which might be suggestive of their incapacity to attract foreign investment due to a variety of reasons like mediocre economic growth and institutions that are not sufficiently protective of investor's rights. Countries in the *medium health group* (Appendix Figure 5), defined as having lower and less volatile spreads than the unhealthy group, have instead experienced a rise in FDI liability and/or foreign exchange reserve to GDP ratios over the years. Finally, we have *healthier emerging countries* (Figure 6), which have exhibited a strong compression of spreads, as well as an

[**] In Lebanon's case, the FDI to GDP ratio has increased due to the sharp decline in GDP since 2018.

increase in the FDI liability and reserve to GDP ratio during the same period compared to *countries in the medium health group*. Furthermore, it is important to note that the sum of FDI liabilities and international reserves has exceeded external debt for this group. These overall correlations provide a “prima facie” case for the hypothesis that the 'bad cholesterol' associated with gross external debt to GDP can, at least in some cases, be more than offset by the 'good cholesterol' associated with FDI liabilities and reserves to GDP ratio, resulting in lower sovereign spreads.

But how about changes in the overall net external liabilities (gross external liabilities minus gross external assets), i.e., the so-called net international investment position (NIIP)? Over time, the NIIP of a country changes with its current account balance[††]. The current account is often seen as the main variable of external fragility by many academic studies and often by policymakers too. The main objective of this work is to show that, when explaining a country's sovereign spreads, the composition of the current account financing is key; and within that, changes in FDI liability is an important variable to explain shifts in the funding cost of a country in international markets. Further, because this relationship can be mediated by a variety of structural or slow-evolving variables that typically distinguish emerging from advanced countries, in what follows we also document the relative strength of this effect in emerging markets vs. advanced countries.

An important dimension of the relationship between the composition of external financing and the sovereign spread is the possibility that causality runs in both directions. For instance, countries with higher sovereign spread may wish to issue less debt (as it is more expensive) and resort instead to FDI and reserve decumulation as alternative sources of financing. Alternatively, higher sovereign credit risk could explain the low levels of FDI as a percentage of GDP or an increase in the debt to GDP ratio due to a higher cost of interest or lower economic growth, resulting from a high credit spread. In other words, we must grapple with endogeneity issues in the econometric estimation of such relationships. To address this challenge, we will employ a panel VAR model within a generalized method of moments (GMM). The purpose of these estimations is to ensure that the variables on the right-hand side of the respective regressions are sufficiently exogenous, making the estimated relationships robust to the endogeneity biases mentioned earlier.

[††] In general, the NIIP at the end of year t is determined by the previous year's level ($t-1$), adjusted by the current account balance, the capital account balance, and any other valuation changes or statistical effects.

In what follows, we describe this methodology and how it is applied to the data in Section 3. In Section 4, we explain the panel VAR model and present the GMM estimation results. Section 5 then tests for the robustness of the results and Section 6 summarizes the main findings.

3. Data and methodology

As in the charts of the previous section, we utilize the database developed by Milesi-Ferretti and Lane[‡‡] on external financial assets and liabilities (stocks). This database includes estimates of each country's net international investment position (NIIP). Focusing on external liabilities, our key variables of interest are gross debt to GDP ratio, gross FDI to GDP ratio and foreign exchange reserve assets to GDP ratio. Since the dependent variable of interest is the sovereign spread it is crucial that our sample consists exclusively of the bond spread for countries that issue foreign debt (i.e. debt issued in jurisdictions outside the respective country's own national borders) denominated in major hard currencies (U.S. dollar, euro, British pound, and Japanese yen).

Likewise, important for the econometric estimation is that the data spans a sufficiently long period, so that one can test the relationship between the sovereign spread and the composition of external financing over a variety of shocks and external crisis episodes that are often associated with large swings in sovereign spreads. Further specifics of the sovereign spread database used in the ensuing econometric analysis are provided in the Section A.4 of the Appendix.

Alongside the financing composition variables as causal factors, we also add to the regressions the well-known determinants of spreads, which include the CBOE Volatility Index (VIX, annual simple average) and 10-year US Treasury yield (annual simple average). Both variables are readily available from a variety of databases, including from the Bloomberg L.P. – from which they were obtained.

[‡‡] The External Wealth of Nations Database. Version: October 31, 2023. External financial assets are claims by domestic residents on non residents consisting of: foreign direct investment (controlling stakes by domestic firms in overseas' affiliates); portfolio investment (holdings by domestic residents of stocks or bonds issued by non-resident entities); other investment (including loans to or deposit in non resident entities, trade credits, etc.); financial derivatives; foreign exchange reserves (holdings of liquid foreign-currency assets by the domestic central bank). Financial liabilities are defined analogously (with the exception of foreign exchange reserves). To mitigate the influence of extreme values, the external assets and liabilities have been winsorized at the 1st and 99th percentiles.

Table 1
Descriptive statistics and data sources

Variable name	Variable description	Obs	Mean	Std. dev	Min	Max	Source
SS	Sovereign spread	1,444	0.032	0.041	0.000	0.236	Bloomberg, Catão and Mano (2015), ECB, WB and domestic official sources
D	Debt liabilities to GDP	1,534	1.191	3.451	0.112	29.235	Milesi-Ferretti and Lane's database
FDI	FDI liabilities to GDP	1,534	1.191	3.471	0.046	27.488	Milesi-Ferretti and Lane's database
IIRR	IIRR to GDP	1,534	0.137	0.110	0.004	0.607	Milesi-Ferretti and Lane's database
VIX	CBOE Volatility Index	1,534	20.291	5.927	11.090	32.692	Bloomberg
Rf	10-Year US treasury yield	1,534	0.036	0.155	0.009	0.064	Bloomberg
g	Real GDP growth, per capita	1,534	0.031	0.044	-0.300	0.247	IMF
CA	Current account balance to GDP	1,534	-0.008	0.062	-0.218	0.204	Milesi-Ferretti and Lane's database

Because the lack of data for developing countries before 1996, we work with a panel of 59 countries, covering the period from 1996 to 2021, comprising 18 advanced economies and 41 emerging markets (Table 2). This sample is arguably sufficient sizeable to account for individual and temporal heterogeneities (Abrigo and Love 2016). To address the previously discussed issue of endogeneity, we carry out a panel VAR estimation using the generalized method of moments (GMM), and measure the causal effects of foreign financing composition shocks on the sovereign spread using Granger causality tests, impulse response functions (IRFs), and forecast error variance decomposition (FEVD).

This methodology has been shown to yield consistent estimates in a variety of applications (see Abrigo and Love, 2016 and Avdjiev et al., 2019). In particular, it is worth noting that GMM is a particularly suitable estimator for panels with shorter time dimension (T=26 in our sample) relative to the cross-section dimension (N=59 in our case), which suits the characteristics of our sample.

To support the findings from the GMM estimation, we also employ local projection estimations in the robustness section.

Table 2
Sample composition and characteristics.

Sample	Countries included	Period	N
Emerging Markets	Turkey, South Africa, Argentina, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Mexico, Panama, Peru, Uruguay, Venezuela, Jamaica, Trinidad and Tobago, Lebanon, Qatar, Egypt, India, Indonesia, Malaysia, Pakistan, Philippines, Angola, Morocco, Tunisia, Kazakhstan, Bulgaria, Russia, China, Ukraine, Hungary, Croatia, Poland, Romania, Vietnam, Côte d'Ivoire, Nigeria and Zambia	1996-2021	41
Advance Economies	Austria, Belgium, France, Italy, Luxembourg, Netherlands, Sweden, Finland, Greece, Portugal, Spain, Cyprus, Israel, Korea, Slovak Republic, Latvia, Lithuania and Slovenia	1996-2021	18

4. Estimation and Results

To assess the dynamic relationship between sovereign spreads and external liabilities, we employ a panel VAR model estimated using GMM. Considering N countries (i = 1, ..., N) and time periods (t = 1, ..., N), we aim to estimate the following model:

$$Y_{i,t} = A(L)Y_{i,t} + \Gamma W_{i,t} + u_i + \epsilon_{i,t} \quad (1)$$

Where $Y_{i,t}$ is a vector of the endogenous variables in our model, i.e., $Y_{i,t} = \left[SS_{i,t}\ D_{i,t}\ \ FDI_{i,t}\ IIRR_{i,t}\right]'$, where $SS_{i,t}$ stands for the sovereign spread for the country i in the period t, $D_{i,t}$ denotes the gross debt[§§] to GDP for the country i in the period t, $FDI_{i,t}$ is the gross FDI to GDP for the country i in the period t, and $IIRR_{i,t}$ represents the FX reserves to GDP for the country i in the period t. These last three variables are the primary external financial liabilities (or assets in the case of IIRR) of interest, as discussed in previous sections. $W_{i,t} = \left[VIX_t \ \ rf_t\right]'$, is a vector of exogenous variables where in VIX_t represents the CBOE Volatility Index for period t, and rf_t stands for the 10-Year US treasury yield for period t (Both VIX_t and rf_t are the same across countries, thus dispensing the i subscript). $A(L)$ is a matrix polynomial in the lag operator L, Γ represents the matrix coefficient for the exogenous variables, u_i is the vector of time-invariant country effects and $\epsilon_{i,t}$ is the error term. Our relatively parsimonious model is conducive to efficient estimation given our sample size. At the end of this section, we will add GDP growth as an additional endogenous variable and evaluate the robustness of the model relative to this addition.

