# A three-way dynamic causality analysis on domestic credit risk, external debt, and external debt servicing and its implications on debt sustainability initiatives: Evidence from Zambia.

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**Abstract**

The COVID-19 pandemic increased banks' exposure to sovereign risk and made the majority of nations' post-crisis public debt worse. The results showed a unidirectional causal relationship between external debt and commercial banks' credit risk using a VECM with a consistent 1.659 percent increase in external debt as a proportion of GDP followed a 1 percent increase in banks' credit risk, indicating a vicious cycle. Additionally, we found that for every percentage increase in debt service as a share of GDP, there is a 0.9 percent increase in credit risk. The repayment of foreign debt also had a positive effect on the external debt. Based on this, we concluded that although debt treatment procedures have paved the way for a recovery path, a focus on reducing bank credit risk is necessary to keep the positive impacts of these activities from being undermined by a repo effect.

*Key words: Vicious cycle, External Debt, Credit Risk, Debt Service Suspension initiative, Vector Error Correction Model.*

## 1. Introduction

The link between sovereigns and banks have over the recent past resulted in several problems, including vicious cycles that occur when a country's sovereign creditworthiness deteriorates to the point where it lowers the market value of the domestic sovereign debt that commercial banks hold and raises the likelihood that these banks will require enormous bailouts to survive (Brunnermeier et al. 2016). In several emerging economies, this was the experience as the COVID-19 epidemic increased commercial banks' exposure to sovereign risk (Aizenman *et al.,* 2023), which contributed to the post-covid rise in public debt and reduced the expansionary impact of increasing expenditure on bank lending in the majority of these economies and further put pressure on states to support these financial institutions. In response, many sovereigns offered bailouts financed by taxpayers, which eroded their fiscal position at a time when states' balance sheets were already strained by a decline in overall demand and revenue from taxes. In Zambia for instance, commercial banks have over the years tended to hold government bonds over private securities as many of these institutions reason that holding a significant amount of government securities may warrant a bailout by the government in the event of financial distress or a modification of the banking systems regulations that enables them to remain onshore (International Monetary Fund 2023).

While the several studies on African countries have tried to understand the external debt trajectory, no study has examined the effect of bank credit risk on the external debt sustainability. We offer policymakers a novel approach to improve debt sustainability and the growth of the financial sector through my examination of the strength of the link between the banking system and the sovereign. In order to assure robustness and novelty, we examined periods between 2019 and 2021 for Zambia, when there was active secondary market demand for sovereign debt, since pressure from foreign creditors is another aspect of the vicious cycle as observed in Europe (Reinhart and Rogoff 2009).

*Country Context and Background*

As Zambia is not new to unsustainable external debt, having had a massive financial crisis in the early 1990s, the country following the COVID-19 epidemic, became the first nation to experience an external debt default in 2021 (Pinto 2022). Commercial banks that owned a large amount of Zambia's domestic debt became pessimistic following the country's default on its foreign debt, speculating on whether the government would prioritize repaying its domestic debt or declaring bankruptcy as it did with the country's external debt. As a result, the value of sovereign bonds dropped in the secondary market as rating agencies downgraded these bonds, which in turn caused the balance sheets of commercial banks to deteriorate. For instance, Zambia's long-term foreign currency issuer default rating was downgraded by FitchRatings in Hong Kong from C to CC, and all of the foreign currency bonds rated by Fitch were included in the downgrade of the senior unsecured foreign-currency bonds included in the consent-solicitation to C (FitchRatings 2020). The action came after the government, which on September 22, 2020, sent a consent-solicitation to the holders of three global bonds, formally requesting a payment suspension from October 14, 2020, to March 20, 2021 and this wash considered to be the first official step toward default (FitchRatings 2020).

*Structure of Debt in Zambia*

*Table 1: Zambia's sovereign debt structure*

| Year | 2021 | 2021 | 2021 | 2022 | 2022 | 2023 | 2023 |
|---|---|---|---|---|---|---|---|
| External foreign-currency debt | | | | | | | |
| | USD | Percent of total debt | Percent of GDP | USD | Percent of GDP | USD | Percent of GDP |
| Multilateral creditors | 2655 | 7.9 | 10.4 | 112 | 0.5 | 126 | 0.6 |
| World Bank | 1,405 | 4.2 | 5.5 | - | - | - | - |
| ADB/AfDB/IADB | 835 | 2.5 | 3.3 | - | - | - | - |
| Other Multilateral | 416 | 1.2 | 1.6 | - | - | - | - |
| o/w EIB | 181 | 0.5 | 0.7 | - | - | - | - |
| o/w IFAD | 144 | 0.4 | 0.6 | - | - | - | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Bilateral Creditors | 7952 | 23.5 | 31.2 | 851 | 4 | 982 | 4.6 |
| Paris Club | 1332 | 3.9 | 5.2 | 180 | 0.8 | 195 | 0.9 |
| o/w: Israel | 458 | 1.4 | 1.8 | - | - | - | - |
| o/w:UK | 172 | 0.5 | 0.7 | - | - | - | - |
| Non-Paris Club | 6620 | 19.6 | 26 | 671 | 3.2 | 787 | 3.7 |
| o/w: China | 5935 | 17.6 | 23.3 | - | - | - | - |
| o/w: India | 326 | 1 | 1.3 | - | - | - | - |
| Eurobonds | 3280 | 9.7 | 12.9 | 987 | 4.7 | 197 | 0.9 |
| Commercial Creditors | 1555 | 4.6 | 6.1 | 356 | 1.7 | 255 | 1.2 |
| Fuel arrears | 597 | 1.8 | 2.3 | - | - | - | - |
| Arrears to external contractors | 563 | 1.7 | 2.2 | - | - | - | - |
| ZESCO external IPP arrears | 161 | 0.5 | 0.6 | - | - | - | - |
| Domestic Currency debt | 17024 | 50.4 | 66.9 | 4027 | 19 | 1881 | 9 |
| Held by residents | 8328 | 24.7 | 32.7 | 3466 | 16.3 | 1250 | 5.9 |
| Held by non-residents | 3246 | 9.6 | 12.8 | 561 | 2.6 | 631 | 3 |
| T-Bills | 2094 | 6.2 | 8.2 | 1980 | 9.3 | - | - |
| Bonds | 9481 | 28.1 | 37.2 | 2046 | 9.7 | 1881 | 8.9 |
| Domestic budget arrears and ZESCO IPP arrears | 5449 | 16.1 | 21.4 | - | - | - | - |

Note: all figures are in Million USD

Table 1 displays Zambia's public and publicly guaranteed debt stock by creditor composition and contracted debt service as determined by the IMF and Zambian authorities. Regarding the country's multilateral creditors which are essentially institutions that have multiple sovereigns as shareholders and may not always fit the definition of a creditor under other IMF policies (International Monetary Fund 2023), Zambia owed USD 2.6 billion to multilateral lenders in 2021, which made up 10.4

percent of its GDP and 7.9 percent of its total debt. The World Bank had the most share of the nation's debt of any multilateral lender, totaling over 1.4 billion dollars, or 4.2 percent of total debt and 5.5 percent of GDP. The share of the nation's external debt held by bilateral creditors, which included loans to the central government and those guaranteed by official export-credit agencies, was USD 7.9 billion in 2021; USD 1.3 billion of that being held by creditors affiliated with the Paris Club, and USD 6.6 billion by lenders outside of the Paris Club, of which China held USD 5.9 billion (17 percent of the total debt) and 23.3 percent of the GDP.

