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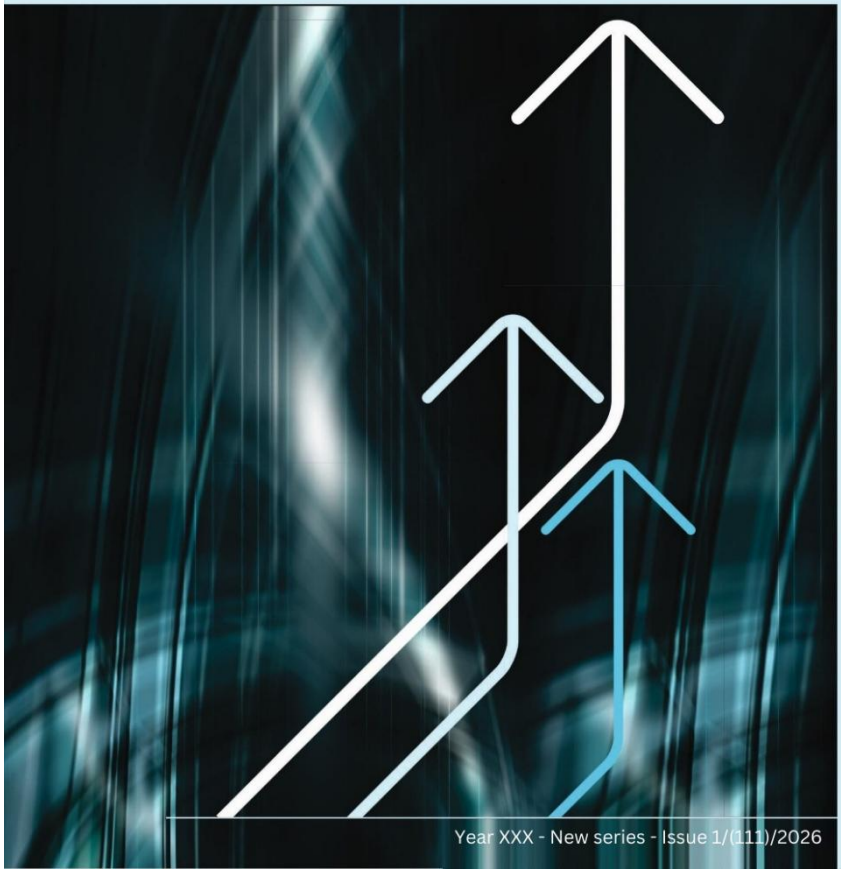

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"VICTOR SLĂVESCU" CENTRE FOR FINANCIAL
AND MONETARY RESEARCH

FINANCIAL STUDIES

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Contents

COMPLEMENTARITIES BETWEEN LOAN SALES AND STANDBY LETTERS OF CREDIT: A THEORETICAL MODEL

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Abstract

In their traditional function, commercial banks engage in recourse loan sales while evaluating clients' creditworthiness and assuming risk. However, banks face regulatory constraints that prevent them from fully exploiting this activity. Loan sales with recourse are treated as deposits, and selling banks are required to hold additional reserves at the Fed; they are also subjected to higher capital requirements and must make additional FDIC deposit insurance premiums. By contrast, standby letters of credit and loan sales without recourse are considered off-balance-sheet items and are not subject to the aforementioned regulatory requirements. This paper uses the time-state preference model to demonstrate that the cash flow structures of recourse loan sales can be replicated by constructing portfolios consisting of non-recourse loan sales and standby letters of credit. Our theoretical model contributes to the existing literature by illustrating how banks can combine loan sales without recourse with standby letters of credit as complementary risk-management and cost-reduction instruments.

Keywords: cash flow structures, credit risk transfer, financial intermediation, off-balance sheet activities, regulatory costs

JEL Classification: G11, G21

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1. Introduction

In the last three decades, commercial loan sales have experienced an unprecedented expansion. The rapid expansion of commercial loan sales and standby letters of credit (SLCs) has raised a key question with regard to the changing nature of traditional banking and financial intermediation. Indeed, as later discussed in this paper, commercial loan sales with recourse are considered instruments of traditional banking, since banks not only perform the credit analysis but also undertake the risk of lending. However, closer examination of commercial loan sales data in the U.S. reveals that a significant portion consists of loan sales without recourse. This transforms the originating banks into simple loan brokers, and as such, it is evident that they deviate from their traditional role.

This paper draws on research conducted by Gargalas (2007) and explores this issue by modelling the relationship between two of the most prevalent off-balance sheet (OBS) instruments in the U.S banking sector: (1) commercial loan sales and (2) SLCs. Our theoretical model demonstrates that banks can eliminate regulatory taxes by creating synthetic loan sales with recourse by combining portfolios of commercial loan sales without recourse with portfolios of SLCs. As a result, bank loan sales activities remain within the scope of their traditional loans and functions.

This has several implications for banks participating in the commercial loan sales market. First, once the aforementioned relationship is clearly established, bank managers can actually focus on implementing the strategy of creating synthetic loan sales with recourse as described by our model, instead of allowing it to emerge passively. Second, while participating in this strategy (or process), banks will become more efficient and will be better able to adapt to a rapidly evolving financial environment.

The paper is organised as follows. Section 1 presents this Introduction. Section 2 reviews recent literature on the principal motivations for commercial loan sales and provides a brief overview of SLCs. Section 3 discusses the theoretical model we developed to analyse the relationship between commercial bank loan sales and SLCs. Finally, Section 4 presents the conclusions of our study.

2. Literature Review

The first type of OBS activities included in our model are commercial loan sales by banks (or depository institutions). In a commercial loan sale, the originating bank sells a loan “in totality” or “in part" (Irani & Meisenzahl, 2017; James, 1988; Siedlarek & Yankov, 2025). In the case of loan sales “in totality,” the buyer buys the entire cash flow (associated with the loan) until the loan matures, while in a participating loan sale, the cash flow from the loan is divided between two or more buyers (Greenbaum et al., 2016; Irani & Meisenzahl, 2017). Commercial loans sold “in part” consist of loan strips and loan participations. Loan strips are short-term shares of long-term loans; upon maturity (e.g., 30 days, 60 days, etc.), the selling bank is required to pay the loan strip holder the contractual amount of the loan, and to refund the originating bank must resell the loan strip for another period or provide direct financing (Greenbaum et al., 2016).[1]

Loan participation consists of a multi-lender financing arrangement that allows the selling (or lead) bank to sell the entire loan to participating banks (Dahiya et al., 2003; Greenbaum et al., 2016). In a loan participation, the lead bank (or seller) negotiates the loan terms with the borrower, directly receives all loan payments from the borrower, and maintains collateral registered in its own name (Dahiya et al., 2003; Greenbaum et al., 2016). In contrast to junior lenders in loan syndication, participants deal only directly with the lead, thereby avoiding the need to have separate contracts with the borrower (Greenbaum et al., 2016).

In a typical commercial loan sale, the originating bank normally continues to service the loan (i.e., monitor borrowers, enforce any existing covenants, and pass the cash flow streams to the buyers) for a fee, which represents a significant source of income from the loan sale (Bord & Santos, 2015; Buchanan, 2016; Dahiya et al., 2003; Greenbaum et al., 2016; Güner, 2006; James, 1988).

Commercial loans may be sold with or without recourse. Commercial loan sales with recourse are originated by the bank and are initially recorded on its balance sheet. Once a buyer (or group of buyers) is found, the loan is sold, and it is removed from the originating

[1] *In 1988, the Financial Accounting Standards Board (FASB) ruled that loan strips can be treated as loan sales if: (a) the buyer of the loan strip assumes full risk, and (b) the lender has no contractual obligation to repurchase the loan strip (Greenbaum et al., 2016).*

bank's balance sheet (Bord & Santos, 2015; Buchanan, 2016; Dahiya et al., 2003; Güner, 2006; James, 1988). If the borrower defaults on the loan, the originating bank is under no obligation to indemnify the buyer (of the loan), thereby transferring credit and default risk to the buyer (Palour & Winton, 2013).

In the case of commercial loans sold with recourse, the selling bank is required to include the loan as part of the assets on its balance sheet to satisfy regulatory capital requirements and subsequently sell them to a third party (Collier, 1994; Drucker & Puri, 2009; Greenbaum et al., 2016; James, 1988). Loan sales with recourse, in essence, leave the originating bank with all, or at least part of the loan's default risk, and such loans must be included in the bank's capital ratios to accurately account for risk (Collier, 1994; Drucker & Puri, 2009; James, 1988). In case of default by the borrower or the deterioration of the quality of the loan, the originating bank is contractually obligated to repurchase the loan from the buyer as specified in the contract between the two parties (Drucker & Puri, 2009).

There are several theories that explain the expansion of commercial loan sales in recent decades. The comparative advantage hypothesis suggests that banks with relatively low capital levels and high funding costs are generally more active in the loan sales market (Demsetz, 2000). The comparative advantage hypothesis suggests that selling banks are those that enjoy a comparative advantage in loan origination and a comparative disadvantage in funding loans (Acharya & Mora, 2015; Pennacchi, 1988). Some banks, particularly larger "money centre" banks, enjoy a comparative advantage in originating loans at lower costs due to their ability to monitor borrowers more efficiently (Fama, 1985; Güner, 2006). They can achieve scale economies in the origination of certain types of loans and can participate in loan sales to fund such loans (Demsetz, 2000). Carlstrom and Samolyk (1995) and Demsetz (2000) found that banks that face capital constraints enjoy a comparative advantage in identifying profitable loans in their areas or regions of operations, and that when they operate in markets with high demand for loans, they tend to have a higher propensity to participate in loan sales. According to the comparative advantage hypothesis, "banks constrained by their funding capacity because of their rich loan-origination opportunities sell loans to those that have relatively cheap funding sources, but poor loan-originating opportunities" (Güner, 2006).

The diversification hypothesis or capital constraints hypothesis offers another explanation for the rapid expansion of commercial loan sales in recent decades. According to this theory, banks that face capital constraints are unable to diversify their sources of funding internally and rely on loan sales to achieve higher levels of diversification. Loan sales provide these banks with alternative (i.e., diversified) funding opportunities, in essence serving as an alternative funding method. Capital-constrained banks facing high loan demand in their respective markets are more likely to participate in loan sales (Becketti & Morris, 1987).

Another reason for loan sales is liquidity (Haubrich & Thomson, 1993; Irani & Meisenzahl, 2017; Pavel & Phillis, 1987). Banks normally use relatively liquid liabilities (e.g., savings accounts and time deposits) to support their illiquid assets (e.g., loans). Banks often pool deposits to provide credit financing, and such pooled deposits generate the scale necessary to support illiquid loans with longer maturities (Irani & Meisenzahl, 2017; Pavel & Phillis, 1987). This increases the amount of liquidity risk in the banking system and overall economy. However, reserve requirements at the Fed, the Central Bank's function as a lender of last resort, participation by depository institutions in the Fed Funds market, and access to the Fed's discount window mitigate the risks associated with holding deposits and provide added liquidity to the banking system (Sarkar, 2009). Banks are able to monitor risks and achieve greater liquidity by selling fee-based services such as monitoring services (Santos and Nigro, 2009; Siedlarek and Yankov, 2025).

The regulatory constraints hypothesis offers another explanation for the notable growth of the commercial loans market in recent decades. This theory suggests that loan sales are a response to reserve and capital requirements (Berger & Udell, 1994; Pavel, 1988; Pavel & Phillis, 1987; Pennachi, 1988; Wall, 1991). Depository institutions are required to hold a portion of their deposits at the Fed in the form of required reserves, which do not generate interest income for the banks (Mishkin, 2021). They are also required to pay a fixed premium based on their total domestic deposits to the Federal Deposit Insurance Corporation (FDIC) (Mishkin, 2021). These regulatory requirements (i.e., holding non-interest-bearing reserves at the Fed and paying deposit insurance premiums to the FDIC increase the opportunity costs of regulatory compliance for the banks, and provide

economic incentives to participate in the commercial loan sales market (Mishkin, 2021).[2]

By participating in loans sales, banks are also able to reduce the regulatory costs of on-balance sheet funding (i.e., minimum reserve requirements, capital adequacy ratios, and the cost of FDIC insurance premiums) (Güner, 2006; McCrary and Outsterhout, 1989; Pavel and Phillis, 1987; Pennachi, 1988; Santos and Nigro, 2009; Wall, 1991). By selling loans and removing such sales from their balance sheets, the selling banks are also able to generate fee income and improve key financial metrics such as Return on Assets (ROA) and Return on Equity (ROE) (Gorton & Haubrich, 1990).[3]

Finally, commercial loan sales can also be explained by the reputational barriers hypothesis. According to Demsetz (2000), the issuance of SLCs enhances the likelihood that a bank participates in the sell side of the loan sales market. A bank's reputation as a well-regarded issuer of SLCs provides an indication of the bank's perceived credit quality (Demsetz, 2000). As Goldberg and Lloyd-Davies (1985) indicate, issuing SLCs has no impact on overall bank riskiness and tends to have a positive impact on the bank's reputation while generally increasing its propensity to participate in the loan sales market.[4]

The second OBS activity examined in our model is SLCs. Letters of credit (LCs) are contractual agreements written by a bank (or "issuer") on behalf of one its customers (or "account party") to make a payment to a third-party beneficiary for goods sold or services rendered by the third-party beneficiary to the bank's client (or account party) (Banks, 1984; Bennett, 1986; FCA, 2008). There are two (2) categories of letters of credit: (1) commercial letters of credit, and (2) SLCs. Commercial letters of credit are short-term credit instruments

[2] *During periods of high interest rates, the opportunity cost of holding non-interest reserves at the Fed and making deposit insurance premium payments to the FDIC are higher, providing banks with economic incentives to participate in loan sales (Gryglewicz, Mayer, and Morellec, 2024).*

[3] *Off-balance sheet financing refers to items that are not normally recorded as assets or liabilities on a company's balance sheet, resulting in contingent claims (or liabilities) against the firm's assets and income. This category normally includes futures contracts, loan commitments, options, securitisation, standby letters of credit, and swaps.*

[4] *Pavel (1988) investigates loan sales without recourse, the other off-balance sheet instrument included in our analysis, and concludes that they have no impact on overall bank riskiness.*

typically used in international trade finance (FCA, 2008). When a bank issues a commercial letter of credit on behalf of a customer, the letter is send directly to the third-party beneficiary; after the bank customer or account party confirms receipt of the goods sold by the third-party beneficiary, the bank sends payment to the third-party beneficiary on behalf of the client or account party (FCA, 2008). The bank retains legal title to the goods shipped by the third-party beneficiary to its client or account party until the customer or account party reimburses the bank (Banks, 1984; Bennett, 1986; FCA, 2008).

In contrast to commercial letters of credit, SLCs represent payment guarantees by the bank or "issuer" to the third-party beneficiary in the event of non-performance or default by its customer (Brewer & Koppenhaver, 1992; FCA, 2008; James, 1988).[5] Typically, a third-party beneficiary presents a standby letter of credit to an issuer (or bank) in the event of non-performance or default by the bank's customer (or account party), thereby creating a primary obligation between the bank (or issuer) and the third-party beneficiary (Banks, 1984). If this payment demand (by the third-party beneficiary) complies with the terms of the standby letter of credit, it must be honoured by the issuer (or bank) (Banks, 1984; James, 1988). As a result, SLCs are riskier than commercial letters of credit, and, as such, they can contribute to increases in liquidity, interest rate, and credit risks for the issuing banks (Bennett, 1986; Brewer & Koppenhaver, 1992).

There are two (2) types of SLCs: (1) performance-based SLCs, and (2) financial SLCs (Bennett, 1986; FCA, 2008): (1) performance-based SLCs, and (2) financial-guarantee SLCs (FCA, 2008). Under a performance-based standby letter of credit, the bank or issuer is obligated to pay a specified amount to the third-party beneficiary in the event of default or non-performance by its customer or account party (Bennett, 1986; FCA, 2008). In the case of a standby letter of credit with a financial guarantee, if the customer or account party defaults on its debt incurred with the third-party beneficiary, the issuing bank is

[5] *Unlike a guarantee, which represents a secondary liability (or obligation) for the guarantor that depends on the non-performance of the underlying contract, in the case of a standby letter of credit the obligation between the issuer and the third-party beneficiary rests on the fact that the issuer is required to honour the third-party beneficiary's demand for payment if it complies with the terms of the letter of credit, independent of the underlying contract (between the account client and the third-party beneficiary) (Banks, 1984).*

required to pay any principal and interest owed by the customer or account party to the third-party beneficiary (Bennett, 1986; FCA, 2008).

Even though OBS activities (e.g., commercial loan sales and SLCs) are excluded from the traditional assets and liabilities categories on bank balance sheets, the regulations established by the Basel Committee on Banking Supervision require banks to hold designated capital reserves against their OBS activities (BIS, 2017). Under Basel II and Basel III regulations, a bank's OBS exposures are multiplied by a credit conversion factor (CCF) to estimate their credit equivalent amount (CEA), thereby converting them into on-balance sheet credit equivalents (BIS, 2017). Next, the on-balance sheet credit equivalent is multiplied by the risk-weighted factor to estimate its risk-adjusted amount (or value) (BIS, 2017). Basel II and III regulations establish a 100% CCF for direct credit substitutes, which includes SLCs (BIS, 2017). However, for performance-based SLCs, which carry lower risk than financial-guarantee SLCs, Basel regulations establish a CCF of 50% (BIS, 2017).

3. Theoretical Model

This section presents the theoretical model, which links SLCs to the two existing types of commercial loan sales: (1) recourse loans and (2) non-recourse loans. Commercial loan sales with recourse expose the bank to credit risk and underwriting risk (Parlour & Winton, 2013). Alternatively, a commercial loan sale without recourse, combined with a simultaneous standby letter of credit on the same loan, exposes the selling bank to underwriting risk arising from the loan sale and to credit risk resulting from the standby letter of credit. Since the underlying loan is the same, both strategies offer the same level of risk exposure. In accordance with the Law of One Price, if the cash flows, the risks, and the timing under the two strategies are equal, the value of the two strategies for the selling bank must also be the same.

In practice, our theoretical model contemplates two hypothetical scenarios. Under Scenario 1, a bank sells a commercial loan issued to Client A without recourse; if the borrower defaults on this loan, the bank bears zero credit risk. Under Scenario 2, the bank issues a standby letter of credit for Client A, and the bank wholly assumes Client A's credit risk. The latter is the equivalent of a bank internally repackaging Client A's loan as a commercial loan with recourse.

Typically, commercial banks do not engage in the hypothetical scenarios described above; however, they can minimise regulatory taxes by:

1) Creating a portfolio of multiple commercial loans without recourse, which are sold to selected groups of clients.
2) Issuing SLCs for clients of equal credit risk to those whose commercial loans without recourse are included in the aforementioned portfolio.
3) Creating a third portfolio in which commercial loan sales without recourse and the SLCs are treated as loans with recourse, resulting in substantial savings in regulatory taxes.

We assume no government intervention in the form of "regulatory taxes." Then, loan sales with recourse can be shown to be an equivalent strategy to loan sales without recourse, along with a standby letter of credit issue. This relationship can be expressed as follows:

$$LS_{w^*,i} = LS_{w/o,i} + SLC_i \quad (1)$$

where:

$LS_{w^*,i}$ = value to the bank of the i^{th} loan sold with recourse.
Value to the selling bank is the dollar profit earned as an upfront fee or as an interest differential.

$LS_{w/o,i}$ = value to the bank of the i^{th} loan sold without recourse, and

SLC_i = value to the bank of a standby letter of credit guaranteeing the i^{th} loan, which equals the fee earned.

Equation (1) shows that the two strategies are equivalent. We will prove Equation (1) using the payoff functions in a "state preference theory" framework. We start with a number of assumptions. First, we assume complete markets, where all securities can be priced, and there is a unique price for each security. Second, we assume that for every loan, each state falls into one of two (2) groups: (1) a state of bankruptcy or (2) a non-bankruptcy state.

Also, regarding the i^{th} loan, the first group consists of all states in the [0, B_i] interval, where B_i is the last (highest payoff number) state of nature in which bankruptcy occurs. The second group of states consists of the states that fall in the (B_i, ∞) interval, the non-bankruptcy states. We will also use a one-period framework.

In the case of loan sales with recourse, the bank will originate the loan and will immediately sell it with recourse at the beginning of the period (i.e., t=0). The selling bank will pay the discounted face value of the loan to the borrower and will receive an amount equal to the amount that was paid to the borrower plus a premium in the form of an interest differential from the buyer of the loan. This premium represents the bank's compensation for originating and servicing the loan and for bearing the credit risk associated with the loan. At the end of the period (t=i), the borrower will pay off the loan. However, if the borrower is insolvent, the selling bank will take legal possession of the borrower's assets and will pay an amount equal to the face value of the loan to the purchaser of the loan.

Alternatively, if the bank sells the loan without recourse and simultaneously issues a standby letter of credit on the same loan, the bank will engage in the following activities. First, the selling bank will originate the loan by paying the borrower an amount equal to the discounted face value of the loan. Immediately thereafter, the bank sells the loan without recourse to a third party and will receive a payment equal to the discounted face value of the loan, plus compensation for originating and servicing the loan, in the form of an interest rate differential from the third party.

At the same point in time, the selling bank will issue a standby letter of credit guaranteeing the i^{th} loan and will collect fees for that service. At the end of the period (t=i), the borrower will pay off the loan. In case of insolvency, the selling bank will take over the assets of the borrower and will also pay an amount equal to the face value of the loan to the beneficiary of the standby letter of credit.

Let:

D_i = face value of the i^{th} loan,

$A_i(s)$ = end of period value of the i^{th} borrower's assets, under the s^{th} state of nature,[6]

$P(s)$ = price of a pure (primitive) associated with the s^{th} state of nature,

$LS_w{}^*{}_{,i}(s)$ = end of period payoff of the loan sale with recourse of the i^{th} loan under the s^{th} state of nature,

$LS_{w/o,i}(s)$ = end of period payoff of the loan sale without recourse of the i^{th} loan under the s^{th} state of nature,

[6] *Our model assumes that the number of end-of-the-world states of nature is infinite and will arrange those states in ascending order from zero to infinity, according to their payoffs.*

$SLC_i(s)$ = end of period payoff of a standby letter of credit issued to guarantee the i^{th} loan sold without recourse, under the s^{th} state of nature, and

τ_{1i} = "regulatory taxes" incurred by the bank

The following section compares the payoffs of the two strategies at t=i. If the payoffs at t=i are equal, then the t=0 values of the two strategies should also be equal. The t=i value of the payoffs of a loan sale with recourse is the following:

$$\int_0^{\infty} LS_{w^*,i(s)} P(s) ds \tag{2}$$

If the bankruptcy and non-bankruptcy states are separated, the above payoff function can be decomposed as follows:

$$\int_0^{B_i} LS_{w^*,i(s)} P(s) ds + \int_{B_i}^{\infty} LS_{w^*,i(s)} P(s) ds \tag{2a}$$

At this point, we will explore the possible values that $LS_{w^*,i}(s)$ can obtain at the end of the period for different states s. Assuming that the borrower is solvent (i.e. s falls in the interval (B_i,∞)), the cash flows will equal zero, since the selling bank will not be required to make any payments, and the second component of expression (2a) will be eliminated.

If s falls in the interval [0, B_i] (i.e., the borrower is not solvent), the selling bank will incur a loss since it will have to buy back the loan and, at the same time, take over the assets of the borrower whose value will be lower than the face value of the loan. In this case, the cash flow from the loan sale will be negative and equal to $A_i(s) - D_i$.

As a result, the first part of (2a) may be expressed as:

$$\int_0^{B_i} [A_i(s) - D_i] P(s) ds \tag{2b}$$

As expression (2b) illustrates, the t=0 cash flows will be equal to negative Di e^{-r} in the case of a loan sale without recourse. This means that, at t=0, the selling bank will originate the loan and will pay the discounted face value to the borrower. At the same time, the bank will sell the loan without recourse and will collect an amount equal to $D_i\ e^{-r^{**}}$ from the buyer. The value to the bank selling the loan without recourse is equal to $D_i\ (e^{-r^{**}} - e^{-r})$.

Expression (3) shows the value of the payoffs of a loan sale without recourse at t=i:

$$\int_0^{\infty} LS_{w/o,i(s)} P(s) ds \tag{3}$$

Considering the bankruptcy and non-bankruptcy states, (3) can be written as follows:

$$\int_0^{B_i} LS_{w/o,i}\, P(s) ds + \int_{B_i}^{\infty} LS_{w/o,i}\, P(s) ds \tag{3a}$$

A closer examination of the possible values that $LS_{w/o,i}(s)$ may take at the end of the period for different values of s, reveals that cash flows associated with $LS_{w/o,i}(s)$ are not state contingent:

- If s falls in (B_i, ∞), the borrower is solvent and the selling bank will not be required to make any payments. Therefore, the cash flow associated with the loan will equal zero.
- Conversely, if s belongs to (0, B_i) (i.e., the borrower is insolvent), the bank will not have to make any payments since the loan was sold without recourse. Therefore, the cash flow associated with the loan sale will be equal to zero.

Therefore, regardless of the state of the variable s, the cash flow associated with the loan sale will be zero, and LSw/o,i(s) will be state-independent. Thus, the value of the payoff functions in Equation (3) and Equation (3a) will always equal zero. Finally, the payoffs of the standby letter of credit (SLCs) at t=0 will equal the fees collected by the selling bank for issuing such a letter.

The value of the payoffs of the standby letter of credit at t=1 can be expressed as:

$$\int_0^{\infty} SLC_i(s) P(s) ds \tag{4}$$

Taking bankruptcy and non-bankruptcy states into account, (4) can be broken down as follows:

$$\int_0^{B_i} SLC_i(s) P(s) ds + \int_{B_i}^{\infty} SLC_i(s) P(s) ds \tag{4a}$$

We now examine the possible values of $SLC_i(s)$ at the end of the second period for different values of s:

- If "s" falls in (B_i, ∞) interval (i.e., borrower is solvent), the cash flows will equal zero, and the selling bank will not make any payments.
- Alternatively, if s belongs to (0, B_i] (i.e., borrower is insolvent), the bank will have to indemnify the lender and incur the loss.