Im-Pesaran-Shin (2003) panel unit root tests have been used to check for stationarity, which does not require balanced datasets. The endogenous and exogenous variables (VIX and $rf_{t,}$) are stationary in levels (see Table 3 in the Appendix). As the VIX and rf_t do not vary across countries, we employ the Dickey-Fuller unit-root test in this case. One lag order was selected based on the Schwarz-Bayesian (SBIC) information criteria.

First, we estimate the panel VAR using the generalized method of moments (GMM). To evaluate the robustness of the relationship between sovereign spreads and external liabilities, we estimate a model breaking down by advanced and emerging markets. In the robustness section, we explore additional models that maintain the four endogenous variables but include a different exogenous variables, with only one exogenous variable at a time – i.e. either the VIX or the U.S. treasury bond interest rate r. Estimated eigenvalues for the various VAR models satisfy the stability condition, implying that each modulus is strictly less than one. After parameter estimation for each models, we computed orthogonalized impulse response functions (OIRFs) and forecast error variance decomposition (FEVD) to measure the impact of each variable over time. The OIRFs measure the response of one variable to a one standard deviation shock in another variable. To obtain the orthogonalized impulse response functions we use the Cholesky decomposition with the following order: Debt to GDP, IIRR to GDP, FDI to GDP, and

[§§] Sum of the stocks of portfolio debt liabilities and other investment liabilities to nonresidents.

sovereign spread. This means that sovereign spread is treated as the most endogenous variable, while Debt to GDP is considered the most exogenous. In the robustness section, we will explore different orders for the Cholesky decomposition.

Figure 7 displays the Orthogonal Impulse Response Functions (OIRF) for the entire sample, and Figure 8 presents the OIRF for emerging countries only. Our attention is focused on the first column which depicts the effect of a one standard deviation shock in external liabilities on the sovereign spread. We focus on the accumulated shock responses during the first three years, which seem to be the relevant period according to Figures 7 and 8. First, given a standard deviation shock in of FDI/GDP ratio, the negative response in spreads is 1.2%, resulting in a decrease in the country's external risk. Second, given a positive standard deviation shock in IIRR/GDP ratio, the negative response in is 2.41%. More reserves yield less external risk. Lastly, given a standard deviation shock in Debt/GDP, the positive response in spreads is 2.72%, causing a rise in the credit spread. All the responses are aligned with the expected outcomes.

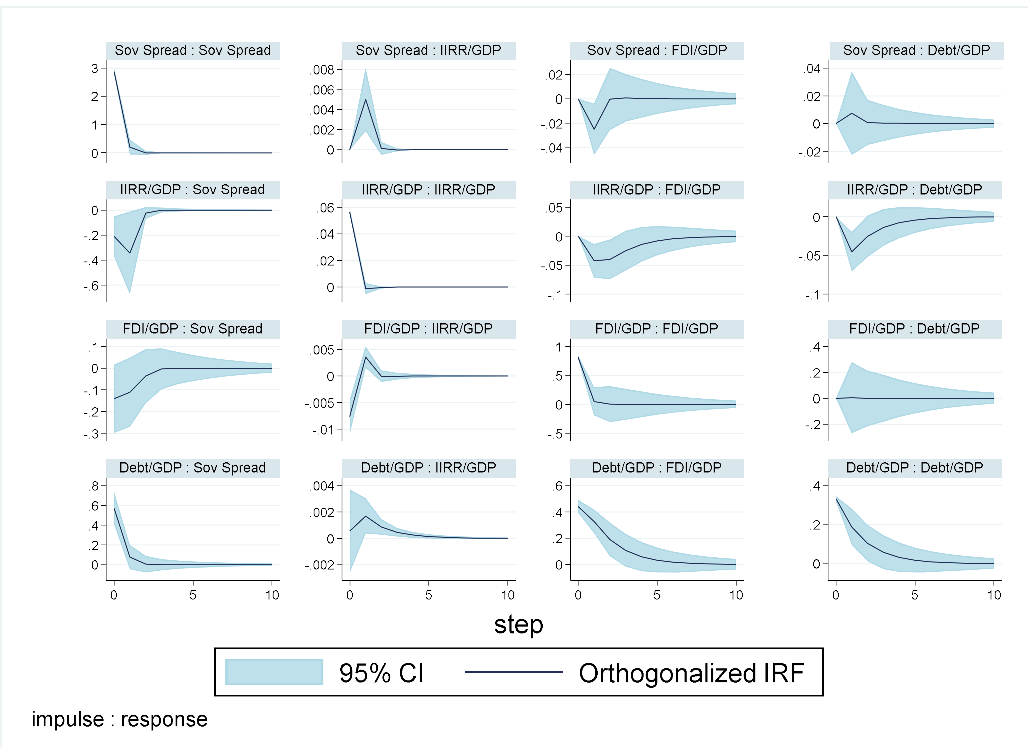


Figure 7. Impulse response functions, GMM, the complete panel of 59 countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row; the response variables are listed in the first column.

The results for emerging countries are shown in Figure 8. Following a one standard deviation shock to the Debt/GDP ratio, the positive response in spreads is 6.47%. For reserves, a one standard deviation shock to the IIRR/GDP ratio leads to a negative response in spreads of 5.48%. Consistent with the economic literature, international reserves are a key determinant of sovereign spreads for emerging countries. The effects of Debt/GDP and IIRR/GDP shocks are stronger for emerging countries than for the full sample. In the case of a one standard deviation shock to the FDI/GDP ratio, the positive response in spreads is 0.05%, which is almost negligible. The response of sovereign spreads to different shocks is rapid, peaking in the first year but showing persistence for two to three years.

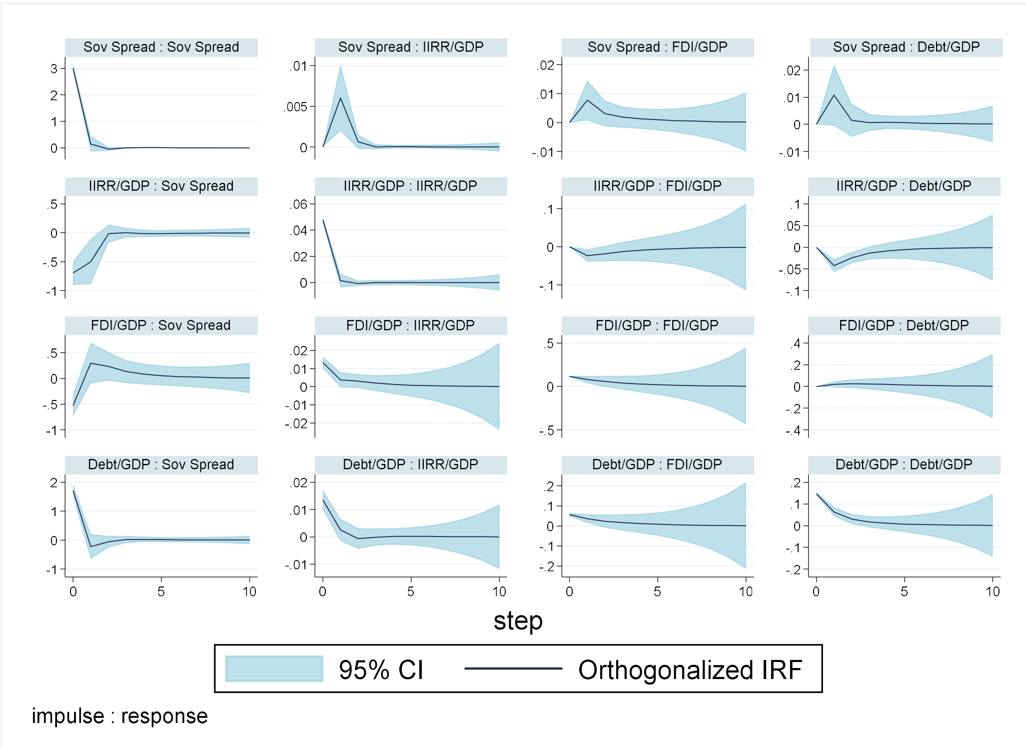


Figure 8. Impulse response functions, GMM, 41 emerging countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row; the response variables are listed in the first column.