According to estimates from the International Monetary Fund (2023), as of December 2021, the country recorded 2.4 billion USD in external debt in foreign currencies that had been disbursed and had some sort of security attached to it, such as a government or third-party guarantee. All of this debt was past due, and the authorities had recorded negative balances in cases where the security stipulated a claim on money in a particular account. For instance, 1.5 billion USD or 4.6 percent of all external debt and 6.1 percent of GDP, was the amount of foreign currency debt held by commercial creditors. A significant amount of the overall debt was represented by bonds and Treasury bills, the majority of which are held by commercial banks in Zambia. Approximately 34.3 percent of the total debt in 2021 was held in bonds and Treasury bills combined which shows the degree of exposure to sovereign default faced by holders of bonds and Treasury bills (of whom commercial banks are the main participants), as it accounted for more than 70 percent of the country's debt denominated in local currency. Post the country's August 2021 general elections, spreads on Zambia's Eurobonds fell precipitously, but subsequently begun to rise. As of July 5, 2022, they were among the highest in frontier markets at 3,541 basis points (World Bank, 2022a). Domestically, the government was forced to rely on short-term domestic debt at rising interest rates along with private placements, including to help its expenditure arrears, as a result of tight financing conditions that persisted from 2019 to the first half of 2021. Despite some support from liquidity injections from the Bank of Zambia, these measures also increased budgetary financing challenges and expenditure.

## 2. *Related Literature*

*External and Public Debt Restructuring*

According to Reinhart and Rogoff (2011), domestic public debt is defined as debt issued under domestic law jurisdiction and often held by domestic creditors in the holder's country of residence. However, as a result of the global market's development, many nations' debt structures have lately transformed towards external creditors (Arslanalp and Tsuda 2014). Eduardo and Panizza (2008) define external debt as any loan that is issued on the international market. Regarding the treatment of these two forms of debt, Asonuma *et al.* (2016) and other recent scholars have identified two primary debt restructuring strategies: preemptive, which involves restructurings without missing payments or with only temporary missed payments, and post-default, which involves restructurings after payments are missed. Analyzing the importance of these two restructuring options, Díaz-Cassou *et al.* (2011) further argue that when deciding whether to restructure before or after default, countries must consider the trade-off between a speedier recovery of market access and more substantial debt reduction. However, restructuring debt often comes with a number of challenges including delays which substantially jeopardize the effectiveness of restructuring sovereign debt to handle debt sustainably for many emerging economies (Bai and Zhang 2012), which according to Benjamin and Wright (2009) implies that the creditors have to take a big loss. To put the factors that cause the delayed restructuring process in most developing countries in perspective, political crises in the debt holder's nation usually cause more institutional and structural bottlenecks that prolong the restructuring period than factors caused by creditors (Trebesch 2010).

The costs of the restructuring procedures as they relate to the credibility of the nations that carry the debt as well as the creditors are further difficulties arising from debt restructuring as stated by both Borensztein and Panizza (2008) and Sandleris (2016). To further clarify, Cruces and Trebesch (2013) demonstrate that debt restructuring programs involve large haircuts that are associated with higher bond yield volatility, longer periods of market exclusion and considerable borrowing limits over the long term (Asonuma *et al.,* 2016). Thus, the likelihood of future financial difficulties

on the part of the lending country rises, undermining its initial restructuring initiative's efficacy. However, Díaz-Cassou *et al*. (2011) in examining the losses incurred by both domestic and international creditors regarding their respective external and domestic debt, were unable to identify any appreciable differences in the percentage of haircuts resulting from the use of various restructuring mechanisms. Regarding the macroeconomic implications of debt restructuring, Easterly (2002) showed that participating nations' debt increased their overall debt levels long after the restructuring initiative ended in their evaluation of the efficacy of the severely indebted poor countries initiative. Reinhart and Trebesch (2016) came to the conclusion that debt restructurings grow more on the premise that they be subject to nominal haircuts, highlighting the advantages of restructure activities. Reinhart and Trebesch (2016) however also claimed that nominal relief measures are best suited for development and inclusive growth which was also highlighted by Forni *et al.* (2016) in their analysis of the impact of the Paris Club accords on inclusive economic growth.

*Relationship between banks and sovereigns and its implication on the potential eruption of Vicious Cycles*

Understanding the frequency, nature, and associated factors of vicious cycles is crucial in laying the groundwork for the development of appropriate economic and legal frameworks to combat future crises. This is because it clarifies who among domestic or foreign creditors pays for the losses incurred during such crises (Mitchener 2014). The vicious cycle shares many characteristics with past crises, including credit booms, implicit and explicit government guarantees, and financing bonanzas (Reinhart and Rogoff 2009). The credit risk of banks and the sovereigns that regulate them tends to change together, as demonstrated by Podstawski and Velinov (2018). The sovereign-bank nexus is thus the term for this link, which has attracted interest of several scholars (Brunnermeier et al. 2011).

Uhlig (2014) applies an alternative moral hazard theory to explain banks' inclination to hold significant quantities of public debt. According to Uhlig (2014), weak commercial banks implications may fall on the central bank if economic fundamentals deteriorate because of insufficient collateral haircuts mandated by the central bank

within a monetary union. Adding to this, Leonello (2018) included the impact of government guarantees on the relationship between banking systems and sovereign debt crises after employing a model in which both the government and the banks are vulnerable. His findings showed the importance of guarantees as a channel for the stability of both banks and sovereigns, even in the scenario where banks do not hold sovereign bonds. Furthermore, he emphasized how the feasibility of greater guarantees to boost financial stability without endangering national solvency may be an essential component of the interaction between banks and sovereigns. Gennaioli *et al.* (2013) claim that because inclusive and advanced financial institutions allow commercial banks to take on more leverage, they are more vulnerable to sovereign collapses. They assert that government failures result in larger declines in private lending in countries where banks own a larger proportion of government bonds and financial institutions are more well-established. Acharya and Naqvi (2019) developed a macro-financial model using a monetary vector autoregressive model to show how the "reaching for yield" promoted by a loosening of monetary policy lessens the vicious cycle in a Monetary Union. According to Acharya and Naqvi (2019), the fed's accommodating monetary policy lowers asset yields, increases liquidity, and eventually raises the point at which a liquidity shock might lead to a bank failing. Thus, bank managers typically invest in risky assets in order to optimize their portfolios. This portfolio balance channel improves credit conditions, lowers the cost of government borrowing, and lessens the impact of financial instability by providing local banks and assets with liquidity.

