Government Debt Expansion and Stock Returns

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Government debt expansion and stock returns

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Abstract

Using an international data set, this article documents a negative association between increases in the central government debt-to-GDP ratio and dollar-denominated stock index returns. Depending on the estimation method, raising the debt ratio by 1 percentage point diminishes the stock returns by between 39 and 95 basis points. We show that this result cannot be explained by changes in the investment risk. Instead, government debt issuance exerts upward pressure on private interest rates and appears to signal a greater tax burden in the future. These two factors coincide to produce a fall in stock market prices.

KEYWORDS

crowding out, government debt, stock returns, taxation

JEL CLASSIFICATION

E43; G12; H20; H63

1 | INTRODUCTION

For fear of losing popular support, democratically elected governments may be reluctant to embark on fiscal consolidation initiatives involving the raising of distortionary taxes or cutting expenditure. A society that is not averse to the idea of leaving negative bequests may opt for persistent deficits, leaving the burden of debt repayment to future generations (Cukierman & Meltzer, 1989). Popular anxieties, expressed recently in politicians' public statements and in the press, centre on countries' abilities to service their debts and the possibility of sovereign debt default. Indeed, such concerns appear to be well founded, as the average central government debt to GDP ratio for OECD countries has risen from 38.7% in 1990 to 100.0% in 2015.[1] Lane (2012) points out that economies laden with debt are characterized by multiple equilibria with the distinct possibility of a self-fulfilling speculative attack. A perception of heightened likelihood of default will increase yields, which in turn hinders efforts to service debt and makes default more probable. The recent European sovereign debt crisis illustrates this mechanism and exemplifies the grave ramifications that debt overhang can have for the economy, financial markets, and broader society.

A casual interpretation of governments' policy announcements might lead to the conclusion that their policies are based upon sound economic reasoning and strong empirical evidence. That, however, is far from the case. Prior to the financial crisis and the ensuing Great Recession, knowledge of fiscal policy was a highly contested area. Summarizing the current state of scholarship on fiscal policy, Alesina (2012) concluded: “we as economists, do not know as much as we would like or perhaps we should. The issues are complicated…”. One area about which very little is known is the relationship between government indebtedness and stock market performance. With a few exceptions, the literature has been silent on this issue. Notably, theoretical linkages between fiscal policy and stock prices were the subject of work carried out by Blanchard (1981) and Shah (1984). On the empirical side, Darratt (1988, 1990) used Canadian data to examine the relationship between stock market fluctuations and budget deficits. Our paper contributes to the literature by providing evidence based on a data set comprising 61 countries. The use of this resource permits us to draw conclusions that are generalizable internationally.

Our results indicate that stock prices tend to decrease as governments become more indebted. Depending on the econometric specification, increasing public debt by 1% of GDP leads to a ceteris paribus drop in the stock market index ranging from −0.39% to −0.95%. We probe this issue further and attempt to provide a rationale for this unfavourable market reaction. Perhaps our finding could be driven by changes in the risk premium component of discount rates, as the threat of government insolvency looms larger at higher levels of indebtedness. On the other hand, public spending stabilizes the economy in times of recession, providing a safety net for businesses. On balance, we find no strong evidence that changes in market risk are associated with issuance of additional bonds and bills by the government. Nevertheless, increasing the stock of public debt exerts an upward pressure on interest rates and results in a larger tax burden in the future. We believe that these two by-products of rising debt obligations are responsible for the observed stock price declines.

The remainder of this article is organized as follows. By reviewing theoretical and empirical studies, the next section reflects on the channels through which government debt expansions could affect stock prices. This review motivates our research questions and the testing that follows. Section 3 elaborates on data sources, sample composition and basic summary statistics. The main body of empirical evidence on the four hypotheses of interest is presented in Section 4. Alternative specifications of our stock returns model are considered in Section 5. We end this article with concluding remarks and recommendations.

2 | PUBLIC SECTOR DEBT AND STOCK PRICES

It is difficult to make a priori predictions about the effect that issuance of additional government debt may have on equity prices. Within the framework of the extended *IS-LM* model, Blanchard (1981) argued that fiscal expansion under fixed prices can influence stock values. However, the direction of the effect is ambiguous within this setting. Similarly, in the theoretical model of Shah (1984), short-term jumps in stock prices can occur in response to an unanticipated increase in government expenditure, but whether these jumps are upwards or downwards depend on the parameters of the model. This theoretical indeterminateness is perhaps exacerbated by the lack of empirical research in this area. To the best of the authors' knowledge, no prior study explicitly measured the response of stock markets to changes in the stock of government obligations. The most closely related research is that of Darratt (1988, 1990) who focused on the link between Canadian fiscal deficits and local stock returns. However, joint reading of these two papers does not necessarily help to resolve the controversy regarding the direction of the impact.

We begin our theoretical considerations with the conventional frameworks for pricing stocks, namely the dividend discount model (Gordon, 1962; Gordon & Shapiro, 1956) and cash flow valuation model (Fisher, 1930; Williams, 1938). At their core, both models rely on a similar conceptual approach in that they sum the discounted future benefits accruing to shareholders, be they measured by dividends or free cash flow to equity. As we will proceed to argue, government borrowing can influence both the discount rate and the benefits realized by stock market participants. It is through these two channels that the impact of public sector debt on stock valuations could potentially manifest itself.

In standard models, such as the Capital Asset Pricing Model (Lintner, 1965; Mossin, 1966; Sharpe, 1964) or the three factor Fama French model (Fama & French, 1993), the discount rate can be viewed as the risk-free rate augmented by the relevant risk premiums. Yields on short term government debt are typically taken to approximate the risk-free rate. However, as pointed out by Blinder and Solow (1973) flotation of new government debt issues will exert upward pressure on interest rates and, consequently, on discount rates. Whenever the increase in government bond yields becomes intolerable, the government may resort to "financial repression" by using regulatory and other indirect measures to force domestic financial intermediaries to invest more money in government bonds (McKinnon, 1973; Shaw, 1973). Even if such actions may restrain the yields on government bills and bonds, they will be unequivocally detrimental to corporations. The glut of public sector debt held by banks crowds out corporate lending (Becker & Ivashina, 2018) and will ultimately increase the costs of corporate borrowing.