In addition to the OIRF analysis, we also perform standard Granger causality tests. We present the results of the Granger causality tests, based on the GMM PVAR models, in Tables 4 and 5. The results of the OIRF analysis and the Granger causality tests support our main thesis. First, holding reserves is considered a self-insurance strategy against external crises, thereby reducing sovereign spreads. Second, external debt is associated with higher external risk exposure, but this effect is only significant in emerging countries.

Lastly, not all foreign liabilities are equivalent. Catão and Milesi-Ferretti (2013) distinguished the components of a country's external balance to determine whether countries with high debt liabilities are more vulnerable to external crises than those with non-debt liabilities, particularly Foreign Direct Investment. Consistent with their findings, we observe that a positive shock to the FDI to GDP ratio reduces sovereign spreads in the full sample, with virtually no effect observed for emerging economies.

Table 4. Complete sample

Granger causality test results for GMM PVAR. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels. Null-hypothesis: variable X does not Granger-cause variable Y.

Y (column)	X (row)	SS	D	FDI	IIRR
SS	chi2		1.999	2.896*	3.906*
	p-value		0.157	0.089	0.051
D	chi2	0.243		0.000	11.168***
	p-value	0.622		0.987	0.001
FDI	chi2	5.367**	8.133***		9.076***
	p-value	0.021	0.004		0.000
IIRR	chi2	10.283***	1.591	12.062***	
	p-value	0.001	0.207	0.001	

Table 5. Emerging countries

Granger causality test results for GMM PVAR. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels. Null-hypothesis: variable X does not Granger-cause variable Y.

Y (column)	X (row)	SS	D	FDI	IIRR
SS	chi2		3.623*	5.625**	4.878**
	p-value		0.057	0.018	0.027
D	chi2	3.466*		4.317**	22.315***
	p-value	0.063		0.038	0.000
FDI	chi2	4.333**	0.209		5.776**
	p-value	0.037	0.648		0.016
IIRR	chi2	8.150***	1.796	2.683*	
	p-value	0.004	0.180	0.100	

Finally, we present the results of the forecast error variance decomposition (FEVD) at a five-year horizon following the initial shock. These findings are displayed in Table 6, organized first by impulse and then by response variable. When examining the impact on sovereign spreads over a five-year horizon, the Debt to GDP ratio contributes to the variance of sovereign spreads by 3.74% for the complete sample and 22.61% for emerging countries. In the case of the IIRR to GDP ratio, there is a contribution to the variance of sovereign spreads by 1.83% for the complete sample and 5.55% for emerging countries. Lastly, the FDI to GDP ratio contributes to the variance of sovereign spreads by 0.37% for the complete sample and 3.33% for emerging countries.

These FEVD results are consistent with the findings obtained from the impulse response function and the Granger causality analysis. The combined effect of the variances of IIRR to GDP and FDI to GDP partially balances the effect of the variance of Debt to GDP when examining the impact on the variance of sovereign spreads over a five-year horizon. The variance effects of external assets and liabilities on the variance of spreads are stronger in emerging countries.

Table 6

Forecast error variance decomposition. The table shows FEVD at the horizons of up to 5 years for the PVAR variables, including the complete sample and the emerging countries results.

Forecast Horizon	Impulse	Response	Share of variance		Forecast Horizon	Impulse	Response	Share of variance	
			Complete sample	Emerging countries				Complete sample	Emerging countries
5	D	SS	3.74%	22.61%	5	D	IIRR	0.12%	7.00%
5	IIRR	SS	1.83%	5.55%	5	IIRR	IIRR	96.95%	84.06%
5	FDI	SS	0.37%	3.33%	5	FDI	IIRR	2.15%	7.56%
5	SS	SS	94.04%	68.49%	5	SS	IIRR	0.76%	1.35%
5	D	D	98.17%	85.55%	5	D	FDI	34.75%	17.41%
5	IIRR	D	1.77%	8.32%	5	IIRR	FDI	0.4%	3.48%
5	FDI	D	0%	5.74%	5	FDI	FDI	64.76%	78.86%
5	SS	D	0.03%	0.37%	5	SS	FDI	0%	0.24%

Another key variable in our analyses is economic growth. Since our base estimation considers external debt, FDI, and international reserves as a percentage of GDP, gross domestic product is considered in the ratio. We can also take into account the direct effect of economic growth on the sovereign spread. Economic growth improves the payment capacity of a country, so as GDP growth expands, we could expect a compression in the sovereign spread.

Grandes (2002) suggests that a permanent change in real GDP growth has a significant and robust impact on sovereign bond spreads in Argentina, Brazil, and Mexico. Presbitero et al. (2015) find that the coefficient on real GDP growth indicates that low-growth countries are penalized when issuing bonds, as they tend to do so at wider spreads. Conversely, Chen et al. (2016) examine changes in S&P foreign currency sovereign credit ratings for 103 countries during 1982–2012 and find that the growth rate of real per capita GDP displays a significant response to sovereign credit rating changes. They address endogeneity concerns by employing a system GMM approach and a difference-in-differences framework. Finally, Tebaldi et al. (2018) apply a GMM estimator to identify the determinants of sovereign spreads in thirty-one emerging economies from 1994 to 2014. The empirical analysis provides evidence that GDP growth plays an essential role in determining the spreads.

To incorporate the essential role of economic growth in external credit risk, we include real GDP growth in our original panel VAR model as an endogenous variable. Now, the vector of endogenous variables is represented as $Y_{i,t} = \left[SS_{i,t}\ D_{i,t}\ \ FDI_{i,t}\ IIRR_{i,t}\ g_{i,t}\right]'$ and we maintain VIX_t as the exogenous variable in our model. GDP growth is expressed in log differences to address stationarity concerns. The eigenvalues confirm that this model specification also satisfies the stability condition.

In Figures 9 and 10, we display the OIRFs for the full sample and for emerging countries, respectively. In this case, we use the Cholesky decomposition with the following order: GDP growth, Debt to GDP, IIRR to GDP, FDI to GDP, and sovereign spread. This means that GDP growth is considered the most exogenous variable.

The conclusions are very similar to those obtained with the specification of the previous model. Our attention remains focused on the first column to analyze the effect of a one standard deviation shock in external liabilities (and assets in the case of IIRR) and GDP growth on the sovereign spread. As we will see, these results are consistent with those obtained in the robustness section. As before, we focus on the accumulated shock responses during the first three years.

First, following a one standard deviation shock in the Debt/GDP ratio, the positive response in spreads is 1.06% for the full sample and 1.48% for emerging countries. Second, a one standard deviation shock in the FDI/GDP ratio leads to a positive response in spreads of 0.22% for the full sample and a negative response in spreads of 0.18% for emerging countries. Moreover, after a one standard deviation shock in the IIRR/GDP ratio, the negative response in spreads is 4.01% for the full sample and 6.34% for emerging countries. Lastly, the novelty of this model lies in its response to a shock in GDP growth: spreads decrease in line with anticipated results and the literature. A one standard deviation shock in the GDP growth rate results in a negative response in spreads of 3.87% for the full sample and 6.66% for emerging countries. The results of the Granger causality tests are presented in Tables 7 and 8 in the Appendix.

These results show that FDI/GDP, IIRR/GDP, and GDP growth Granger-cause sovereign spreads in the case of the full sample, while Debt/GDP, IIRR/GDP, and GDP growth Granger-cause sovereign spreads for emerging countries.

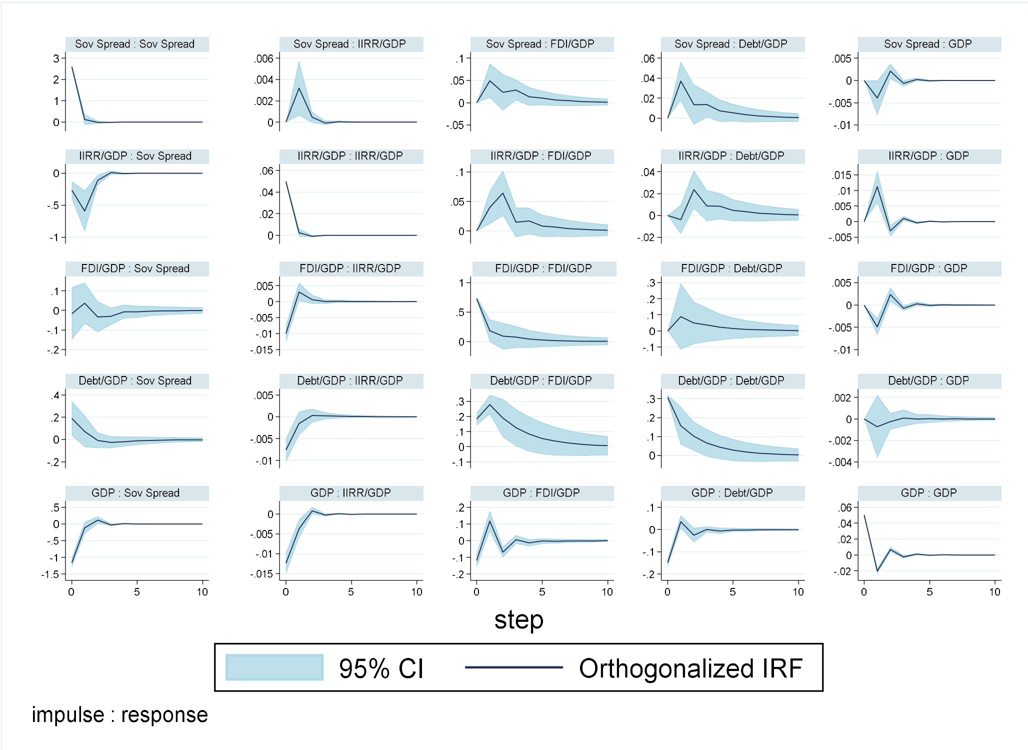


Figure 9. Impulse response functions, GMM, the complete panel of 59 countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row; the response variables are listed in the first column.