*Debt Service Suspension Initiative (DSSI) and the G20 Common Framework*

Analyzing the nation's debt servicing and treatment landscape under various initiatives is crucial for determining the link between domestic credit risk and external debt, including debt service on external debt. The DSSI, which was established in May 2020, was among the initiatives that assisted nations in focusing their efforts on combating the epidemic and preserving the lives and means of subsistence for millions of the most vulnerable individuals. Out of the 73 qualifying nations, 48 (including Zambia) took part in the program before it ended at the end of December 2021. According to the most recent estimates, the project postponed $12.9 billion in debt-service payments that participating nations owed to their creditors between May 2020 and December 2021 (World Bank

2022b). As a result, the Republic of Zambia received an extension of the time-limited suspension of debt service, which was due from January 1 to June 30, 2021, from the representatives of the Paris Club Creditor Countries (Paris Club 2021).

Merling and Cashman (2023) examined the combined current and potential usage of the Special Drawing Right (SDR) and the Debt Service Suspension Initiative (DSSI) for several nations. Their findings for Zambia indicated that the amount of SDRs allotted was $1,335 billion which signified both the real and potential figure since, starting in August 2021, SDRs were automatically added to member countries' accounts at the IMF. The amount of SDRs actually used, however, was just 1.6% less than the $1,313 billion allotted. The real DSSI debt suspension, which amounted to $529 million, was far smaller than the SDR allocation, indicating that DSSI was comparatively ineffectual when viewed on a point-per-percent basis. The actualized DSSI debt suspension was only 40.3% of the total SDRs. Special Drawing Rights have been considered to have a number of more attractive features when compared to the other two programs from the standpoint of the recipient nations. According to Vasic-Lalovic (2022), one advantage of SDRs is that they are issued by the IMF SDR department for free and without any strings attached. Furthermore, member nations do not have to repay them, and as a result, they do not incur additional debt in the process of maintaining the debt that has already accrued.

Fuje *et al.* (2021) examined the DSSI's success in decreasing the sovereign spread of Sub-Saharan African (SSA) nations since its inception and found that Zambia had exponentially higher sovereign spreads when compared to other SSA and B-rated nations (Albania, Belarus, Belize, Costa Rica, Egypt, El Salvador, Jamaica, Jordan, Mongolia, Montenegro, Pakistan, Papua New Guinea, Sri Lanka, Turkey, and Ukraine). In particular, they demonstrated that the Emerging Markets Bond Index (EMBIG) for SSA and B-rated nations increased from 600 to 1400 (SSA) and 400 to 850 (B-rated) between December 2019 and April 15, 2020, prior to the announcement of the DSSI. The EMBIG of both of these nation groups fell sharply and came down to 600 when the DSSI was announced in May. However, Zambia's situation was distinct, with its EMBIG rising from 1800 to 4500 prior to the DSSI's release. Following the nation's ratification of the DSSI pact in September 2020, its EMBIG increased further, almost reaching the 4000

marks. These findings demonstrated the DSSI's ineffectiveness non reducing the spread for severely distressed nations including Zambia.

In addition, the DSSI has received a lot of controversy for a variety of reasons. Firstly, the G20 Research Group (2020) reported that there was a lack of agreement among the G20 nations about the DSSI, with private creditors advocating for the inclusion of multilateral development banks (MDBs). In July 2020, a collaborative study financed by 10 MDBs and carried out by the World Bank indicated that joining the DSSI would have come at a cost greater than the benefits, given that MDBs were already delivering significant net positive financial flows. Conversely, the Chinese government urged the World Bank to create a fund that would be comparable to the IMF's Catastrophe Containment and Relief Trust (CCRT), which the IMF was using to help poor countries pay their debts. Chinese officials' dissatisfaction with private and multilateral creditors' lack of participation and their worries that foreign creditors were abusing China's debt suspensions became more and more evident (G20 Research Group, 2020) as many Chinese experts questioned the World Bank's reasoning for not joining the initiative as well. They contended that while the reasoning was valid, it would have also applied to China Eximbank and CDB, and that providing suspensions would have led to a downgrade of the credit ratings of these two institutions, potentially making it more difficult for them to continue lending (Hainan Broadcasting Group 2021).

It soon became evident that the meaning of "official creditor" was never completely clear, even though the G20 claimed that all official bilateral creditors would participate in the DSSI. These and other seemingly trivial differences soon found use in the field of geopolitics (Brautigam 2020). Declaring that their definition of "official" was "based on the profile of the creditor entity and the profile of subsidy," the World Bank criticized Beijing for not listing the Chinese Development Bank (CDB) among its official creditors (World Bank 2022b). According to the International Monetary Fund (2022), "official" creditors need to be entities that regularly get direct budget support or are direct budgetary units of the national government. Even in the lack of monetary support, the creditor may have been regarded as "official" if there was "unambiguous documentary evidence" that they worked on behalf of the government. It was difficult to include CDB and Eximbank because of a big hole in the debt restructuring plan that left out the MDBs

and private creditors. China insisted that if all creditors—commercial and private—had been involved, the participation of CDB and Eximbank for all of their projects in this framework would not have been contentious. Two other questions arose about the coverage of debt to be handled: whose debt and for whom would borrowers qualify? The DSSI only comprised countries which were on the UN's list of Least Developed Countries, which also included Angola, and that were qualified for the World Bank's concessional IDA loan window (World Bank 2022b).

In an effort to help low-income countries with unsustainable debt in a structural way, the G20 and the Paris Club have approved the Common Framework for debt treatment beyond the DSSI (International Monetary Fund, 2023). The Common Framework takes requests from qualified debtor nations into consideration for debt treatment on a case-by-case basis. A Creditor Committee is constituted in reaction to a request for debt treatment. The World Bank and IMF provide help for the negotiations, in part because of their Debt Sustainability Analysis. The notion is that, in order to ensure the long-term sustainability of public debt, the debt treatment under the Common Framework should be supplemented by changes that align with the guidelines of an Upper Credit Tranche (UCT) program backed by the IMF. By uniting the Paris Club and G20 official bilateral creditors in a coordinated approach, the Common Framework marks a significant advancement for official creditors (Ministry of Economics and Finance 2022). On August 31, 2022, Zambia obtained a 38-month agreement under the Extended Credit Facility under the G20 Common Framework, amounting to SDR 978.2 million (about US$1.3 billion, or 100% of quota) (International Monetary Fund, 2022). The program was designed to support proposals for economic transformation that are aimed at bringing macroeconomic stability back.

Bolton *et al.* (2021) note that the G20 common framework has made notable strides in fostering inclusivity and sustainable debt treatment for low-income countries by bringing together Paris and Non-Paris club members in the treatment of numerous low-income nations. This win results from the fact that China, the greatest creditor of the majority of low-income countries, is not a member of the Paris Club. As a result, a treatment mechanism that excludes non-members of the Paris Club (e.g. the DSSI) would not offer a sustainable treatment mechanism. Setser (2023) however argues that the main

flaw in the common framework is that it cannot serve as a basis for coordination among official creditors if they lack sufficient common ground to cooperate. In other words, the words "Common Framework" are only in the name and not in the details of the legislation governing the initiative.