From a theoretical perspective, in the IS-LM model, a fiscal expansion increases aggregate demand and shifts the IS curve rightwards. This leads to a rise in interest rates and, relatedly, depresses investments and capital stock (Faini, 2006). If, however, agents are rational and live either indefinitely or in dynasties, they will recognize that debt issued to finance current tax cuts will have to be repaid in the future. Consequently, the increase in current disposable income arising from the tax cut will be saved by agents, in anticipation of a higher tax burden in the future. This saving behaviour will offset the upward pressure on interest rates generated by public debt expansion. Barro (1974) shows that, in the presence of operative intergenerational transfer, increasing government borrowing leaves interest rates unaffected. To put it differently, given a certain level of public spending, agents are indifferent to whether the government chooses to finance itself by levying taxes or by issuing debt. This is because debt can be viewed as delayed tax liabilities (Plosser, 1987). This logic came to be known in the literature as the "Ricardian equivalence".

Of course, one may argue that the assumptions necessary to derive this invariance proposition do not hold in the real world. What is more important, however, is whether Ricardian equivalence holds empirically. While there is long-standing discussion on this issue in the literature, no clear consensus has emerged. By examining U.S. data, Plosser (1982, 1987) argued that the stock of public debt is unrelated to interest rates, a result that was later confirmed by Boothe and Reid (1989) for Canada. On the other hand, Engen and Hubbard (2005) as well as Laubach (2009) show a strong positive association between the projected increase in U.S. federal debt and forward rates. Similarly, Bernoth, Von Hagen, and Schuknecht (2003) show that the interest rate spread between a Eurobond-issuing EU country and Germany depends on their relative debt changes. In light of these mixed results, we have decided to conduct our own independent analysis.

In addition to the risk-free rate, discount rates also embody a risk premium element which increases with the level of uncertainty. Issuance of additional public sector debt makes the possibility of default or repudiation more tangible. Corsetti, Kuester, Meier, and Müller (2013) perceptively point out that sovereign default risk can spill over to the private sector. What is more, poor financial condition of a government is likely to instigate volatile developments in the political arena. Baker, Bloom, and Davis (2016) construct an economic policy uncertainty index derived from the content of newspaper articles and conclude that some of the index's peaks coincide with "battles over fiscal policy". On the other hand, government budgets naturally stabilize output variations and can be used as lifelines for too-big-to-fail privately owned businesses (Brown, 1955; Fatás & Mihov, 2001; Wren-Lewis, 2010). The net effect of the forces involved is difficult to predict and needs to be assessed empirically. For this reason, we empirically evaluate to what extent the jumps in the level of prevailing risk, as measured by changes in stock market volatility, are related to increases in public debt.

While the discount factor is critical for pricing of stocks, one also needs to consider the ability of corporations to generate income, as this will affect both the level of free cash flows to equity and dividends. Since issuance of government debt can lead to interest rate increases, consumers may become disinclined to finance their purchases with credit which, in turn, will lead to a drop in demand for products. Corporate profitability may be undermined further by the rising cost of servicing variable rate debt. What is more, investors pay attention to after-tax cash flows, which is important considering the view of Barro (1974) and Lucas Jr and Stokey (1983) that government bonds are simply "congealed future taxes". Investors may equate increases in public sector debt to prospective hikes in corporate, dividend and capital gains taxes. This is corroborated by the empirical results of Park (1997), who shows that expected tax changes implied by yields on tax-exempt municipal bonds are linked positively to the level of federal debt. Our inquiry also attempts to establish whether raising government indebtedness is associated with future tax increases.

3 | DATA

The sample used in this study includes all countries for which stock market information and government debt data could be found in our data sets. The country-level stock market indices used here have been constructed by MSCI and downloaded from the Thomson Reuters Datastream. These indices are market capitalization weighted and denominated in US dollars. The common currency denomination is necessary, since we are adopting a global investor's perspective. At the time of the study, MSCI provided index information for 77 markets for which we computed continuously compounded returns. The annual series of government debt-to-GDP ratio, along with other macroeconomic variables, came from the World Development Indicators (WDI) database accessed through the UK Data Service. Unlike MSCI, the WDI data set does not cover Taiwan and Palestine, so these two nations had to be excluded from our investigation. Furthermore, there was no debt data for another 14 countries, which led to their exclusion. Consequently, the final analysis is conducted on a set of 61 countries, which are listed in Appendix A at the end of this article. Often the size of cross section in our regressions is smaller due to availability of control variables and the need to difference or lag our indicators, which proves problematic for very short series. The WDI starts to provide debt data from 1990, a date marking the beginning of our investigation timeframe. The time series dimension ends in 2014. At this stage, it must be mentioned that, for many nations, it is impossible to obtain data for the full period, which effectively means that we are basing our inferences on an unbalanced panel.

Table 1 provides definitions of the variables used in our study, while Table 2 reports summary statistics. The dollar-denominated returns averaged about 3.72% per annum. Credit Suisse (2015) reports that real return averages computed over a longer period of 115 years exceeded our estimate for most countries. This is likely to be due to the fact that part of the sample considered here was affected by the recent global banking crisis and the economic slowdown that followed. The average debt-to-GDP ratio was 56% and tended to increase by 26 basis points per annum. We also gauge the changes in stock market risk using $\Delta ln\sigma$ variable, which measures the continuously compounded increase in volatility. Within a given year, volatility is calculated as a standard deviation of daily returns. The mean of this variable reported in Table 2 reveals a tendency towards diminishing riskiness associated with stock market investments over time. The interest rate here is that paid on bank deposits, which represent a convenient alternative to investing in equity. Depositors struggled to increase their wealth in real terms, as the mean of *Inflation* exceeded that of *Interest_Rate*. However, examination of the statistics for different percentiles reveals that depositors' real losses occurred primarily in nations struggling with hyperinflation. Our sample countries had, on average, a real growth rate of 3.22% per annum and unemployment of 8.31%. Finally, we do not observe any strong trends in the tax burden imposed by governments. Although the mean change in the government tax revenue to GDP ratio is slightly negative, the median has a small positive value.