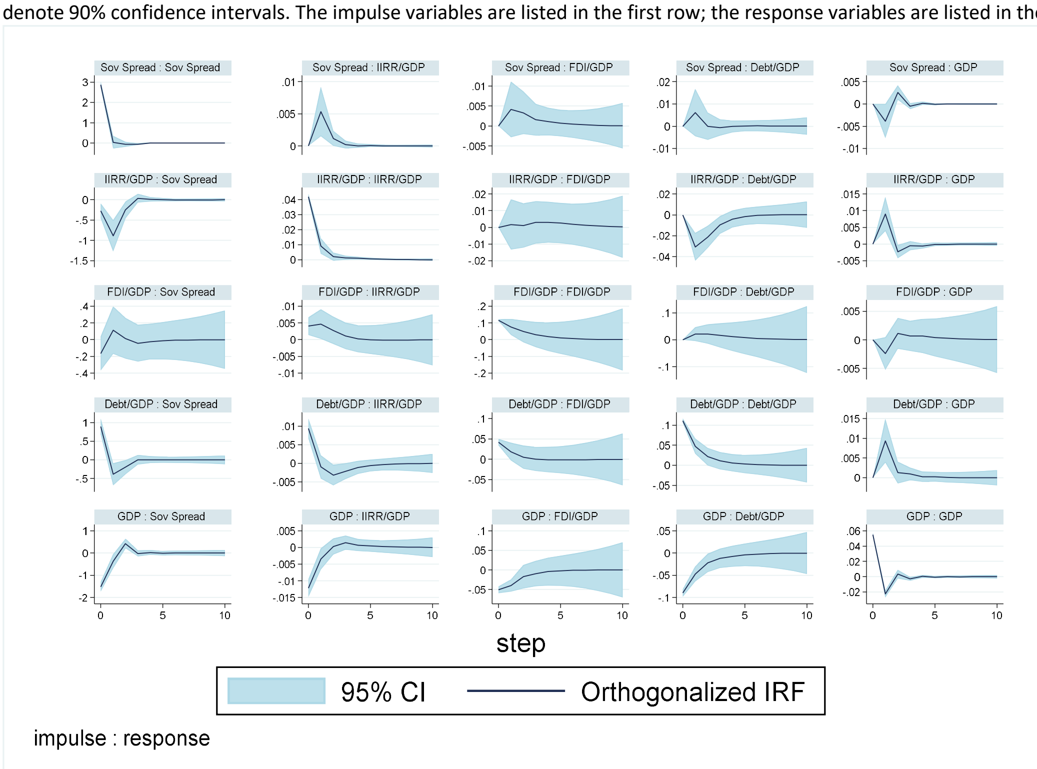


Figure 10. Impulse response functions, GMM, 41 emerging countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row; the response variables are listed in the first column.

5. Robustness checks

To confirm the robustness of the results, we conduct four additional empirical exercises involving: (1) we corroborate the results using the local projection method (2) an alternative exogenous variable, (3) a different Cholesky ordering of endogenous variables and (4) include the current account balance in the model.

5.1 Local projection method

To support the main findings from our PVAR GMM estimation, we also apply the local projections framework introduced by Jordà (2005). This technique estimates the dynamic response of an endogenous variable to a shock. Unlike VAR models, which require estimating a complete system of equations, local projections allow for the direct estimation of responses at each time horizon. This offers several advantages, including flexibility—there is no need to specify and estimate a full VAR model—and robustness, as local projections are less susceptible to model specification errors. Furthermore, they provide simplicity by offering a direct method for estimating Impulse Response Functions. Thus, local projections serve as a natural alternative to VARs when the goal is to calculate impulse responses. Montiel Olea and Plagborg-Møller (2021) explain that, because local projection estimators are essentially regression coefficients, they are both simple and intuitively interpretable. In their paper, they demonstrate that, in addition to its intuitive appeal, local projection inference is robust to two common challenges in macroeconomic applications: highly persistent data and the estimation of impulse responses at long horizons.

We present the IRFs generated by the local projection estimations, focusing on the response of spreads to shocks in external liabilities (or assets). We display the IRFs for the full sample (Figure 11) and specifically for emerging countries (Figure 12). The results closely align with those obtained from the GMM estimations. Following a shock to the Debt to GDP ratio, the results show a significant positive response in spreads during the first four periods, with a stronger response observed for emerging countries.

Conversely, after a shock to the IIRR to GDP ratio, the charts indicate a significant negative response in spreads over the first four periods, with a more pronounced effect also for emerging countries. In the case of FDI to GDP shocks, the response of spreads is ambiguous and not significant.

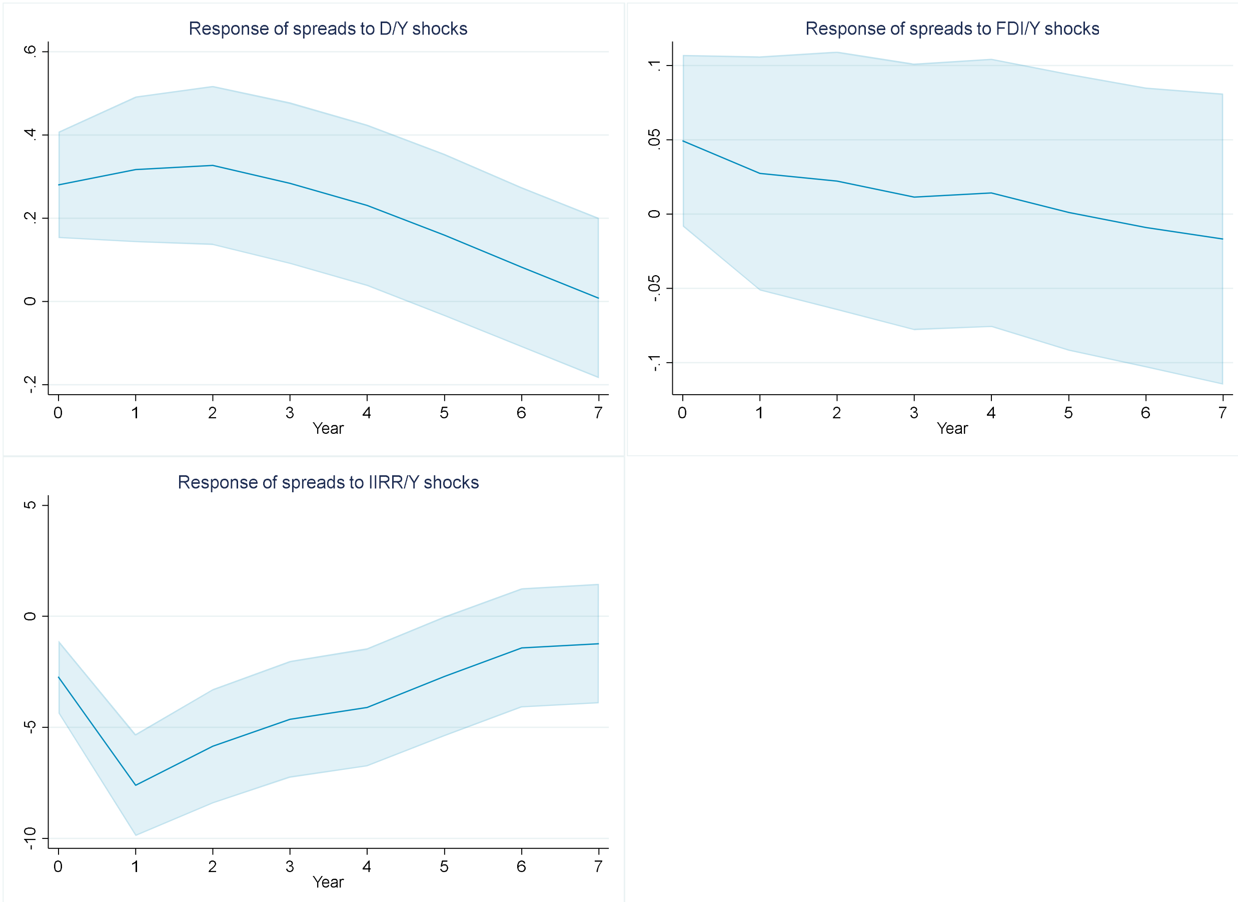
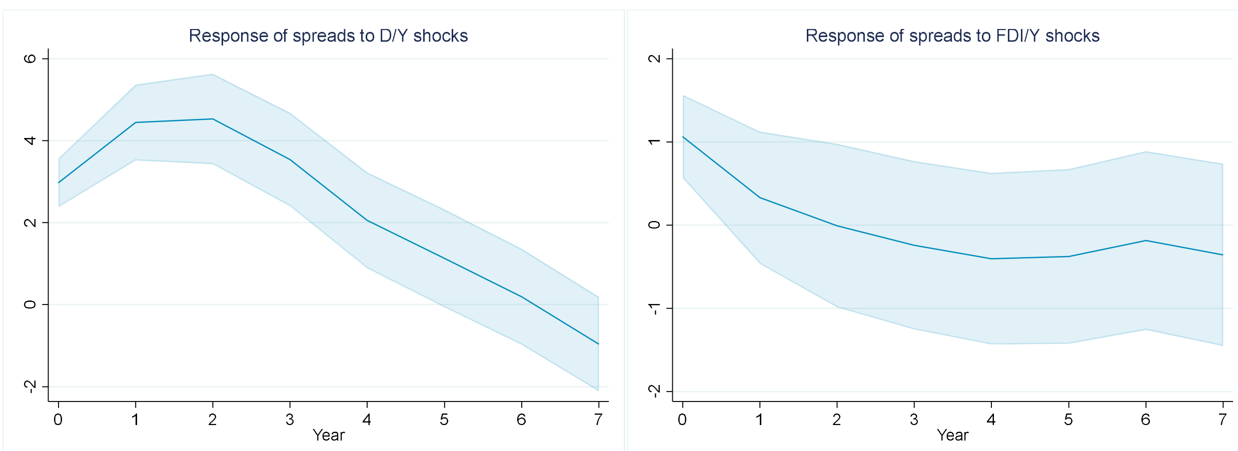