According to Setser (2023), the conflict-of-interest results from the Chinese official creditors' desire to keep both their claim's par value and a coupon that pays for their funding costs. The majority of other official bilateral creditors concur that concessional rates ought to apply to claims made against extremely low-income nations. China has the ideological position that Chinese policy lenders should be treated the same as MDBs, as seen by its insistence that the World Bank and other multilateral development banks (MDBs) take a haircut alongside bilateral and commercial creditors Setser (2023). Whatever its motivation, it stems from a view of the debt load that low-income nations' existing stock of MDB claims generate. According to Setser (2023), there are two more drawbacks to the common framework. Firstly, that it favors countries that took part in the DSSI more than others, ignoring the fact that many of the non-participating countries are at risk of distress and would benefit from the framework's immediate intervention. Secondly, the framework does not specify how non-compliant creditors in the private sector might be compelled to participate in the framework as such, in order to prevent litigation over payment default, countries that seek debt treatment under the framework must also undertake tedious negotiations to pursue their official creditors.

### 3. Data and Measurability

As a proxy in measuring credit risk, we employed the ratio of non-performing loans (NPLs), which is determined by dividing the entire amount of leases and loans that are past due by 90 days or more by the total amount of gross loans and non-accrual loans (Ghosh 2015). A rising ratio of non-performing loans (NPLs) is indicative of a deteriorating credit quality, which might lead banks to increase their provisioning and incur large capital losses (Funyina and Muhanga 2021).

In measuring credit risk, the stock of credit in a given month t for this model is given by;

$Loan_t = \frac{A_0}{T_m} \sum_{i=1}^{T_m} i(1 + \beta)^{t-T_m+i}$, where $A_0$ is the amount granted at t = 0

In addition, the total amount of loans that are ninety days or more past due is determined by $T_w$, the number of months a loan remains on the balance sheet after it becomes past due, and the lifetime default ratio $\alpha$, a parameter $\gamma$ that characterizes the cumulative distribution of defaults over the lifetime of each vintage.

$$PastDue90_t = \alpha A_0 [\frac{\gamma(1+\gamma)^{T_m-1}}{(1+\gamma)^{T_m}-1} \left\{ \sum_{i=1}^{T_w-3} [\frac{(1+\gamma)^{T_m}}{\gamma(1+\gamma)^{T_m-1}} \right.$$

$$- \frac{(1+\gamma)^{T_m-i}}{\gamma(1+\gamma)^{T_m-i-1}}](1+\beta)^{t+i-T_m-T_w}$$

$$+ \sum_{i=1}^{T_m-T_w+2} \left[\frac{(1+\gamma)^{T_m-i}-1}{\gamma(1+\gamma)^{T_m-i-1}} - \frac{(1+\gamma)^{T_m-T_w+3-i}-1}{\gamma(1+\gamma)^{T_m-T_w+2-i}}\right](1+\beta)^{t+i-T_m-3}$$

$$+ \sum_{i=1}^{T_w-3} [\frac{(1+\gamma)^{T_w-2-i}-1}{\gamma(1+\gamma)^{T_w-3-i}}](1+\beta)^{t+i-T_w-1}$$

According to the above equation, the total amount of delinquent loans across all vintages determines the amount of loans that are past due at any given time. The oldest entities contribute with loans that become past due at the end of their lifetime, while the most recent entities contribute with loans that become past due soon after they are granted. The oldest entities' contribution is shown by the first part of the equation, while the most recent entities' contribution is shown by the third. The second element pertains to the residual entities that have been given a little leeway between the more developed and the more recent entities. It can be demonstrated that the aforementioned equations may be reformulated as follows:

$$Loan_t = \frac{A_0}{T_m}(1+\beta)^{t+1}\left[\frac{(1+\beta)^{T_m}(\beta T_m-1)+1}{\beta^2(1+\beta)^{T_m}}\right]$$

$$PastDue90_t = \alpha \left(\frac{A_0}{T_m}\right)(1+\beta)^{t+1}[\gamma[(1+\beta)^{T_w-3}-1][(1+\beta)^{T_m}(1+\gamma)^{T_m}-1]$$

$$/[\beta[(1+\beta)(1+\gamma)-1][(1+\gamma)^{T_m}-1(1+\beta)^{T_m+T_w}]$$

Thus, the classic NPL, given by the ratio of loans that are ninety days or more past due and the contemporary stock of loans, NPL, is given by:

$$NPL = [(1+\beta)^{Tw-3}$$
$$- 1][(1+\beta)^{Tm}(1+\gamma)^{Tm} - 1]\beta\gamma T_m]$$
$$/[(1+\beta)(1+\gamma) - 1]\ [(1+\gamma)^{Tm} - 1(1+\beta)^{Tm}(\beta T_m - 1) + 1](1+\beta)^{Tw}$$

The aforementioned equation connects the non-performing loan (NPL) ratio to the actual default ratio through a transformation that is reliant on the vintage cumulative growth rate of the portfolio. distribution of defaults, mean duration to maturity, and length of time a loan is non-performing (NPL). If one assumes that the amount of loans that fail in the first few months of each vintage is negative or relatively low, then the number of loans that fail is modest. As a result, increases in the portfolio will have a bigger impact on the amount of loans that are still outstanding than on the amount of past-due loans, which lowers the NPL. This will cause past-due loans to climb in proportion, which will raise NPL, if it is high enough.

In Measuring Zambia's external debt services, we employed the debt service on total external debt in US dollars which is the total of interest paid on short-term debt, principal repayments (repurchases and levies) to the IMF, and interest paid on long-term debt that is actually paid in cash, products, or services. The entire amount of debt due to nonresidents that may be repaid with money, goods, or services was calculated by adding together all forms of long-term debt—public, publicly guaranteed, and private nonguaranteed—as well as any short-term debt and IMF financing used. All debt with an initial maturity of one year or less is considered short-term debt, as is interest on long-term debt that is past due. Current U.S. dollars are used for data (World Bank 2024).
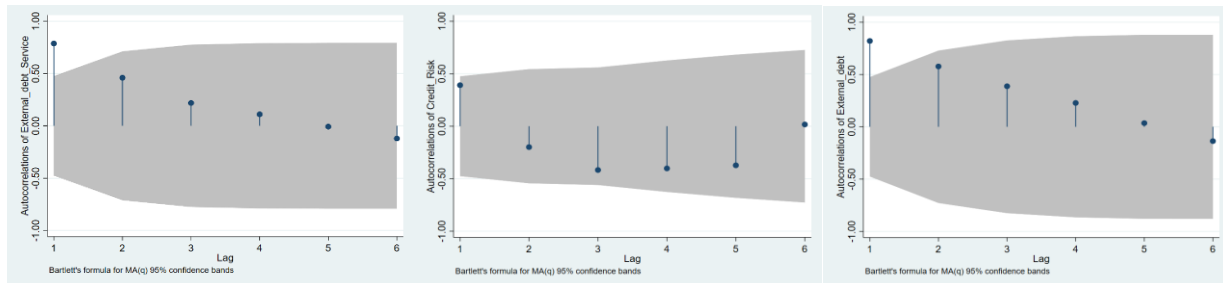
*Table 2: Summary Statistics*

| Stats | Credit Risk | External Debt | External Debt Service |
|---|---|---|---|
| mean | 9.770984 | 58.20075 | 3.429488 |
| variance | 4.733727 | 1918.723 | 11.98551 |
| Se(mean) | 0.5276879 | 10.62384 | 0.8396607 |
| skewness | 0.5582916 | 0.7782749 | 1.380996 |
| kurtosis | 2.970898 | 2.284675 | 3.574046 |
| N | 17 | 17 | 17 |