Since the borrower is unable to make the full payment, the selling bank will take ownership of the borrower's assets, which are valued below the face value of the loan. As a result, the cash flow will be negative and equal to $A_i(s) - D_i$. In this case, expression (4a) can be rewritten as:

$$\int_0^{B_i} [A_i(s) - D_i]P(s)ds \tag{4b}$$

Since the value of expression (4a) always equals zero, the value of the t=1 cash flows of the combination strategy will equal the value of expression (4b). As shown before, expressions (2b) and (4b) are identical; therefore, the value of the t=1 payoffs of a loan sale with recourse will be equal to the value of the payoffs of the combination strategy.

Considering the above, and taking the *Law of One Price* into account, we can conclude that to rule out the possibility of profitable arbitrage, the value of the payoffs at t=0 must be equal under both strategies. That is,

$$\begin{aligned} LS_{w^*,i} &= -D_i e^{-r} + D_i e^{-r} = -D_i e^{-r} + D_i e^{-r^{**}} + SLCfee \\ &= LS_{w/o,i} + SLC_i \end{aligned} \tag{5}$$

or

$$LS_{w^*,i} = LS_{w/o,i} + SLC_i \tag{5a}$$

Equation 5(a) above is Equation (1) restated, *QED*.

The selling bank's ability to honour its SLCs or its loan sales with recourse has not been considered because this risk is identical under both scenarios. Therefore, this ability (or lack thereof) will not affect the bank's decision to sell a loan with recourse versus using the

combination strategy. Therefore, we exclusively focus on the returns generated.

Since both strategies carry the same amount of risk, Equation (1) can be extended to a portfolio of (n) loans, which are sold or issued with SLCs. After adding both sides, we obtain:

$$\sum_{i=1}^{n} LS_{w^*,i} = \sum_{i=1}^{n} LS_{w/o,i} + \sum_{i=1}^{n} SLC_i \quad (6)$$

Equation (6) indicates that bank managers do not need to separately implement the suggested strategy for each loan sold. Instead, they could focus on creating portfolios of loans sold without recourse and portfolios of SLCs issued on other loans, so that the expected cash flows generated will be the same as those generated by equivalent portfolios of loans sold with recourse.

In the absence of "regulatory taxes", there is no benefit of one strategy over the other.[7] Of course, this conclusion will change if "regulatory taxes" are introduced.

We now consider the scenario of government intervention through "regulatory taxes." In view of "regulatory taxes", equation (1) no longer holds because of the additional "regulatory" cash flow associated with a loan sale with recourse. For the selling bank, the value of the loan sale with recourse will be lower unless it can increase the loan's interest differential by an amount equal to the additional "regulatory taxes" it incurs. This can only take place if the demand curve for loan sales with recourse is perfectly inelastic. Otherwise, a portion or all of the "regulatory taxes" will be incurred by the selling bank, reducing its value for the loan sale with recourse.

[7] *Our model considers three types of regulatory taxes: (1) reserve requirements, capital requirements, and FDIC deposit insurance premiums. Regulation D stipulates that when a loan is sold with recourse, the sales proceeds remain on the bank's books and are treated as deposits (GAO, 2016). As a result, the bank is required to maintain additional reserves at the Fed, which increases the costs of loan sales with recourse (GAO, 2016). Conversely, under Regulation D, the sale of an asset under the seller's endorsement or any other type of guarantee does not constitute a primary obligation of the seller. It would not give rise to the creation of a reservable deposit if the seller has not entered into an unconditional promise to repurchase (the asset) in the event of default (of the underlying asset). Finally, regarding the FDIC deposit insurance premium, when a loan remains on the selling bank's books, the sale proceeds are treated as deposits and included in the premium calculation.*

Equation (1) would be restored if the portion of the "regulatory taxes" is added to the value of the loan sold with recourse at t=0, or

$$LS_{w,i} + \tau_{1i} = LS_{w/o,i} + SLC_i \quad (7)$$

In expression (7), $LS_{w,i}$ represents the value to the bank of the i^{th} loan sold with recourse, in the presence of "regulatory taxes". A profit-maximising selling bank should prefer the strategy shown on the right-hand side of expression (7), instead of the one shown on the left-hand side, in order to save a dollar amount equal to τ_{1i}.

The relationship shown in (6) can be extended to encompass all n loans for which the above procedure is followed. By summing both sides of expression (7) over the n loans, we obtain:

$$\sum_{i=1}^{n} LS_{w^*,i} = \sum_{i=1}^{n} LS_{w/o,i} + \sum_{i=1}^{n} SLC_i - \sum_{i=1}^{n} \tau_{1i} \quad (7a)$$

In the absence of "regulatory taxes", the τ_{1i} terms equal zero for all i and r^* will equal r^*_1. Therefore, the value of a loan sold with recourse would equal the value of the same loan sold without recourse plus the value of a standby letter of credit issued to guarantee this same loan. By contrast, if "regulatory taxes" are introduced, the value of the strategy shown on the left hand side of expression (7) would be lower than the value to the bank of the strategy shown on right hand side and the difference would equal the term τ_{1i} (i.e., the value of the "regulatory taxes" imposed on the i^{th} loan sold with recourse). Therefore, if "regulatory taxes" are introduced, a bank that intends to sell a loan with recourse would be better off selling the loan without recourse and issuing a standby letter of credit guaranteeing the loan.

To generalise the results described above, we will consider a scenario in which the bank issues a standby letter of credit to guarantee the k^{th} loan, while simultaneously selling the m^{th} loan without recourse. We assume that loans k and m are of similar size and of the same risk class, with or without monitoring. Therefore, the bankruptcy state is the same for both or B_i.

Based on the above, we develop the following variations of Equations (1) and (7):

$$LS_{w,k} = LS_{w/o,k} + SLC_m \quad (8)$$

Equation (8) assumes the absence of "regulatory taxes".

$$LS_{w,k} + \tau_{1k} = LS_{w/o,k} + SLC_m \quad (9)$$

Equation (9) assumes that "regulatory taxes" are introduced.

To generalise (9), assume that all pairs of *k* and m loans are of equal size and fall into the same risk category. Thus, we obtain:

$$\sum_{k=1}^{n} LS_{w,k} + \sum_{k=1}^{n} \tau_{1k} = \sum_{k=1}^{n} LS_{w/o,k} + \sum_{m=1}^{n} SLC_m \quad (9a)$$

To demonstrate that Equation (8) holds, we explore the payoff functions suggested by both sides of this equation. Once this has been established, the validity of equation (9) follows. Let $SLC_m(s)$ be the s^{th} state-of-nature end-of-period payoff of a standby letter of credit issued to guarantee the m^{th} loan. Since loan *k*, which is sold, and loan *m*, which is guaranteed by a standby letter of credit, are of equal size, we can assume that for s falling into the [0, B_i] interval, the payoff of loan *k* that is sold, $Ak(s) – D_k(s)$, and the payoff of the standby letter of credit on loan *m*, $A_m(s) – D_m(s)$, are equal, as Equation (10) shows:

$$A_k(s) - D_k(s) = A_m(s) - D_m(s) \quad (10)$$

To prove that Equation (8) holds, we will use the no-arbitrage method discussed earlier. The value of the t=1 payoffs of the standby letter of credit on loan *m* equals the following:

$$\int_0^{\infty} SLC_m P(s) ds$$

The payoff function shown above can be decomposed into the bankruptcy and non-bankruptcy states as follows:

$$\int_0^{B_i} SLC_m P(s) ds + \int_{B_i}^{\infty} SLC_m P(s) ds$$

The second term always equals zero, and the decomposed payoff function reduces to:

$$\int_0^{B_i} [A_{im}(s) - D_m(s)] P(s) ds$$

As indicated earlier, it can be shown that the t=1 payoff of the loan sale with recourse of loan *k* will equal the following:

$$\int_0^{B_i} [A_k(s) - D_k(s)] P(s) ds$$

By virtue of Equation (10), the following equality holds:

$$\int_0^{B_i} [A_k(s) - D_k(s)]P(s)ds = \int_0^{B_i} [A_m(s) - D_m(s)]P(s)ds \qquad (11)$$

Since the payoffs of the loan sale without recourse will, as mentioned earlier, be equal to zero, the above equality establishes Equation (8) and by extension Equations (9) and (9a). However, the argument could be made that Equation (9a) holds in a portfolio sense. Another plausible argument is that the volume of the n_1 loans is approximately equal to the volume of the n_2 loans. As a result, Equation (9a) could be seen as describing an actual daily situation faced by banks.

Normally, banks will not enter the type of transactions suggested by the right-hand side of Equation (6) for the same loan. However, Equation (7) can be viewed in a portfolio sense, that is, as Equation (7a). What is more, going over the bank's books and "off-books", one would not expect to obtain pairs of loans *k, m* that are of equal size and risk, as Equation (9a) requires.

Conversely, if a large number, n_1, of loans are sold without recourse and a large number, n_2, of SLCs are issued on different loans, and, if the n_1 and n_2 loans are similar in size and of the same average risk, the selling banks would be effectively selling loans with recourse and Equation (9a) would hold. This suggests that banks that wish to sell loans with recourse, having recognised the benefits of selling such loans "indirectly," will consider loan sales without recourse and issuance of SLCs as joint activities.[8]

4. Conclusions

This paper presents a theoretical model that examines complementarities between two OBS activities commonly used by banks: (1) commercial loans without recourse, and (2) SLCs. Our theoretical model demonstrates that banks have an incentive to create portfolios of loans sold without recourse and match them with portfolios

[8] *For example, a selling bank may assume the "with recourse" position by selling the loan of a blue-chip corporation, without recourse, while simultaneously issuing a standby letter of credit to guarantee a commercial paper issue (of similar size) by the same corporation or by a similar blue-chip corporation. This example illustrates how the previous relationship can be implemented. In practice, a relatively small share (less than 10%) of commercial paper is usually backed by SLCs, and loan commitments remain as the most used backup facility.*

of SLCs on other loans with similar risk profiles to avoid the "regulatory taxes" associated with reserve requirements at the Fed, capital requirements, and the payment of FDIC deposit insurance premiums. As a result, banks have financial incentives to create "synthetic" portfolios of loans with recourse.

This strategy allows banks to avoid the "regulatory tax~~es~~" costs associated with loan sales with recourse, while maintaining their traditional credit analysis and credit risk-taking functions. It also allows banks to recapture their funding, while continuing to exploit their comparative advantage in the collection and use of private information regarding the creditworthiness of their clients. Banks that follow this strategy are able to utilise their resources more efficiently.

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DETERMINANTS OF NONPERFORMING LOANS IN ROMANIA AND CENTRAL, EASTERN AND SOUTHEASTERN EUROPE

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Abstract

This paper investigates the macroeconomic and bank-specific determinants of nonperforming loans in Romania and selected Central and Eastern European countries. Using a combination of econometric approaches, the study employs fixed-effects panel regressions for 18 Romanian banks over the period 2007Q4 – 2023Q4, a Bayesian Vector Autoregression model for Romania, and a Panel VAR framework for six Central, Eastern and South-Eastern European (CESEE) countries over the period 2008Q4 – 2024Q4. The results indicate that bank profitability, capitalisation, and operational efficiency play a significant role in shaping credit risk at the bank level. At the macroeconomic level, economic growth and exchange rate appreciation reduce NPLs, while unemployment, interest rates, and inflation increase default risk. Impulse response functions reveal strong persistence in NPL dynamics and highlight unemployment as the most robust and influential determinant of credit risk across all models. The findings suggest that credit risk is driven by a complex interaction between macroeconomic conditions and bank-specific characteristics, with labour market developments representing the main transmission channel between the real economy and financial stability.

Keywords: credit risk, banks, Bayesian VAR, panel VAR, panel regression

JEL Classification: E44, E51, G21, G32

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1. Introduction

The efficient and stable functioning of the banking system represents an essential prerequisite for economic development, given the crucial role that banks play in financial intermediation and the management of monetary flows. The implementation of a rigorous corporate governance framework, complemented by appropriate risk management and monitoring strategies, becomes indispensable for preventing the emergence of crises and strengthening the resilience of banking institutions.

The Federal Reserve defines credit risk as "the potential that a borrower or counterparty will fail to perform on an obligation". For most banks, loans are the largest and most obvious source of credit risk.

Nonperforming loans constitute a key indicator analysed within credit risk assessment. Nonperforming loans are defined as loans that are subject to significant payment delays or for which there is a likelihood that they will no longer be repaid by the borrower. The nonperforming loan ratio is calculated as the proportion of nonperforming loans relative to the total loan portfolio.

According to the European Central Bank, a loan becomes nonperforming when there are indications that the borrower is unlikely to repay the debt, or when more than 90 days have elapsed without the borrower fulfilling their payment obligations.

The credit rating agency Moody's classifies nonperforming loans as follows:

- when the payment of principal and interest is overdue by at least 60 days, in the case of consumer loans;
- when the payment of principal and interest is overdue by at least 90 days, in the case of commercial and leasing loans.

The reasons why a borrower may no longer be able to service their debt are numerous. For instance, an individual may lose their job, or a company that has contracted a loan may experience financial difficulties.

Nonperforming loans affect banks in two main ways. First, they reduce profitability by generating losses, which necessitates the calculation of provisions. Through provisioning, banks create financial reserves to cover nonperforming loans if needed, thereby preventing major losses. Another way in which banks are affected by nonperforming loans is through their reduced capacity to provide

adequate credit to companies and firms, limiting job creation and, more broadly, hindering economic well-being.

In order to mitigate credit risk, banks monitor and collect information on borrowers who contract loans. Consequently, managerial efficiency and risk management strategies directly influence loan repayment performance.

2. Literature review

The relationship between nonperforming loans and macroeconomic, as well as bank-specific factors, has been widely examined in the empirical literature, particularly in the context of financial stability and credit risk. Economic theory suggests that both macroeconomic conditions and internal bank characteristics play a crucial role in shaping the dynamics of loan quality.

A large body of empirical evidence highlights the importance of macroeconomic determinants of NPLs. Nkusu (2011), using dynamic panel methods and a structural Panel VAR for developed countries, finds that economic growth, housing prices, stock market performance, and the nominal effective exchange rate reduce NPLs, while unemployment, inflation, and interest rates increase credit risk. Similar results are reported by Louzis et al. (2012) for Greece, who show that GDP growth reduces NPLs, whereas unemployment, interest rates, and public debt exert a positive impact, with consumer loans being particularly sensitive to interest rate changes. For Central and Eastern European countries, Moinescu (2012) and Škarica (2013) confirm that economic growth reduces NPLs, while unemployment, exchange rates, inflation, and interest rates contribute positively to credit risk.

Labor market conditions emerge as one of the most robust determinants of nonperforming loans. Tsagkanos and Bellas (2014), using a difference GMM model for Euro Area countries, find that unemployment and public debt increase NPLs, while economic growth reduces them. Ghosh (2015), analysing U.S. states, reports that higher unemployment and inflation rates significantly increase NPLs, whereas income growth reduces default risk. More recently, Čakajac et al. (2024) provide strong cross-country evidence that higher unemployment rates are systematically associated with higher NPL ratios across European economies.

In addition to macroeconomic factors, several studies emphasize the role of bank-specific characteristics. Klein (2013) shows

that higher capital ratios and profitability reduce NPLs in Central and Eastern Europe, while excessive credit growth increases credit risk. Anastasiou et al. (2016) confirm that profitability indicators such as ROA and ROE have a negative effect on NPLs in Euro Area banks. Similar conclusions are drawn by Petkovski et al. (2018) for Czech banks and by Naili and Lahrichi (2022) for banks in the Middle East and North Africa, where capitalisation, efficiency, and profitability are found to significantly improve loan quality, while rapid credit expansion increases default risk.

Exchange rate dynamics are particularly relevant in economies with a high share of foreign currency lending. Nkusu (2011) shows that exchange rate depreciation increases NPLs by raising the real burden of foreign-denominated debt, while Hada et al. (2020) find similar evidence for Romania, identifying the RON/CHF exchange rate as one of the main drivers of NPL growth during the post-crisis period. Inflation is generally found to increase nonperforming loans, as shown by Ghosh (2015), Us (2020), and Naili and Lahrichi (2022), reflecting the erosion of real incomes and the deterioration of borrowers' repayment capacity.

Recent contributions adopt VAR and Panel VAR frameworks in order to capture dynamic interactions and spillover effects. Huljak et al. (2020), using a Bayesian Panel VAR for Euro Area countries, find that NPL shocks reduce credit growth, economic activity, and house prices. Us (2020), employing a Panel VAR for Turkish banks, confirms that unemployment, inflation, exchange rates, and public debt increase NPLs, while economic growth reduces credit risk. Nerjaku and Sinaj (2024), using a VAR model for Albania, also show that GDP growth lowers NPLs, whereas unemployment and inflation increase default risk.

Overall, the empirical literature consistently supports the view that nonperforming loans are driven by a combination of macroeconomic conditions, particularly economic growth, unemployment, and interest rates, and bank-specific factors such as profitability, capitalisation, and efficiency.

3. Data and Methodology

3.1. Bank-specific and macroeconomic indicators

The panel regression analysis uses data from 18 individual banks from Romania, as well as macroeconomic indicators from the IMF Database

and Eurostat from 2008Q4 to 2023Q4. The VAR models use only macroeconomic indicators from 2008Q4 to 2024Q4. The variables were considered as follows:

- **Return on Equity (ROE)** – calculated as the ratio of net profit to shareholders' equity. Poor performance of a credit institution may be associated with certain managerial characteristics that lead to reduced profitability. In situations where profitability is very low, managers may resort to granting loans to riskier borrowers in an attempt to increase returns, which ultimately leads to a higher level of nonperforming loans. Therefore, the expected impact of ROE on the NPL ratio is negative;
- **Return on Assets (ROA)** – calculated as the ratio of net profit to total assets. Inefficient banks with low profitability are more likely to engage in less secure and riskier investments to improve their performance (similarly to ROE, given that both indicators measure profitability). Consequently, the expected impact of ROA on the NPL ratio is negative;
- **Cost-to-Income Ratio (CTI)** – calculated as the ratio of operating expenses to net operating income. According to the *"bad management"* hypothesis proposed by Berger and DeYoung (1997), weak managerial skills lead banks with low cost efficiency to experience higher levels of nonperforming loans due to inadequate collateral evaluation, poor credit scoring, and insufficient monitoring of borrowers. Therefore, the expected impact of CTI on the NPL ratio is positive;
- **Equity Ratio (ER)** – calculated as the ratio of total equity to risk-weighted assets. According to the *"moral hazard"* hypothesis proposed by Keeton and Morris (1987), banks with relatively low capital respond to moral hazard incentives by increasing the riskiness of their loan portfolios, which, on average, leads to higher NPL ratios in the future, as potential losses can be shifted to other parties. Therefore, the expected impact of the equity ratio on the NPL ratio is negative;
- **Economic Growth (GDP)** reflects the overall state of an economy. When GDP increases, economic conditions improve, resulting in higher domestic production and, consequently, higher household incomes. As borrowers' incomes rise, the probability of default decreases. Therefore,

the expected impact of economic growth on the NPL ratio is negative;

- **Unemployment Rate (UNEMP)** represents the number of unemployed individuals relative to the total working-age population. When a borrower loses their job, they typically lose their primary source of income, creating additional pressure on debt repayment. As a result, an increase in the unemployment rate is expected to lead to a rise in nonperforming loans;
- **Inflation Rate (HICP)** is measured using the Harmonised Index of Consumer Prices with a fixed base year of 2015. Inflation affects borrowers' repayment capacity through various channels. Higher inflation may facilitate debt repayment by reducing the real value of outstanding loans when interest rates are fixed, or because it is often associated with lower unemployment, as suggested by the Phillips curve. However, inflation may also reduce real incomes when wages are rigid, negatively affecting borrowers' repayment capacity. Moreover, when interest rates are variable, inflation can further weaken debt-servicing capacity. Consequently, the relationship between inflation and NPLs may be either positive or negative *(*Nkusu*, 2011)*;
- **Interest Rate (INTRATE)** is measured by the yield on 10-year government bonds, in line with the Maastricht convergence criterion. An increase in the interest rate raises the total cost of loan repayments, placing additional financial pressure on borrowers. Therefore, the expected impact of higher interest rates on the NPL ratio is positive;
- **Real Effective Exchange Rate (REER)** is calculated as a weighted average of exchange rates against 42 trading partners for each country. Similar to inflation, an appreciation of the national currency may have mixed effects. On the one hand, it can reduce the competitiveness of export-oriented firms and negatively affect their debt repayment capacity. On the other hand, it can improve the repayment capacity of borrowers who have contracted foreign-currency loans (Nkusu, 2011).

Table 1
Descriptive table of bank-specific and macroeconomic variables

Indicator	Expected Sign
Return on Equity (ROE)	-
Return on Assets (ROA)	-
Equity Ratio (ER)	-
Cost to Income (CTI)	+
Economic Growth (GDP)	-
Unemployment Rate (UNEMP)	+
Inflation Rate (HICP)	+ / -
Interest Rate (INTRATE)	+
Real Effective Exchange Rate (REER)	+ / -

3.2. Panel Regression

Panel data represent a combination of cross-sectional data and time series. In this study, only the fixed-effects panel regression method is employed in order to control for unobserved heterogeneity across individuals. The panel regression model takes the following form:

$$NPL_{it} = \alpha + X'_{it}\beta + u_{it,\ i = 1, \ldots, N;\ t = 1, \ldots, T} \quad (1)$$

where *i* denotes the number of cross-sectional units (banks), and *t* represents time. Panel models use an error term that can be expressed as $u_{it} = \mu_i + v_{it}$, where μ_i captures the individual-specific effect for each unit, and v_{it} represents the idiosyncratic error term (white noise). It should be noted that μ_i is time-invariant. When the regression model is estimated using fixed effects, μ_i is treated as a fixed parameter, while the error term v_{it} is assumed to be independently and identically distributed, IID(0, σ_v^2). Therefore, the fixed-effects model is correctly specified when the cross-sectional units exhibit heterogeneous behaviour across individuals (Baltagi, 2005).

3.3. Bayesian VAR

To analyse the dynamic interactions between nonperforming loans and macroeconomic conditions in Romania, this study employs a Bayesian Vector Autoregression (BVAR) framework. Compared to classical VAR models, the Bayesian approach is particularly well-suited for systems

with relatively short time series and a large number of parameters, as it mitigates over-parameterisation and improves estimation efficiency through the use of prior information. The BVAR model is specified as a standard VAR of order p:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \cdot \cdot \cdot + A_p y_{t-p} + Cx_t + \varepsilon_{t,\ t = 1, 2, ..., T} \quad (2)$$

where y_t is a vector of endogenous macroeconomic variables, including the nonperforming loan ratio, real GDP growth, unemployment rate, inflation, interest rate, and the real effective exchange rate; A_p is a (n x m) matrix, p being the number of lags; C is a (n x m) matrix; x_t denotes a vector of deterministic components or a constant term and ε_t is a vector of innovations assumed to be normally distributed with zero mean and variance–covariance matrix. In compact matrix notation, the model can be written as:

$$Y = \bar{X}B + \varepsilon \quad (3)$$

In the Bayesian framework, the parameters B and Σ are treated as random variables rather than fixed but unknown quantities. Estimation, therefore, combines information from the data with prior beliefs regarding the parameters' distribution.

Bayesian inference relies on Bayes' rule, according to which the posterior distribution of the parameters is proportional to the product of the likelihood function and the prior distribution. In this study, a Normal–Wishart prior is adopted for the VAR coefficients and the variance–covariance matrix of the residuals. This prior choice allows the variance–covariance matrix to be treated as unknown and jointly estimated with the coefficients, providing greater flexibility compared to alternative priors such as the Minnesota prior, which assumes a fixed covariance structure.

The posterior distribution is obtained analytically under the Normal–Wishart prior, enabling efficient estimation even in small samples. The lag length of the model is selected based on standard information criteria, while stationarity conditions are verified to ensure model stability.

To identify and interpret the dynamic effects of macroeconomic shocks on nonperforming loans, impulse response functions are derived from the estimated BVAR. Structural shocks are identified using a Cholesky decomposition of the variance–covariance matrix, which imposes a

recursive ordering consistent with economic theory. The impulse responses trace the effect of a one-standard-deviation innovation in each macroeconomic variable on the evolution of nonperforming loans over time.

3.4. Panel VAR

To capture the dynamic interactions between nonperforming loans and macroeconomic conditions at the regional level, a Panel Vector Autoregression (Panel VAR) framework is employed. This approach allows all variables to be treated as endogenous while exploiting both the time-series and cross-sectional dimensions of the data. The model is specified as:

$$y_{it} = B(L)y_{it} + \varepsilon_{it} \quad (4)$$

where y_{it} is a (k x 1) vector of endogenous macroeconomic variables, including the nonperforming loan ratio; B(L) denotes a matrix polynomial in the lag operator; i = 1, … , N indexes the countries; t = 1, … , T denotes the time dimension; and ε_{it} is a vector of reduced-form innovations with zero mean and a variance–covariance matrix Σ_{ε}.

The Panel VAR framework extends the standard VAR model by allowing for heterogeneity across countries while preserving a common dynamic structure. Under the assumption that the characteristic polynomial associated with B(L) defines a stable process, the model admits a moving-average representation, which forms the basis for impulse response analysis.

The dynamic effects of macroeconomic shocks on nonperforming loans are examined using impulse response functions (IRFs). These responses trace the effect of a one-standard-deviation innovation in each macroeconomic variable on the evolution of the NPL ratio over time, while accounting for feedback effects among all variables in the system.

To identify the shocks, generalised impulse response functions are employed. This approach accounts for the contemporaneous correlation among the reduced-form residuals and has the advantage of being invariant to the ordering of variables, unlike recursive identification schemes based on Cholesky decomposition. As a result, the estimated responses reflect average dynamic effects across the panel of countries without imposing potentially restrictive identifying assumptions.