The last three columns in Table 3 report the results of three panel root tests. Since each of them relies on a different methodological approach, juxtaposition of the findings allows us to reach more reliable conclusions. The first test by Levin, Lin, and Chu (2002) assumes that the persistence parameter does not vary across cross-sectional units and relies on a t-statistic that, under the null of a unit root, is asymptotically normally distributed. The version of the test presented here allows for individual intercepts. The approach of Im, Pesaran, and Shin (2003) is different in that ADF tests are run separately for each of the cross-sectional units. The W-statistic is based on the standardized average of the t-statistics obtained from these tests and, under the null, W has an asymptotic standard normal distribution. Instead of working with t-statistics, Maddala and Wu (1999) focus on the p-values from individual unit root tests. These can

TABLE 1 Variable definitions

Variable	Definition	Source of data
Return	Continuously compounded return on the MSCI country stock market index for a given calendar year. The return is denominated in US dollars and expressed in percentage points	Thomson Reuters Datastream
Debt	Entire stock of central government's direct fixed-term obligations (% of GDP)	World Development Indicators
ΔDebt	First difference in the *Debt* variable	World Development Indicators
$\Delta ln\sigma$	Continuously compounded rate of change in stock market volatility relative to previous year expressed in percentage points. Volatility is defined as standard deviation of daily returns within a given calendar year. Dollar denominated MSCI country indices were used to calculate daily returns	Thomson Reuters Datastream
Interest_Rate	Interest rate on deposits paid by banks	World Development Indicators
Tax_Increase	The difference between this and last year's tax burden. Tax burden is measured here by tax revenue expressed as a percentage of GDP	World Development Indicators
GDP_Growth	Annual percentage growth rate in real GDP expressed in constant 2005 US dollars	World Development Indicators
Unemployment	Share of total unemployment in the total labour force	World Development Indicators
Inflation	Inflation in consumer price index (annual %)	World Development Indicators

TABLE 2 Summary statistics

							Panel unit root tests		
Variable	No. obs.	Mean	St. Dev.	25th percentile	Median	75th percentile	Levin, Lin and Chu t*	Im, Pesaran and Shin W-stat	Maddala and Wu Fisher-ADF
Return	1,185	3.7288	36.9573	−14.5047	7.9846	25.4783	−31.23***	−24.19***	795.11***
Debt	711	56.1297	33.1425	31.9661	52.3361	72.8350	−3.50***	−0.07	130.68*
Δ*Debt*	650	0.2618	8.4075	−2.7320	−0.2252	2.4655	−5,779.30***	−451.57***	232.87***
Δ*lnσ*	1,155	−1.2826	34.7910	−26.2779	−5.3994	18.8132	−30.16***	−24.18***	795.07***
Interest_Rate	1,208	11.9409	74.3617	2.9296	5.6858	9.6177	−122.29***	−38.61***	357.72***
Tax_Increase	862	−0.0308	1.3130	−0.5118	0.0559	0.5654	−21.74***	−16.18***	499.42***
GDP_Growth	1,481	3.2165	4.0818	1.5217	3.3684	5.3605	−18.43***	−17.63***	537.24***
Unemployment	1,220	8.3143	4.7750	4.6000	7.6000	10.5000	−4.08***	−3.94***	175.19***
Inflation	1,451	20.4540	242.5861	1.9739	3.5366	7.5838	−231.94***	−75.44***	1,087.79***

Note: See Table 1 for variable definitions. *** and * denote rejection of the unit root hypothesis at 1% and 10% significance level, respectively.

be combined, according to the principles outlined in the study by Fisher (1932), to create a test statistic following a χ^2 distribution. Table 2 reveals that, with the exception of *Debt*, the hypothesis of unit root is strongly rejected for all variables. The stationarity of *Debt* is questionable, considering that the Im et al. (2003) fails to reject the null, while the Fisher-ADF test indicates a rejection only at a 10% significance level. Consequently, in the regressions that follow, we use the first difference of this variable (Δ*Debt*).

4 | EMPIRICAL RESULTS

4.1 | Government debt changes and stock market returns

As was argued in Section 2, issuance of additional government bonds can increase discount rates and lead to future tax increases, which would depress valuations of equities. On the other hand, the traditional Keynesian view holds that expansionary fiscal policy can provide a stimulus to the economy, which could benefit shareholders. The relative validity of these two viewpoints can only be assessed empirically. To this end, we proceed to quantitatively measure the influence of central government debt increases on stock market valuations. Our primary objective is to focus on increases in debt, rather than deficit. This is because debt needs to be sold in the markets and may consequently influence prices of assets, while deficit is a purely accounting construct.

Consequently, Table 3 reports models linking our *Return* variable with Δ*Debt* and additional controls. Models (1) and (2) employ a simple pooled OLS estimation with common intercept, while Models (3) and (4) include both country and year dummies. Since the null hypothesis of redundant fixed effects is strongly rejected, the latter two regressions are preferred on econometric grounds. The most important finding that becomes immediately apparent is that, irrespective of the estimation method and regression specification, issuance of new government debt depresses stock market valuations. Increase in debt equivalent to 1% of GDP leads to lowering of the dollar-denominated index returns by between 39 and 95 basis points. The hypothesis of debt neutrality is rejected in all models at 5% significance level, or better. These results add credence to the claim that stock market investments can be crowded out by government bonds and bills.

The estimated coefficients on the control variables warrant further reflection. Firstly, no significant contemporaneous association between GDP growth and returns has been detected. This finding mirrors the conclusions of Binswanger (2000, 2004) who argued that the nexus between growth rates in real activity and stock price movements broke down in the 1980s, both in the United States and in the G7 countries. High unemployment appears to be a good signal for markets, which at first glance may seem counterintuitive, as it measures underutilization of resources. Although Boyd, Hu, and Jagannathan (2005) note that rising unemployment is indeed followed by slower growth, they also report that, during expansion periods, this effect is dominated by an expectation of declining future interest rates. As a result, the stock market usually rises following bad news from the labour market. Lastly, interest rates are inversely

TABLE 3 Return regressions

	Pooled least squares estimation		Two-way fixed effect panel	
	(1)	(2)	(3)	(4)
Intercept	4.2756*** (*1.4722*)	1.9197 (*4.6258*)		
$\Delta Debt_{i,t}$	−0.4315** (*0.2001*)	−0.6529** (*0.2762*)	−0.3876** (*0.1641*)	−0.9540*** (*0.2312*)
$GDP\_Growth_{i,t}$		−0.4014 (*0.5424*)		−0.2442 (*0.5888*)
$Unemployment_{i,t}$		0.9358** (*0.4568*)		1.8005** (*0.7924*)
$Interest\_Rate_{i,t}$		−0.3937 (*0.3533*)		−1.4105** (*0.5953*)
Adjusted R^2	0.6352%	1.4963%	57.9470%	55.4374%
Number of observations	572	402	572	402
F-stat (regression)	4.6504	2.5228	11.9279	8.2298
Prob (F-stat)	0.0315	0.0406	0.0000	0.0000
F-stat (redundant fixed effects)			11.9412	8.3931
Prob (F-stat)			0.0000	0.0000

Note: The models estimated in the table can be expressed as $Return_{i,t} = \beta_{0,i} + \beta_{1,t} + \beta_2 \Delta Debt_{i,t} + \beta_3 GDP\_Growth_{i,t} + \beta_4 Unemployment_{i,t} + \beta_5 Interest\_Rate_{i,t} + \varepsilon_{I,t}$. Instead of using country-specific and time-specific fixed effects, Models (1) and (2) rely on estimating a common intercept. Models (1) and (3) introduce a restriction of $\beta_3 = \beta_4 = \beta_5 = 0$. The dependent variable in the models above is continuously compounded return on MSCI county stock market index denominated in US dollars. Definitions of the explanatory variables are provided in Table 1. To conserve space, the fixed effects are not reported. F-stat (Regression) tests the hypothesis that the model has no explanatory power, while F-stat (redundant fixed effects) is for the null that both cross section and period fixed effects can be omitted. Parameter standard errors are given in parentheses. ***, **, * denote statistical significance at 1%, 5%, and 10%, respectively.

related to market valuations, which is particularly apparent in Model (4). This is not surprising, since a higher rate of interest leads to heavier discounting of future cash flows generated by companies and translates into higher costs of servicing corporate debt.