Figure 11. Local Projection, the complete panel of 59 countries. Shaded areas denote 90% confidence intervals.



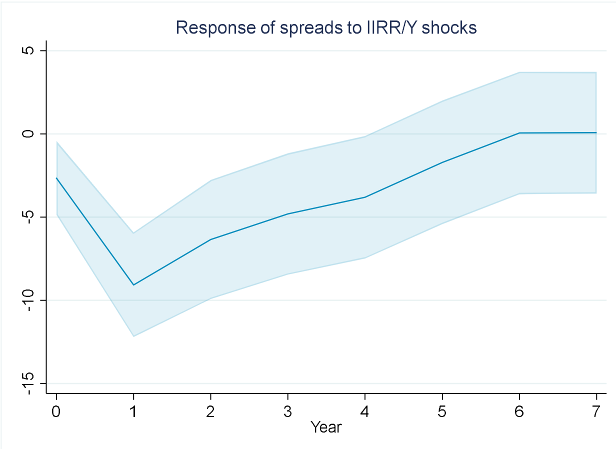


Figure 12. Local Projection, 41 emerging countries. Shaded areas denote 90% confidence intervals.

5.2 Alternative exogenous variables (rf_t)

We estimate an additional model using the same endogenous variables but introduce a different exogenous variable: the 10-year US Treasury yield. Both the VIX index and the US Treasury yield are standard measures of global liquidity conditions. The literature (see, for instance, Avdjiev et al. 2017 and Cerutti et al. 2017) emphasizes various variables as global liquidity drivers, and these two, in particular, are commonly used.

The results of our estimation remain consistent when using the 10-year US Treasury yield instead of the VIX index as the exogenous variable. The external liabilities' (impulse) effects yield similar outcomes on the sovereign spread response in the IFR analysis (see Appendix). The stability conditions are also satisfied. We use the risk-free rate as a proxy for the level of economic uncertainty, similar to the VIX. The results align with the robustness of the original model.

5.3 Cholesky decomposition order

Sims (1980) suggested that the interpretability of Impulse Response Functions often depends on the orthogonalized errors. The orthogonalization process, conducted through Cholesky decomposition, is influenced by the ordering of series in a PVAR, thereby affecting the resulting estimates in OIRF and FEVD. The model maintains its robustness even with different variable orderings.

As can be seen in the Appendix, we detail the results of the OIRF, and the response of the sovereign spread to impulses of external liabilities is very similar to the results obtained with the original Cholesky decomposition order.

5.4 Current account balance

As mentioned, the current account is often regarded as the main indicator of external fragility by many academic studies and policymakers. Taking this into consideration, we incorporate the current account balance as a percentage of GDP (CA/GDP) as an additional endogenous variable in our model. For both the full and emerging country samples, we find similar results. First, the results align with the robustness of the original model. Second, the CA/GDP is significant at 1% for the full sample and at 6.5% for emerging countries. Lastly, given a one standard deviation shock in the CA/GDP ratio, the spread shows a positive response in the first period, followed by a negative response in the second and third periods. The accumulated response is nearly neutral for both samples. This result supports our main thesis: when explaining a country's sovereign spreads, the composition of current account financing is more important than the current account balance itself.

6. Conclusion

The economic literature has not comprehensively explored the direct relationship between sovereign bond spreads and a country's external financial position. This essay aims to fill that gap. It seeks to identify empirical patterns in the relationship between sovereign spreads and external liabilities (or assets). The main findings of this study align with our initial expectations: maintaining modest levels of external debt is associated with reduced exposure to foreign risk and, consequently, narrower sovereign spreads. Countries with a higher ratio of foreign exchange reserves to GDP are in a more favorable position, leading to lower spreads.

However, the relationship between sovereign spreads and FDI liabilities is less straightforward. For the full sample, FDI liabilities appear to help reduce sovereign spreads, but this effect is not observed in emerging countries. The estimations in this paper do not allow us to describe FDI as 'good cholesterol', but in contrast to external debt, it is clear that FDI does not represent 'bad cholesterol'.

One of the objectives of this study is to demonstrate that when explaining a country's sovereign spreads, the key factor is not the external deficit but rather how it is financed. This is why we include FDI liabilities as a crucial variable for understanding shifts in a country's borrowing costs in international markets.

Given the inherent difficulty in theoretically establishing whether external liabilities (and assets) -such as FDI, external debt, or international reserves- drive the behavior of sovereign spreads or vice versa, we must grapple with endogeneity. To tackle this issue, we employ a panel VAR model within a GMM framework, along with local projections estimation. The findings reveal that positive shocks to the IIRR lead to a significant decrease in the sovereign spread, while the effect of FDI shocks (both as a ratio to GDP) is less clear. As expected, a one standard deviation increase in the Debt to GDP ratio results in a significant rise in the sovereign spread. These effects are stronger and more pronounced for emerging countries. Moreover, the findings remain robust across various model specifications.

Additionally, we incorporate the impact of economic growth on sovereign spreads. Economic growth enhances a country's payment capacity, thus an increase in GDP growth would typically lead to a narrowing of sovereign spreads. Our findings align with this expectation, as evidenced by the decrease in sovereign spreads in response to a shock in GDP growth in the OIRF. Finally, the results in the robustness section also support our main thesis: when explaining credit spreads, the composition of current account financing is more important than the balance itself.

Further empirical research should focus on the composition of external liabilities and assets for each country, distinguishing between liabilities of the consolidated public sector and those of the private sector. This differentiation would be highly valuable and could yield significant insights into understanding the behavior of sovereign and corporate spreads.