4. Results

4.1. Panel regression results

In order to examine the determinants of the nonperforming loan ratio at the bank level, a sample consisting of 18 banks from the Romanian banking system is used over the period 2007Q4–2023Q4.

Five-panel regression models were estimated, combining bank-specific and macroeconomic indicators in order to minimise the effects of multicollinearity. The regression models are estimated using fixed effects to account for unobserved heterogeneity across banks.

Table 2

Variance – Covariance matrix of bank-specific and macroeconomic indicators

%	NPL	ROA	ROE	CTI	ER	GDP	UNEMP	INTRATE
NPL	100							
ROA	-44.70	100						
ROE	-41.96	88.98	100					
CTI	16.05	-24.82	-36.46	100				
ER	-12.20	24.04	11.97	-9.68	100			
GDP	-6.75	13.66	14.31	2.37	2.55	100		
UNEMP	69.18	-28.39	-27.00	3.53	-10.31	-11.89	100	
INTRATE	17.14	-13.22	-13.64	-1.95	-4.61	-15.55	35.96	100

Source: Own EViews calculations

The variance–covariance matrix indicates a positive correlation between the nonperforming loan ratio, the cost inefficiency indicator, the unemployment rate, and the interest rate, as well as a negative correlation with financial profitability, return on assets, the equity ratio, and economic growth, in line with the empirical literature and economic theory. The strongest correlation is observed between the profitability indicators, namely ROA and ROE, with a positive correlation coefficient of 88.98%, which implies that these two variables cannot be used simultaneously in the regression model.

Table 3

Panel regression results

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
ROE	-0.13***		-0.13***		
	[-16.13]		[-16.58]		
ROA		-0,97***			
		[-15.49]			
ER			-0,06***	-0.08***	-0.08***
			[-4.38]	[-5.84]	[-5.96]
CTI				0.01***	0.01***
				[6.19]	[6.32]
GDP	-0,10**				-0.13**
	[-2.12]				[-2.23]
UNEMP		5,45***			
		[29.29]			
INTRATE			0.65***	0.95***	0.94***
			[5.35]	[10.21]	[9.42]
R-Squared	0.4765	0.6194	0.4932	0.5223	0.5223
Adjusted R-Squared	0.4679	0.6131	0.4844	0.5139	0.5146
F-Statistic (Prob)	0.00000	0.00000	0.00000	0.00000	0.00000
***p < 0.01; **p < 0.05; *p < 0.1			t – statistic in [ ]		

Source: Own EViews calculations

The estimated models include different combinations of bank-specific and macroeconomic variables in order to reduce multicollinearity and assess the robustness of the results. The findings indicate that bank profitability plays a crucial role in explaining credit risk, as both return on equity and return on assets exhibit negative and highly statistically significant coefficients. In particular, ROE has a coefficient of -0.13 in Models 1 and 3, while ROA displays a much stronger effect in Model 2, with a coefficient of -0.97, suggesting that asset profitability is a more relevant indicator for capturing lending performance and credit quality. These results support the "bad management" hypothesis, according to which inefficient and poorly performing banks tend to engage in riskier lending practices, leading to higher levels of nonperforming loans.

Furthermore, bank capitalisation, measured by the equity ratio, has a negative and statistically significant impact on NPLs in Models 3, 4, and 5, indicating that better-capitalised banks are more resilient and less exposed to credit risk. Similarly, the cost-to-income ratio enters positively and significantly in Models 4 and 5, implying that higher

operational inefficiency is associated with higher levels of nonperforming loans.

From a macroeconomic perspective, economic growth has a negative and statistically significant effect on NPLs in Models 1 and 5, confirming that economic expansions improve borrowers' income and repayment capacity, thereby reducing default risk. In contrast, the unemployment rate exerts by far the strongest impact on credit risk, as shown in Model 2, where a one percentage point increase in unemployment leads to an increase of approximately 5.45 percentage points in the NPL ratio. This result highlights the central role of labour market conditions in shaping credit risk dynamics, as job losses directly undermine borrowers' ability to service debt. Additionally, the interest rate has a positive and highly significant effect in Models 3, 4, and 5, indicating that higher borrowing costs increase debt-servicing burdens and contribute to higher default rates, in line with the classical interest rate transmission mechanism.

In terms of model performance, the R-squared values range between 0.47 and 0.62, suggesting a moderate to good explanatory power for panel data, with the highest fit observed in Model 2. All F-statistics are highly significant, confirming the overall statistical validity of the estimated specifications. Overall, the results indicate that nonperforming loans in the Romanian banking sector are driven by a combination of bank-level factors related to management quality and efficiency, as well as macroeconomic conditions, particularly labour market developments and financing costs, thus confirming both economic theory and the empirical literature on credit risk determinants.

4.2. Bayesian VAR results

The VAR model was estimated in MATLAB using the BEAR toolbox developed by Dieppe, Legrand, and van Roye (2016). In the empirical analysis, the model was estimated for Romania over the period 2008Q4 – 2024Q4. The number of lags was chosen based on the information criteria test (Appendix, Table 4), and the confidence interval has a 68% probability level.

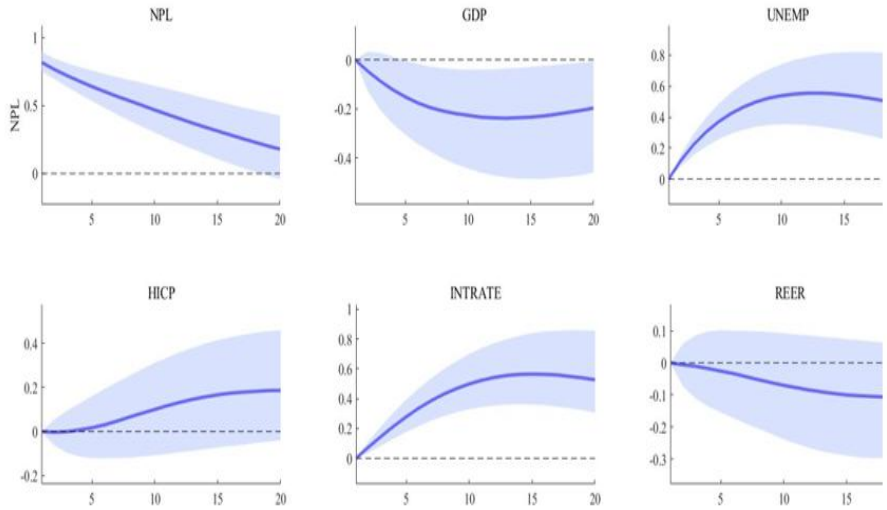
The variables are introduced into the model in the following order: the nonperforming loan ratio, economic growth, the unemployment rate, the inflation rate, the interest rate, and the real effective exchange rate. This ordering is chosen because the nonperforming loan ratio contemporaneously affects the

macroeconomic environment through the credit channel, whereas the remaining macroeconomic variables affect nonperforming loans with a lag (Klein, 2013).

VAR models are characterised by a specific stability condition. If the modulus of the roots of the characteristic polynomial is less than one, then the roots lie within the unit circle, and the model is considered stable (Appendix, Table 5).

Figure 1

Romania, BVAR impulse response functions



Source: Own estimation in MATLAB

A positive shock to the NPL ratio generates an immediate and persistent increase in NPLs, with an initial impact of approximately 0.8 percentage points. The persistence of the response indicates a strong inertia effect in the dynamics of nonperforming loans, suggesting that once credit quality deteriorates, banking sector vulnerabilities tend to propagate over time. This result reflects the existence of structural rigidities in the banking system and confirms that financial distress has long-lasting effects.

A positive GDP shock leads to a decline in the NPL ratio, with a maximum impact of around -0.21 percentage points. However, the effect becomes statistically significant only after a few quarters,

indicating a delayed transmission mechanism. This result is consistent with economic theory, according to which economic expansion improves borrowers' income levels and financial conditions, thereby strengthening their repayment capacity and reducing the probability of default.

A shock to the unemployment rate generates a strong and persistent increase in the NPL ratio, reaching up to 0.55 percentage points. This is one of the most pronounced effects observed across all variables. The result confirms that labour market conditions play a crucial role in determining credit risk. When borrowers lose their jobs, they typically lose their main source of income, which significantly weakens their ability to service debt and leads to a higher incidence of loan defaults.

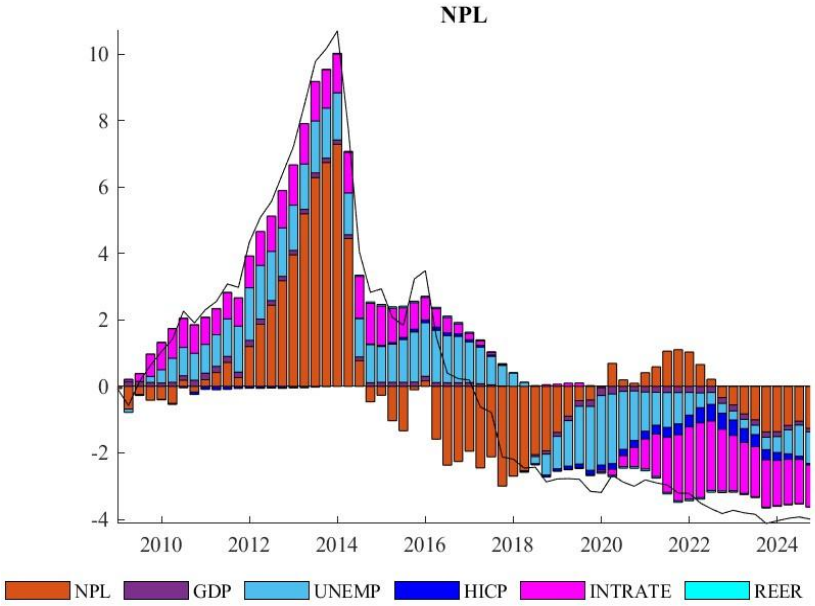
A positive shock to inflation begins to produce a negative effect on the NPL ratio after a few quarters, indicating a gradual decline in NPLs. Although the initial impact is weak and statistically insignificant, the effect becomes relevant in the medium term, suggesting the existence of a lagged transmission mechanism. The economic interpretation is that inflation reduces the real value of outstanding debt, particularly for loans with fixed interest rates, thereby easing debt servicing and lowering default risk. The delayed response reflects the time required for real income and balance sheet adjustments to materialise.

A positive shock to the interest rate leads to a clear and statistically significant increase in the NPL ratio, reaching up to 0.5 percentage points. The effect is persistent and reflects the classical interest rate channel of monetary transmission. An increase in interest rates raises the cost of borrowing and debt servicing, placing additional financial pressure on households and firms, which ultimately increases the probability of default and the level of nonperforming loans.

A positive shock to the real effective exchange rate starts to generate a negative and statistically significant effect on the NPL ratio after approximately five quarters, indicating a decline in NPLs. This result suggests that an appreciation of the domestic currency improves the repayment capacity of borrowers with foreign currency–denominated loans, as the real burden of servicing external debt decreases. The effect appears with a delay, reflecting the indirect nature of the exchange rate transmission channel.

Figure 2

Romania, Historical decomposition of NPL



Source: Own MATLAB estimations

Romania recorded the highest value of the nonperforming loan ratio in 2014, reaching 22.36%, which represents the largest value in the analysed sample. This peak was mainly driven by the large volume of loans denominated in Swiss francs contracted prior to the 2008 financial crisis. As the Romanian leu depreciated, a significant number of borrowers faced difficulties in servicing their debt, which led to a sharp increase in nonperforming loans. The historical decomposition indicates that, in addition to the interest rate and the unemployment rate, the NPL ratio was influenced by an additional determinant during the period 2011–2014. In 2010, due to the increase in the budget deficit and the decline in gross domestic product, the government decided to reduce public sector wages and increase the value-added tax (IMF, 2010; IMF, 2012). These measures exerted additional pressure on borrowers and weakened their capacity to meet financial obligations. The NPL shock declines sharply in 2014 because, in order to mitigate the alarming rise in nonperforming loans, the National Bank of

Romania issued a series of recommendations aimed at encouraging banks to sell their NPL portfolios to other financial institutions. During the period 2016–2020, the NPL shock became negative as many banks adopted the new IFRS accounting standards, which increased prudential behaviour and strengthened balance sheet discipline. After 2020, regulations concerning loan moratoria during the Covid-19 pandemic, labour market policies designed to control unemployment, and the reduction in interest rates contributed to stabilising the NPL ratio.

4.3. Panel VAR results

The sample includes data from the following countries: the Czech Republic, Croatia, Poland, Romania, Slovenia, and Hungary over the period 2008Q4 – 2024Q4, while the set of endogenous variables consists only of the macroeconomic variables used in the previous Bayesian model.

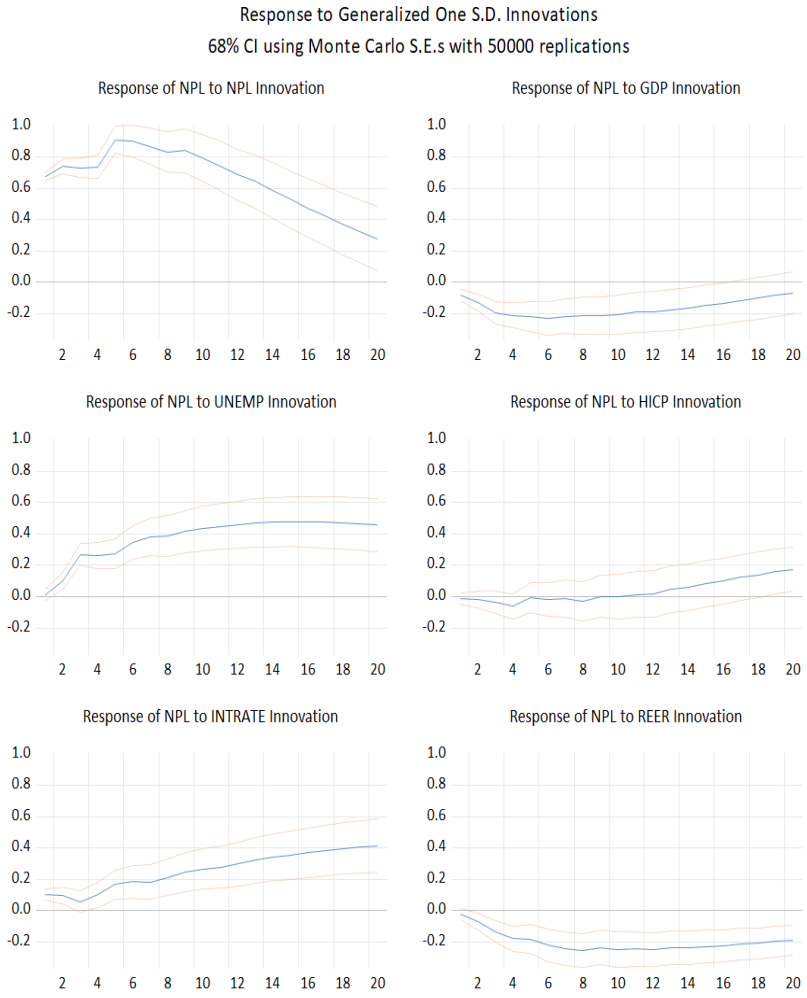
The stationarity tests (Appendix, Table 6) indicate that the inflation rate, economic growth, and the real effective exchange rate are stationary at the 1% significance level. The nonperforming loan ratio is stationary at the 5% level, while the interest rate is also stationary at the 5% level; however, the Phillips–Perron test suggests the presence of a unit root. The unemployment rate is stationary at the 10% level, although the Augmented Dickey–Fuller test indicates non-stationarity. In the model, the variables are included in levels, as economic reasoning suggests that rate variables are generally stationary.

The model is estimated with five lags, as indicated by the information criteria for the optimal lag length (Appendix, Table 7).

The stability testing procedure aims to identify the roots of the characteristic polynomial associated with the coefficient matrices. According to the results obtained, the estimated VAR model is stable (Appendix, Figure 4). To assess the robustness of the results, the presence of autocorrelation is tested using the Lagrange Multiplier (LM) test. The results indicate that the null hypothesis of the test, namely, that there is no autocorrelation at lag *h,* cannot be rejected. Therefore, the model can be considered efficient (Appendix, Table 8).

Figure 3

Impulse Response Functions of Panel VAR



Source: Own EViews estimations

A positive innovation in the NPL ratio leads to a large and persistent increase in NPLs, which gradually decays over time but remains positive throughout the entire horizon. This suggests a strong persistence of financial stress at the regional level: once loan quality deteriorates in one period, its effects tend to propagate over several

years across the banking systems of the region. This pattern indicates that credit risk displays high temporal dependence, meaning that past financial conditions strongly influence future outcomes.

A positive GDP shock generates a systematic decline in NPLs, with the strongest effect appearing in the medium term. This result suggests that economic expansion has a generalised stabilising effect on banking systems in the region. Rather than acting instantaneously, growth improves credit quality gradually, reflecting the cumulative effect of higher income, stronger corporate performance, and improved labour market conditions across countries.

An unemployment shock leads to a pronounced and sustained increase in NPLs, making it one of the most influential variables in the Panel VAR. The effect intensifies over time and remains persistently positive. This indicates that labour market deterioration represents a systemic source of financial vulnerability in the region. Rising unemployment translates into widespread repayment difficulties, which aggregate into higher levels of credit risk across countries.

An inflation shock produces a relatively modest and gradual increase in NPLs. The effect is weaker compared to other variables and becomes visible only in the medium to long run. This suggests that inflation plays a secondary role in explaining regional credit risk dynamics. Its influence appears to operate indirectly, through changes in real incomes, real interest rates, and general macroeconomic uncertainty, rather than as a primary driver of loan defaults.

A positive interest rate shock leads to a steady and monotonic increase in NPLs, which becomes stronger over time. This reflects a broad regional pattern: higher financing costs systematically worsen borrowers' debt servicing capacity, leading to a gradual accumulation of nonperforming loans across banking systems. Unlike GDP or unemployment, the interest rate effect is progressive and cumulative, indicating that prolonged periods of high interest rates have long-lasting consequences for financial stability.

A positive REER shock (currency appreciation) results in a negative response of NPLs, particularly in the medium term. This suggests that exchange rate appreciation improves overall credit quality in the region, most likely due to the prevalence of foreign currency lending in Central and Eastern Europe. As domestic currencies strengthen, the real burden of foreign-denominated debt declines, which reduces default risk at the aggregate level.

5. Conclusions

Based on the analyses conducted, the economic determinants of the nonperforming loan (NPL) ratio in Romania and, subsequently, in six Central and Eastern European countries were identified. Three types of models were estimated within the study: fixed-effects panel regressions for Romania using a sample of 18 banks, including four bank-specific indicators and three macroeconomic indicators; a Bayesian VAR model with Cholesky decomposition for Romania, employing six macroeconomic variables, namely the nonperforming loan ratio, economic growth, the unemployment rate, the inflation rate, the interest rate, and the real effective exchange rate; and finally, a Panel VAR analysis with generalized impulse responses, applied to the Czech Republic, Croatia, Poland, Romania, Slovenia, and Hungary, using the same set of macroeconomic variables.

At the level of the Romanian banking sector, the six fixed-effects panel regression models capture the dynamics between the nonperforming loan ratio and indicators of profitability, capitalisation, and efficiency, alongside macroeconomic variables. Poor management significantly contributes to an increase in nonperforming loans, with profitability exerting the strongest impact, in line with economic theory. In order to mitigate the problem of nonperforming loans, banks should improve their overall performance, particularly the profits generated by their assets, equity and increase the profitability (Ferreira, 2022). Efficient and highly profitable banks tend to engage in safer and less risky investments, whereas poorly performing banks resort to riskier placements in an attempt to enhance profitability. This behaviour ultimately increases their exposure to credit risk and leads to higher levels of nonperforming loans.

At the macroeconomic level, deteriorating economic conditions systematically translate into higher levels of nonperforming loans. Economic growth and the real effective exchange rate have a negative impact on nonperforming loans, whereas the unemployment rate, the interest rate, and the inflation rate exert a positive impact on NPLs. These results are also consistent with economic theory. Moreover, the historical decomposition of the NPL ratio indicates that, in addition to the macroeconomic variables included in the model, there were other unobserved determinants that contributed to the deterioration of the banking system, such as wage cuts or tax increases.

At the panel level, the results of the generalised impulse response functions are similar to those obtained from the Bayesian model. Economic growth and the real effective exchange rate have a negative impact on nonperforming loans, whereas the unemployment rate and the interest rate have a positive impact on nonperforming loans. These results are, once again, consistent with economic theory. The inflation rate is found to be statistically significant in this type of estimation only in the medium to long run. The unemployment rate is the variable that exerts the strongest impact on nonperforming loans across all three types of models. This result can be explained by the fact that when a borrower loses their job, they usually lose their main source of income, which significantly weakens their ability to service debt and increases the likelihood of default.

As future research directions, regression models could incorporate a dynamic estimation approach based on the Generalised Method of Moments (GMM) in order to capture potential endogeneity among variables, while VAR models could employ alternative shock identification strategies, such as sign restrictions. With regard to the choice of variables, other relevant indicators in credit risk analysis could also be considered, such as the probability of default or the loan loss provisioning coverage ratio.

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APPENDIX

Table 4

Information criteria for BVAR model, Romania

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-779.8915	NA	1279.252	24.18128	24.38199	24.26047
1	-493.7874	510.5859	0.584811*	16.48577	17.89075*	17.04012*
2	-457.8748	57.46018	0.602892	16.48845	19.09772	17.51798
3	-427.7069	42.69911	0.775694	16.66790	20.48145	18.17259
4	-383.4557	54.46298*	0.695557	16.41402*	21.43184	18.39387

Source: Own EViews estimations

Table 5

Roots of the characteristic polynomial for BVAR model, Romania

```
Roots of the characteristic polynomial (modulus):
0.951  0.951  0.746  0.746  0.500  0.500
No root lies outside the unit circle.
The estimated VAR model satisfies the stability condition
```

Source: Own EViews estimations

Table 6

Stationary tests for Panel VAR

Variabie	ADF Test	PP Test
NPL	0.0251	0.0041
GDP	0.0000	0.0000
UNEMP	0.1765	0.0527
HICP	0.0000	0.0000
INTRATE	0.0222	0.2030
REER	0.0000	0.0000

Source: Own EViews estimations

Table 7

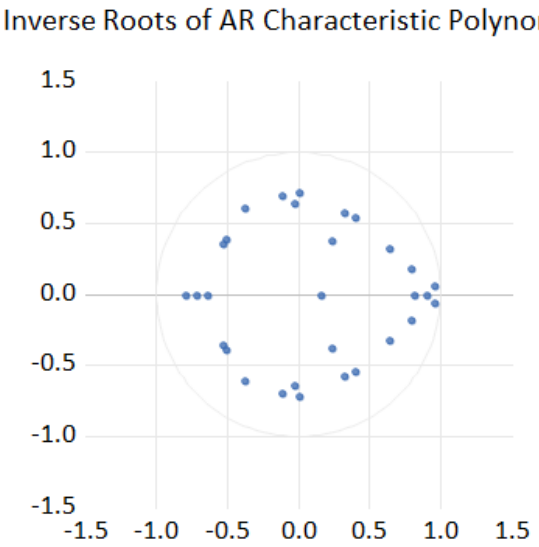
Informational criteria for Panel VAR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-4616.35...	NA	8846.251	26.11501	26.18059	26.14110
1	-2662.40...	3830.619	0.174108	15.27915	15.73822*	15.46180
2	-2596.25...	127.4529	0.146859	15.10878	15.96134	15.44799*
3	-2549.00...	89.42212	0.137875	15.04524	16.29128	15.54100
4	-2499.86...	91.34234	0.128111	14.97099	16.61052	15.62331
5	-2453.70...	84.23114*	0.121122*	14.91360*	16.94662	15.72248
6	-2426.25...	49.17515	0.127352	14.96187	17.38838	15.92730

Source: Own EViews estimations

Figure 4

Roots of the characteristic polynomial for Panel VAR



Source: Own EViews estimations

Table 8

Lagrange Multiplier test for autocorrelation for Panel VAR

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	58.23891	36	0.0109	1.631648	(36, 1399.2)	0.0109
2	53.07151	36	0.0331	1.484147	(36, 1399.2)	0.0332
3	66.54639	36	0.0015	1.869910	(36, 1399.2)	0.0015
4	64.08921	36	0.0027	1.799291	(36, 1399.2)	0.0027
5	34.35564	36	0.5469	0.954397	(36, 1399.2)	0.5470

Source: Own EViews estimations

EXPLOSIVE PRICE DYNAMICS IN GLOBAL REIT MARKETS: EVIDENCE FROM DEVELOPED REGIONS

Laura Andreea IANCU, PhD Candidate*

Abstract

This paper investigates the presence and timing of explosive price dynamics in major listed real estate markets over the period 04 January 2011 – 11 February 2026. The analysis focuses on four benchmark indices: the FTSE EPRA Nareit Developed Europe Index, the FTSE Nareit All Equity REITs Index (USA), the FTSE EPRA Nareit Developed Asia Pacific Index, and the FTSE EPRA Nareit Developed Index (World). Using a bubble-detection framework designed to identify periods of explosive price behaviour, the study documents episodic, momentum-driven overheating phases across regions. The results reveal that explosive episodes are concentrated during sustained appreciation regimes and tend to precede or coincide with local and global market peaks. The post-pandemic recovery of 2020–2022 emerges as the most synchronised overheating phase across regions. While the U.S. market exhibits multiple moderate explosive clusters consistent with a long-term upward trend, Europe shows a pronounced pre-correction overheating phase around 2018–2020. Asia-Pacific displays recurrent but comparatively shorter-lived explosive episodes. At the global level, explosive dynamics intensify during periods of coordinated international expansion. Overall, the findings suggest that listed real estate markets are characterised by recurrent, regionally heterogeneous yet occasionally synchronised explosive dynamics. Monitoring acceleration phases in REIT prices may therefore provide valuable early warning signals of subsequent corrections and heightened systemic risk.