The measures of fit seem to be much better for the two-way fixed effect panels. This is primarily due to the fact that the year dummies are able to capture the common global trend in stock market movements and effectively isolate the domestic component of returns. The hypothesis that the regressors do not have explanatory power is rejected in all specifications. We also note that *Inflation* is not included in the set of independent variables, as it is highly correlated with *Interest_Rate* ($\rho = 0.87$). Its inclusion could lead to multicollinearity problems and inflated standard errors. As specified, our models do not suffer from multicollinearity and the highest variance inflation factor (VIF) in the models is 1.18. According to Chatterjee and Price (1991), estimation problems can arise when VIFs exceed the value of 10.

In summary, the findings in Table 3 support the claim that increases in central government's indebtedness diminish the wealth of shareholders. At this stage, it is important to ask through which channels this relationship establishes itself in the data. We will consider three possible mechanisms and endeavour to verify related evidence. Firstly, issuance of new debt erodes the creditworthiness of the government and increases the probability of its default. Such political uncertainties could potentially translate into higher stock market risk. Secondly, the action of selling newly issued government bonds and bills may increase interest rates, consequently depressing stock prices. Lastly, the need to borrow may reflect structural problems in balancing the budget and signal future tax increases. In what follows, we investigate each of the possible explanations in greater detail.

4.2 | Government debt and stock market riskiness

In the seminal model of corporate debt pricing proposed by Merton (1974), the probability that a company will go bankrupt increases nonlinearly in the present value of debt relative to the current value of the firm. A similar relationship holds if the situation is assessed from the point of view of governments. As new debt is issued, the probability of default increases, undermining creditworthiness and credit ratings. Aizenman, Hutchison, and Jinjarak (2013) use a large sample of countries to show that spreads on sovereign credit default swaps, which represent the cost of default insurance, increase with the public debt-to-tax base ratio. Notably, exceeding the debt capacity can also destabilize a country politically. In recent years, this has been witnessed in Greece, which balanced precariously on the edge of solvency. During the period of 2007–2015, this country had no less than seven different prime ministers. In general, policy uncertainty has been documented to adversely affect stock prices and to exacerbate investment risk (Antonakakis, Chatziantoniou, & Filis, 2013; Baker et al., 2016; Bittlingmayer, 1998; Pástor & Veronesi, 2013).

The above arguments explain why debt-financed fiscal profligacy can create a hazardous investment environment. However, one needs to bear in mind that there could be strong offsetting effects. Fiscal policy may be deliberately counter-cyclical, with stimulus or bailout packages and automatic fiscal stabilizers having a dampening effect on economic fluctuations (Brown, 1955; Fatás & Mihov, 2001; Fernández-Villaverde, 2010; Wren-Lewis, 2010). That being the case, questions can be raised about the net effect of these opposing forces. We endeavour to measure it empirically by linking changes in stock market risk to increases in government indebtedness. Table 4 reports the estimates of four models where $\Delta ln\sigma$ is taken as a dependent variable.

The sign of the coefficient on $\Delta Debt$ appears to change depending on specification, with statistical significance being reached only in one model and at merely 10% level. The assertion that increases in government borrowing aggravate investment risk finds little support in the data. Consequently, the story that the stock price declines accompanying debt expansion are caused by jumps in risk premium should be treated with scepticism. Furthermore, other macroeconomic variables lack consistency in terms of the strength of their predictive power. Most variation can be explained by the period dummies, indicating that stock markets are strongly integrated and tend to change their riskiness simultaneously. Overall, the findings presented in this section suggest that we need to look for drivers other than risk to rationalize the negative debt-return nexus.

4.3 | Are interest rates affected?

Whenever a government takes large quantities of bonds and bills to the market, they compete with private debt and drive up the interest rates (Blinder & Solow, 1973). This could potentially raise the level of private interest rates in the economy and negatively affect stock prices. However, as Friedman (1978) reminds us, the conclusions of Blinder and Solow (op cit) hinge upon the assumption that government bonds and private sector real capital are perfect substitutes and, should this assumption be violated, debt-financed deficits will not necessarily lead to the abovementioned portfolio crowding out effect. The academic discussion is further complicated by the fact that prior empirical papers fail to reach a consensus regarding the impact of fiscal imbalances on interest rates (Ardagna, Caselli, & Lane, 2007; Evans, 1985; Faini, 2006; Laubach, 2009; Plosser, 1982, 1987).

TABLE 4 Empirical determinants of $\Delta ln\sigma$

	Pooled least squares estimation		**Two-way fixed effect panel**	
	(1)	**(2)**	**(3)**	**(4)**
Intercept	0.0912 (*1.5487*)	1.7407 (*4.8157*)		
$\Delta Debt_{i,t}$	−0.2270 (*0.2199*)	−0.1124 (*0.3031*)	0.2911* (*0.1562*)	0.2999 (*0.2217*)
$GDP\_Growth_{i,t}$		0.2879 (*0.5683*)		−0.4060 (*0.5711*)
$Unemployment_{i,t}$		−0.8881* (*0.4760*)		−0.4184 (*0.7789*)
$Interest\_Rate_{i,t}$		0.6651* (*0.3685*)		0.5830 (*0.5800*)
Adjusted R^2	0.0116%	0.7111%	66.5025%	62.0168%
Number of observations	564	397	564	397
F-stat (regression)	1.0654	1.7090	16.7426	10.3705
Prob (F-stat)	0.3024	0.1472	0.0000	0.0000
F-stat (redundant fixed effects)			16.9363	10.7338
Prob (F-stat)			0.0000	0.0000

Note: The regressions above model the continuously compounded increase in stock market risk, which is measured by standard deviation of daily MSCI index returns within a given calendar year. This is done by estimating equations of the following form $\Delta ln\sigma_{i,t} = \beta_{0,i} + \beta_{1,t} + \beta_2 \Delta Debt_{i,t} + \beta_3 GDP\_Growth_{i,t} + \beta_4 Unemployment_{i,t} + \beta_5 Interest\_Rate_{i,t} + \varepsilon_{I,t}$. Models (1) and (2) restrict the country and time fixed effects to zero and instead use a common intercept. Specifications (1) and (3) assume that $\beta_3 = \beta_4 = \beta_5 = 0$. For the exact definitions of explanatory variables, see Table 1. F-stat (Regression) tests the hypothesis that the model has no explanatory power, while F-stat (redundant fixed effects) is for the null that both cross-section and period fixed effects can be omitted. Parameter standard errors are given in parentheses. ***, **, * denote statistical significance at 1%, 5% and 10%, respectively.