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Appendix

A.1. Country Sample Breakdowns

Figure 4: Unhealthy Emerging Markets: External Liabilities and Sovereign Spreads

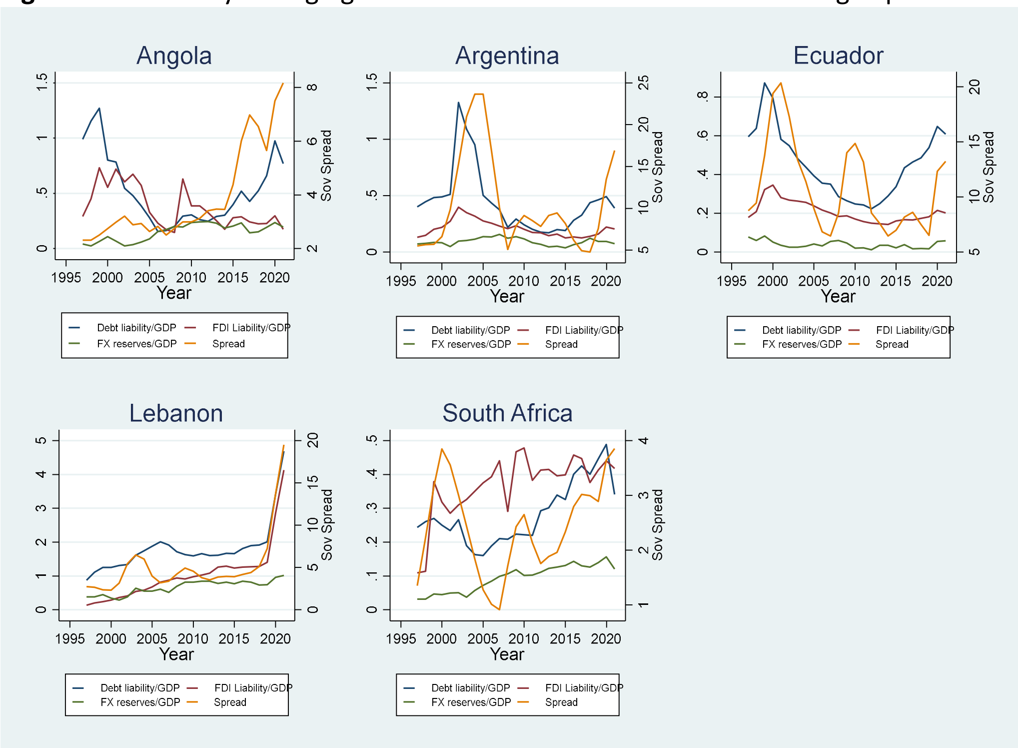


Figure 5: Medium Health Emerging Markets: External Liabilities and Sovereign Spreads

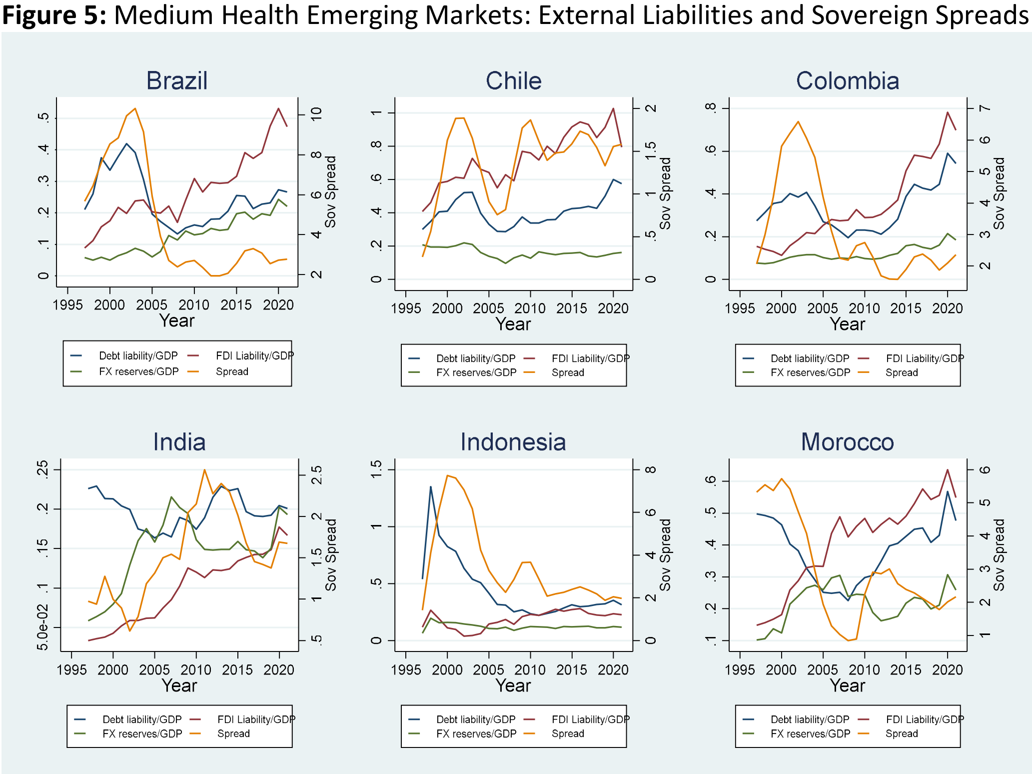
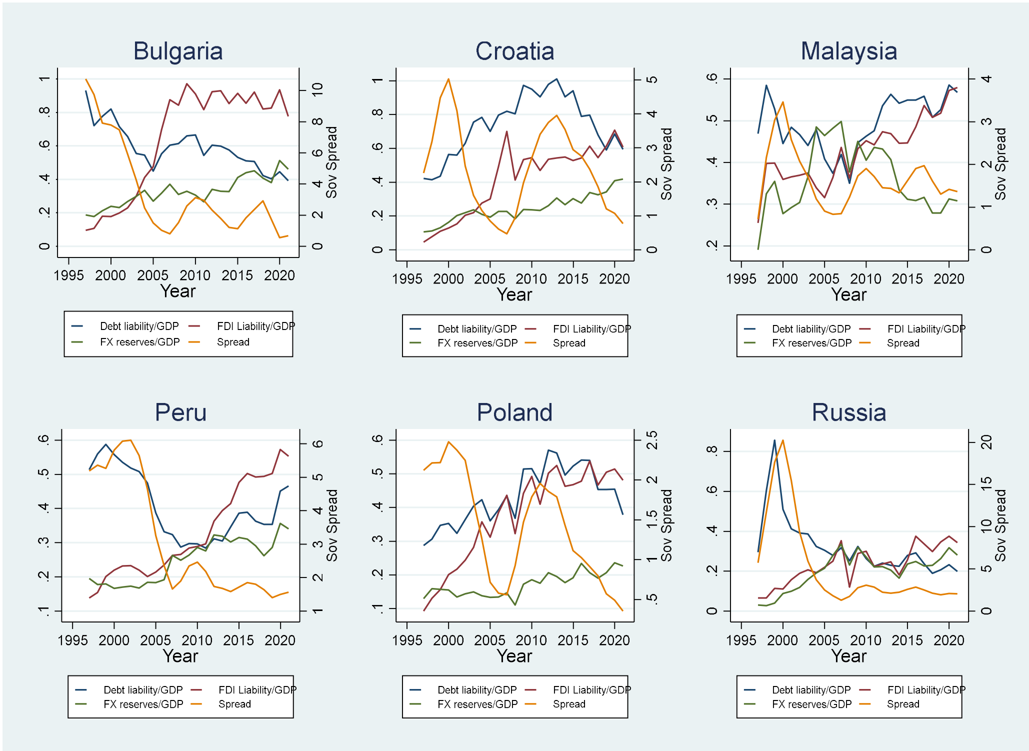


Figure 6: Healthier Emerging Markets. External Liabilities and Sovereign Spreads.



A.2. Unit root tests

Table 3

Unit Root Test: : tests include lagged of the series be chosen such that the Akaike information criterion (AIC) and subtract the cross-sectional averages from the series (demean). ISP test for panel data and dfuller test for variables do not vary across countries (VIX and Rf). We use a trend in the Rf stationary test.

Variable name		SS	D	FDI	IIRR	VIX	Rf	g	CA
ISP (Im-Pesaran-Shin)	$W_{t\ bar}$	-2.945	-3.484	-5.033	-2.239			-13.145	-6.342
	p-value	0.001	0.000	0.000	0.012			0.000	0.000
dfuller	Z(t)					-2.737	-3.181		
						0.005	0.088		

Null hypothesis ISP & dfuller: all panels have a unit root

A.3. Robustness check

A.3.1. OIRF: rf_t as the exogenous variable

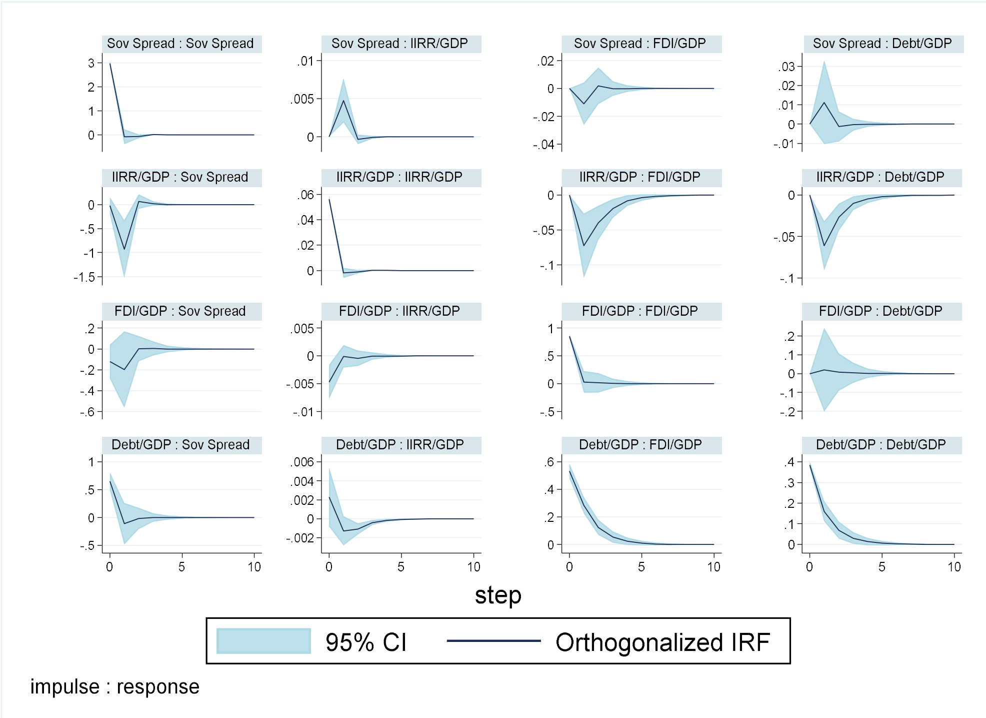


Figure 13. Impulse response functions, GMM, the complete panel of 59 countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row, the response variables are listed in the first column.