Keywords: asset price bubbles, real estate securities, financial econometrics, market overheating, bubble detection, financial stability

JEL Classification: G12, G15, R30, C22

DOI: https://doi.org/10.65672/fs.2026.1.3

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1. Introduction

The origins of the 2008–2009 global economic and financial crisis are widely linked to the sharp contraction in real estate values that occurred after an extended period of sustained expansion (Caraiani et al., 2019; Iancu et al., 2023). Recent studies emphasise that increasing housing prices stimulated bank lending through securitisation mechanisms, first displacing credit directed toward non-housing sectors and subsequently supporting a broader expansion of credit across the entire economy (Martín, Moral-Benito, and Schmitz, 2021; Blanco-Arroyo, Esteve, and Prats, 2026).

Conversely, residential real estate, typically viewed as a comparatively illiquid and more stable asset class, may serve as an indicator of overall economic conditions, household sentiment, and financial soundness within an economy. Changes in housing returns can therefore signal underlying macroeconomic adjustments that may not yet be fully reflected in the more rapidly responding equity markets (Salisu, Gupta, and Cepni, 2026).

The concept of a rational housing bubble refers to a situation in which housing asset prices diverge from their underlying fundamental values (Stiglitz, 1990). When increases in housing prices can be accounted for by economic fundamentals, the likelihood of a financial crisis remains limited, as prices would be expected to decline only in response to changes in those fundamentals. By contrast, when price growth is primarily driven by speculative factors, the presence of a rational housing bubble becomes more plausible, potentially generating adverse consequences for the broader real economy (Stiglitz, 2003; Kivedal, 2013). Conversely, the collapse of a bubble may trigger a financial crisis. Such an event can generate substantial adverse wealth effects for households that own residential property. Indeed, Carmen Reinhart and Kenneth Rogoff (2008) show that, in the aftermath of financial crises, the real level of debt tends to increase sharply, in many cases nearly doubling (Gil-Alana, Dettoni, Costamagna, and Valenzuela, 2019).

The economic relevance and far-reaching implications of real estate bubbles have contributed to the development of an extensive and rapidly expanding body of literature examining their formation, dynamics, and macro-financial consequences (Idrovo & Lennon, 2013; Miao, 2014; Kim & Lim, 2016; Zhang et al., 2017; Shi, 2017; Caraiani

& Călin, 2020; André et al., 2022; Iancu et al., 2023; Saritas et al., 2026).

This study advances the existing research on asset price bubbles in equity REIT markets by examining the presence of recurring episodes of speculative exuberance.

Existing empirical research on listed real estate markets has predominantly focused on individual regional dynamics or has relied on conventional econometric approaches centred on cointegration relationships, volatility modelling, or fundamental valuation frameworks. While these studies provide important insights into local market behaviour, they offer limited evidence regarding the timing, recurrence, and cross-market interaction of speculative episodes at the global level. In contrast, the present study adopts a multi-regional perspective and employs the BSADF data-stamping methodology, which allows for the identification of multiple, non-overlapping episodes of explosive price dynamics across markets (Iancu et al., 2023). This framework further enables the investigation of synchronisation patterns, thereby providing new evidence on whether overheating phases in REIT markets emerge independently or reflect broader globally coordinated financial cycles.

The sample period considered in this study offers a particularly relevant macro-financial setting for the analysis of speculative dynamics in listed real estate markets. Spanning 2011–2026, the dataset covers three distinct global monetary regimes that shaped asset price behaviour following the Global Financial Crisis. The early phase is characterised by prolonged accommodative monetary policy and quantitative easing programs implemented across advanced economies, which supported capital inflows and asset price appreciation. This is followed by the unprecedented liquidity expansion associated with the COVID-19 pandemic, during which large-scale fiscal and monetary interventions generated rapid market recoveries and intensified risk-taking behaviour. The final segment of the sample captures the transition toward monetary tightening and higher interest rates, creating conditions conducive to valuation adjustments and market corrections. Examining explosive price dynamics across these contrasting regimes allows for a comprehensive assessment of how shifts in global liquidity and financial conditions influence overheating episodes in REIT markets.

To appropriately capture the complex dynamics of speculative behaviour observed in modern financial markets, this study relies on a

recursive right-tailed unit root testing framework capable of identifying multiple, non-contiguous episodes of explosive price behaviour within a single sample. Traditional econometric approaches are often limited to detecting a single bubble episode or rely on ex-post valuation benchmarks, which may overlook short-lived or recurrent overheating phases. This limitation becomes particularly relevant in the post-pandemic environment, characterised by rapid liquidity expansions, abrupt regime shifts, and repeated acceleration patterns across asset classes. The Backward Supremum Augmented Dickey–Fuller (BSADF) methodology addresses these challenges by allowing both flexible subsample estimation and precise date-stamping of bubble origination and collapse periods. As a result, it has been increasingly applied in the empirical detection of speculative dynamics across a wide range of financial assets, including equity markets, commodities, cryptocurrencies, and real estate markets Yao and Li, 2021; Yao et al., 2023; Lupu et al., 2024; Huang and Wang, 2024; Lupu et al., 2025; Chen et al., 2025; Vriz and Grossi, 2026; Lupu et al., 2026. Its ability to identify recurrent explosive regimes makes it especially suitable for examining listed real estate markets, where multiple overheating episodes may emerge under changing global financial conditions Zhang et al., 2024; Cincinelli et al., 2024.

The current paper makes the following contributions. First, it provides a comprehensive and up-to-date cross-regional analysis of explosive price dynamics in listed real estate markets over an extended post–Global Financial Crisis horizon (2011–2026). By jointly examining Europe, the United States, Asia-Pacific, and a global aggregate benchmark, the study offers a unified comparative framework that allows for the identification of both regional heterogeneity and global synchronisation effects in REIT overheating episodes.

Second, the paper explicitly focuses on price indices (excluding dividend reinvestment), thereby isolating capital appreciation dynamics from income effects. This distinction is particularly relevant in REIT markets, where dividend yields are structurally significant. By concentrating on pure price movements, the analysis directly targets acceleration patterns consistent with speculative behaviour and short-term market overheating.

Third, the study documents the timing and clustering structure of explosive episodes across regions, highlighting the post-pandemic rebound (2020–2022) as the most globally synchronised overheating phase in the sample. The results show that explosive signals

systematically precede or overlap with cyclical peaks, reinforcing the interpretation of acceleration phases as potential early warning indicators of subsequent corrections.

Fourth, the paper contributes to the systemic risk literature by demonstrating that global REIT overheating is not merely the sum of independent regional dynamics. Instead, synchronised explosive phases emerge during periods of coordinated international expansion, suggesting cross-market transmission mechanisms and global liquidity effects.

The remainder of the paper is structured as follows. Section 2 presents the data and outlines the empirical methodology employed to detect explosive price dynamics. Section 3 reports and discusses the main empirical results, highlighting cross-regional differences and synchronisation patterns. Section 4 concludes with implications for market monitoring and financial stability.

2. Data and methodology

2.1. Data

The empirical analysis employs four major listed real estate benchmarks: the FTSE EPRA Nareit Developed Europe Index (FTSE W Europe REIT $ – Price Index), the FTSE Nareit All Equity REITs Index (FTSE USA REIT – Price Index), the FTSE EPRA Nareit Developed Index (FTSE World REIT $ – Price Index), and the FTSE EPRA Nareit Developed Asia Pacific Index (FTSE W Asia Pacific REIT $ – Price Index). The sample period spans from 04 January 2011 to 11 February 2026. All series are expressed as price indices (capital appreciation only), excluding dividend reinvestment, and denominated in U.S. dollars to ensure cross-regional comparability. The data were obtained from the London Stock Exchange Group (LSEG) platform.

The FTSE W Europe REIT index captures the price performance of publicly listed REITs and real estate operating companies across developed European markets, reflecting valuation dynamics within the European listed property sector and sensitivity to regional macroeconomic and monetary conditions.

The FTSE USA REIT index tracks U.S.-listed equity REITs operating across major property segments such as residential, retail, office, industrial, and healthcare real estate, providing a benchmark for the largest and most liquid REIT market globally.

The FTSE World REIT index represents an aggregate of developed listed real estate markets across North America, Europe, and Asia-Pacific, serving as a comprehensive proxy for global publicly traded real estate performance and enabling cross-market comparative analysis.

The FTSE W Asia Pacific REIT index measures the performance of REITs in developed Asia-Pacific markets, including Japan, Australia, Singapore, and Hong Kong, capturing regional real estate cycle heterogeneity and distinct macro-financial dynamics.

2.2. Methodology – Bubble detection with the BSADF method

Recursive Unit Root Testing for Bubble Identification

The econometric identification of speculative episodes in asset price time series has conventionally relied upon right-tailed extensions of the augmented Dickey–Fuller (ADF) unit root framework, which test for the presence of explosive autoregressive roots (Diba & Grossman, 1988). While theoretically sound, this class of tests exhibits substantial power losses when confronted with episodes of transient exuberance embedded within longer histories of stationary or near-unit-root dynamics. The methodological contribution of Phillips et al. (2011, 2015) addresses this limitation through a recursive testing strategy premised on the sequential application of right-tailed ADF statistics to systematically varying subsamples of the data, thereby permitting the detection and date-stamping of multiple, non-contiguous episodes of explosive behaviour.

Consider a univariate time series y_t observed over T periods. Define the fractional indices r_1 and r_2 as the proportional positions marking the origin and termination of a given subsample, respectively, such that the subsample contains observations indexed from $\lfloor r_1 T \rfloor$ to $\lfloor r_2 T \rfloor$, where $\lfloor \cdot \rfloor$ denotes the integer-part operator. The fractional window size is accordingly $rw = r_2 - r_1$. Over each such subsample, the following augmented Dickey–Fuller specification is estimated:

$$\Delta y_t = c_{r_1,r_2} + \beta_{r_1,r_2} \cdot y_{t-1} + \sum_{i=1}^{k} \varphi^i_{r_1,r_2} \cdot \Delta y_{t-i} + \varepsilon_t, \qquad \varepsilon_t \sim iid\ N\left(0, {\sigma_{r_1,r_2}}^2\right) \tag{1}$$

where y_t denotes the natural logarithm of the real asset price or the continuously compounded return, Δy_t represents the first difference

thereof, and the coefficients c, β, and φ are subsample-specific parameters to be estimated.

The lag order k is selected to ensure that the residual process ε_t is serially uncorrelated, typically via an information criterion such as the Akaike (AIC) or Schwarz (BIC). The error term ε_t is assumed to satisfy the standard conditions of zero mean, constant variance, and independence. Crucially, the fractional endpoints r_1 and r_2 express the subsample boundaries as proportions of the full sample size T.

Whereas the conventional ADF test is constructed under a unit root null hypothesis (β = 0) with a left-tailed stationary alternative (β < 0), the framework of Phillips et al. (2011) inverts the direction of the test by specifying a right-tailed alternative (β > 0), consistent with mildly explosive autoregressive dynamics. The authors demonstrate that right-tailed unit root tests possess meaningful inferential content for the early detection of asset price exuberance, thereby furnishing a prospective diagnostic for incipient speculative pressures.

The subsample-specific test statistic is defined as the ratio of the estimated coefficient to its standard error:

$$\boldsymbol{ADF}_{r_1}^{r_2} = \frac{\beta_{r_1,r_2}}{\text{s. e.}\left(\beta_{r_1,r_2}\right)}$$

To operationalise the recursive testing procedure, the full sample is normalised such that the fractional scale ranges from 0 to 1. The number of observations in any given subsample indexed by r_w is then $T_w = \lfloor r_w T \rfloor$. Given a minimum fractional window size r_0, which is typically set to ensure a sufficient number of degrees of freedom for reliable coefficient estimation, a sequence of ADF statistics may be constructed by systematically expanding the endpoint r_2 from r_0 to 1 while holding the starting point r_1 fixed at 0. The supremum of this sequence constitutes the Supremum ADF (SADF) statistic:

$$\boldsymbol{SADF}(r_0) = \sup_{r_2 \in [r_0,1]} \boldsymbol{ADF}_0^{r_2}$$

The SADF procedure performs well in identifying a single episode of explosive dynamics followed by collapse. However, its power deteriorates markedly in empirical settings characterised by multiple, temporally disjoint phases of exuberance. The fixed-origin design of the SADF statistic constrains its capacity to disentangle recurrent boom–bust sequences, as each forward-expanding

subsample necessarily incorporates earlier episodes of instability, thereby diluting the signal associated with subsequent bubbles.

To remedy this deficiency, Phillips et al. (2015) generalised the SADF framework by permitting both the initial and terminal observations of each subsample to vary freely across the admissible range. This extension, termed the Generalised SADF (GSADF) statistic, evaluates the supremum over a substantially richer set of subsamples and thereby substantially enhances the procedure's ability to detect multiple distinct episodes within a single realisation.

The GSADF statistic is defined as:

$$\boldsymbol{GSADF}(r_0) = \sup_{r_2 \in [r_0, 1],\, r_1 \in [0, r_2 - r_0]} \boldsymbol{ADF}_{r_1}^{r_2}$$

Rejection of the unit root null occurs when GSADF(r_0) exceeds the corresponding right-tailed critical value derived from the asymptotic distribution of the test statistic. Phillips et al. (2015) tabulate finite-sample critical values via Monte Carlo simulation, and these values are employed throughout the empirical analysis reported in this study. The 95% confidence interval critical values specific to the sample size under consideration are computed via 1,000 Monte Carlo replications and are provided in the supplementary materials.

Date-Stamping Algorithm and the BSADF Sequence

While the GSADF statistic furnishes a test for the presence of at least one explosive episode within the full sample, it does not directly identify the precise observation-level origination and termination dates of individual bubbles. Phillips et al. (2015) address this through a recursive date-stamping algorithm predicated on the Backward Supremum ADF (BSADF) sequence.

For any fixed terminal observation indexed by fractional endpoint r_2, the BSADF statistic is defined as the supremum of the ADF statistics computed over all admissible initial observations r_1 lying in the interval [0, $r_2 - r_0$]:

$$\boldsymbol{BSADF}_{r_2}(r_0) = \sup_{r_1 \in [0, r_2 - r_0]} \boldsymbol{ADF}_{r_1}^{r_2}$$

It follows immediately that the GSADF statistic may equivalently be expressed as the supremum of the BSADF sequence over all terminal observations:

$$\boldsymbol{GSADF}(r_0) = \sup_{r_2 \in [r_0, 1]} \boldsymbol{BSADF}_{r_2}(r_0)$$

The BSADF sequence is then evaluated against the sample-size-adjusted critical values of the GSADF distribution. A speculative episode is deemed to have originated at the first observation r_e at which the BSADF statistic exceeds the right-tailed critical threshold:

$$\hat{r}_e = \inf_{r_2 \in [r_0, 1]} \{ r_2 : \boldsymbol{BSADF}_{r_2}(r_0) > cv_{r_2,\alpha}^{\boldsymbol{SADF}} \}$$

where $cv_{r_2,\alpha}^{\boldsymbol{SADF}}$ denotes the α%-level critical value of the SADF test evaluated on a subsample of size $\lfloor r_2 T \rfloor$ observations.

Correspondingly, the episode is considered to have collapsed at the first subsequent observation at which the BSADF statistic recedes below the critical threshold:

$$\hat{r}_f = \inf_{r_2 \geq \hat{r}e} \{ r_2 : \boldsymbol{BSADF}_{r_2}(r_0) < cv_{r_2,\alpha}^{\boldsymbol{SADF}} \}$$

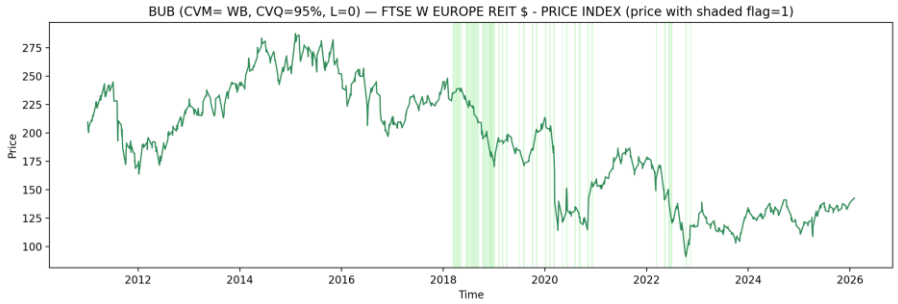
This date-stamping mechanism delivers precise, observation-level estimates of bubble inception and termination dates, thereby enabling the classification of individual crash events according to whether they occur during or immediately following a BSADF-identified speculative regime. The critical values employed in the origination and collapse tests are derived from the finite-sample distribution of the SADF statistic conditional on the subsample length, ensuring appropriate size control throughout the recursive procedure.

In our empirical implementation, we adopt the automatic initialisation rule proposed by Phillips, Shi, and Yu (2015), which sets the minimum fractional window size as $r_0 = 0.1 + 1.8/\sqrt{T}$, with the corresponding integer window size given by $T_0 = \lfloor r_0 T \rfloor$. This specification balances the competing objectives of ensuring sufficient subsample size for reliable coefficient estimation while maintaining adequate power against explosive alternatives in empirically relevant sample lengths.

3. Results and discussion

Figure 1

Bubbles for FTSE W Europe REIT $ – Price Index



Source: Author's computation

The figure displays the price evolution of the FTSE EPRA Nareit Developed Europe Index (FTSE W Europe REIT $ – Price Index) together with the corresponding bubble indicator (BUB) under the CVM framework (WB specification, CVQ = 95%, L = 0). The shaded green vertical bands mark the days classified as explosive (flag = 1), while the continuous line represents the underlying price index.

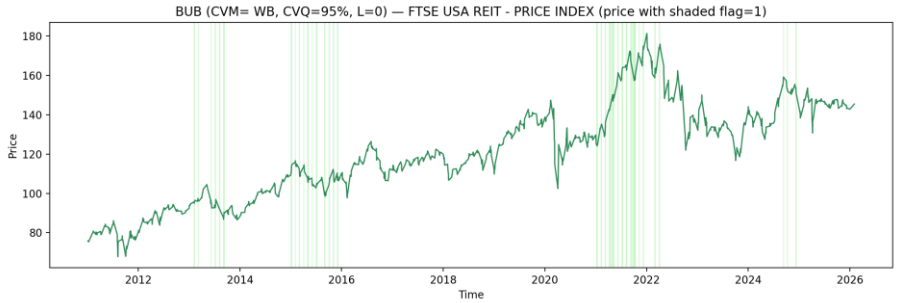
Over the sample period, the European REIT market exhibits a pronounced cyclical structure. After an initial correction in 2011–2012, the index entered a strong appreciation phase between 2013 and 2015, reaching a major peak around 2015–2016. This is followed by a gradual moderation and renewed upward movement until 2018. Beginning in 2018–2019, the index enters a sustained downward trajectory, which intensifies during the COVID-19 shock in 2020, leading to a sharp structural break and substantial price compression. The post-pandemic recovery (2021) proves temporary, as the market experiences renewed weakness in 2022–2023, consistent with tightening financial conditions and rising interest rates. The final segment of the sample (2024–2026) suggests stabilisation at a lower valuation regime compared to the mid-2010s peak.

The bubble detection pattern differs notably from the Asia-Pacific case. Explosive signals are heavily concentrated in the 2018–2020 interval, immediately preceding and overlapping with the major structural downturn. This clustering indicates that the methodology identifies late-stage acceleration and instability prior to the substantial correction. In contrast, earlier expansion phases (e.g., 2013–2015)

generate comparatively fewer or no persistent explosive flags, suggesting that the price increases during that period were more gradual and less characterised by explosive dynamics.

Figure 2

Bubbles for FTSE USA REIT – Price Index



Source: Author's computation

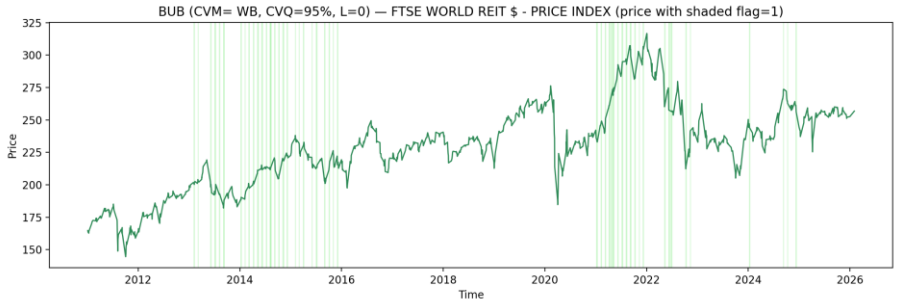
The U.S. REIT market displays a relatively smoother and more persistent upward trend compared to the European benchmark. Between 2011 and 2016, the index follows a steady appreciation path with moderate corrections. The 2016–2019 period is characterised by continued expansion, reflecting favourable financing conditions and strong real estate fundamentals. The COVID-19 shock in 2020 produced a visible but relatively short-lived contraction, followed by a strong rebound that culminated in a pronounced peak during 2021–2022. Subsequently, the index corrects amid tightening monetary policy and higher interest rates, before stabilising in the 2023–2026 interval at levels below the 2021 peak but significantly above the early-sample valuations.

Explosive signals appear in several distinct clusters. Early episodes are visible around 2013–2014 and again during 2015–2016, coinciding with sustained price acceleration phases. A more pronounced and dense concentration of flags emerges during the 2021–2022 expansion, immediately preceding and overlapping with the local maximum. This clustering suggests intensified upward momentum and potential overheating during the post-pandemic recovery. In contrast, the 2020 downturn itself does not exhibit persistent explosive signals, consistent with the upward-focused nature of the detection framework.

Overall, the U.S. REIT market appears to experience multiple momentum-driven episodes, with the most significant cluster occurring during the rapid post-COVID rebound. The distribution of explosive flags supports the interpretation that overheating dynamics tend to materialise during strong appreciation phases, particularly when price growth accelerates beyond its long-run trend.

Figure 3

Bubbles for FTSE World REIT $ – Price Index



Source: Author's computation

The figure presents the price evolution of the FTSE EPRA Nareit Developed Index (FTSE World REIT $ – Price Index) over the sample period, with shaded vertical bands marking days identified as explosive (flag = 1).

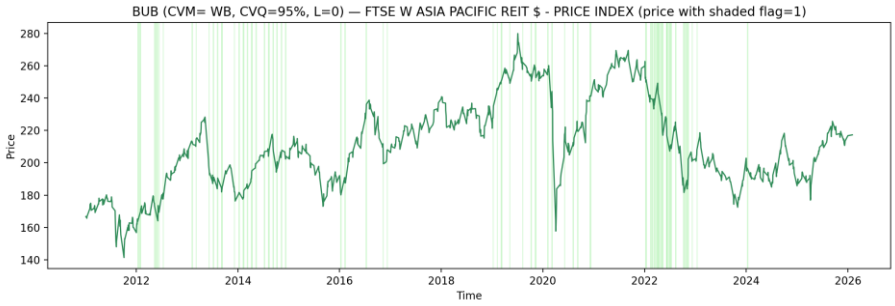
The global REIT benchmark exhibits a clear long-run upward trajectory from 2011 to 2019, characterised by successive expansion phases interspersed with moderate corrections. The index rises steadily through 2013–2016, followed by continued growth until the pre-pandemic peak. The COVID-19 shock in early 2020 produced a sharp and abrupt contraction, representing the most significant negative break in the sample. This decline is followed by a strong and rapid recovery during 2020–2021, culminating in a new global maximum around 2021–2022. Thereafter, the index enters a correction phase associated with tightening global financial conditions, before stabilising in the 2023–2026 interval at levels below the peak but well above early-sample valuations.

Explosive signals appear in multiple clusters across the sample. A dense concentration is observed during the 2013–2016 expansion phase, coinciding with sustained and accelerating appreciation. Another prominent cluster emerges during the post-

pandemic rebound in 2021–2022, immediately preceding and overlapping with the global peak. In contrast, the 2020 collapse itself shows limited explosive activity, consistent with the focus on detecting upward price acceleration rather than downturn dynamics.

Figure 4

Bubbles for FTSE W Asia Pacific REIT



Source: Author's computation

The figure presents the price dynamics of the FTSE EPRA Nareit Developed Asia Pacific Index (FTSE W Asia Pacific REIT $ – Price Index) over the sample period, together with the binary bubble indicator (BUB) obtained under the CVM framework (WB specification, CVQ = 95%, L = 0). The green vertical shaded areas correspond to days classified as explosive episodes (flag = 1), while the solid line represents the underlying price index.

From a descriptive standpoint, the index exhibits multiple cyclical phases. The 2011–2013 period shows moderate growth with intermittent corrections, followed by a more sustained upward trajectory between 2016 and 2019, culminating in a pronounced peak just prior to the COVID-19 shock. The sharp contraction in early 2020 reflects the pandemic-induced disruption in global real estate markets. Subsequently, the index rebounds strongly through 2021, reaching new local highs, before entering a correction phase during 2022–2023, likely associated with tightening global monetary conditions and rising interest rates. The most recent period (2024–2026) indicates partial recovery and stabilisation.

The bubble detection results suggest that explosive signals are not uniformly distributed across the sample. Instead, they tend to cluster around periods of rapid price acceleration. A relatively dense concentration of flags appears during the 2012–2014 interval,

coinciding with sustained upward momentum. Additional clusters are visible in the pre-pandemic expansion phase (2017–2019) and again during the post-pandemic rebound in 2021–2022. In contrast, crisis periods characterised by sharp downward adjustments (notably early 2020) show limited or no explosive flags, consistent with the methodology's focus on detecting exuberant price dynamics rather than crashes.

4. Conclusions

This study examined the presence and timing of explosive price dynamics across four major listed real estate benchmarks: the FTSE EPRA Nareit Developed Europe Index, the FTSE Nareit All Equity REITs Index, the FTSE EPRA Nareit Developed Index, and the FTSE EPRA Nareit Developed Asia Pacific Index, over the period 04 January 2011 – 11 February 2026. The evidence indicates that explosive episodes are episodic, momentum-driven, and predominantly concentrated around phases of accelerated appreciation preceding local or global peaks.

