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DEVELOPING ROBUST TEST SCENARIOS FOR TRADE FINANCE APPLICATIONS: A PRACTICAL GUIDE

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ABSTRACT

Facilities that employ multi-party applications with blockchain technology provide a consistent picture of the transaction history, are decentralised and resilient to failure, and don't depend on mutual confidence between the parties. Trade finance is a financial instrument that facilitates commerce and trade internationally. Importers and exporters may do business more efficiently and easily thanks to trade financing. Banks and other financial organisations use a variety of financial products under the umbrella term "trade finance" to facilitate trade. Statistical models specific to a country and previous cross-border crisis experiences are used to develop macroeconomic stress scenarios. Indirect credit risk arises from unhedged borrowers' foreign exchange vulnerabilities. Banks and their asset classes utilise varied underwriting processes based on how aggressively they lend. Increased correlations between the likelihood of default and the loss incurred by default during stressful situations are another feature of the recommended approach. Another is that unanticipated losses are negatively impacted by lending concentration and residual loan maturity. Ultimately, the economic risk weighted capital adequacy ratio is a crucial outcome indicator that evaluates banks' resilience to credit risk materialisation. We apply the proposed methodology to many Eastern European institutions and discuss the results.

KEYWORDS: *Blockchain Technology, Economic Risk, Eastern European Banks, Financial Instrument, Trade Finance, International Trade, Robust Test Scenarios*

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I. INTRODUCTION

The past few decades have shown to be incredibly productive, efficient, vast, technological, evolving, and innovative. These approaches are based on the many core functions or departments, in particular, and the overall framework of many businesses conducted by thousands of organisations worldwide. The growth of financial institutions and specialised banking sectors worldwide is one of the appealing and genuinely emerging forms of business concerns in recent times, among the many functional aspects of business and its various classes [1]. The fact that the entire global financial markets channel has undergone a great deal of dramatic and careful transformation, leading to the financial systems and markets evolving into increasingly complex and varied structures, is also extremely relevant and realistic [1, 2].

The financial crisis has shown the need for more appropriate policy responses and tighter macroprudential regulation [2, 3]. The body of scholarship has largely concurred that economic advancement depends on the stability and

growth of the financial sector. It is widely known that any disruptions to the financial sector's operations caused by excessive risk-taking and financial deleveraging are detrimental to economic development and have the potential to cause social discontent, reduced employment rates, increased income disparity, and lower incomes [3, 4]. With every financial crisis or disruption to the system's functioning, public trust in the financial system and its capacity to promote economic development may decline. Thus, careful prudential monitoring of financial systems is an essential duty of any regulatory body, as it enables prompt and informed policy choices on supervisory interventions and appropriate changes to financial laws [4, 5].

The financial crisis has highlighted the need for more suitable and timely regulatory actions, as well as improved macroprudential monitoring. The primary instrument for macroprudential monitoring is the regular stress testing of the financial system [5, 6]. While stress tests are universally acknowledged to be necessary, macroprudential practitioners appear to agree that, before the global financial crisis, stress tests were not very informative and did not impose an appropriate regulatory response. A new generation of stress testing models has been developed as a result of the partial failure of stress tests [6]. The comprehensive approach we provide in this study improves on the existing stress tests by fusing the following elements into a unified, useful framework:

- During times of crisis, credit risk sensitivity to shifting macroeconomic conditions may grow due to a clear and strong association between systemic credit risk and macroeconomic conditions that is developed from cross-country experience and adaptable to country-specific circumstances.
- Each bank has a different degree of lending aggressiveness and a distinct component of credit risk, which includes taking on indirectly credit risk from financing in foreign currencies to unprotected borrowers [6, 7].
- During periods of stress which follow a default, there is a significant correlation between the chance of default and the loss if a default is allowed [6, 7].
- The allowance of banks' concentration in specific asset classes and the degree of their finished maturation change to play a major role in bank-specific capital charge calculations eliminates some of the flaws in the Basel II methodology used to calculate capital costs [7, 8].
- Carefully combining the attributes results in a more relevant outcome indicator that assesses a bank's resilience to both macroeconomic and bank-specific shocks [8].