If our investigation shows that expansions of government debt lead to higher level of interest rates, this will have ramifications for stock market prices. Since the cash flows generated by stocks will be discounted more heavily, equities will consequently depreciate in value. This, in turn, will diminish the wealth of households and could reduce their consumption of corporate products. As the option of buying consumer durables on hire purchase becomes more costly, consumption will drop even further (Engen & Hubbard, 2005). Moreover, interest rate rises imply higher costs of servicing variable-rate corporate debt and, therefore, diminished profits. Lastly, high borrowing costs can reduce investors' demand for stocks, as investing on margin becomes less affordable. All of these effects could potentially coincide to produce significant falls in stock prices.

Table 5 reports parameter estimates for models that link the interest rate level to increases in government debt and control variables. *Inflation* appears as a regressor in all specifications and always has a *t*-statistic in excess of 40. This means that dropping it could result in severe omitted variable bias. The most important finding in Table 5 is the robust rejection of the Ricardian equivalence. An increase in the debt-to-GDP ratio by 1 percentage point appears to raise interest rate by about 6–10 basis points. These estimates are twice as large as those obtained for the United States by Engen and Hubbard (2005) and Laubach (2009). Consequently, in our sample, expansions in central government indebtedness increase interest rates in a non-trivial way which, in turn, has dire ramifications for stock markets.

The interest rate modelled here is that accruing to depositors. This is quite sensible, because as Cebula (1985) pointed out, for the crowding out effect to affect the private sector, government borrowing needs to influence private interest rates. Interestingly, the World Development Indicators data set also includes information on bank lending rates for short- and medium-term loans. We replicate our regressions with the lending rates acting as the dependent variable and report our findings in Appendix B (Table B1). The debt-neutrality hypothesis is again rejected in most of the specifications and the sensitivity of lending rate with respect to $\Delta Debt$ seems to be even greater than that recorded for deposit rates. As a side note, we would like to point out that the same is true of sensitivity to inflation, which suggests that the loan-deposit interest rate spread increases in an inflationary environment. Another issue that has been pointed out by Faini (2006) and Ardagna et al. (2007) is that the interest rate effect could be asymmetric. Since debt increases are more worrying in countries that already have an above-average indebtedness level, the market reaction could potentially be stronger. However, we have discovered that once the fixed effects and relevant controls are incorporated into our model, no evidence of asymmetries could be found.

Taken together, the results presented in this section attest to the fact that government decisions to increase borrowing are accompanied by jumps in interest

TABLE 5 Modelling the interest rate

	Pooled least squares estimation		Two-way fixed effect panel	
	(1)	**(2)**	**(3)**	**(4)**
Intercept	3.0527*** (*0.1725*)	2.1632*** (*0.4307*)		
$\Delta Debt_{i,t}$	0.0959*** (*0.0248*)	0.1027*** (*0.0281*)	0.0729*** (*0.0175*)	0.0622*** (*0.0193*)
$GDP\_Growth_{i,t}$		−0.0028 (*0.0534*)		−0.2270*** (*0.0445*)
$Unemployment_{i,t}$		0.1084** (*0.0430*)		−0.1903*** (*0.0596*)
$Inflation_{i,t}$	0.4653*** (0.0107)	0.4662*** (*0.0114*)	0.4288*** (*0.0076*)	0.4203*** (*0.0082*)
Adjusted R^2	86.0531%	86.9555%	95.0568%	95.6291%
Number of observations	468	431	468	431
F-stat (regression)	1,441.7132	717.5992	120.7366	126.4363
Prob (F-stat)	0.0000	0.0000	0.0000	0.0000
F-stat (redundant fixed effects)			12.6021	12.9063
Prob (F-stat)			0.0000	0.0000

Note: The generalized expression for the regressions presented in this table can be written as $\Delta Interest\_Rate_{i,t} = \beta_{0,i} + \beta_{1,t} + \beta_2 \Delta Debt_{i,t} + \beta_3 GDP\_Growth_{i,t} + \beta_4 Unemployment_{i,t} + \beta_5 Inflation_{i,t} + \varepsilon_{I,t}$. Specifications (1) and (2) dispense of the country and year fixed effects and employ a pooled OLS estimation. Models (1) and (3) restrict β_3 and β_4 to 0. For the exact variable definitions, please refer to Table 1. The first F-statistic is for the hypothesis that the model has no explanatory power, while the second one is for the null that both cross- ection and period fixed effects are redundant. Parameter standard errors are given in parentheses. ***, **, * denote statistical significance at 1%, 5%, and 10%, respectively.

rates, which can adversely affect share prices through several channels. However, this is unlikely to be the end of the story. After all, our results in Table 3 indicated that the strong negative relationship between *Return* and $\Delta Debt$ persists even after controlling for the level of interest rates. Clearly, other forces must also be at play here. To probe this issue further, we investigate whether government debt issuance may signal increases in future tax burden.

4.4 | Tax implications of government debt expansion

In the absence of sales of public assets, the government needs to satisfy a borrowing constraint equating current debt to the present value of expected future surpluses (Chung & Leeper, 2007; Smith & Zin, 1991). Fiscal surpluses may not be easily achievable, as cuts to public spending can prove politically perilous. An alternative way to follow would be to increase the tax burden. Needless to say, raising taxes on corporate profits, capital gains or dividends reduces cash flows to shareholders and can result in stock prices declines. Taxation can also lead to a significant deadweight loss (Feldstein, 1999) and expansion of the underground economy (Tanzi, 1983). The side effects of high corporate tax rates are particularly troublesome and include lower economic growth (Lee & Gordon, 2005) as well as declines in investments, FDI and entrepreneurial activity (Djankov, Ganser, McLiesh, Ramalho, & Shleifer, 2010). All of these unintended consequences of the tax burden can further aggravate stock market falls.