Across all regions, explosive signals tend to cluster during sustained upward movements rather than during downturns. The post-pandemic rebound of 2020–2022 emerges as the most synchronized overheating phase at the global level, with dense flag concentrations in the U.S., Asia-Pacific, and the global aggregate index. This suggests that the rapid liquidity-driven recovery following the COVID-19 shock generated conditions consistent with temporary price acceleration beyond long-run fundamentals.

Regional heterogeneity is nevertheless evident. The European REIT market displays a pronounced concentration of explosive signals in the 2018–2020 interval, preceding a substantial structural correction. In contrast, the U.S. market shows a more gradual long-term appreciation path, punctuated by multiple smaller explosive clusters and a particularly strong episode during the 2021–2022 expansion. The Asia-Pacific index exhibits several momentum-driven phases, though with less structural persistence compared to Europe. The global index largely reflects the synchronisation of these regional cycles, amplifying signals during periods of coordinated expansion.

Importantly, explosive flags systematically precede or overlap with cyclical peaks, while crisis and contraction periods show limited explosive activity. This pattern supports the interpretation that

overheating in listed real estate markets materialises during acceleration phases rather than during downturns. The results are therefore consistent with a boom–correction dynamic in which speculative pressures accumulate during strong appreciation regimes and dissipate once financial conditions tighten or external shocks materialise.

Overall, the findings indicate that the listed real estate markets are susceptible to recurrent, regionally heterogeneous, yet occasionally synchronised explosive dynamics. The post-pandemic expansion stands out as the most globally aligned overheating episode in the sample. These results contribute to the understanding of cyclical risk in publicly traded real estate and provide empirical support for monitoring acceleration phases as early warning signals of potential market corrections.

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A COMPARATIVE ANALYSIS OF MACROECONOMIC DIVERGENCES BETWEEN NORDIC AND ANGLO-SAXON ECONOMIES

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Abstract

This paper analyses the macroeconomic differences between the Nordic countries (Sweden, Denmark, Norway, and Finland) and the Anglo-Saxon countries (USA, UK, Canada, and Australia), focusing on the evolution of GDP, the policy rate, and inflation. Furthermore, financial market performance was assessed through stock market indices for both groups. The study is relevant for understanding the way in which different economic-ideological models influence financial stability and social development, considering the interaction of these economies in the global market. This research aims to compare the economic developments of the two groups of economies during the 2005-2023 period, in order to identify the impact of different economic policies on stability and sustainable growth. The methodology applied involves a comparative analysis of macroeconomic data as well as the real economy, represented by stock market performance. The main research question addressed in the study is: What are the significant differences in macroeconomic performance between the Nordic and Anglo-Saxon economies? Towards the conclusion of the study, differences in the approaches of the two groups of countries will be observable, both during periods of crisis and economic expansion. The analysis of stock market index volatility serves as an indicator of overall economic health, reflecting the prosperity and stability of each country across its key sectors.

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1. Introduction

In recent decades, the economic literature has increasingly highlighted the existence of distinct institutional varieties of capitalism, which reflect significant differences regarding the role of the state, labour market organisation, social welfare systems, and the regulation of financial markets (Hall & Soskice, 2001; Amable, 2003). Two of the most contrasting models are Nordic capitalism (practised in states such as Denmark, Sweden, Finland, and Norway) and the Anglo-Saxon model (found in the United States of America, the United Kingdom, Canada, and Australia). These models represent archetypes of the "universalist welfare state" versus the "minimally regulated free market," each with a distinct economic philosophy and important implications for macroeconomic performance and citizen well-being. The Nordic model is often characterised by a unique combination of a competitive free market and an extensive welfare state, capable of providing high-quality public services, redistributive equity, and massive investments in human capital (Andersen et al., 2007; Sapir, 2006). In contrast, the Anglo-Saxon model promotes minimal state intervention, high labour market flexibility, pro-cyclical fiscal policy, and a heavy reliance on financial markets for resource allocation (Boyer, 2005). In the current global context, marked by challenges such as persistent post-pandemic inflation, the fragmentation of global supply chains, the energy transition, and demographic pressures, it is essential to understand which of these models has offered greater economic resilience and systemic stability. Thus, this paper aims to conduct a comprehensive comparative analysis between the Nordic and Anglo-Saxon economies from three complementary perspectives: (i) the evolution of major macroeconomic indicators during the 2005–2023 period (GDP, inflation, interest rates); (ii) the performance and volatility of stock market indices in the 2017–2024 interval, as a reflection of market confidence and financial stability; (iii) the assessment of the influence of different economic policies on the dynamics of economic stability.

The methodology applied combines quantitative analysis of macroeconomic time series with a qualitative approach to institutional and public policy differences. Economic governance models are analysed not only descriptively, but also in relation to moments of systemic crisis. The paper draws upon recent contributions from the comparative literature, such as those by Kenworthy (2011), Aiginger and Guger (2006), and Storm and Naastepad (2012), who have highlighted that the diversity of capitalisms does not imply absolute hierarchies, but rather different responses to structural and cyclical challenges.

The main contribution of the paper lies in correlating economic policy models and macro-financial performance in a temporally synchronised and analytically comparable manner, based on empirical data from two economically advanced but ideologically divergent regions. In an era where governments worldwide are seeking solutions to balance economic growth, fiscal sustainability, and social equity, the analysis presented offers valuable lessons for public policy formulation, especially in emerging economies shaping their development strategies. The remainder of the paper is organised as follows: Section 2 provides a review of the relevant literature on the typologies of capitalism and the structural differences between the Nordic and Anglo-Saxon models. Section 3 describes the dataset and methodology. Section 4 presents the empirical results regarding macroeconomic indicators and capital markets, along with a discussion of the findings. Section 5 concludes with conclusions and suggestions for future research.

2. Literature Review

Over the past half-century, the academic literature has extensively documented the existence of distinct institutional models of capitalism, as reflected in the varying ways in which states integrate market mechanisms with public intervention. A fundamental premise is the “varieties of capitalism” framework proposed by Hall and Soskice (2001), which distinguishes between coordinated market economies (CMEs), characteristic of Northern Europe, and liberal market economies (LMEs), exemplified by countries such as the United States, the United Kingdom, and Australia. These two types of economic organisation entail substantial divergences in social policy, labour market regulation, innovation, and the distribution of income.

The Nordic model is frequently regarded as an example of an "active welfare state," integrating competitive markets with a high degree of redistribution and universalist social protection. Andersen et al. (2007) underscore that the success of the Nordic model is grounded in a highly progressive tax system, substantial public investments in education and health, and the institutionalised cooperation among employers, labour unions, and the state. Sapir (2006) classifies the Nordic model as the most effective of the European social models, combining economic efficiency with social equity. In contrast, the Anglo-Saxon variant emphasises labour market flexibility, limited governmental intervention, and targeted social policies generally restricted to disadvantaged groups. These characteristics are associated with ongoing economic expansion, but also with high levels of income inequality and labour market precariousness (Kenworthy, 2011; OECD, 2017). Boyer (2005) argues that this model is more exposed to cyclical fluctuations and financial crises due to the deregulation of the banking system and capital markets. Regarding macroeconomic performance, the Nordic model proved more resilient than the Anglo-Saxon economies during the 2008 global financial crisis (OECD, 2011). According to an IMF report (IMF, 2013), robust social protection systems and a responsible fiscal structure helped mitigate the impact of the recession on domestic demand and employment in Nordic countries. Furthermore, the European Commission (2020) notes that Nordic economies tend to exhibit superior performance in terms of fiscal sustainability and green transitioning, whereas Anglo-Saxon economies primarily depend on market instruments and short-term fiscal incentives.

On the financial market, the literature highlights clear differences in stock market index behaviour, volatility levels, and their correlation with economic cycles. Empirical studies (e.g., Christiansen and Ranaldo, 2008; Bekaert et al., 2012) show that stock exchanges in Anglo-Saxon economies tend to be more volatile but often offer higher long-term returns. On the other hand, Nordic markets exhibit greater stability but are more conservative regarding systemic risk-taking. Significant support for this view comes from the World Economic Forum (2023), which indicates that Norway, Sweden, and Finland are consistently ranked at the top for financial stability and quality of economic governance. At the same time, the Global Competitiveness Index (WEF) shows that Anglo-Saxon economies excel in innovation and financial market development, but face

challenges related to social polarisation and economic volatility. Another important aspect highlighted by the literature is the management of public debt and inflation. Nordic countries have practised counter-cyclical fiscal policies, with a firm commitment to fiscal sustainability and central bank independence (IMF, 2022). In contrast, countries such as the USA and the United Kingdom adopted expansionary monetary and fiscal policies during crisis periods, which led to the accumulation of high debt levels and inflationary pressures in the post-pandemic era (OECD, 2023).

In conclusion, the specialised literature provides a solid theoretical framework and ample empirical evidence supporting the idea that models of capitalism fundamentally influence an economy's macroeconomic trajectory and financial stability. However, few studies have conducted a synchronised analysis of macroeconomic performance and financial markets between these two groups of countries, over an extended period and in the context of recent crises (2008, 2020, 2022). This study seeks to address this gap, thereby contributing to an understanding of how institutional differences influence economic dynamics over time.

3. Methodology

This paper adopts a comparative quantitative and qualitative approach, designed to investigate the differences between two fundamental economic models from the perspective of macroeconomic performance and capital market stability. The research is based on the empirical analysis of time series pertaining to key macroeconomic and stock market indicators in the 2005–2023 and 2017–2024 intervals, respectively, in parallel with a theoretical interpretation based on the institutional characteristics and economic policies of each category of states. The selection of countries was based on the relevant academic literature, specifically on the 'varieties of capitalism' model proposed by Hall and Soskice (2001) and extended by Amable (2003). Consequently, the Nordic economies category includes Denmark, Finland, Norway, and Sweden, while the Anglo-Saxon group is represented by the United States of America, the United Kingdom, Canada, and Australia. This framework reflects the structural differences with respect to the role of the state in the economy, social policies, the degree of labour market regulation, and income redistribution mechanisms. These intervals were selected to capture

both periods of crisis (such as the 2008 global financial crisis and the economic crisis provoked by the COVID-19 pandemic), as well as the stages of recovery and reform, alongside the global inflationary context and post-pandemic fiscal consolidation. The data frequency varies according to the nature of the indicators: annual for macroeconomic data and daily for stock market financial data.

Regarding the macroeconomic indicators, the analysis concentrated on the following variables: real gross domestic product (GDP) per capita (expressed in international dollars, adjusted for purchasing power parity), the inflation rate as measured by the consumer price index (CPI), and the monetary policy interest rate. The data for these indicators were collected from internationally recognised sources, renowned for their accuracy and data comparability, such as the OECD.Stat, Eurostat, the World Bank (World Development Indicators), the International Monetary Fund (World Economic Outlook Database), FRED (Federal Reserve Economic Data), and the official websites of the national central banks. For the analysis of capital market performance, the most representative stock market indices for each country were selected: OMX Copenhagen 25 (Denmark), OMX Helsinki 25 (Finland), OBX Index (Norway), and OMX Stockholm 30 (Sweden) for the Nordic economies, and the S&P 500 (USA), FTSE 100 (United Kingdom), S&P/TSX Composite (Canada), and ASX 200 (Australia) for the Anglo-Saxon economies, respectively. For each of these indices, conditional volatility was calculated using the GARCH model in EViews 12, with the data being extracted from the Investing.com financial platform.

To analyse the return volatility of the stock market indices in the working sample, we employ the GARCH model. This is an econometric model used to describe the time-varying conditional variance (conditional heteroskedasticity) within a time series, such as financial returns (Chen, 2024).

GARCH models are widely used in volatility analysis because they effectively capture time-varying variance and volatility clustering, two core characteristics of financial return series. They allow current volatility to depend on past shocks and past volatility, making them flexible and well-suited for modelling financial markets. Due to their strong empirical performance, ease of estimation, and numerous extensions, GARCH models have become a standard tool in risk management, forecasting, and econometric analysis. Strong applications of this methodology are well documented in the literature.

Notable examples include the studies of Albu et al. (2014, 2015a, 2015b, 2016), which provide comprehensive empirical demonstrations across multiple market contexts. Additional relevant contributions can be found in Lupu and Calin (2014), who extend the methodological framework to broader financial applications, as well as Calin (2015), which offers further refinement and validation. Together, these works illustrate the robustness and versatility of the methodology.

Thus, prior to applying the GARCH (1,1) specification, we calculate the logarithmic returns for the 8 previously described stock market indices. The choice of this econometric model stems from its widespread use in both the academic literature and professional practice. The form defines the GARCH model.

Let there be a series of logarithmic returns $\{r_t\}$. The mean equation becomes:

$$r_t = \mu + \epsilon_t \tag{1}$$

In which:
r_t = the return at time t
μ = the constant mean
ϵ_t = the error term or shock at time t.

In this context, the error equation is:

$$\epsilon_t = \sigma_t z_t \tag{2}$$

Where:
$z_t \sim i.i.d.\, N(0,1)$ an independent and identically distributed (i.i.d.) random variable, and
σ_t^2 is the conditional variance at time t

The conditional variance equation GARCH (p, q) has the form:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^{q} \alpha_i \epsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2 \tag{3}$$

In which:
$\alpha_0 > 0$, $\alpha_i > 0$, $\beta_j > 0$
α_i = the ARCH coefficients
β_j = the GARCH coefficients.

To obtain the results, the GARCH (1,1) model is estimated for each of the 8 indices, yielding 8 volatility models. Subsequently, the results were annualised to provide an optimal basis for comparison.

Furthermore, an applied descriptive-explanatory analysis was conducted. In the first phase, the values and trajectories of the selected indicators for each group of countries are empirically presented, emphasising major trends, structural breaks or crisis moments, and the convergences/divergences between the models. In the second stage, these developments are explained through the lens of the structural and institutional differences between the two economic models, integrating theoretical interpretations that support the hypothesis that the architecture of economic and social policy significantly influences macroeconomic stability and stock market performance. Comparative graphical representations and summary tables are also utilised to visually illustrate the observed differences and facilitate comparability between the two groups.

4. Results and Discussion

4.1. Discussion on the descriptive-explanatory analysis

Between 2005 and 2007, the Anglo-Saxon countries registered solid economic growth, led by Canada and Australia, nations bolstered by global demand and resource-based industries. The 2008–2009 crisis led to a sharp economic decline, with Canada being the most affected (-11.3%), while Australia proved to be relatively resilient. In the period between 2010 and 2019, economic growth was moderate for the United States and the United Kingdom, which recorded steady growth of 3–4%, while Australia enjoyed a more pronounced level of prosperity. Canada registered a higher level of volatility, which led to significant downturns in certain periods. In 2020, the pandemic generated an unprecedented economic decline, followed by a remarkable recovery in 2021, with growth rates ranging between 8% and 21%. Between 2022 and 2023, the growth rates diminished but remained relatively high (Appendix, Figure 1). Economic growth was more stable in the Nordic states. Norway and Finland registered growth rates exceeding 6% and 8%, respectively, in 2007, and despite the 2008–2009 global economic crisis, their recovery was rapid. Norway consistently remained stronger, owing to its energy resources. After 2010, economic growth trends were more subdued. Denmark, Sweden, and Finland oscillated between 2–5%, while Norway benefited from sustained energy demand. In 2020, the declines were less pronounced than in other regions, and in 2021–2022, Norway recorded explosive growth (24.2% and 33.8%), fuelled by energy

exports. In 2023, a sharp decline followed (-11%), representing a correction of the previous boom (Appendix, Figure 2). Anglo-Saxon economies exhibited pronounced cyclicality, with sharp downturns and rapid recoveries, supported by structural flexibility and substantial fiscal and monetary stimuli. By contrast, Nordic economies were distinguished by a more stable, yet vigorous dynamic, underpinned by fiscal prudence, a competitive export base, and institutional resilience. The differences in the intensity of economic shocks and the pace of recovery reflect distinct economic models; while Anglo-Saxon countries respond promptly to stimuli, Nordic states are better able to attenuate fluctuations through established protective measures and counter-cyclical policies. Concurrently, Norway's performance during the 2021–2022 period stands out as a significant anomaly, attributable to favourable conditions in the energy markets. The 2005–2023 period illustrates that both models can function effectively in crisis contexts, provided that economic policy ensures a balance between flexibility and stability.

Inflation remained within the 2–3.5% range in the Anglo-Saxon countries, in line with monetary targets (Mello, L. (ed.), 2008). The financial crisis caused a sharp drop in inflation, particularly in the United States, where a 2% deflationary period was even recorded in 2009. Between 2010 and 2019, inflation remained largely below the 2% threshold, reflecting a disinflationary regime supported by globalisation and modest wage growth. In 2020, inflation was subdued, reflecting the effects of the pandemic. In 2021, however, an intensification was observed, which reached values of 8% in the United Kingdom by 2022 (Appendix, Figure 3). The surge in inflation was driven by accumulated demand, supply chain bottlenecks, and exceptionally high energy prices (Bethmann, E., Hong, C., Jones, L., & Peterson; J., 2022). In 2023, inflation began to decline but remained above the historical average. In the Nordic countries, inflation is lower during the first part of the period. Between 2005 and 2008, inflation was moderate in these cases, not reaching 3%, while in 2009, declines or even deflationary pressures were recorded. From 2010 to 2019, inflation remained low, particularly in Sweden, where the use of negative interest rates became necessary (Andersson, F. & Jonung, L., 2020). In 2020, inflation remained low, but it rose rapidly in 2022 (exceeding 7% in all Nordic countries except Norway). Although inflation rates approached those of the Anglo-Saxon countries, the dynamic was slightly delayed. In 2023, inflation remained pronounced, although a sharp decrease

was noted in Denmark, attributable to declining energy prices (European Commission, 2024). We can observe how both groups of countries experienced a cyclical inflation pattern. The Anglo-Saxon economies were more exposed to external shocks and, consequently, registered higher volatility, whereas the Nordic economies had a lower level of inflation before the pandemic. Overall, the 2005–2023 period reflects a radical shift in the global inflationary paradigm. Anglo-Saxon countries faced inflationary pressures earlier and more intensely, while Nordic economies absorbed these shocks with greater prudence.

Prior to the onset of the 2008 financial crisis, interest rates were relatively high, supporting moderate economic growth. The financial crisis triggered a sharp decline in interest rates, bringing them close to zero, marking the beginning of a period of loose monetary policy (Cecchetti, S., 2008). In the 2010–2019 period, interest rates remained at low levels, with a tentative normalization attempt initiated by the United States and Canada starting in 2016 (Appendix 1, Figure 4). The COVID-19 pandemic once again drove interest rates to the lowest values recorded for the analysed period. However, in the 2022–2023 period, accelerated inflation led to a sharp increase in rates: over 5% in the United States and Canada, nearly 5% in the United Kingdom, and 4% in Australia. This radical change marks the transition to a new restrictive monetary cycle. The Nordic countries followed a similar path, with high rates before the crisis and sharp reductions between 2008–2010. Subsequently, interest rates were maintained at very low levels, and Sweden and Denmark applied negative interest rates between 2015 and 2020, as previously specified. The pandemic did not generate further reductions but consolidated the zero-interest rate regime (Appendix, Figure 5). Beginning in 2022, inflationary pressures forced a sharp reversal of interest rates in the Nordic economies as well, reaching values between 3.4% and 4.2% in 2023. Although both groups of countries followed similar directions in monetary policy, there were clear differences in the pace and magnitude of the adjustments. Anglo-Saxon economies adopted a more responsive and counter-cyclical approach, unlike the Nordic nations, particularly Sweden and Denmark, which were noted for a more conservative strategy (Turk, R.A., 2016). The United States and Canada began the normalization process earlier (starting in 2016), while most Nordic countries maintained interest rates near zero until 2021. However, the global inflationary wave ultimately imposed a convergence of monetary strategies.

4.2. Discussion regarding the financial market analysis

The graph depicting the dynamics of stock market index returns in the Anglo-Saxon countries (Appendix, Figure 6) exhibits values averaging near zero, which is typical for high-frequency financial time series. However, clear episodes of heightened volatility are evident, the most notable of which occurred in March 2020, when the COVID-19 pandemic triggered a global health crisis and widespread stock market panic. This event is illustrated in the graph by major spikes, both negative and positive, in some cases exceeding daily fluctuations of ±10%. The S&P 500 and TSX indices, representing the North American markets, are distinguished by a more pronounced amplitude of these oscillations, indicating a more aggressive investor response in this region, as well as greater liquidity that permits such abrupt movements. The FTSE 100 and ASX 500, in contrast, appear slightly more temperate, although they follow the same general trajectory, confirming the high level of global market interconnection. In the years following the health crisis, particularly in 2021, a significant reduction in daily volatility is observed, a sign of gradual recovery and consolidated market confidence, driven by the resumption of economic growth and monetary stimuli. However, the 2022–2023 period brings back heightened volatility, generated by factors such as persistent inflation, the accelerated increase in monetary policy interest rates, the war in Ukraine, and uncertainties regarding the global economic trajectory. Daily returns during this period are, nevertheless, better anchored and less extreme than those of 2020, which may indicate investor adaptation and acquired wisdom in risk management. The comparison of the four indices reveals that the American markets, represented by the S&P 500, are more volatile but also more reactive, whereas the British and Australian markets are more conservative, likely due to their sectoral structure and local investment culture. The TSX, with its significant component of companies from the resources sector, exhibits volatility influenced by the dynamics of oil and metal prices, which partly explains the larger movements observed. Daily returns become an indirect indicator of investor sentiment and the degree of financial stress existing at a given moment. The emerging conclusion is that, despite geographical diversification, correlations between major stock exchanges remain high during crisis periods, which limits the effectiveness of diversification at such times. Concurrently, it is confirmed that volatility is not merely an expression

of uncertainty, but also of the markets' adaptability in the face of rapid changes in the economic environment.

We will further analyse the evolution of daily returns for the main stock market indices in the Nordic countries, specifically the OMX Stockholm, OMX Copenhagen 25, Oslo OBX, and OMX Helsinki 25, during the period from the beginning of 2017 to the beginning of 2024. These indices are relevant for understanding investment behaviour in developed economies, albeit on a smaller scale compared to the major global financial centres (Appendix, Figure 7). The evolution of daily returns is centred, much like the Anglo-Saxon ones, around the zero value, which is typical for mature markets in the absence of external shocks. However, the graph highlights several episodes of accentuated volatility, particularly during the March-April 2020 period, when markets reacted violently to the onset of the COVID-19 pandemic. This global health crisis was felt simultaneously across all four Nordic markets, which recorded daily drops exceeding 10%, followed by rapid recoveries. The volatility was widespread, indicating a high correlation between these exchanges during moments of systemic stress. In fact, the entire 2020–2021 period was characterised by higher-than-average fluctuations, reflecting economic uncertainty and unprecedented monetary interventions. Subsequently, the markets appear to have returned to a more subdued volatility regime, though not to pre-pandemic levels, a sign that investors remained cautious in the face of persistent risks. The 2022–2023 period brought new episodes of agitation, driven by the resurgence of inflation, successive interest rate hikes, and the conflict in Ukraine. Daily returns again became more dispersed, particularly for the OMX Copenhagen 25, which registered some more extreme isolated variations, possibly reflecting specific news related to large listed companies or changes in liquidity. The OMX Helsinki 25, represented by a more pronounced visual density, seems to have a relatively lower and more constant volatility, suggesting either a more balanced sectoral structure or reduced participation from international investors. The Oslo OBX, as an index for a market where the energy sector holds a significant weight, might be particularly influenced by oil and natural gas price developments, but in this graph, it largely aligns with the other Nordic indices. Towards the end of the analysed period, namely in 2023–2024, new negative spikes appear among the daily returns, which may signal the resurgence of systemic risks or reactions to political, macroeconomic, or geopolitical decisions. According to these

observations, Nordic markets are not isolated from global dynamics and, although they may possess their own characteristics of stability, they react synchronously to international shocks. This limits the benefits of diversification within the Nordic region during crisis periods. Concurrently, the analysis highlights that daily returns can offer a detailed perspective on the degree of market stress and uncertainty, and the presence of common patterns among exchanges indicates an increasingly strong financial interdependence. In conclusion, the graph reflects a common behaviour of Nordic capital markets in the face of major risks, a gradual return to post-pandemic normality, but also the persistence of accentuated volatility episodes, which underscores the need for careful risk management and broader global diversification in investment strategies.

In Figure 8 (in the Appendix), we remark an increased volatility in March 2020 (the COVID-19 crisis). All indices registered significant volatility peaks in the first quarter of 2020. The S&P 500 and ASX 500 experienced the most pronounced increases, with values exceeding 16%, an indication of the global panic in financial markets. This peak is consistent with the onset of the pandemic and the market crash. We also note resurgences of volatility at various moments (e.g., in 2022), possibly linked to: the war in Ukraine, high inflation and rising interest rates, and other geopolitical tensions. The results denote a pronounced volatility for the S&P 500 index, perhaps reflecting a greater sensitivity of the US market to economic and geopolitical news.

Figure 9 (in the Appendix) is dedicated to the volatility of indices from the Nordic countries. We continue to observe an abrupt peak in volatility in Q1 2020, caused by the COVID-19 pandemic. The maximum level reached is around 8%, similar to other global markets. Furthermore, a synchronised response of these Nordic exchanges to the global shock is observed. After the initial shock, volatilities decrease rapidly and stabilise between 0.5% and 2%, indicating reduced post-pandemic volatility. An interesting observation is the distinct trajectory we remark for the OMX Copenhagen 25. From late 2022 through 2023–2024, the OMX Copenhagen 25 exhibits recurrent episodes of increased volatility, some exceeding 12%. These spikes are not visible in the other indices and could reflect increased sensitivity to local shocks (e.g., the pharmaceutical sector, green energy), speculative movements, or significant corporate news within major Danish companies.