*Source: Author's computation*

Table 2 shows that the standard error which indicates how different the population mean is likely to be from a sample mean and explains how much the sample mean would vary if were to repeat a study using new samples from within a single population was largest on external debt and the least on the credit risk of Zambian Banks. As measure of central tendency that give an indication of the average value of a distribution, table 2 also shows that the external debt had the largest mean value of 58.2 while the external debt service had the lowest mean value of 3.43 implying that on average, the Zambia's external debt service as a percentage of total external debt was approximately 3.4 percent. As a measure of variability, table one shows that external debt had the largest variability around its mean variable with credit risk exhibiting the lowest. In understanding the distributional structure of the employed variables, we estimated the skewness and kurtosis of the employed variables which showed that the tails of all the variables were stretched right in comparison to the normal distribution with all the variables exhibiting more peak than a normal distribution.

Moreover, we examined autocorrelation (AC) using a correlogram, or graph of autocorrelations, with pointwise confidence intervals, based on Bartlett's formula for MA(q) processes. In my case, it shows the correlation between the logarithmic transformation values of credit risk, external debt, and debt service six months ago and now. It can only be used to specify the q in MA(q) in stationary series. Partial Autocorrelation (PAC) produces a partial correlogram, or graph of partial autocorrelations, along with confidence intervals using a standard error of 1/sqrt(n). The residual variances for each lag may or may not be shown on the graph. It also shows the relationship, adjusted for the nine previous delays, between the current value of the series and its value from ten quarters ago.

*Figure 1: Measure of Autocorrelation*

The graphic view of the AC figure 1 does not shows a slow decay in the trend, suggesting stationarity. The graphic view of the AC instead shows no spikes, suggesting that all other lags are mirrors of the third one.

## 4. Methodology

*Vector Error Correction Model (VECM)*

We employed the Vector Error Correction Model (VECM) in analyzing the presence of causality among the variables employed. The rational for this cointegrated Vector autoregressive model is that there is a common stochastic trend, an I(1) process Z, underlying for example two (or more) processes X and Y;

$$X_t = \gamma_0 + \gamma_1 Z_t + \epsilon_t \, , \, Y_t = \delta_0 + \delta_1 Z_t + \eta_t$$

Here, $\epsilon_t$ and $\eta_t$ are stationary of order, I(0), with mean 0. They may be serially correlated. Though $X_t$ and $Y_t$ are both I(1), there exists a linear combination of them which is stationary: $\delta_1 X_t - \gamma_1 Y_t \sim I(0)$.

In specifying the VECM, we keep in mind that given a conventional VAR model of the form;

$$x_t = \Phi_1 x_{t-1} + \ldots + \Phi_p x_{t-p} + \epsilon_t,$$

There always exists an error correction representation of the form:

$$\Delta x_t = \Pi x_{t-1} + \sum_{i=1}^{p-1} \Phi_i^* \Delta x_{t-i} + \epsilon_t$$

where $\Pi$ and the $\Phi*$ are functions of the $\Phi$'s. Specifically,

$$\Phi_j^* = -\sum_{i=j+1}^{p} \Phi_i \, , j = 1, \ldots, p-1$$

$$\Pi = -(I - \Phi_1 - \ldots - \Phi_p) = -\Phi(1).$$

If $\Pi = 0$, (all $\lambda(\Pi) = 0$) then there is no cointegration. Nonstationarity of I(1) type vanishes by taking differences. If $\Pi$ has full rank, k, then the x's cannot be I(1), but are stationary:

$(\Pi^{-1}\Delta x_t = x_{t-1} + \ldots + \Pi^{-1}\epsilon_t).$

The interesting case is, $Rank(\Pi) = m, 0 < m < k$, as this is the case of cointegration. We write;

$$\Pi = \alpha\beta_0'$$

which is a matrix of the form $(k \times k) = (k \times m)[(k \times m)']$.

Where the columns of $\beta$ contain the m cointegrating vectors, and the columns of $\alpha$ the m adjustment vectors: $Rank(\Pi) = min[\,Rank(\alpha), Rank(\beta)]$.

Furthermore, we can see that there is an adjustment to the 'equilibrium' x* or long-term relation described by the cointegrating relation. Setting $\Delta x = 0$ we obtain the long run relation, $\Pi x^* = 0$ , which can also be written as $\Pi x^* = \alpha(\beta'x^*) = 0$. In the case;

$0 < Rank(\Pi) = Rank(\alpha) = m < k$ , the number of equations of this system of linear equations which are different from zero is m: $\beta'x^* = 0_{m\times1}$.

The long run relation does not hold perfectly in $(t-1)$. There will be some deviation, an error,

$$\beta'x_{t-1} = \xi_{t-1} \neq 0$$

The adjustment coefficients in $\alpha$ multiplied by the 'errors' $\beta'x_{t-1}$ induce adjustment. They determine $\Delta x_t$ , so that the x's move in the correct direction in order to bring the system back to 'equilibrium'. The VECM can therefore be specified as;

$$\Delta CR_t = \partial + \sum_{i=1}^{k-1} \beta_i \Delta CR_{t-1} + \sum_{i=1}^{k-1} \Phi_i \Delta ED_{t-j} + \sum_{i=1}^{k-1} \varphi_i \Delta EDS_{t-m} + \lambda_1 ECT_{t-1} + u_{1t}$$

$$\Delta ED_t = \omega + \sum_{i=1}^{k-1} \beta_i \Delta CR_{t-1} + \sum_{i=1}^{k-1} \Phi_i \Delta ED_{t-j} + \sum_{i=1}^{k-1} \varphi_i \Delta EDS_{t-m} + \lambda_1 ECT_{t-1} + u_{1t}$$

$$\Delta EDS_t = \partial + \sum_{i=1}^{k-1} \beta_i \Delta CR_{t-1} + \sum_{i=1}^{k-1} \Phi_i \Delta ED_{t-j} + \sum_{i=1}^{k-1} \varphi_i \Delta EDS_{t-m} + \lambda_1 ECT_{t-1} + u_{1t}$$

Where;

$k-1$ = the lag length reduced by 1

$\beta_i, \Phi_i, \varphi_i$ = The short-run dynamic coefficients of the model's adjustment long run equilibrium.