On the one hand, debt issuance may be viewed as an innocuous way to smooth government revenue. On the other hand, it may be an ominous sign that structural budget imbalances are present and that the future tax burden will have to rise. We verify empirically whether public debt expansion is followed by increases in tax revenue-to-GDP ratio by estimating the following model:

$$Tax\_Increase_{i,t} = \beta_{0,i} + \beta_{1,t} + \beta_2 \Delta Debt_{i,t} + \sum_{j=1}^{n1} \beta_{2+j} \Delta Debt_{i,t-j} + \beta_{n1+3} Inflation_{i,t} + \varepsilon_{i,t}$$

All variables appearing in the equation above have been defined in Table 1. $\beta_{0,i}$ and $\beta_{1,t}$ stand for the country and year fixed effects, while $\varepsilon_{i,t}$ denotes a random residual. Table 6 reports the estimated parameters of the model. Specifications (1) and (2) assume that $\beta_{0,1} = \beta_{0,2} = \ldots = \beta_{0,\mathrm{N}}$ and $\beta_{1,1} = \beta_{1,2} = \ldots = \beta_{1,\mathrm{T}}$, while Regressions (1) and (3) restrict β_{n1+3} coefficient to zero. We would also like to note that $(\beta_3 + \beta_4 + \ldots + \beta_{n1+2})$ represents the total increase in the tax revenue-to-GDP ratio in the $n1$ years following the year in which an increase in public debt equivalent to 1% of GDP took place.

Beginning our analysis with Model (1), we selected the lag length $n1$ by using the Akaike criterion (Akaike, 1973, 1974) and capping the maximum number of lags at 4. This selection criterion indicated that 4 lags should be included. It should be noted that selecting higher-order models leads to a substantial loss of degrees of freedom, since we are dealing with a panel with a relatively large cross-sectional dimension. Turning our attention to the results, it can be seen that the value of β_2 coefficient is negative, which suggests the presence of debt-financed tax cuts. However, the statistical significance of this finding is debatable and such policy actions are not sustainable in the long run. This is clear, as the initial cut is followed by tax increases, which are of much greater magnitude (i.e., $|\beta_2| < (\beta_3 + \beta_4 + \beta_5 + \beta_6)$). This is true regardless of the estimation method. The cumulative tax hikes in the 4 years following the year of debt expansion are statistically significant in all of the regressions (i.e., the null of H_0: $\beta_3 + \beta_4 + \beta_5 + \beta_6 = 0$ is consistently rejected). Such results indicate that the growing indebtedness of government does not simply represent ephemeral government revenue smoothing. Instead, it signals a structural deficit problem that will need to be addressed by changing taxation policy in the years to follow.

Some economists of the Keynesian persuasion would argue that, due to its short-term growth boosting effect, a debt-financed expansion may be desirable, even if it is not sustainable over a long period. However, since our *Tax_Increase* variable is defined as the first difference in tax revenue-to-GDP ratio, our estimates indicate that the tax burden in 4 years following debt expansion increases faster than GDP. This is undoubtedly bad news for companies and investors alike. Therefore, if agents are rational and forward-looking, increases in government indebtedness will have to result in immediate decreases in stock prices. This is why, in addition to the interest channel, the tax effects can be propounded as a rationalization for the negative association between *Return* and $\Delta Debt$.

Although somewhat tangential to our main analysis, it is interesting to note that the coefficient on *Inflation* is negative, and significantly so in the two-way fixed effect panel. This may suggest that some countries are trying to inflate their way out of financial difficulties without resorting to increasing the tax burden. Such a policy could be implemented by using the open market operations of the central bank. It goes without saying that governments operating in countries where central banks are

TABLE 6 Empirical models for *Tax_Increase*

	Pooled least squares estimation		Two-way fixed effect panel	
	(1)	(2)	(3)	(4)
Intercept	−0.0567 (*0.0588*)	−0.0132 (*0.0745*)		
$\Delta Debt_{i,t}$	−0.0298*** (*0.0079*)	−0.0350*** (*0.0081*)	−0.0015 (*0.0094*)	−0.0094 (*0.0097*)
$\Delta Debt_{i,t\text{-}1}$	−0.0152* (*0.0089*)	−0.0080 (*0.0092*)	0.0045 (*0.0102*)	0.0199* (*0.0109*)
$\Delta Debt_{i,t\text{-}2}$	0.0301*** (*0.0092*)	0.0252*** (*0.0093*)	0.0302*** (*0.0106*)	0.0272** (*0.0106*)
$\Delta Debt_{i,t\text{-}3}$	0.0141 (0.0100)	0.0150 (0.0099)	0.0041 (0.0110)	0.0019 (0.0109)
$\Delta Debt_{i,t\text{-}4}$	0.0161 (0.0111)	0.0132 (0.0110)	0.0008 (0.0121)	−0.0032 (0.0120)
$Inflation_{i,t}$		−0.0151 (0.0124)		−0.0609*** (0.0208)
Adjusted R^2	6.3392%	6.2635%	16.7546%	16.9218%
Number of observations	411	403	411	403
F-stat (regression)	6.5500	5.4770	2.2326	2.2221
Prob (F-stat)	0.0000	0.0000	0.0000	0.0000
F-stat (redundant fixed effects)			1.8173	1.8328
Prob (F-stat)			0.0005	0.0004
$\beta_3 + \beta_4 + \beta_5 + \beta_6$	0.0452	0.0455	0.0397	0.0458
F-stat (H_0: $\beta_3 + \beta_4 + \beta_5 + \beta_6 = 0$)	7.6738	7.8884	3.0742	4.1770
Prob (F-stat)	0.0059	0.0052	0.0804	0.0418

Note: The regressions presented above link increases in tax burden to the current and past government debt changes and inflation. The general regression equation can be written as follows: $Tax\_Increase_{i,t} = \beta_{0,i} + \beta_{1,t} + \beta_2 \Delta Debt_{i,t} + \beta_3 \Delta Debt_{i,t\text{-}1} + \beta_4 \Delta Debt_{i,t\text{-}2} + \beta_5 \Delta Debt_{i,t\text{-}3} + \beta_6 \Delta Debt_{i,t\text{-}4} + \beta_7 Inflation_{i,t} + \varepsilon_{1,t}$. Models (1) and (2) assume that ($\beta_{0,1} = \beta_{0,2} = \ldots = \beta_{0,N}$) and ($\beta_{1,1} = \beta_{1,2} = \ldots = \beta_{1,T}$) and introduce pooled intercept instead. Models (1) and (3) restrict β_7 to 0. In addition to the null hypotheses that the regression has no explanatory power and that the fixed effects are redundant, a third null is tested. It verifies whether historical debt increases are tax-neutral. Parameter standard errors are given in parentheses. ***, **, * denote statistical significance at 1%, 5%, and 10%, respectively.

strongly independent or those residing in the Euro zone will be restricted in pursuing such policy avenues.