5. Conclusions

The analysis conducted highlights systematic differences between the Anglo-Saxon and Nordic economies, both from a macroeconomic perspective and regarding the behaviour of financial markets. During the 2005–2023 period, the Anglo-Saxon countries followed a model characterized by high structural flexibility, rapid responses to economic shocks, and expansionary fiscal and monetary policies. This model allowed for vigorous economic recoveries, but it also accentuated the volatility of economic cycles, inflation, and financial markets. In contrast, the Nordic economies demonstrated superior resilience, supported by fiscal prudence, solid institutions, and effective counter-cyclical measures, which permitted an attenuation of fluctuations and greater long-term stability.

Throughout major crises, such as the 2008–2009 financial crisis and the 2020 pandemic, the Nordic countries managed to avoid extreme deteriorations in macroeconomic indicators, and their economic recovery was often more balanced. However, post-pandemic dynamics exposed the limits of Nordic conservatism, particularly regarding the lag in monetary adjustments. At the same time, the extreme volatility of stock markets in the Anglo-Saxon countries, reflected in the amplitude of daily returns and episodes of financial stress, was coupled with a more rapid adaptability of investors to new market conditions. This volatility, although risky, can also be interpreted as an expression of the market's capacity to rapidly integrate information and react to uncertainties. In the case of Nordic countries, capital markets proved more stable during normal periods but reacted synchronously with international markets during times of crisis, which limits the effectiveness of diversification within the region.

The relevance of these results lies in highlighting two functional economic models that are, however, profoundly different in their approach to risk and public policy. The Anglo-Saxon model favours flexibility and rapid intervention, whereas the Nordic model relies on structural stability and gradual adjustments. Both models have demonstrated their effectiveness in crisis contexts, but with different trade-offs between speed of adaptation and the degree of volatility. Furthermore, the results have significant implications for economic policy formulation: in periods of global uncertainty, the mix of proactive counter-cyclical policies and institutional stability becomes essential for maintaining economic sustainability.

However, the analysis also presents certain limitations. The analysed period, although extensive, does not cover the long-term effects of new emerging global shocks, such as the energy transition, geopolitical shifts, or accelerated digitalisation. Lastly, financial markets are also affected by behavioural factors, which are difficult to quantify in a purely descriptive analysis.

In conclusion, the findings of this research contribute to the understanding of the differences in resilience and shock response among advanced economies, offering a useful framework for reflection on economic policies and investment strategies. They suggest that there is no single successful model, but rather a need for continuous adaptation, a balance between flexibility and stability, and institutional learning in the face of global challenges.

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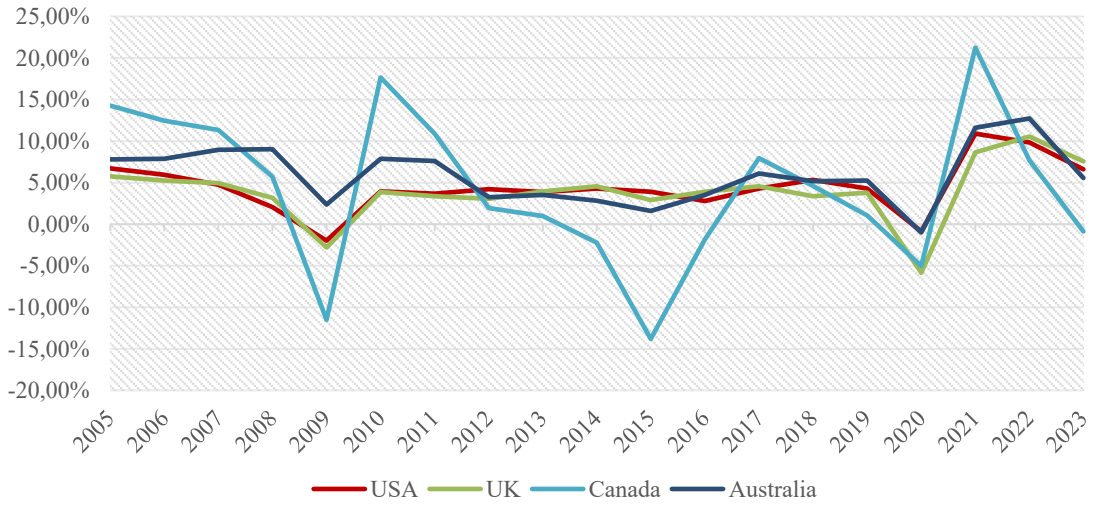
APPENDIX

Figure 1

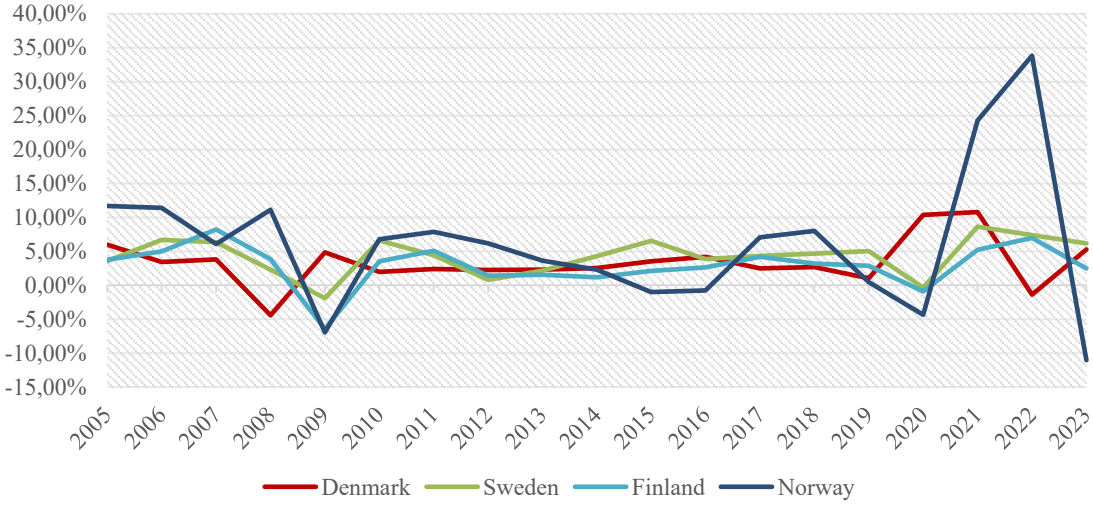
Dynamics of Economic Growth in Anglo-Saxon Countries (2005-2023)



Source: Authors' representation

Figure 2

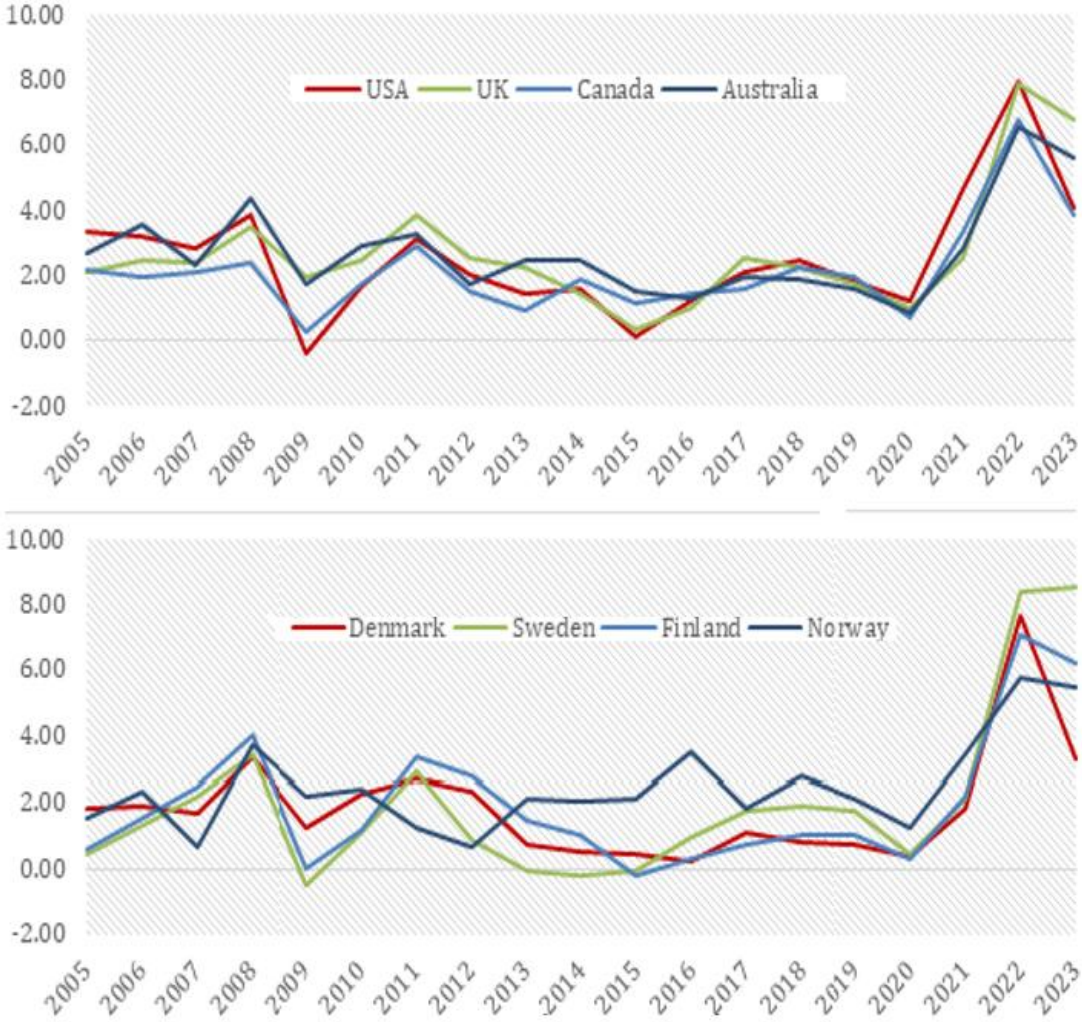
Dynamics of Economic Growth in Nordic Countries (2005-2023)



Source: Authors' representation

Figure 3

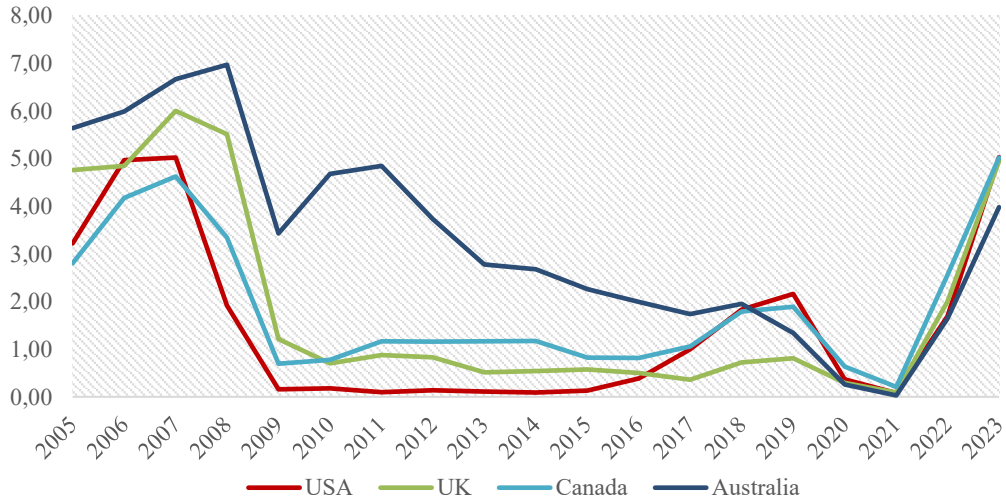
Evolution of the Inflation Rate in Anglo-Saxon and Nordic Countries (2005-2023)



Source: Authors' representation

Figure 4

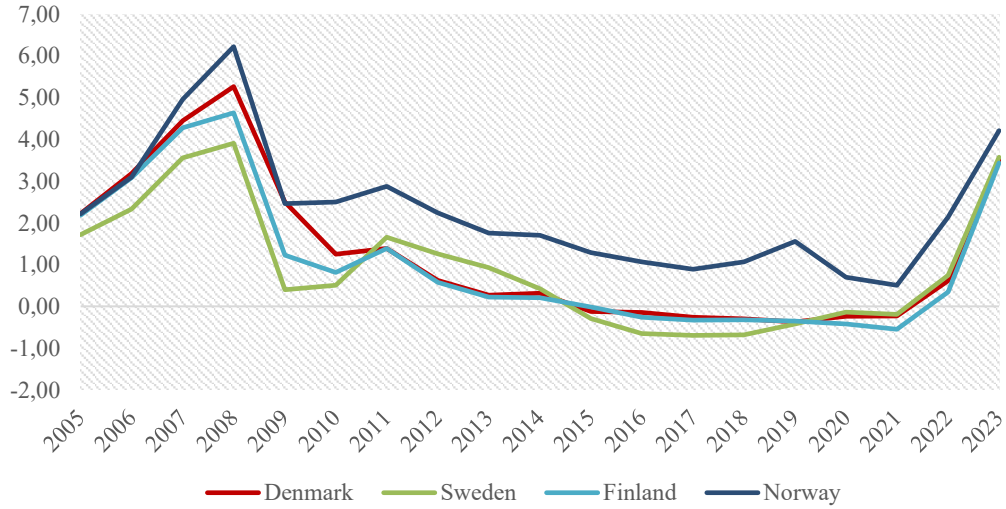
Evolution of the Reference Interest Rate in Anglo-Saxon Countries (2005-2023)



Source: Authors' representation

Figure 5

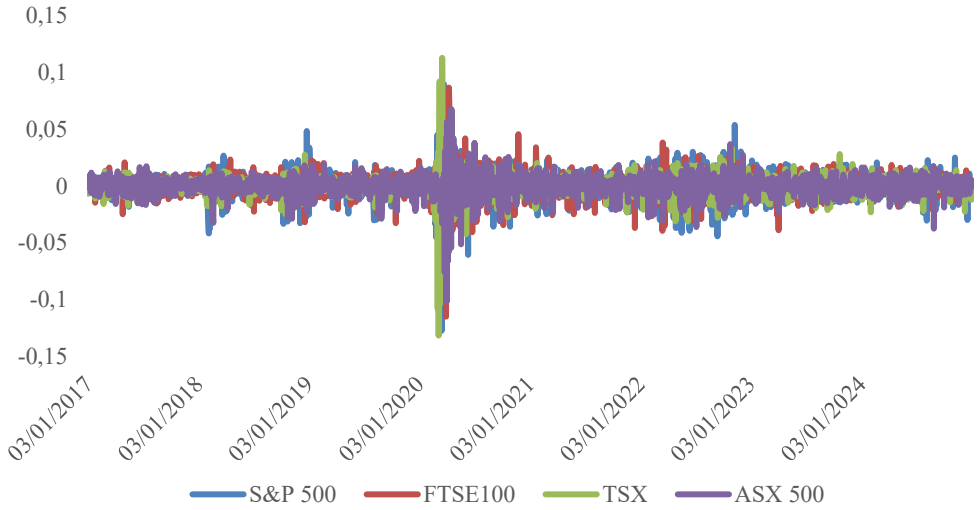
Evolution of the Reference Interest Rate in Nordic Countries (2005-2023)



Source: Authors' representation

Figure 6

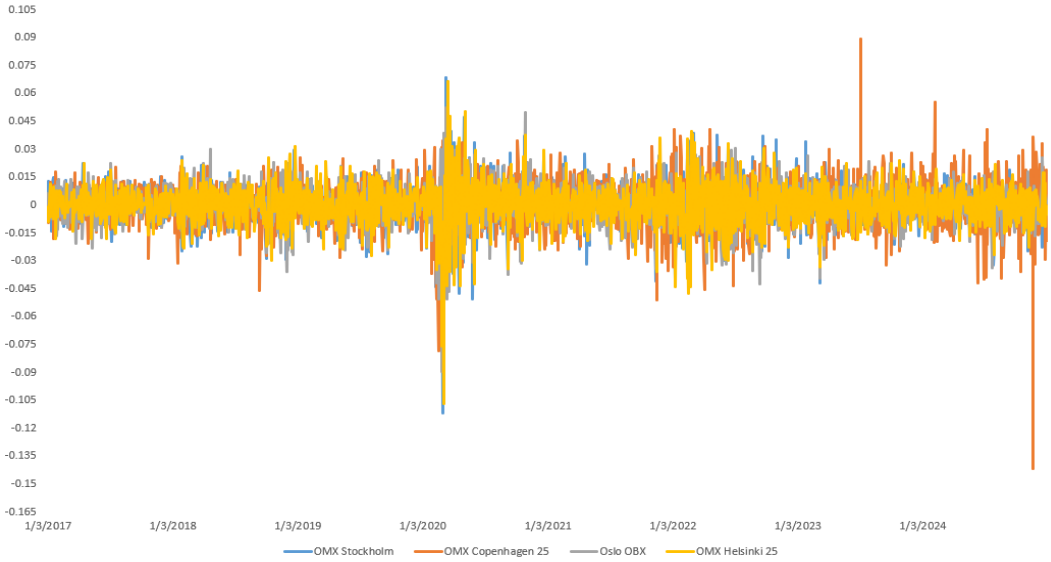
Dynamics of Stock Market Index Returns in Anglo-Saxon Countries (2017-2024)



Source: Authors' representation

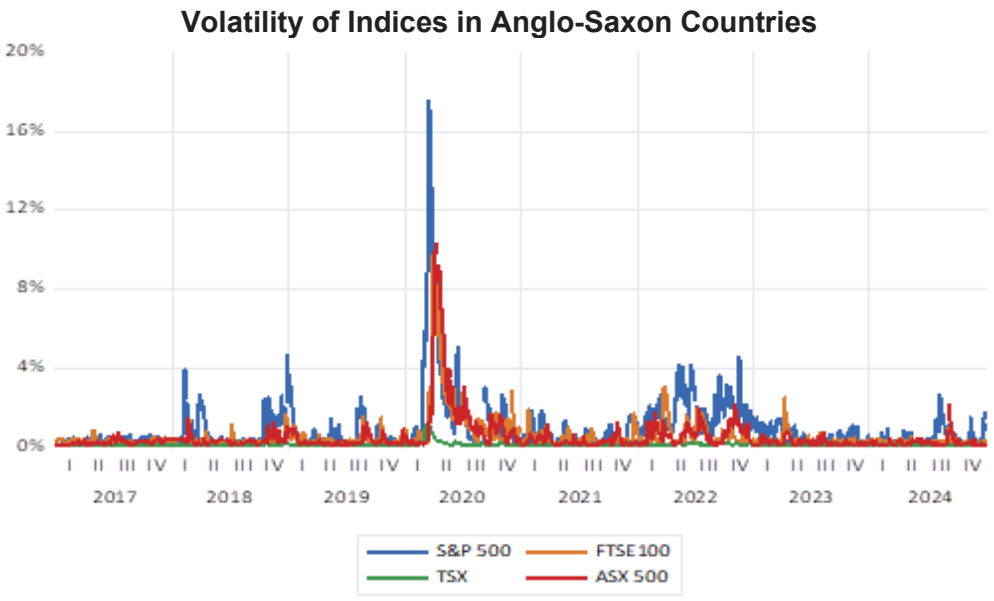
Figure 7

Dynamics of Stock Market Index Returns in Nordic Countries (2017-2024)



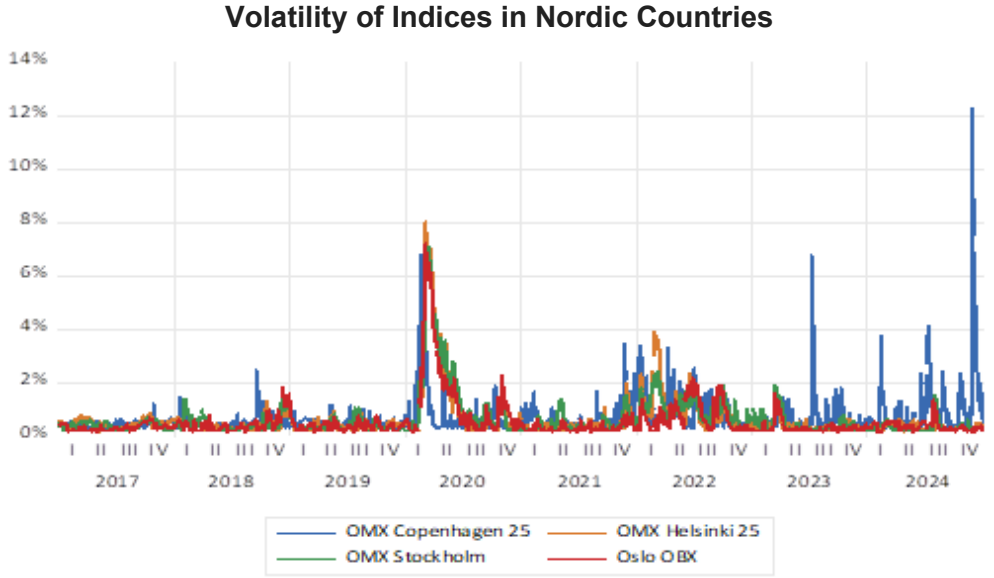
Source: Authors' representation

Figure 8



Source: Authors' representation

Figure 9



Source: Authors' representation

FINANCIAL RISK MANAGEMENT IN THE FISCAL POLICY OF THE REPUBLIC OF MOLDOVA: CHALLENGES AND DIRECTIONS FOR TRANSFORMATION

Mariana PRUTEANU, PhD Candidate*

Abstract

Financial risk management is increasingly central to fiscal policy in volatile and highly open economies. This paper assesses the fiscal risk management system of the Republic of Moldova using a SWOT framework complemented by a TOWS strategy matrix (SO, ST, WO, WT). The analysis relies on institutional and regulatory documents and selected international assessments to map strengths, weaknesses and external pressures affecting fiscal sustainability. The findings indicate four practical directions: embedding risk assessment in budget planning, strengthening analytical capacity for scenario and sensitivity work, expanding digital fiscal monitoring tools, and formalising cooperation with international partners. The paper concludes that these steps can improve the coherence of fiscal risk governance and support Moldova's fiscal sustainability agenda in the context of EU-related commitments.

Keywords: fiscal sustainability, strategic risk assessment, fiscal governance, public finance management, macroeconomic vulnerability

JEL Classification: G17, G18, G32, H21

DOI: https://doi.org/10.65672/fs.2026.1.5

1. Introduction

In recent years, the concept of public finance sustainability has undergone profound transformations, driven by the increasing volatility of the macroeconomic environment, persistent uncertainties in global markets and the increasing pressures on national budgets. In this context, the management of financial risks in the field of budgetary and fiscal relations is gaining strategic importance, especially in transition

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economies, where constraints related to financial resources, human capital and technological infrastructure increase the exposure of the system to external economic and geopolitical shocks.

In the Republic of Moldova, financial risks in the field of budgetary and fiscal relations are addressed fragmentarily and without a clear methodological integration into the budgetary reform processes. Although relevant strategic initiatives have been launched, such as the Public Finance Management Strategy for the period 2023-2030, the existing approaches are still predominantly oriented towards short-term budgetary balancing, without the consistent integration of tools for identifying, assessing and monitoring structural financial risks. The dimension of financial risks in budgetary-fiscal relations is in a gradual process of consolidation, reflecting both the internal pace of reforms and the influence of commitments undertaken in the context of the European path of the Republic of Moldova and the framework of cooperation with international partners. All this highlights the high vulnerability of the budgetary-fiscal system to internal socio-economic and political instability and regional volatility.

The system of budgetary-fiscal relations involves a variety of factors that influence the efficiency of financial risk management, and their identification and systematisation are a necessary step, both from a theoretical and applied perspective. For this purpose, the use of structured analytical tools becomes justified, and the SWOT analysis provides an adequate framework for assessing the current situation and outlining strategic directions of intervention. Applying this approach in the context of public finances of the Republic of Moldova allows for the identification of unobserved institutional reserves, points of vulnerability and their correlation with external trends – both in relation to exogenous factors, such as the requirements formulated by international financial institutions, and to the structural volatility of public revenues collected.

The purpose of the research is to apply the SWOT analysis to the financial risk management system in the field of budgetary and fiscal relations in the Republic of Moldova, with the objective of substantiating a typology of strategic options (TOWS model) aimed at strengthening fiscal sustainability. The study examines both the internal dimensions of the institutional and regulatory framework, as well as relevant external influences on the quality of the decision-making process in matters of fiscal risk. The paper specifically examines the potential for adapting international good practices –

including the standards of the IMF Fiscal Transparency Code, Public Expenditure and Financial Accountability (PEFA) approaches and fiscal resilience testing tools – to the administrative and economic specificities of the Republic of Moldova.

This paper contributes to a better understanding of financial risk management in the fiscal policy of the Republic of Moldova by proposing an integrated analytical perspective that combines documentary evidence, institutional analysis and the SWOT–TOWS framework. On this basis, the study not only identifies the main structural vulnerabilities and institutional constraints affecting fiscal risk governance, but also formulates strategic directions adapted to the national budgetary and financial context. At the same time, the analysis places these directions within the broader process of administrative modernisation and European integration, emphasising the role of institutional coordination, procedural consistency and the gradual alignment with relevant international practices.

2. Research methodology

The methodology used in this paper combines qualitative analysis with strategic analysis tools, with the aim of assessing how financial risk management mechanisms can be adapted to the institutional specifics of the Republic of Moldova. The basic tool of the analysis is the application of the SWOT method (Strengths, Weaknesses, Opportunities, Threats), which allows the identification and interpretation of internal and external factors with an impact on the functioning of the risk management system in the field of budgetary and fiscal policy.

To structure the conclusions resulting from the SWOT analysis, the TOWS strategic matrix (Weihrich, 1982) was applied, this method being frequently applied to correlate the internal elements of the system (strengths and weaknesses) with the exogenous factors (opportunities and threats). This method contributes not only to a coherent and systemic assessment of the current state but also to the substantiation of strategic action directions at the institutional and normative level.