$\lambda_1$ = The speed of adjustment parameter with a negative sign.

$ECT_{t-1}$ = The error correction term which is the lagged value of the residuals obtained from the cointegrating regression of the dependent variable on the regressors.

$u_t$ =Residuals/impulses/shocks. CR = Credit Risk, ED = External debt, EDS = External debt service.

## 5. Results and Discussions

In an attempt to lower macroeconomic volatility, a number of nations had modified the laws governing their central banks' credit control programs during the early 2000s. As one of the main causes of inflationary pressures, restricting central bank funding to the government was one of the essential elements of these reforms (Matamoros-Indorf et al. 2012). It has also been observed that restricting central bank financing to the government protects the banks from issues that threaten sovereigns, such as unmanageable external and domestic debt. In order to satisfy the government's commitments, both budgetary and non-budgetary, the central bank of Zambia was compelled to increase the amount of credit it extended to the general government.

*Figure 2: Bank of Zambia Claims on Government*
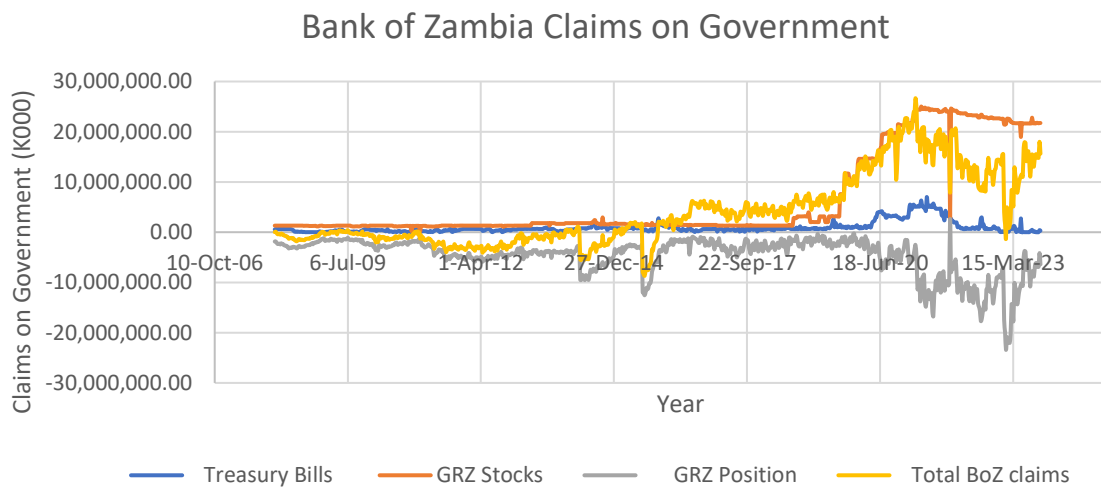


*Source: Author's computations based on data from the Bank of Zambia*

Figure 2 shows how the Central Bank of Zambia limited lending to the government in all of its financial instruments from 2006 to December 2019, totaling less than K10 billion. The limited financial streams associated with COVID-19 significantly hindered the government's capacity to mobilize resources; thus, the banking sector emerged as the main source of financial flows for the government. As of November 2019, the Bank of Zambia owned claims on government assets, including bonds and Treasury bills (T-Bills), worth around K9 billion. As of January 2020, the Zambian central bank had sold a record K2.64 billion worth of government securities, with maturities still due and K1.07 billion in liquidity into T-bill sales. Their appetite for securities increased rapidly during the pandemic, and by March 2020, they had purchased K24.4 billion in bonds. In an environment of constrained growth, the central bank lowered interest rates by 225 basis points to a record 9.25 percent at the time of this debt sale (Business Telegram 2021). Lower rates were the goal of a stimulus program implemented by the Bank of Zambia (BOZ) in an attempt to lessen the impact of COVID-19 on the main players in the economy. Given the necessity of supporting public health during the epidemic, the rise in subscriptions indicated a spike in borrowing demand, which makes sense. Since 2019, the government's net assets have increased significantly; in January 2023, they reached a height of K23 billion.

*Figure 3: Commercial Banks Claims on Government*
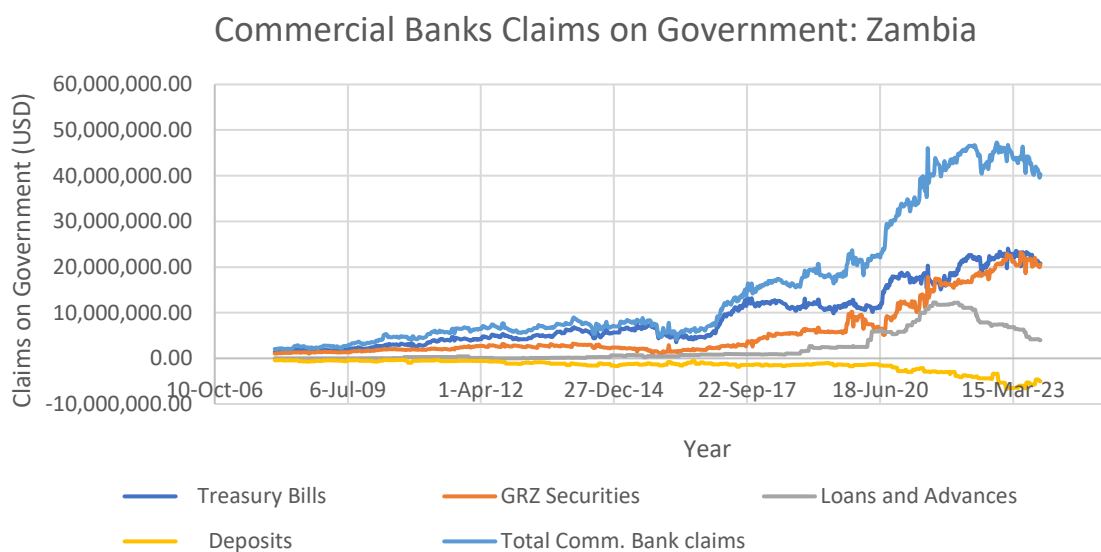


*Source: Author's computations based on data from the bank of Zambia*

Figure 3 shows that, prior to the COVID-19 outbreak, commercial banks in Zambia had limited the amount of funds they granted to the government. For example, between 2006 and 2019, the total amount of claims made by commercial banks against the government scaled quite steadily, peaking at K20 billion in March of 2019. Government revenue was significantly reduced during the early phases of the pandemic due to the economy's decreased economic activity. Consequently, banks were forced to give the government a disproportionate amount of credit, which exposed them to sovereign risk. This implied that in the event of national debt difficulties leading to higher borrowing rates and lower prices, these financial intermediaries would have sustained large capital losses. These capital losses further reduced the net worth of the banks and could have initiated a vicious cycle whereby the banks increased credit spreads and interest rates, pushing lending even more toward the private sector and possibly harming investment, tax revenues, and long-term growth.