5 | FURTHER CONSIDERATIONS

In what follows, we present alternative specifications of the stock returns model introduced in the previous section. Since the joint hypothesis of redundant country- and year-fixed effects is consistently rejected in the returns regressions, we constrain ourselves to presenting two-way fixed effect panel models with a full set of controls. The first concern that we want to contemplate relates to whether the reaction to public debt issuance is uniform across different countries, regardless of their level of indebtedness. Presumably, investors could become more apprehensive and agitated in cases where the public debt burden is already sizable. Here, we use a 60% debt-to-GDP threshold to distinguish between the nations that are heavily laden with debt and those that are not. Our threshold selection is motivated by the fact that across EU member states a limit of 60% had been imposed by the Stability and Growth Pact of 1997 and its importance was further underscored by the Fiscal Compact of 2012 (Lane, 2012). To operationalize our inquiry, we created a dummy variable indicating heavily indebted countries and label it accordingly as $I(Debt_{i,t} > 60\%)$. Subsequently, we interact $I(Debt_{i,t} > 60\%)$ as well as $(1\text{-} I(Debt_{i,t} > 60\%))$ with $\Delta Debt$ and enter the resultant constructs as explanatory variables into our return regression. Such an approach permits us to differentiate the strength of the stock market reaction to debt issuance conditional on the level of government liabilities. The estimation results (displayed in Column (1) of Table 7) reveal that increasing public debt by 1% of GDP in countries that are below our debt threshold leads to a 75 basis points decrease in returns. An analogous estimate of a fall for the highly indebted countries is 109 basis points. While this difference between the two estimates may appear sensible and nontrivial from an economic perspective, it is insignificant from a statistical point of view (p-value = .4309).

Another important issue that we ought to consider at this stage is that not all forms of debt are equal. Governments that have control over their own legal tender and central bank may resort to monetizing their domestic currency denominated debt in times of need. Needless to say, such liberties cannot be taken with respect to sovereign debt, making the likelihood of default appreciably higher. To delve into this issue empirically, we collect new data from the World Development Indicators database and construct the *External_Debt* variable, which divides the external public debt stocks by GDP. By regarding all non-external debt as domestic, we further create a *Domestic_Debt* variable, which is likewise scaled by GDP. Both of these indicators, in their first-differenced from, are entered into our return regression (see Specification (2) in Table 7). Although increases in both types of government debt significantly depress stock valuations, their impact is not homogeneous. As anticipated, the detrimental impact of foreign debt is more severe, which is evidenced by the significantly higher regression coefficient (p-value = .0089). Some caution is advised when interpreting these results, as the data used for this estimation were available only for 17 countries. Nevertheless, governments that consider equity investors to be an integral part of their electorate are advised to carefully consider the forms of debt that they plan to issue.

Our next point of inquiry relates to the selection of the functional form. In our prior estimations, we have presupposed that the relationship between changes in debt and stock prices is linear. Specification (3) in Table 7 disposes of this assumption and includes a squared $\Delta Debt$ term as an explanatory variable. This term proves to be statistically significant at the 5% level and bears a negative coefficient. Such a finding points towards the existence of concavity in the function of interest. While the returns increase with debt reductions, they do so at a diminishing rate. On the other end of the spectrum, huge increases in public debt decrease the returns more than linearly, which could potentially reflect the devastating impact of defaults and financial panics.

Last but not least, we investigate whether there is any evidence of a delayed response of stock market prices to changes in public debt. Unless central government indebtedness is explicitly considered as a risk factor, an

TABLE 7 Alternative specifications of return regressions

	(1)	(2)	(3)	(4)
$\Delta Debt_{i,t} \times (1\text{-}I(Debt_{i,t} > 60\%))$	−0.7463** (*0.3506*)			
$\Delta Debt_{i,t} \times I(Debt_{i,t} > 60\%)$	−1.0909*** (*0.2893*)			
$\Delta External\_Debt_{i,t}$		−2.9750*** (*0.7013*)		
$\Delta Domestic\_Debt_{i,t}$		−1.3001*** (*0.3756*)		
$\Delta Debt_{i,t}$			−0.6815*** (*0.2603*)	−1.0168*** (*0.2490*)
$\Delta Debt_{i,t} \times \Delta Debt_{i,t}$			−0.0219** (*0.0098*)	
Lagged $\Delta Debt_{i,t}$				−0.3550 (*0.2352*)
$GDP\_Growth_{i,t}$	−0.2627 (*0.5896*)	−3.1306*** (*1.1188*)	−0.2883 (*0.5856*)	−0.0296 (*0.6423*)
$Unemployment_{i,t}$	1.7058** (*0.8019*)	0.1526 (*1.4162*)	1.5776** (*0.7940*)	1.8998** (*0.8967*)
$Interest\_Rate_{i,t}$	−1.3945** (*0.5960*)	−1.5128 (*0.9367*)	−1.3104** (*0.5935*)	−1.3347** (*0.6421*)
Adjusted R^2	55.3866%	55.3700%	55.9650%	55.2429%
Number of observations	402	140	402	362
F-stat (regression)	8.1119	5.1059	8.2806	7.5526
Prob (F-stat)	0.0000	0.0000	0.0000	0.0000
F-stat (redundant fixed effects)	8.3212	5.2337	8.5697	7.7098
Prob (F-stat)	0.0000	0.0000	0.0000	0.0000