The analysis is based on the study of reference, theoretical and analytical literature, covering institutional economics, fiscal risk theory, public finance management and international experience in fiscal sustainability. The empirical research includes relevant sources and

documents, which include institutional reports and public data on the budgetary and fiscal policy of the Republic of Moldova, strategic documents, in particular the Public Finance Management Strategy for the period 2023-2030 and the Law on Public Finance (2014, as amended) and reports of international organizations - PEFA Moldova Assessment (2022), IMF Article IV Consultation Report (IMF, 2023), as well as methodological recommendations from the IMF Fiscal Transparency Code (IMF, 2019) and the PEFA Supplementary Framework for Fiscal Risks. Similarly, the fiscal resilience testing practices applied by the IMF to assess the sensitivity of the fiscal system to macroeconomic and institutional shocks were analysed.

The structure of the analysis aims to correlate the theoretical framework with the institutional particularities of the Republic of Moldova in the field of financial risk management. In this context, the possibilities of adapting international financial risk management instruments to the institutional and functional framework of the Ministry of Finance of the Republic of Moldova, the Court of Accounts and local public administration authorities are examined, with an emphasis on their compatibility with existing norms, processes and institutional capacities.

Thus, the methodological framework used combines qualitative analysis of documentary sources with strategic SWOT analysis, theoretically based on the works of Weihrich (1982) and Dyson (2004). The SWOT method is considered representative and based on consistent data and information sources, which support decision-makers in formulating financial strategies and public policies.

The selection of data for the SWOT analysis was carried out through a systematic process of information triangulation, based on the information base mentioned above. Within this methodology, the SWOT analysis was used as a synthesis tool to integrate the results from multiple sources, and the TOWS matrix allowed the correlation between internal and external factors in order to formulate strategic directions for strengthening the financial risk management system. Therefore, this approach provides an integrated and comparable picture of fiscal risks, based on official sources, scientific literature and validated empirical observations.

The analytical procedure draws on documentary and empirical material relevant to fiscal risk governance in the Republic of Moldova. The analysis integrates strategic documents, legal acts, macro-fiscal reports and methodological frameworks applied by national authorities

and international organizations, with particular attention to the institutional, regulatory and operational aspects that influence the public sector's capacity to identify, assess, monitor and respond to fiscal risks.

The distinction between internal and external factors followed their relevance for the functioning of fiscal risk governance. Internal factors were examined in relation to institutional capacity, administrative coordination and analytical consistency, which made it possible to distinguish between strengths and weaknesses within the existing fiscal risk management framework. External factors were considered in light of the broader fiscal and institutional environment, allowing the identification of opportunities associated with reform support, access to expertise and methodological transfer, as well as threats related to volatility, uncertainty and external pressures on public finances.

On this basis, the TOWS matrix supported the formulation of strategic options derived from the interaction between the factors retained in the SWOT analysis. SO strategies reflect situations in which existing institutional resources may be used to take advantage of favourable external developments, while ST strategies highlight the role of internal strengths in limiting the effects of external pressures. WO strategies point to the possibility of reducing internal weaknesses through external support, standards or reform opportunities, whereas WT strategies express a more defensive orientation, aimed at reducing the combined effect of structural weaknesses and adverse external conditions. Only those strategic directions for which a clear analytical connection could be identified between the relevant SWOT factors were retained in the final matrix.

3. Theoretical and contextual considerations

In the literature, financial risk management and fiscal sustainability are treated as essential dimensions of fiscal policy, analysed at both the conceptual and applied levels. Reference studies emphasise the role of these policies in maintaining macroeconomic stability and reducing institutional vulnerabilities, especially in transition economies.

From a theoretical perspective, the analysis of fiscal and budgetary policy requires an integrated view of public finance mechanisms, fiscal sustainability and institutional vulnerability. In the

literature, fiscal policy is examined through budgetary balance, the capacity to absorb shocks, the containment of contingent liabilities and the continuity of public finance functions over time. This broader perspective supports the connection between fiscal policy design and the logic of financial risk management.

Studies on fiscal sustainability and public finance governance underline the importance of coherent institutions, transparent procedures and anticipatory risk assessment (Dinga, 2016; Criclivaia & Brumă, 2015; Câmpeanu et al., 2012). Fiscal sustainability is understood in terms of long-term consistency between public revenues, expenditures and financing capacity (Dinga, 2016), while fiscal risk is shaped by both internal and external determinants, which calls for a multidimensional analytical approach (Criclivaia & Brumă, 2015). At the same time, the functioning of budgetary-fiscal mechanisms needs to be examined in relation to institutional and macroeconomic constraints (Câmpeanu et al., 2012).

From an applied perspective, recent research points to the need to strengthen risk control and internal monitoring mechanisms. Risk management and internal control can be understood as organizational functions that support the administration of public finances (Cara, 2023). Taken together, these contributions support the use of a SWOT-based assessment in the present study, as this approach connects the theoretical discussion on fiscal sustainability with the practical diagnosis of institutional strengths, weaknesses, opportunities and threats.

In this context, the analysis of budgetary-fiscal relations in the Republic of Moldova from the perspective of financial risks highlights three interdependent factors that influence the coherence and efficiency of the management process.

The first factor highlights the increasing dependence on external financing, which determines a heightened exposure to risks generated by the instability of international lending conditions and variations in donor policies.

Another important factor concerns the fragmented nature of risk identification and response tools, in the context of the existence of strategic documents such as the Public Finance Management Strategy for the period 2023–2030, which are not accompanied by clearly defined institutional mechanisms.

Likewise, the amplification of pressures on budgetary-fiscal relations associated with the instability of budgetary priorities,

inflationary developments and the formulation of spending policies unsupported by appropriate risk analyses will be taken into account.

At the same time, international recommendations – including the IMF Fiscal Transparency Code (IMF, 2019) and the PEFA framework – highlight the importance of periodically assessing financial risks and integrating them into the institutional framework of the budget planning process.

4. Research results

Analysis of budgetary-fiscal relations from the perspective of financial risks

The SWOT framework was developed based on the analytical procedure outlined above, focusing on factors that emerged repeatedly and proved relevant to fiscal risk governance in the Republic of Moldova. The resulting configuration reflects the interaction between internal institutional features and the broader environment in which fiscal policy is formulated and implemented. The selected factors, therefore, capture recurring patterns identified across strategic, regulatory and macro-fiscal sources.

Their differentiation followed two main considerations: functional relevance for fiscal risk management and strategic significance for future policy adaptation. Institutional infrastructure, legal provisions and accumulated experience in fiscal administration were considered strengths insofar as they supported coordination and continuity in risk governance. Fragmented procedures, limited analytical integration, and insufficient standardisation were considered weaknesses because they reduced the coherence of the existing framework.

The external environment was assessed from the same analytical perspective. International methodological standards, technical assistance and digital modernisation trends were considered opportunities, as they create favourable conditions for improving fiscal risk management capacities. Macroeconomic volatility, dependence on external financing and regional instability were considered threats because they increase fiscal exposure and affect the predictability of the decision-making environment. This distinction supports the transition from SWOT diagnosis to the formulation of TOWS-based strategic options.

The SWOT analysis shows that the current framework of financial risk management in the fiscal policy of the Republic of Moldova combines certain institutional strengths with a number of persistent structural vulnerabilities. The existence of a basic legal framework, accumulated experience in fiscal administration and the use of strategic planning instruments provide a starting point for more coordinated action. At the same time, this framework remains affected by fragmented procedures, limited methodological integration and the weak incorporation of fiscal risk assessment into routine budgetary processes.

The main weaknesses identified by the analysis are linked to the institutional architecture of fiscal risk governance. Responsibilities for identifying, assessing and monitoring fiscal risks remain distributed across several public bodies, without a sufficiently standardised basis for coordination, comparability of assessments and aggregation of results. This situation affects the continuity of information flows, reduces the visibility of interdependent risks and limits the capacity for preventive response. In this context, institutional fragmentation, weak analytical standardisation, and limited procedural integration appear to be central weaknesses of the existing system.

The external environment also plays an important role in shaping fiscal risk management. Access to international expertise, technical assistance and contemporary standards of fiscal transparency creates favourable conditions for institutional learning and gradual reform. At the same time, regional instability, macroeconomic uncertainty and the sensitivity of public finances to external financing conditions increase exposure to adverse shocks. From this perspective, reform support and methodological transfer emerge as relevant opportunities, whereas volatility, uncertainty and externally driven fiscal pressures define the main threats.

In this complex dynamic, characterised by external influences with varied effects on institutional capacity, the interaction between the internal features of the system and external factors was the basis for the application of the TOWS strategic matrix. This approach allowed the structuring of four strategic directions for financial risk management in the field of budgetary-fiscal relations of the Republic of Moldova.

Starting from the structure of the four strategic directions identified using the TOWS matrix, the article further analyses the content of each group, relating it both to the institutional peculiarities of

the Republic of Moldova and to the requirements of the international framework of good practices in public finance.

The results of the SWOT analysis reflect the current state of the financial risk management system in the field of budgetary and fiscal relations in Moldova, including its institutional structure, regulatory framework, digital infrastructure and external dependencies. It highlights both the internal characteristics (strengths and weaknesses) and the impact of the external environment (opportunities and threats), which have a determining effect on the sustainability of fiscal policy. In order to provide a synthetic presentation and facilitate the interpretation of the results, the main findings are systematised in Table 1.

Table 1

SWOT analysis of the financial risk management system in the fiscal policy of the Republic of Moldova

Strengths	Opportunities
• Fiscal regulation, budget discipline • Public finance strategy, sustainability • Electronic budget execution systems • International partnerships for fiscal reforms • Public fiscal indicators and transparency	• International standardisation, fiscal transparency • Institutionalisation of fiscal risk analysis • IT infrastructure, digital solutions • Technical assistance to international partners • Civic interest in budgetary transparency
Weaknesses	**Threats**
• Lack of an independent fiscal body for risk assessment • Incomplete framework for assessing fiscal risks in budget planning • Insufficient transparency on contingent liabilities and government guarantees • Limited inter-institutional coordination in managing fiscal risks • Low analytical capacity and insufficient digital integration in scenario modelling	• Slow pace of reform implementation, associated with political instability and governance fragmentation • Increasing social obligations and fiscal guidelines with an impact on budgetary sustainability • Significant exposure to external financing from highly volatile sources • Geopolitical instability and energy risks with the potential to affect budgetary balances • Structural skills deficit in fiscal and digital analysis

Source: developed by the author based on Dinga (201), Criclivaia & Brumă (2015) Cara (2023), the Public Finance Management Strategy 2023–2030, the Law on Public Finance and Budgetary-Fiscal Responsibility, PEFA assessment materials, and relevant IMF and Ministry of Finance documents used in the analysis.

The factors summarized in Table 1 also support the formulation of TOWS-based strategic options. Their combination allows the analysis to move from diagnosis to strategic interpretation by relating

internal strengths and weaknesses to external opportunities and threats. In this context, SO strategies highlight the use of existing institutional resources in connection with favourable external developments, while ST strategies show how internal strengths may help limit the effects of external pressures. WO strategies indicate the possibility of addressing internal weaknesses through external support, reform opportunities and methodological transfer, whereas WT strategies reflect a defensive orientation focused on reducing fiscal exposure in a context of institutional fragility and external instability.

Thus, the analysis reveals the existence of a fiscal regulatory framework that incorporates budgetary discipline mechanisms, including the establishment of limits for the budget deficit and public debt. The national public finance management strategy provides explicit directions for strengthening fiscal sustainability. The implementation of electronic systems for budget execution and treasury accounting increases the transparency and traceability of public financial operations. The Republic of Moldova's collaboration with the European Union and international financial institutions (IMF and other international partners) contributes to promoting structural reforms and strengthening institutional capacity, by harmonizing the economic and fiscal framework with international and European standards. At the same time, the publication of fiscal indicators on specialized official platforms increases transparency and access to relevant information, facilitating the assessment and monitoring of public finance performance.

The strengths identified above and presented in Table 1 can be capitalized on by exploiting the opportunities offered by the international context and domestic developments, which can contribute to strengthening the sustainability and resilience of the financial risk management system. In this regard, the process of harmonization with European Union practices creates premises for the implementation of international standards, such as the IMF Fiscal Transparency Code and the PEFA methodology. Collaboration with international partners ensures access to technical and methodological assistance, supporting the strengthening of institutional capacities. Therefore, the development of IT infrastructure and digital solutions facilitates the automation of the processes of analysis and monitoring of fiscal indicators. There is also the possibility of institutionalizing risk analysis by creating a fiscal council or by introducing specialized scenario modelling platforms. The increased interest of civil society and the

media in budgetary transparency and the efficiency of public spending contributes to increasing the accountability of the authorities in managing public finances.

Although the identified strengths and opportunities provide favourable premises for strengthening the sustainability of fiscal policy, the analysis also reveals the existence of weaknesses that reflect structural and functional limitations of the system. Highlighting them is essential for understanding the internal constraints that may diminish the capacity to capitalize on existing advantages and the potential offered by the external context. Therefore, the analysis highlighted the absence of an independent fiscal council to fulfil the role of assessing fiscal forecasts and risks. Fiscal risk assessment procedures are insufficiently institutionalized within the medium-term budgetary planning process. Transparency regarding contingent liabilities, government guarantees and quasi-fiscal risks – especially in the public sector and at the subnational governance level – remains limited. There is also a low level of inter-institutional coordination in forecasting and risk management, as well as limited analytical resources within the Ministry of Finance, associated with a low degree of digital integration in scenario modelling processes.

The identification of weaknesses provides a comprehensive perspective on the internal limitations of the system. In addition to this assessment, the analysis highlights the presence of external threats that, by their characteristics and magnitude, may accentuate existing vulnerabilities and negatively influence the capacity to effectively manage financial risks in the field of budgetary and fiscal relations. In this context, the analysis reveals a significant exposure of the budget to external financing, including sources with a high degree of volatility, such as grants and loans.

The unstable geopolitical context in the region, marked by the conflict in Ukraine and the associated energy risks, generates pressures on budgetary balances and on the predictability of public revenues and expenditures. The increase in social obligations, together with fiscal measures that affect budgetary sustainability, amplifies the risks to the balance of public finances. At the same time, there is an increasing deficit of skills in the field of fiscal analysis and digital analysis, which may limit the institutional capacity to manage risks. At the same time, the slow pace of reform implementation, associated with institutional and organisational constraints, may diminish the efficiency of the process of modernising the fiscal system.

Matrix of fiscal risk management strategies in the Republic of Moldova

Thus, we can conclude that the fiscal risk management system in the system of budgetary and fiscal relations in the Republic of Moldova is characterised by several discrepancies: between the regulatory framework and institutional practices, between strategic objectives and available resources, as well as between the requirements of international partners and internal administrative constraints. In order to formulate potential directions for institutional and procedural renewal, a strategic typological approach based on the TOWS matrix methodology was applied. This tool provides not only a systematic representation of the current situation, but also the possibility of identifying combinations of strengths, weaknesses, opportunities and threats, which can form the basis for formulating viable transformation strategies (see Figure 1).

Figure 1

Typology of strategies according to the TOWS matrix

		External factors	
		Opportunities (O)	**Threats (T)**
Internal factors	**Strengths (S)**	**SO** – Leveraging strengths to exploit external opportunities	**ST** – Using strengths to reduce the impact of external threats
	Weaknesses (W)	**WO** – Using opportunities to overcome weaknesses	**WT** – Reducing internal vulnerabilities and external risks

Source: developed by the author

The matrix highlights correlations between internal and external factors, providing a coherent framework for formulating financial risk management strategies in budgetary and fiscal relations. Its content reflects the adaptation of the TOWS approach to the specifics of the

Republic of Moldova and compliance with international standards in the field of public finance, facilitating the identification of viable strategic options.

The formulated strategies are structured into four categories, which allowed the identification of reform directions of both proactive and compensatory nature.

1) **SO strategies: Strengthening capacities by developing opportunities**

The Republic of Moldova has a set of internal capacities that can be used to deepen financial risk management mechanisms in the field of budgetary and fiscal relations. A central element is the existence of a medium- and long-term strategic document – *the Public Finance Management Strategy for the period 2023–2030*, approved by the Ministry of Finance, which provides for strengthening budgetary transparency, integrating digital solutions and improving fiscal accountability mechanisms. Also, operational information platforms (budget.gov.md, https://mtender.md/, trez.mf.gov.md) ensure public access to the main parameters of the budgetary process, representing a solid technological basis for the analysis and operational monitoring of budget execution.

In this context, opportunities are emerging for the implementation of modern international standards for financial risk management in the field of budgetary and fiscal relations, in particular in line with *the* Fiscal Transparency Code (IMF, 2019) and the Fiscal Risk Assessment Tool (FRAT) (IMF, 2022). A major issue is the adaptation of these standards to the current stage of development of the medium-term budgetary planning system (MTEF), within which elements of scenario analysis and assessment of macroeconomic assumptions are already integrated.

Given the combination of the aforementioned factors, the following institutional transformation directions can be considered proactive budgetary surveillance strategies that aim to integrate the following institutional transformation directions:

- Strengthening the regulatory framework regarding the integration of financial risk analysis in the field of budgetary and fiscal relations in budgetary planning documents, including forecasts, budgetary frameworks and explanatory notes to budget projects;

- Expand the functionality of electronic platforms by developing additional modules to provide information on probabilistic scenarios, shocks and budget sensitivity analyses;
- Develop internal methodologies for assessing and monitoring financial risks in the field of budgetary and fiscal relations, taking into account the recommendations of international organizations and adapting successful practices from the region, in particular in terms of integrating risk analysis into multi-annual budgetary planning, institutionalizing the functions of independent fiscal councils and using digital platforms for budgetary transparency (e.g. Estonia, Latvia, Lithuania, Poland, Romania);
- Strengthen cooperation with international donors (IMF, EU4PFM, World Bank) to support institutional development, digitalisation of processes and capacity building of human resources.

These strategic milestones represent an opportunity to strengthen institutional capacity by leveraging existing resources, without requiring fundamental changes to the organisational architecture. At the same time, the presence of external threats – such as macroeconomic instability, fiscal pressure and geopolitical risks – requires the analysis of adaptation strategies aimed at reducing the vulnerability of the system. These elements will be detailed in the next section, dedicated to ST strategies, presented below.

2) ST strategies: Managing threats by leveraging existing institutional tools

The analysis of the external environment of the fiscal-budgetary policy constitutes a systematic approach to assess the economic, social, geopolitical and institutional factors outside the national fiscal framework, which are likely to directly or indirectly influence its formulation, implementation and sustainability. In the case of the Republic of Moldova, this analysis reveals the existence of a significant set of exogenous threats that exert pressure on the balance of public finances. These include macroeconomic volatility generated by regional crises – including the military conflict in Ukraine and the instability of energy supply – as well as internal factors, such as inflationary pressures, the increase in socially sensitive spending and the possible erosion of budgetary discipline in the context of political cycles. These risks are recorded in the conclusions of the IMF Article IV consultation (IMF, 2023) and in the PEFA Moldova report (PEFA,

2022), which highlight the insufficiency of the strengthened mechanisms for analysing the fiscal impact of emergency spending.

At the same time, the availability of functional digital tools – such as the Trezor.md platform, electronic public procurement systems and budget execution reporting mechanisms – together with the institutional experience gained in managing crisis situations during the COVID-19 pandemic, creates premises for developing strategies to counter external threats by adapting and capitalizing on existing solutions, without the need to establish additional structures. In this regard, within the ST approach, the following strategic directions of action can be advanced, which would have as a benchmark the strengthening of internal capacities to mitigate external risks and increase budgetary and fiscal resilience. In this case, it is important:

- Applying budgetary-fiscal stress tests according to the FRAT methodology (IMF, 2022), which is based on the development of probabilistic scenarios, modelling the budget's sensitivity to macroeconomic shocks and assessing the risks associated with state-owned enterprises, the banking sector and contingent liabilities;
- Strengthen public reporting on financial risks in the field of budgetary and fiscal relations and measures to mitigate them, including by introducing specific subsections in the explanatory notes to the budget and CFMTE, in accordance with the Fiscal Transparency Code (IMF, 2019);
- Establish standards for communicating fiscal risks to civil society, academia and other stakeholders, aimed at reducing the likelihood of pressure on decisions in the field of budgetary and fiscal relations in times of volatility and economic recession. PEFA Moldova (PEFA, 2022) emphasises the need to strengthen transparency and citizen participation in the budget debate process.

These measures can form the basis of the mechanism for adapting budgetary and fiscal policy to external risks, aimed at capitalising on existing instruments and integrating them into a coherent strategic management framework. At the same time, certain institutional limitations – such as reduced staff capacity and fragmentation of analytical functions – may require recourse to external support, which justifies the inclusion of WO strategies in the analysis process.

3) WO strategies: strengthening institutional capacities through external assistance mechanisms

Despite a well-defined regulatory framework and a functioning digital infrastructure, the financial risk management system in the field of budgetary and fiscal relations in the Republic of Moldova continues to present significant vulnerabilities generated by a number of internal constraints. These vulnerabilities include the absence of a specialized analytical structure within the Ministry of Finance responsible for the integrated monitoring and assessment of financial risks in the field of budgetary and fiscal relations, insufficient integration of the risk-based approach into the budget planning process, the predominantly formal nature of medium-term planning, and limited institutional capacity in critical areas such as modelling, forecasting, and simulation of crisis scenarios. The findings are documented in the PEFA Moldova Assessment (PEFA, 2022) and in the conclusions of the International Monetary Fund's Article IV consultation (IMF, 2023) and indicate the need for targeted external support aimed at strengthening institutional capacities and operationalising mechanisms for advanced fiscal risk analysis.

At the same time, Moldova has ample opportunities for institutional strengthening by attracting international assistance, both in the form of technical expertise and through donor support programs (EU4PFM and IMF capacity-building initiatives). Access to methodologies, practices and digital solutions tested in the EU and Eastern Partnership countries allows not only to compensate for existing deficiencies, but also to adapt the risk management system to international standards.

In this context, the following directions of action can be identified within the WO strategies:

- Establishing an independent budgetary-fiscal council, with a mandate to assess the credibility of budgetary forecasts and to prepare public reports on financial risks in the field of budgetary and fiscal relations. Such a practice is established in most European Union member states and corresponds to the recommendations of the International Monetary Fund on strengthening the transparency and sustainability of budgetary-fiscal policy.
- Adopting a unified methodology for identifying and classifying financial risks in the field of budgetary and fiscal relations, covering areas such as state-owned enterprises, the banking sector, climate

and demographic risks. The implementation of this direction can be achieved through the assistance of international organisations, taking as benchmarks the IMF Fiscal Transparency Code (IMF, 2019).

- Develop and integrate methodologies for estimating contingent liabilities into the medium-term budgetary framework. The practice of including these risks in the explanatory notes to the budget is already applied in some countries in the region and could be adapted to the context of the Republic of Moldova.
- Strengthen institutional capacity by developing human resources skills, including through international training programs, internships and experience exchanges. This measure would allow for the reduction of institutional constraints in the fields of scenario analysis, economic modelling, and the advanced use of digital data processing tools.
- Creating an integrated technical architecture for a digital register of financial risks in the field of budgetary and fiscal relations, allowing their classification by levels of government (central, local), by economic sectors and according to their probabilistic characteristics.

The implementation of these directions involves correlating national reforms with the priorities of the international agenda and preparing for large-scale institutional adjustments. At the same time, external risks generated by economic and political instabilities can amplify the effects of internal vulnerabilities, which requires the adoption of governance strategies adapted to the conditions of double vulnerability, specific to the WT framework.

4) WT Strategies: Mitigating Systemic Vulnerabilities and Building Resilience

The limited institutional capacity in the field of macro-fiscal analysis and risk management, the low level of inter-institutional coordination and the absence of a consolidated regulatory framework for identifying and monitoring fiscal risks are structural factors of the vulnerability of fiscal policy. These internal shortcomings are amplified by external risks, such as the volatility of the geopolitical context, dependence on external financing and unforeseen budgetary pressures generated by additional social commitments or exceptional expenditures.

The PEFA Moldova reports (PEFA, 2022) highlight the low level of integration of fiscal risk assessment into the budget preparation process and the absence of institutionalised procedures for responding to crisis scenarios. In the same vein, the International Monetary Fund's Article IV Consultation Report (IMF, 2023) signals the vulnerability of the budgetary planning framework to macroeconomic shocks and volatility of fiscal revenues.

In order to counter these challenges, it is necessary to adopt a set of defensive strategies aimed at reducing exposure to risks and maintaining an adequate level of institutional control over budgetary and fiscal processes:

- Institutionalising financial risk analysis procedures in the field of budgetary and fiscal relations by including them in the normative acts of the Ministry of Finance, with the explicit definition of the periodicity, methodology and related responsibilities. Such an approach would reduce fragmentation in existing practices and ensure systematic, coherent monitoring of risks.
- Create a centralised risk management mechanism within the Ministry of Finance, with responsibilities for data collection, aggregation and reporting, as well as for developing methodological standards applicable to all agencies and territorial entities, in order to standardise and compare information.
- Establish restrictive fiscal rules to limit extra-budgetary initiatives by amending the Public Finance Law and introducing clear provisions on the sources of coverage of additional liabilities.
- Establish a phased crisis response framework, applicable to events with a high probability of fiscal impact (e.g. increases in energy prices, significant fluctuations in revenues, massive budgetary obligations generated by court decisions), to ensure rapid and coordinated reactions.
- Implementation of ex ante assessment of the budgetary-fiscal impact for all legislative or administrative initiatives with an effect on the budget, as a preventive tool for maintaining the sustainability of public finances.
- Expansion of the digitalisation of budgetary processes by including scenario analyses and stress tests in existing and future IT platforms (trez.mf.gov.md, MTEF modules), reducing dependence on manual interventions in crises.

The implementation of WT strategies does not require extensive structural transformations, but the strategic orientation of existing institutional resources and the consolidation of political commitment. By coherently applying these measures, the resilience of the system can be strengthened in contexts marked by constraints and uncertainties, while creating the premises for the development of a sustainable architecture for long-term fiscal risk management.

5. Conclusions

The analysis shows that financial risk management in the fiscal policy of the Republic of Moldova operates in a framework marked by both institutional preconditions for improvement and structural constraints that continue to affect policy coherence. The SWOT diagnosis points to the presence of a basic legal and strategic foundation, accumulated administrative experience and a growing openness to methodological modernisation. At the same time, the system continues to face fragmented coordination, insufficient standardisation of risk assessment procedures and the limited integration of fiscal risk analysis into routine budgetary decision-making.