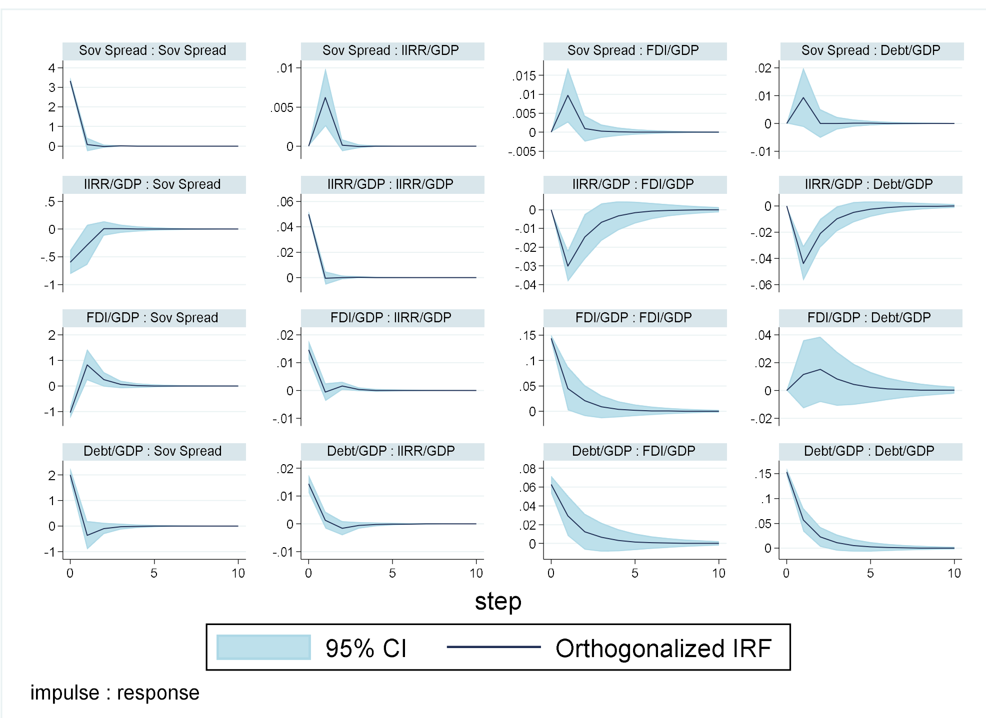


Figure 14. Impulse response functions, GMM, 41 emerging countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row, the response variables are listed in the first column

A.3.2. OIRF: Cholesky decomposition order

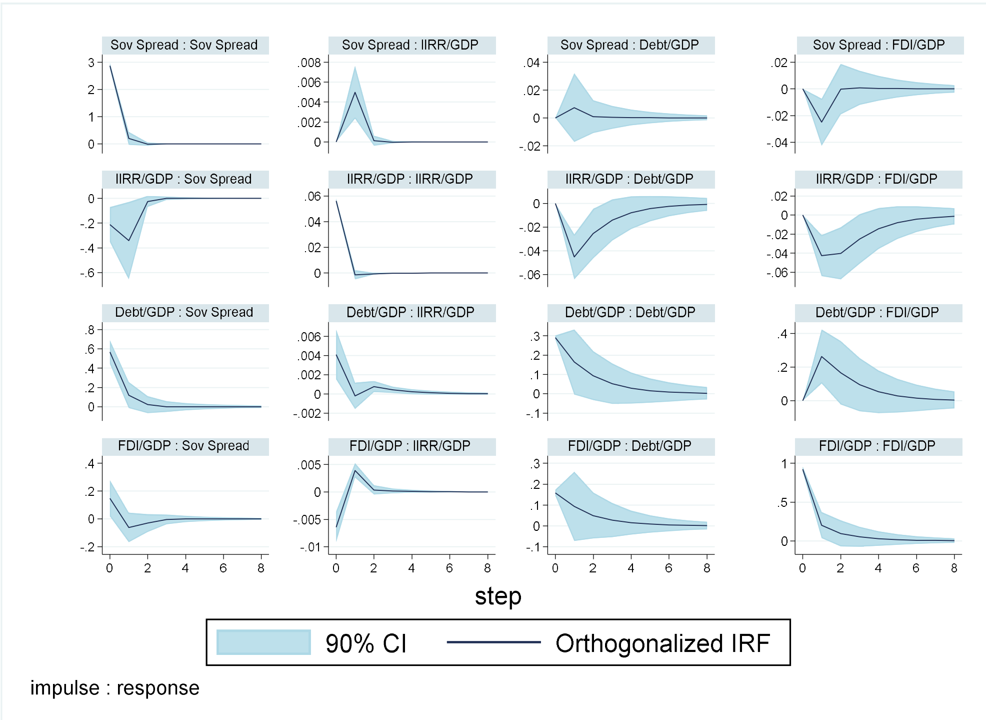


Figure 15. Impulse response functions, GMM, the complete panel of 59 countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row, the response variables are listed in the first column.

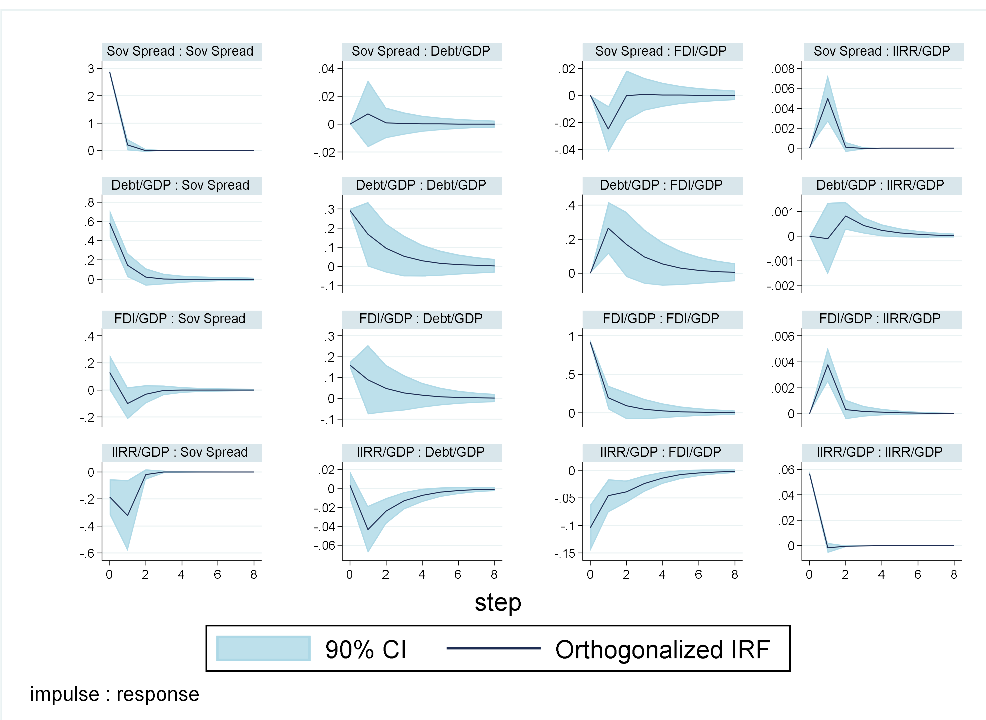


Figure 16. Impulse response functions, GMM, the complete panel of 59 countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row, the response variables are listed in the first column.