Note: All regressions reported in this table are two-way fixed effect panels. The dependent variable in the models above is continuously compounded return on MSCI county stock market index denominated in US dollars. The regressions presented can be expressed as $Return_{i,t} = \beta_{0,i} + \beta_{1,t} + \beta_2 \Delta Debt_{i,t} \times (1\text{-}I(Debt_{i,t} > 60\%)) + \beta_3 \Delta Debt_{i,t} \times I(Debt_{i,t} > 60\%) + \beta_4 \Delta External\_Debt_{i,t} + \beta_5 \Delta Domestic\_Debt_{i,t} + \beta_6 \Delta Debt_{i,t} + \beta_7 \Delta Debt_{i,t} \times \Delta Debt_{i,t} + \beta_8 \text{Lagged } \Delta Debt_{i,t} + \beta_9 GDP\_Growth_{i,t} + \beta_{10} Unemployment_{i,t} + \beta_{11} Interest\_Rate_{i,t} + \varepsilon_{I,t}$. Specification (1) assumes that $\beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$, Model (2) takes $\beta_2 = \beta_3 = \beta_6 = \beta_7 = \beta_8 = 0$, Model (3) restricts $\beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_8 = 0$, while (4) imposes a restriction of $\beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_7 = 0$. $I(Debt_{i,t} > 60\%)$ is a dummy variable taking the value of one whenever the debt-to-GDP ratio exceeds 60%. $\Delta External\_Debt_{i,t}$ is the first difference in the external public debt stocks-to-GDP ratio, while the $\Delta Domestic\_Debt_{i,t}$ is the first difference in the domestic central government debt-to-GDP ratio. Definitions of the remaining explanatory variables are provided in Table 1. To conserve space, the fixed effects are not reported. F-stat (Regression) tests the hypothesis that the model has no explanatory power, while F-stat (redundant fixed effects) is for the null that both cross section and period fixed effects can be omitted. Parameter standard errors are given in parentheses. ***, **, * denote statistical significance at 1%, 5%, and 10%, respectively.

observation that $\Delta Debt$ forecasts future returns would run contrary to the Efficient Market Hypothesis (Fama, 1970). In an efficient market, future prices should follow a random walk and be completely unpredictable. To examine this issue in greater detail, we include lagged $\Delta Debt$ as an additional explanatory variable in our return model. According to the findings reported in column (4) of Table 7, the impact of this variable is negative, which is consistent with our a priori expectations. Although the redundancy of this variable cannot be rejected at the conventional significance levels, the associated p-value is relatively low and equal to 0.13. It can be further inferred from the estimates that an increase in public debt by 1% of GDP reduces stock returns by a total of 137 basis points over a two-year period.

6 | CONCLUSIONS

This article contributes to the vigorous debate on the impact of fiscal policy by showing that stock price performance is weakened by the issuance of additional public debt. In order to rationalize this finding, we empirically tested auxiliary hypotheses. First, the stock declines do not seem to be accompanied by elevated levels of return volatility, which invalidates justifications based on the risk premium story. Second, we examine the pressure that increasing government debt exert on interest rates. Despite over 40 years of theoretical and empirical research in this area, there is still little consensus about the strength of such pressure and the size of the arising effect. Using an international sample, we show that interest rates increase between 6 and 10 basis points when government debt is increased by 1% of GDP. From the perspective of stock market investors, the situation is exacerbated even further by the fact that the costs of servicing bloated public sector borrowing are financed by future increases in the tax burden.

Our findings have a range of practical implications. First, they highlight the importance of fiscal self-restraint to policy makers. Future governments may find the prioritization of the balanced budget imperative difficult, as the population of developing countries is ageing (Alesina, 2012). However, many pension funds are heavily invested in equity markets and issuance of more public debt could seriously undermine the quality of life of senior citizens. Second, the results provide clear-cut guidance to international investors. In selecting their portfolio composition, forward-looking stock market participants may want to underweight countries that are expected to run chronic budget deficits financed by debt. Our findings with regard to interest rate behaviour could also be instructive to those who have committed their funds to fixed income instruments. Last but not least, the insights provided are food for thought for some voters who believe that rising government liabilities are of no immediate concern, as the burden of debt repayment can be left to future generations. This is a somewhat misguided notion, as the ramifications of such actions are felt immediately in capital markets.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from Thomson Reuters Datastream and UK Data Service. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from the authors with the permission of Thomson Reuters Datastream and UK Data Service.

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ENDNOTE

[1] Information sourced from the World Development Indicators (September 2017) database.

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APPENDIX A

LIST OF SAMPLE COUNTRIES

Australia, Austria, Bahrain, Bangladesh, Belgium, Botswana, Bulgaria, Canada, China, Colombia, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Indonesia, Ireland, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea, Lithuania, Malaysia, Mauritius, Mexico, Morocco, Netherlands, New Zealand, Nigeria, Norway, Oman, Pakistan, Peru, Philippines, Poland, Portugal, Russia, Singapore, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, Trinidad & Tobago, Tunisia, Turkey, Ukraine, United Arab Emirates, United Kingdom, United States, Zimbabwe

Appendix B

TABLE B1 Determinants of the lending interest rate

	Pooled least squares estimation		Two-way fixed effect panel	
	(1)	(2)	(3)	(4)
Intercept	1.1015*** (*0.3145*)	0.0486 (*0.7784*)		
$\Delta Debt_{i,t}$	0.0596 (*0.0448*)	0.0984* (*0.0509*)	0.1379*** (*0.0440*)	0.2174*** (*0.0480*)
$GDP\_Growth_{i,t}$		0.2306** (*0.0978*)		0.5688*** (*0.1143*)
$Unemployment_{i,t}$		0.0416 (*0.0792*)		0.3850*** (*0.1470*)
$Inflation_{i,t}$	1.7953*** (0.0196)	1.8125*** (*0.0208*)	1.7920*** (*0.0192*)	1.8319*** (*0.0210*)
Adjusted R^2	96.5770%	96.8615%	97.7217%	98.0346%
Number of observations	468	448	468	448
F-stat (regression)	6842.8356	3449.8549	282.1169	302.3045
Prob (F-stat)	0.0000	0.0000	0.0000	0.0000
F-stat (redundant fixed effects)			276.2994	286.7412
Prob (F-stat)			0.0000	0.0000

Note: The dependent variable in the regressions is the bank lending rate on short- and medium-term loans (*Lending_Interest_Rate*). The models reported in the table can be written as $\Delta Lending\_Interest\_Rate_{i,t} = \beta_{0,i} + \beta_{1,t} + \beta_2 \Delta Debt_{i,t} + \beta_3 GDP\_Growth_{i,t} + \beta_4 Unemployment_{i,t} + \beta_5 Inflation_{i,t} + \varepsilon_{i,t}$. Instead of employing two-way fixed effect estimation, specifications (1) and (2) report pooled OLS results. Models (1) and (3) restrict β_3 and β_4 to 0. For the exact definitions of explanatory variables, please refer to Table 1. The first F-statistic is for the hypothesis that the model has no explanatory power, while the second one is for the null that both cross section and period fixed effects are redundant. Parameter standard errors are given in parentheses. ***, **, * denote statistical significance at 1%, 5% and 10%, respectively.