The use of the TOWS matrix allowed the identification of four categories of strategic options. SO strategies highlight the relevance of existing institutional assets in relation to reform opportunities and external support. ST strategies emphasise the role of current strengths in limiting vulnerability to macroeconomic and regional instability. WO strategies show that several structural weaknesses may be addressed through the selective use of international standards, digital instruments and technical assistance. WT strategies point to the need for defensive measures where institutional fragility and adverse external conditions lead to higher fiscal exposure.

The study suggests that stronger fiscal sustainability in the Republic of Moldova requires a more coherent use of existing institutional resources, clearer procedural integration and a closer connection between fiscal risk assessment and policy formulation. In this perspective, the article offers a diagnostic framework together with a set of analytically grounded strategic directions that may support the gradual consolidation of fiscal risk governance in the broader context of administrative modernisation and European integration.

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THE IMPACT OF GEOPOLITICAL CRISES ON FISCAL AND BUDGETARY STABILITY

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Abstract

This study explores the relationship between geopolitical risk and fiscal-budgetary stability of countries, focusing on how external instability impacts the dynamics of the budget deficit. Using a dynamic System GMM (Arellano-Bover/Blundell-Bond) model on a panel dataset of 25 OECD member countries. The empirical results indicate three fundamental aspects: (i) the existence of significant fiscal inertia, through the positive influence of the lagged value of the deficit on the current one; (ii) a negative relationship between geopolitical risk and the current level of the budget deficit, which suggests a tendency for governments to implement more prudent fiscal policies in times of international uncertainty; and (iii) political stability is found to be a factor favourable to fiscal balance, especially in developed countries, where a predictable political climate and solid institutions allow the formulation and implementation of consistent fiscal policies. Thus, this underlines the importance of a stable policy framework as a foundation for fiscal sustainability, especially in the face of external shocks or high fiscal pressures.

Keywords: Geopolitical Risk Index, budget deficit, Political Stability Index, OECD countries, Arellano-Bover/Blundell-Bond

JEL Classification: C33, C58, E62, H12

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1. Introduction

As defined by Dieckelmann et al. (2024), geopolitical risks are recognised in the form of threats, realisation, and escalation of circumstances associated with armed conflicts, terrorism between states or other situations that impede the smooth conduct of international relations. Thus, at the global level, geopolitical crises have

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destabilised the economy, directly influencing state fiscal and budgetary policies.

The Gulf War (1990-1991), the September 11, 2001 attacks, the Iraq War (2003), the London bombings (2005), the Great Recession of 2008, the Sovereign Debt Crisis (2009-2013), the COVID19 pandemic, the Russian armed attack on Ukraine, and the war between Israel and Hamas are just a few of the events that have led governments to implement and adopt fiscal-budgetary adjustment measures. Whatever their nature, the crises have produced concomitant increases in budget deficits and sovereign debt.

Even if historical geopolitical shocks exhibit limited capacity to generate large-scale systemic crises, Baron & Dieckelmann (2021) argue that these trends generate the need for increased vigilance. For example, the September 11 attacks did not automatically generate a systemic financial crisis, nor did they even directly target the countries affected by the attacks. Considering the fizzle of macroeconomic events in recent years, the 38 member countries of the Organisation for Economic Cooperation and Development have demonstrated that they can manage fiscal imbalances caused by substantial geopolitical risks. According to the European Council (2025), 80% of defence funds have been allocated to the acquisition of new defence equipment in the military field. Thus, the European Union is committed to both increasing and optimising defence spending against the backdrop of unprecedented security threats and challenges in Europe.

Given the current context of global fragmentation and the fact that OECD countries are increasingly relying on rearmament, this research fills a methodological gap by offering an empirical perspective on how the "peace dividend" is being replaced by unpredictable costs for national security. The central objective of this paper is to analyse the relationship between geopolitical uncertainty and fiscal performance by quantifying the impact of geopolitical risk on budget deficits across a panel of 25 OECD member states over a 25-year period. The System GMM estimator used allows both for controlling unobserved heterogeneity across countries and for obtaining consistent estimates in a dynamic framework, where current fiscal decisions are linked to past budgetary performance.

The results indicate that the geopolitical risk index has a significant and negative impact on the budget deficit in the five estimated models. Given the current heightening of geopolitical uncertainties, governments tend to adopt a more prudent fiscal stance,

striving to maintain both investor confidence and macroeconomic stability. We observe that the effect is robust in both developed and emerging countries, indicating a common fiscal adjustment mechanism against geopolitical external shocks. Thus, geopolitical risk can act as a fiscal disciplining factor, motivating authorities to temper fiscal expansion in times of international tensions.

At the same time, by means of empirical evidence, the paper presents specific recommendations for different categories of actors (public policy makers, investors, creditors, society), providing valuable solutions such as: strengthening medium-term budgetary frameworks, independent audits, increased fiscal transparency and social safeguards. Moreover, the study contributes to the literature on fiscal behaviour under uncertainty by providing applicable insights on how countries can increase their fiscal resilience to geopolitical risks.

The rest of the paper is structured as follows: Section 2 contains the literature review and the research hypotheses, Section 3 describes the research methodology, where the variables and the database, including the empirical model, are explained, Section 4 includes the results and practical implications of the work, and the 5th section includes the conclusions, outlining the limitations and considering future research directions.

2. Literature Review

With a focus on both global financial markets and the real economy, Hodula et al. (2024) analyse geopolitical risks and how they impact macro-financial stability. The research shows that geopolitical risks cause a fizzle in the financial market that is also felt more broadly in the economy.

On the one hand, trade barriers arise as a result of geopolitical conflicts being quantified by tariffs and sanctions that are reflected in reduced trade, leading to lower economic growth, higher inflation rates and higher costs incurred by companies, which is also confirmed by (Alcalá & Ciccone, 2004). In line with Adekoya et al. (2022), higher tariffs or restrictions on imports impact both trade and investment between countries, which only unbalances the connectivity of the global supply chain (Jomthanachai et al., 2022). On the other hand, the geopolitical tensions present in resource (oil) rich states cause high volatility in commodity prices, as also mentioned by Caldara & Iacoviello (2022).

In terms of financial markets, geopolitical risks negatively impact equities.

According to Lehkonen and Heimonen (2015), since the geopolitical risk of 49 emerging countries decreases, stock returns increase. This fact is also supported by the bibliometric analysis of Pandey et al. (2022), an analysis that brings to the fore the negative effects of border disputes, conflicts, and, more seriously, war on financial markets.

The higher the value of the geopolitical risk index, the higher the cost of oil (Mignon & Saadaoui, 2024), the slowdown in investment (Wang, Wu & Xu, 2023), the higher the inflation rate, the downward trend in economic activity and trade (Caldara et al., 2024). Moreover, the strain is also being felt in the private sector, which is experiencing lower lending levels, but Demir & Danisman (2021) note that a high geopolitical risk index prevents the provision of consumer and mortgage credit, but not the distribution of corporate credit, as companies have additional collateral and/or more stable cash flows.

In order to analyse the impact of geopolitical risk on foreign direct investment, Yu & Wang (2023) used a fixed effects model. They observe that FDIs are diminished by geopolitical conflicts in emerging countries, whereas the impact on developed economies is not significant.

Thus, based on the literature reviewed, we formulate the following research hypotheses regarding the impact of geopolitical crises on fiscal-budgetary stability:

- *H1: The geopolitical risk index influences fiscal stability statistically.*
- *H2: Large-scale geopolitical crises have a positive impact on the budget deficit, causing it to increase.*

2.1. The Geopolitical Risk Index

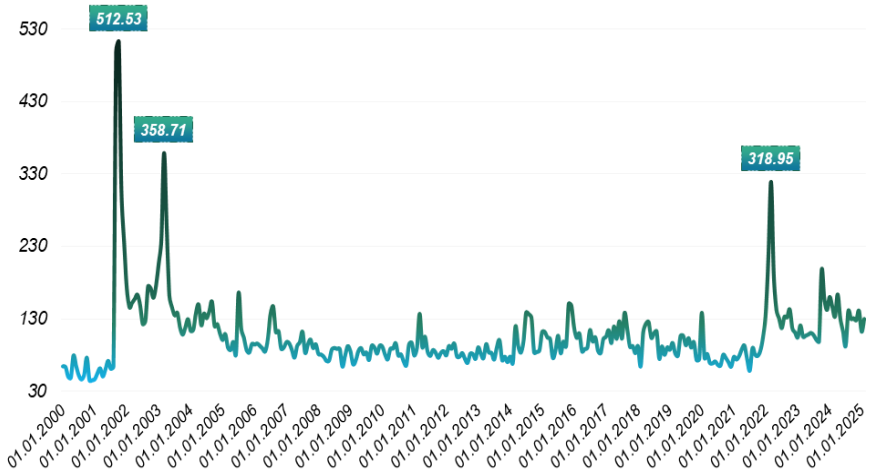
Based on the results of an automated analysis of text from the digital archives of ten internationally recognized newspapers (Chicago Tribune, the Daily Telegraph, Financial Times, The Globe and Mail, The Guardian, the Los Angeles Times, The New York Times, USA Today, The Wall Street Journal, and The Washington Post), the Geopolitical Risk Index interprets values in the 50-100 range as political and/or economic tensions, and values above 100 as major geopolitical crises. In contrast, the stability period is marked by the 0-50 range, which offers favourable conditions for trade and investment.

In other words, Caldara & Iacoviello (2025) quantify the number of articles containing geopolitical events by relating them to the total number of articles that have a monthly frequency. Of note would be that search engines consider eight categories, namely: Threats of war (Category 1), Threats to peace (Category 2), Military escalations (Category 3), Nuclear threats (Category 4), Terrorist threats (Category 5), Outbreak of armed conflict (Category 6), Escalation of armed conflict (Category 7) and Terrorist acts (Category 8).

Figure 1 captures the monthly evolution of the geopolitical risk index over the period 2000-2025. In 2001, we observed an inflexion point caused by the September 11 Attacks of the same year (Guler & Demir, 2024) and the War in Afghanistan (2001-2002). This sudden increase is also the peak of the period analysed, with a score above 500. Two years later, in 2003, the Invasion of Iraq took place, which marked another historic point. The decision of the United States of America to intervene militarily in Iraq led to a shock in international relations. Events such as Russia's Annexation of Crimea in 2014 and Russia's Armed Attack on Ukraine are considered by far the biggest actions threatening global security since World War II, as confirmed by Götz and Ekman (2024).

Figure 1

Monthly evolution of the Geopolitical Risk Index



Source: own elaboration based on data taken from matteoiacoviello.com

3. Data and methodology

This paper is based on a sample of 25 OECD member countries, with the reference period 2000-2024. However, in order to delineate and identify specific risks, we have classified the 25 countries into three categories (global, advanced and emerging countries). The classification has been done in accordance with the International Monetary Fund. The categorisation of countries is in the Appendix.

Data were collected from: Economic Policy Uncertainty, The Global Economy and World Bank Open Data. The dependent variable is the budget deficit. The set of explanatory variables consists of 10 indicators, 3 of which are dummy variables, namely: EU Member States, COVID-19, and Russia-Ukraine Armed Attack.

Table 1 summarises aspects related to abbreviation, name, description, and data source.

Table 1

Data description

Abbreviation	Variable name	Description	Source
Dependent Variable			
DEFICIT	Budget Deficit	The difference between government revenue and government expenditure. The value is expressed as a percentage of GDP.	The Global Economy
Independent Variables			
GEOPOL_RISK	Geopolitical Risk Index	Dario Caldara and Matteo Iacoviello have developed an index of geopolitical events, based on the analysis of newspaper articles covering geopolitical tensions, and observed their evolution and economic effects since 1900.	Economic Policy Uncertainty
POLITICAL_STAB	Political Stability Index	Measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism. The percentage rank indicates the country's position among all countries covered by the aggregate indicator, where 0 corresponds to the lowest rank and 100 to the highest.	World Bank Open Data
PUBLIC_DEBT	Public Debt	The gross amount of government liabilities, reduced by the value of equity instruments and financial derivatives held by the government. Since debt is a stock and not a flow, it is measured at a given date.	The Global Economy

Abbreviation	Variable name	Description	Source
EC_GROWTH	Economic Growth	Annual percentage growth rate of GDP at market prices, based on constant local currency. The aggregates are based on constant 2015 prices expressed in US dollars.	The Global Economy
INFLATION	Inflation Rate	Measured by the consumer price index, it reflects the annual percentage change in the cost to the average consumer of buying a fixed basket of goods and services, which may be updated periodically.	The Global Economy
FDI	Foreign Direct Investments	Net capital inflows for the acquisition of a lasting management interest in an enterprise operating in an economy different from the investor's.	The Global Economy
REM	Remittances	All current transfers in cash or in kind made or received by resident households from or to non-resident households, expressed as a percentage of GDP.	The Global Economy
Dummy Variables			
DUMMY_UE	Member State of the EU	1 if it is a Member State and 0 otherwise	Own processing
DUMMY_COVID	COVID19	1 for 2020-2021 and 0 otherwise	Own processing
DUMMY_WAR	Russian-Ukrainian Armed Attack	1 for 2022-2024 and 0 otherwise	Own processing

Source: Author's research

From a methodological perspective, to analyse the impact of geopolitical crises on fiscal stability at the level of 25 OECD member countries, we used the Arellano-Bover/Blundell-Bond dynamic model (System GMM). For the sample used - composed of a similar number of cross-sectional units (N=25 countries) and time periods (T=25 years) - the System GMM is recognised as a much more robust option. Compared to the Difference GMM (Arellano-Bond) model, the System GMM variant is more effective in the presence of high variable persistence and provides more accurate estimators through the simultaneous use of the difference equation and the level equation.

A high geopolitical risk index score can influence government spending and revenue decisions, leading to higher deficits. In other words, countries with high budget deficits produce macroeconomic instability, which amplifies perceptions of geopolitical risks. In the present case, estimating classical methods such as OLS or using fixed effects models would lead to biased results due to the correlation between the explanatory variables and the error term.

Moreover, the dependent variable has a significant dynamic component because its historical values can influence the present values, due to the inertia of fiscal policies or medium-term budget constraints. Thus, the Arellano-Bover/Blundell-Bond model facilitates the inclusion of the lagged dependent variable as a regressor, capturing more effectively the nature of the economic process under investigation, without introducing the bias generated by its correlation with fixed effects.

The empirical model will take the following form:

$$Y_{it} = \alpha_{Yit-1} + \beta \cdot X_{it} + \ldots + \eta_i + \varepsilon_{it} \quad (1)$$

where: Y_{it}= the dependent variable (Budget Deficit in country *i*, year *t*), Y_{it-1}= the lagged value of the dependent variable (previous year's Deficit), X_{it}= vector of explanatory variables (Geopolitical Risk Index), η_i = country-specific fixed effect (unobserved), and ε_{it} = the error, which captures the effect of other factors not accounted for in the model, including unexpected events.

To test for stationarity, the Levin-Lin-Chu (LCC) panel data unit root test was used. As shown in Table 2, an intervention for the variable Public Debt was needed because the probability exceeded 5%. Thus, Public Debt was differenced at the first-order level.

Table 2

Levin-Lin-Chu Test

Variable	*Statistic*	*p-value*
DEFICIT	-5.4572	0.0000
GEOPOL_RISK	-4.1789	0.0000
POLITICAL_STAB	-3.6642	0.0001
PUBLIC_DEBT	-1.6028	0.0545
EC_GROWTH	-12.6053	0.0000
INFLATION	-3.9520	0.0000
FDI	-5.6205	0.0000
REM	-3.0132	0.0013

Source: Author's research

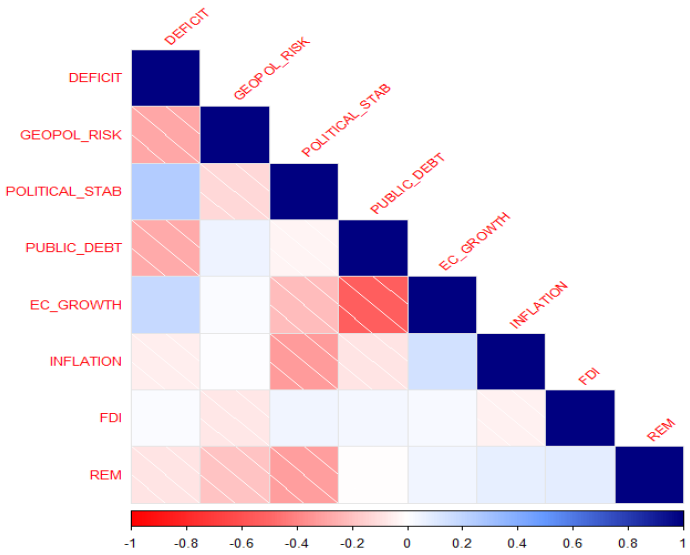
Before estimating the regression model, we have constructed the correlation matrix on the basis of which we can determine the meaning and strength of the relationship between two variables. We find a strong correlation between Public Debt and Economic Growth. Also, we observe in Figure 2 that the Geopolitical Risk Index does not

show strong correlations with the other variables in the economic sphere, which allows us to model the relationship between our variables.

Taking into account the strong level of correlation between the variables mentioned above, we will create separate regression models, avoiding their inclusion in the same model, in order to minimise the influence of multicollinearity on the efficiency and consistency of the estimators.

Figure 2

Correlation matrix



Source: Author's research

4. Results and implications

Taking the correlation relationships into account, five regression models were generated, and they are included in Table 3. The first two models cover the 25 OECD member countries, Model 3 consists of highly developed countries, and the last two models are assigned to emerging countries. The five models are statistically significant according to Prob>chi2 (0.00 < 0.05). For both global and advanced countries, we notice that the key explanatory variable represented by the geopolitical risk index is significant at a threshold of

5%, while for emerging countries, the index has very strong significance.

We observe that, irrespective of the ranking of the countries analysed (at the level of the five models estimated), the higher the geopolitical risk, the lower the budget deficit, thus improving the fiscal position, which can be explained by international support mechanisms. In other words, when a country faces geopolitical tensions, affected governments can obtain external support in the form of grants, non-reimbursable financial assistance or direct budget support. In practice, the capital flows received lead to an improvement in the budget balance.

Moreover, in conditions of geopolitical instability, governments adopt a more prudent behaviour (characterised by expenditure control, revenue consolidation and budget deficit reduction) because maintaining investor confidence in international markets and balancing creditors' perception of sovereign rating risk are vital elements in determining external financing conditions and beyond. From this, we can draw a first implication for policymakers: the implementation of proactive fiscal strategies integrated into multiannual budget planning, including fiscal stress scenarios facilitating reallocations according to the international context, prioritising investments in critical infrastructure, energy security or digital resilience.

Disaggregating the impact according to the level of development of the countries analysed, Models 1 and 2 indicate that a stable political climate leads to an improved budgetary position. In other words, stable governments tend to adopt consistent and long-run fiscal policies, reducing uncertainty both by making revenue collection more efficient and by planning public spending. In contrast, in Models 4 and 5, which include emerging economies, the variable Political Stability Index is no longer significant. Structural weaknesses, restricted administrative capacity and fiscal volatility may dominate the positive effects of a stable political climate. Political stability is found to generate better fiscal performance if there is a lack of effective governance and robust institutional arrangements. A recommendation for policymakers would be that fiscal consolidation policies should be backed by measures to strengthen institutions and promote political stability, particularly in emerging countries, where these components can act synergistically to support long-term fiscal sustainability.

As for the COVID19 pandemic, it caused a significant increase in the budget deficit, due to the increase in public spending associated

with health, social protection and economic support, which occurred at the same time as tax revenues were reduced as a result of the contraction in economic activity. The impact of the pandemic on the budget deficit is more pronounced in emerging economies (Model 5) than in highly developed (Model 3) and OECD countries (Models 1 and 2), indicating a lower institutional and fiscal capacity of emerging countries to respond to major exogenous shocks.

Thus, the validity of the results is supported by the use of the System GMM estimator, which accounts for potential endogeneity (reverse causality) between the geopolitical risk index and fiscal performance. In other words, by instrumenting the variables with their own past values (lags), the model isolates the causal effect.

Table 3

Estimation results

	Model 1	*Model 2*	*Model 3*	*Model 4*	*Model 5*
DEFICIT(-1)	**0.5484*****	**0.6202*****	**0.6783*****	**0.3247*****	**0.4632*****
	[0.0315]	[0.0319]	[0.0329]	[0.0506]	[0.0524]
GEOPOL_RISK	**-0.0875****	**-0.1047****	**-0.0576****	**-0.4548*****	**-0.4556*****
	[0.0374]	[0.0372]	[0.0344]	[0.0828]	[0.0862]
POLITICAL_STAB	**1.2446*****	**1.1341****		-0.2302	-0.2302
	[0.4187]	[0.4159]		[0.4694]	[0.4883]
D_PUBLIC_DEBT	**-0.2760*****			**-0.3244*****	
	[0.0182]			[0.0315]	
EC_GROWTH		**0.5417*****	**0.6345*****		**0.3428*****
		[0.0330]	[0.0429]		[0.0440]
INFLATION	-0.0009	0.0056	0.0656	**-0.0562****	**-0.0594****
	[0.0267]	[0.0265]	[0.0629]	[0.0237]	[0.0246]
FDI	**0.0178***	0.0109	0.0263	0.007	0.0002
	[0.0105]	[0.0105]	[0.0221]	[0.0100]	[0.0104]
REM	-0.2705	0.0351		-0.0387	0.0579
	[0.3595]	[0.3553]		[0.2811]	[0.2928]
D_REM			-1.4990		
			[2.8655]		
DUMMY_UE	-0.7999	-0.3498	-0.2493	-0.0605	0.4001
	[0.6918]	[0.6881]	[0.7352]	[0.8071]	[0.8412]
DUMMY_COVID	**-1.0334*****	**-1.5773*****	**-1.3851*****	**-1.3055*****	**-1.7688*****
	[0.3005]	[0.2957]	[0.3537]	[0.4267]	[0.4424]
DUMMY_WAR	**-0.6700****	-0.0271		-0.6677	0.4707
	[0.3094]	[0.3043]		[0.4741]	[0.4762]
Intercept	-0.5690	**-2.031*****	**-1.3668****	-0.5051	**-1.5886*****
	[0.4655]	[0.4613]	[0.5516]	[0.4460]	[0.4891]
Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000

*Source: own calculations. The description of the variables is presented in Table 1. Standard errors are shown in parentheses; *, **, *** denote statistical significance at 10%, 5% and 1% level, respectively.*

5. Conclusions, limitations and future research directions

Although the geopolitical risk index is considered a factor that causes imbalances, we note that its impact on fiscal stability is complex. International support mechanisms and the prudent behaviour of governments make geopolitical risk an incentive to improve the fiscal position. At the same time, for resource-exporting countries, tense times lead to higher commodity prices, which in turn lead to additional fiscal revenues through export taxes or higher VAT and excise tax revenues.

There is a significant correlation between the intensification of international tensions and the reduction of the budget deficit, including in the case of the Russian-Ukrainian armed conflict. Major geopolitical shocks are prompting governments to take a more prudent fiscal approach, possibly to avoid further deterioration in market confidence and to preserve their resilience in the face of uncertainty. The consistency between the signals transmitted by the geopolitical risk index and the effect of the DUMMY_WAR variable supports the hypothesis that international tensions act as a fiscal disciplining factor with direct implications for fiscal policy formulation.

Even in the presence of external shocks (geopolitical tensions, armed conflicts or threats to national security) or new factors that may worsen the fiscal position, the fiscal adjustment propagates gradually, which justifies the use of a dynamic analytical framework able to capture this type of time dependence, which is the reason for using the Arellano-Bover/Blundell-Bond estimation method.

The existence of a positive and significant relationship between the previous level of the budget deficit and the current one emphasises the presence of fiscal inertia in the budgetary behaviour of the analysed countries, regardless of their classification. In other words, the current fiscal decisions are influenced by the budgetary situation in the previous period, signalling the difficulty of quickly correcting fiscal imbalances.

On the one hand, fiscal adjustments triggered by geopolitical events may point to high fiscal discipline, but also to potential risks to fiscal sustainability. Thus, in order to meet the need for fiscal predictability and stability, we recommend that investors pay close attention to the degree of transparency and consistency of the medium-term fiscal framework published by the authorities, as well as to the existence of independent audits certifying fiscal sustainability. On the

other hand, fiscal adjustment measures may have significant social implications, especially for vulnerable groups. The second recommendation would be linked to ensuring fiscal fairness both by maintaining basic social spending and by adopting compensatory measures targeted at affected groups.

The results indicate that the first hypothesis established in section two is confirmed because in all models the geopolitical risk index statistically influences fiscal-budget stability. In contrast, hypothesis number two is rejected, observing at the level of each model analysed (irrespective of the grouping of countries analysed) that a higher geopolitical risk decreases the budget deficit, improving the fiscal position.

Although it is recognised in the literature, the use of the index measuring geopolitical risk may not fully capture the differences in perceptions and impacts experienced by individual countries; the index basically addresses geopolitical events in a homogeneous way. Thus, future studies could use: the political uncertainty index, sovereign risk measures, or create a composite index tailored to OECD member countries that takes into account external risk dimensions as well as domestic political instabilities.

Another perspective for future research directions could be to examine the role of the quality of public institutions in the geopolitical risk - budget deficit relationship. Thus, OECD member countries experience significant differences in governance efficiency, fiscal transparency and institutional capacity. These may determine how governments respond to external geopolitical shocks.

In other words, countries with well-anchored public institutions may be more resilient to geopolitical uncertainties, maintaining prudent fiscal behaviour even in the face of tense events. Conversely, in countries where fiscal governance is delicate, geopolitical conflicts may create impulsive budgetary decisions leading to increased spending or lower tax revenues. From this, we could draw a final recommendation, namely to include variables such as the government efficiency index and/or the degree of control of corruption.

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Data sources:

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