Short-run VECM: *Causality Analysis*

As understanding the importance of debt sustainability mechanisms in situations where an economy faces the commercial banks high credit risk is the primary objective of my study, knowing how much commercial banks were exposed to sovereign risk is thus essential to diagnosing this. The preceding sections have demonstrated the significant growth in commercial banks' holdings of government securities subsequent to the epidemic. Additionally, they have been amply demonstrated that Zambia's external debt was extremely unsustainable in the recent past, leading to the nation's decision to go into default on its external debt. Against this background, it has also been shown that Zambia due to its unsustainable debt has sought for debt treatment mechanisms, most notably, we have shown that the country has been a recipient under the G20 Common Framework debt sustainability Initiative (DSI). The results in Table 3 show a causal relationship among the Credit risk of commercial banks, External Debt and External Debt Servicing.

Table 3: short run VECM model

| D_CR | Coef. | Std. Err . | z | P>|z| | D_ED Coef. | Std. Err . | z | P>|z| | D_EDS Coef. | Std. Err. | z | P>|z| |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| we_ce1 | | | | | | | | | | | | |
| L1. | (-0.614)** | (0.197) | (-3.11) | (0.002) | (-3.011)** | (0.732) | (-4.11) | (0.00) | (-0.243) | (0.214) | (-1.14) | (0.255) |
| CR | | | | | | | | | | | | |
| LD. | (0.486)** | (0.243) | (2.00) | (0.045) | (1.659)* | (0.899) | (1.84) | (0.065) | (0.188) | (0.263) | (0.71) | (0.475) |
| ED | | | | | | | | | | | | |
| LD. | (0.009) | (0.032) | (0.27) | (0.784) | (-0.482)** | (0.119) | (-4.05) | (0.000) | (-0.045) | (0.035) | (-1.29) | (0.197) |
| EDS | | | | | | | | | | | | |
| LD. | (0.921)** | (0.396) | (2.33) | (0.020) | (10.473)** | (1.468) | (7.13) | (0.000) | (0.605) | (0.429) | (1.41) | (0.158) |
| cons | (-1.533)** | (0.613) | (-2.50) | (0.012) | (0.309) | (2.273) | (0.14) | (0.892) | (0.045) | (0.664) | (0.07) | (0.946) |

** implies significance at 5%, while * implies significance at 10%

*Source: Author's computation*

As can be seen in Table 3, while analyzing the causal relationship between external debt servicing and the credit risk of commercial banks, we demonstrate that there is only one direction of causation between the two variables. For every percentage increase in debt service as a proportion of GDP, the credit risk increases by 0.9 percent. Even if it is evident, credit risk has very little effect on debt servicing since the government's increased commitment to giving priority to its foreign creditors invariably comes at the expense of its local creditors, which are mostly Zambian banks. Therefore, there is a repo impact associated with a country's large growth in foreign debt, which is caused by an increase in credit risk brought on by higher debt payments. A growth in the country's external debt suggests that paying down debt should consume a sizable amount of GDP. Thus, the only determinant of debt treatment programs' effectiveness will be the extent to which they necessitate less debt payment in order to lower the risk to domestic bank credit.

This result clarifies the debate about the usefulness and applicability of debt treatment techniques using the G20 Common Framework and Special Drawing Rights provided by the International Monetary Fund. Regarding the special drawing rights, Fuje *et al.* (2021) note that, when compared to the total external debt service, public and publicly guaranteed, due 2021–2025, the amount of new SDR allocation to 22 speculative and substantial risk developing countries by country grouping covers more than 30% of the

debt service due; of these, 6 countries (Algeria, Central Africa Republic, Iran, Liberia, Somalia, and Zimbabwe) received SDRs in excess of their total debt service due over the following five years. The SDR allotment for Zambia, Burundi, and Suriname was more than 5% of GDP, which might allow for even greater expenditure levels other the growth is less dramatic in other nations as SDRs represent 0.7 percent of GDP in Nigeria; extra SDRs of 1.0 percent of GDP were given to Ecuador and Haiti. Zambia's reserves increased to $2.9 billion, or around 3.1 months' worth of import cover, after receiving an SDR allocation of SDR 1.3 billion (US$1.84 billion) in August 2021 (Mulenga 2023). Regarding the G20 Common Framework, the Ministry of Finance (2023) claimed that the agreement resulted in savings of US$5.8 billion for debt servicing, so freeing up funds for our developmental initiatives. Debt restructuring averted Zambia from having to pay the official creditors US$6.3 billion of its US$13.04 billion over a ten-year period; under the framework, this amount drops to US$750 million, or US$75 million annually. About these, we observe that the current framework and initiatives have been successful in reducing debt service towards external debt, particularly for Zambia, which is expected to reduce the credit risk of commercial banks in line with the model estimates. This is in contrast to the previous Highly Indebted Poor Countries, which were harshly criticized for their inability to reduce debt service and provide further economic resilience to the participating countries.

Additionally, we have established that the link between Zambia's foreign debt and the credit risk of commercial banks is unidirectional, meaning that at the 10 percent significance level, Zambia's external debt increases as a result of the credit risk of commercial banks, however, the opposite of this causal relationship does not hold. Table 3 further indicates a positive relationship between external debt and an increase in credit risk, as indicated by the proportion of non-performing loans to banks overall, as a result of the vicious cycle being quantified by the interplay between sovereign debt and commercial bank credit risk. This was due to the fact that most Zambian banks expected liquidity and were on the verge of collapse as the epidemic peaked with the country's Investrust bank having suffered insolvency and taken over by the Bank of Zambia (Bank of Zambia 2024). In anticipation of the day when they would actually experience insolvency, banks grew their holdings in government bonds. The government would

either directly provide stimulus packages, as it did in 2021 when it provided a K10 million package to stimulate the economy following COVID-19 (Mumba 2021), or it would relax regulations on the operations of commercial banks, a move that was expected to be implemented through BOZ. Figure 3 illustrates how banks aggressively expanded their lending to the government beyond sustainable means. The situation worsened in 2021 when the government missed payments on its Euro Bonds, a move that demonstrated the government's inability to uphold its obligations to lower-tier creditors.

The link between external debt and external debt service was however unidirectional, as seen in Table 3, with only external debt service having a positive impact on external debt and external debt as a percentage of GDP having no influence on external debt service. The relationship between external debt payments and external debt was explained by the IMF's External Relations Department in 1989 using the concepts of investment and debt overhang. After studying a group of fifteen heavily indebted countries, they found that the average ratio of investment to GDP fell sharply from 24 percent in 1971–1981 to 18 percent in 1982–1987. On this, they clarified that a reduction in debt repayment capacity and a halt to foreign capital inflows were related to the drop in investment. One important effect that has received significantly less attention is the manner that having a large debt load diminishes one's incentive to spend, as further highlighted by the IMF's External Relations Department in 1989. A debt overhang is the potential for a country's debt to someday surpass its ability to pay it back. In this instance, anticipated debt payment costs may discourage both domestic and international investment in the future, which would be bad for growth (Poirson *et al.*, 2004). In these situations, the debtor country's economic and social advancement becomes the primary focus of debt servicing duties rather than the predetermined terms of the accrued debt. Consequently, higher debt service offsets a larger percentage of an improvement in the debtor country's economic prospects. That is, rather than attributing future improvements in the macroeconomic climate of the country to their returns on investment, investors are more likely to blame the nation's creditors' greater commitment to high debt payments. As a result, this lessens the economy's investment and the incentive to invest. Because of the disincentive to invest, sovereigns and domestic private enterprises are discouraged from

acquiring domestic assets. Consequently, increasing debt payment increases an economy's potential future foreign debt and reduces its ability to invest and expand.