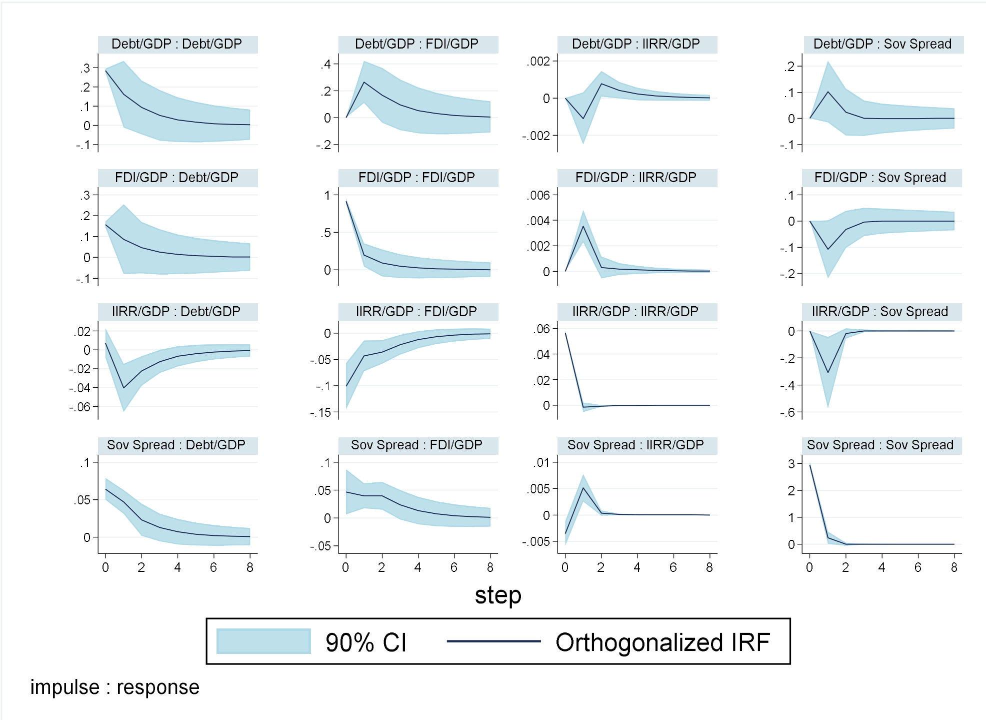


Figure 17. Impulse response functions, GMM, the complete panel of 59 countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row, the response variables are listed in the first column.

A.3.3. OIRF: Current account balance

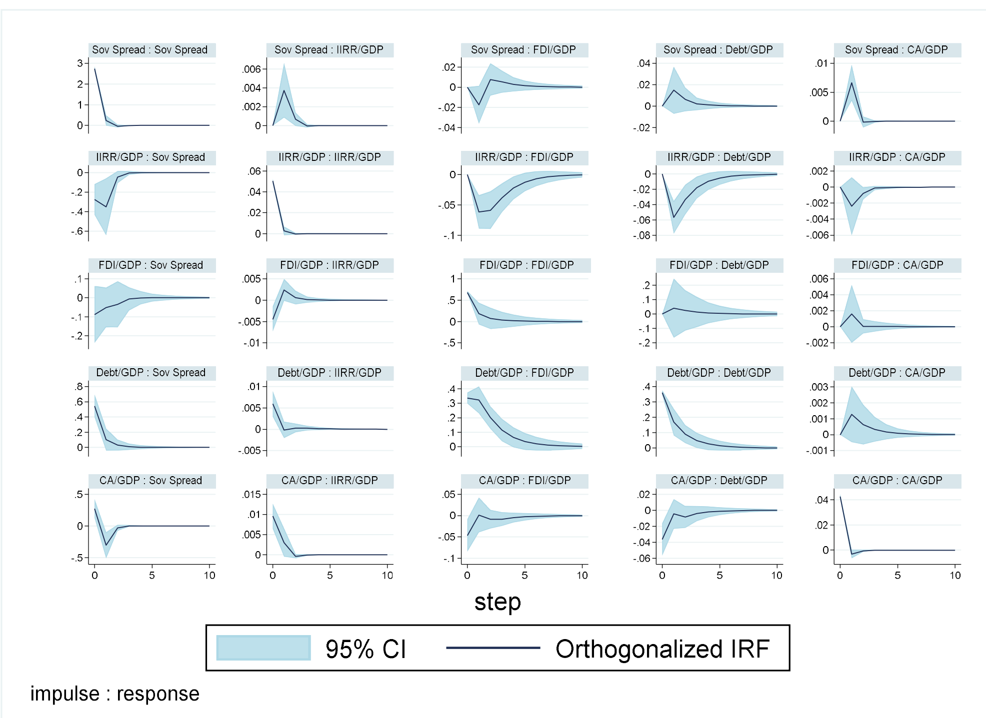


Figure 18. Impulse response functions, GMM, the complete panel of 59 countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row, the response variables are listed in the first column.

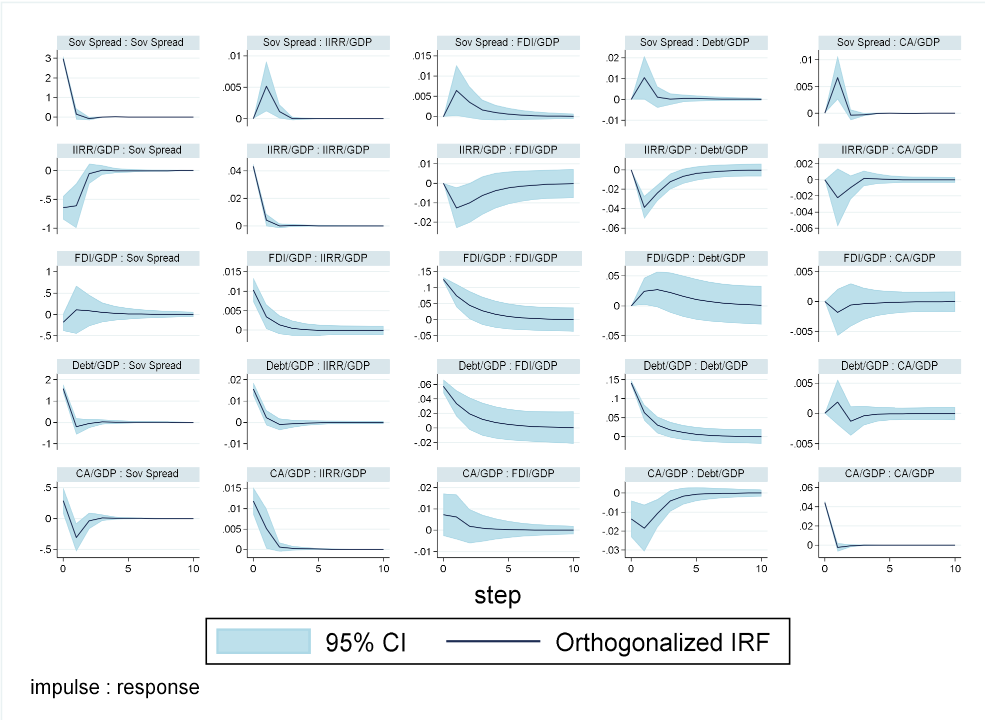


Figure 19. Impulse response functions, GMM, 41 emerging countries. Orthogonalized impulse response functions, shaded areas denote 90% confidence intervals. The impulse variables are listed in the first row, the response variables are listed in the first column.

A.4. Sovereign spreads data

We exclusively focused on sovereign bond spreads for countries that issued foreign debt in hard currencies like the U.S. dollar, euro, British pound, and Japanese yen. Up to 2015, we incorporated data gathered by Catão and Mano (2015), available at https://www.luiscatao.org/research.html. For the period from 2016 to 2021, we calculated countries' spreads in relation to the USA, Germany, the UK, or Japan, depending on the currency of the debt issue. For European countries, we sourced 10-year yields from the European Central Bank database. For emerging countries, we used EMBI data from the World Bank database. For non-European advanced countries and emerging countries without EMBI data, we relied on primary issue yields of 10-year bonds, taking a simple average for countries with multiple 10-year bond issues. In cases where there were no primary issues for a 10-year maturity, we computed the simple average of primary issues falling within the 8-year to 12-year maturity range. All data was obtained from Bloomberg Terminal and other domestic official sources, such as in the case of Yugoslavia/Serbia. To mitigate the influence of extreme values, have been winsorized the spread at the 1st and 99th percentiles.

A.5. Granger causality tests alternative model (GDP growth as an endogenous variable)

Table 7. Complete sample

Y (column)	X (row)	SS	D	FDI	IIRR	g
SS	chi2		0.004	3.548*	13.341***	4.807**
	p-value		0.951	0.060	0.000	0.028

Table 8. Emerging countries

Y (column)	X (row)	SS	D	FDI	IIRR	g
SS	chi2		3.383*	2.003	20.859***	32.515***
	p-value		0.0666	0.157	0.000	0.000

Granger causality test results for GMM PVAR. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels. Null-hypothesis: variable X does not Granger-cause variable Y.