Table 4: Long-run Vector Error Correction Model

Johansen normalization restriction imposed

| beta | Coef. | Std. Err. | z | P>|z| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| _ce1 | | | | | | |
| Credit Risk | 1 | . | . | . | . | |
| External debt | -0.0729446 | 0.0197845 | -3.69 | 0.000 | -0.1117215 | -0.0341677 |
| External debt Service | 1.287979 | 0.2392381 | 5.38 | 0.000 | 0.8190806 | 1.756877 |
| _cons | -11.38988 | . | . | . | . | |

*Note: Long run coefficients in VECM are interpreted by sign reversal.*

*Source: Author's computation*

The Error correction term follows;

$$ECT = [y_{t-1} - \eta_j X_{t-1} - \xi_m R_{t-1}] = [1CR_{t-1} - 1.2879EDS_{t-1} + 0.0729ED_{t-1} + 11.3899]$$

Table 4 demonstrates how the variables converge with time. The long-term perception of servicing debt is "lower future external debt," which further raises the belief that the government will eventually be able to own up to its commitments to domestic creditors and improves the portfolio of non-performing loans. Eventually, an increase in the servicing of external debt reduces the credit risk. Long-term, however, external debt still has a favorable and highly substantial impact on banks' credit risk.

## 6. Conclusion

We demonstrated how the surge in bank-owned sovereign debt offerings exposed a clear bias in favor of domestic lending, driven mostly by the belief that there is "nothing to lose". If a weak home sovereign had defaulted, home banks would have most likely failed even with a diversified portfolio of safe bonds as they are often unable to hedge the default risk of their home sovereign in this circumstance. In the case of their own national default, their downside would be the same whether they speculated or invested in safer assets. Consequently, it makes sense to bet on the resurrection and have a portfolio that is heavily weighted toward house as banks can only survive if there is one.

An alternate explanation is "moral suasion," which holds that governments coerced local banks to purchase domestic sovereign bonds. This scenario may not have applied to Zambia because the Bank of Zambia is independent of the government.

*Figure 4: Summary*
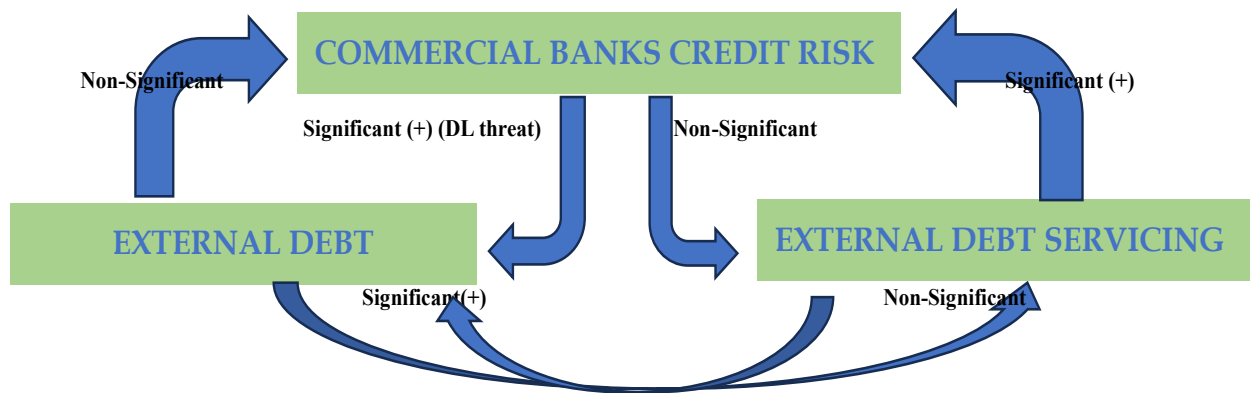


*Source: Author's computation*

Figure 4 summarizes the series of causal relationships. The relationship between external debt service and external debt is unidirectional as only external debt service seems to positively affect debt while external debt as a percentage of GDP does not have an effect on external debt service.

## 7. Recommendations

We recommend that while debt treatment mechanisms—in particular, the current Common framework and the previous DSSI—have sufficiently paved the way for an economy to recover through sustainable external debt, these efforts should emphasize reducing bank credit risk in order to prevent the benefits of these initiatives from being undermined by a repo effect. The idea that an economy should direct its resources toward growth prospects has been used to justify debt treatment systems domestically, especially in the wake of the COVID-19 epidemic. Despite the noble intentions behind these measures, we contend that a clear path for commercial banks' debt is necessary in

order to achieve these advantages. Therefore, the effectiveness of debt treatment in mitigating bank credit risk is constrained by the possibility of a vicious cycle, as shown in Zambia. A debt treatment initiative's benefits will be diminished by the rise in commercial banks' credit risk, further making the initiative irrelevant, if it is unable to give the banks confidence regarding the government's future ability to honor its commitment to domestic creditors.

Second, as we have shown, "horizontal discrimination" between sovereign bonds and bank credit risk is an effective way to reduce the interconnection between external debt and domestic banks' credit risk. Sovereign risk is modeled by a nation through risk weighting, big exposure clauses, and other regulatory measures (Andritzky et al. 2016). Brunnermeier *et al.* (2011) state that this should be implemented in an integrated manner with "vertical" discrimination. By pooling and trading sovereign bond portfolios, the aim is to create a risk-free asset. Moreover, different regulatory regimes based on the riskiness of the sovereign are introduced (a process known as "vertical discrimination"). According to Navaretti *et al.* (2019), the process of establishing these Safe Bonds would require two stages. First, a private market-based financial institution would buy a bunch of bonds that the government had issued. Second, this company would produce a range of products backed by the government bond portfolio through a tranching process. The most junior tranche will bear the whole loss up to the nominal value of the financial entity's holdings in government securities (Navaretti *et al.,* 2019). If and when the value of the lowest tranche was totally depleted, the owners of the subsequent tranche would simply suffer a loss on their shares.

Finally, debt treatment strategies are of little relevance to countries that are already deeply distressed since productive investment can only increase with extra funding intended to alleviate structural impediments and put these economies back on track for growth. Therefore, as long as the country is unable to secure additional funding from international markets to address its structural and economic vulnerabilities—which range from unstable exchange rate markets to deficits—efforts to lower the debt load through debt reduction will only be partially successful. Thus, we suggest that in order to maximize the influence on successful investment, new finance should be combined with debt reduction.

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