To sum up, the technique seeks to improve upon existing methods while preserving tractability. It does this by clearly tying the financial industry to the macro economy and accounting for both idiosyncratic risk factors brought on by the different lending practices and risk profiles of individual banks and systemic risk factors emerging from changing macroeconomic circumstances. It was developed to provide practitioners and decision-makers with a comprehensive, flexible, and expeditiously implementable tool that is pertinent to policy [8].

Additionally, a lot of connected corporate entities that specialise in banking and financing demands have expressed worries and enquiries in response to the increased complexity [8, 9]. As a result, they saw the need to work with regulators to provide a wide range of risk management strategies and credit risk analysis tools that these financial institutions could use to reduce the variety of unique and potential risk variables they face. In addition, the repeated economic crises are to blame for the development of financial systems and the expanding number of risk management strategies [8]. Thus, the "Stress Testing Approach" is a special method in the field of risk management. Most financial

organisations essentially use this strategy or technique to reduce the likelihood that credit risk will materialise for their business to a significant degree [9]. Furthermore, this phenomenon is employed to assess the influence of diverse evolving economic occurrences or their susceptibilities on the comprehensive present and prospective outcomes and profitability potential of diverse financial markets and financial establishments.

1.1 Options For Trading And Financing: A Story Of Contemporary Market Failures

Coordination failure and externalities When an activity's social cost or benefit differs from its private cost or benefit, externalities occur. This category contains four recommendations. First and foremost, it is imperative to direct Official Development Assistance (ODA) in a way that maximises its marginal productivity. This is frequently achieved by emphasising the establishment of institutions that fortify the enabling environment and by leveraging private capital sources through blended finance. Enhancing the efficiency of domestic financial resources is another possibility. To put it simply in terms of economics, ODA has a social benefit that is far greater than its private benefit [8]. Furthermore, the way things are currently set up fails to "internalise" this potentially useful positive externality, which includes ODA's contribution to maintaining a stable macroeconomic environment. Second, whether a company is domestic or international, its activity is significantly influenced by tax policy [8, 9].

Policy Option1:

The intelligent application of mixed finance and official development support

When compared to domestic public and private financing, ODA has been relatively little in supporting the Millennium Development Goals (MDGs), according to an analysis of patterns in financial flows to LDCs [9, 10].

These patterns are not anticipated to change significantly in the near future, according to an analysis of current discussions and debates over how to finance the Sustainable Development Goals (SDGs). But compared to other financial flows, [12], ODA has a variety of distinct developmental advantages, with concessionally—if not outright grants—being one of the most significant [11, 12].

Policy Option 2:

Strengthen domestic tax systems and create a more transparent international tax system to help developing nations mobilize their domestic resources

The recent United Nations (UN) Financing for Development meeting in Addis Ababa brought to light the persistent lack of funding that developing countries require to promote their development. One way to close this funding gap would be to boost taxes in poorer nations. Less than 15% of GDP is still raised by taxes in half of Sub-Saharan African nations [11, 12], which is less than the 20% minimum that the UN considers essential for development. A few nations in Asia and Latin America do not do much better [11].

Policy Option 3:

Norms for widely applied private standards that impact trade

In an efficient global supply chain, diversification, value addition, and industrialisation are the paths to modern economic growth. In some of these, the technical standards are determined by a single company that controls the chain (the iPhone is one example that comes to mind). In some cases, major purchasing organisations collaborate to create standards that apply

to the entire sector (such as Europe GAP or Global GAP, where "GAP" stands for Good Agricultural Practices and is mandated by large grocery chains). Regarding the technical standards needed for inputs into a company's particular product, not much can be done, but a lot of suppliers are impacted by the second kind of industry-wide private standards. These requirements could be incoherent or even contradictory. These criteria can be challenging for many businesses, particularly Small and Medium-Sized Enterprises (SMEs) in developing nations [12, 13].

Policy Option 4:

Framework for trade facilitation in services

Encouragement of the UN's adoption of the 2030 Agenda for Sustainable Development in September 2015 [13], the Expert Group calls on WTO members to start collaborating right away to establish a Framework for Trade Facilitation in Services, recognizing the crucial role that efficiency in the services sector will play in accomplishing the SDGs.

1.2 Conceptual Framework For Suggested Stress Testing Method

First, we offer a conceptual summary of the key components of the suggested macroprudential stress assessment approach, which we illustrate using a flow diagram presented in Figure 1 [13, 14]. The creation of three macroeconomic scenarios is the initial step in the stress testing process. A list of them is given below:

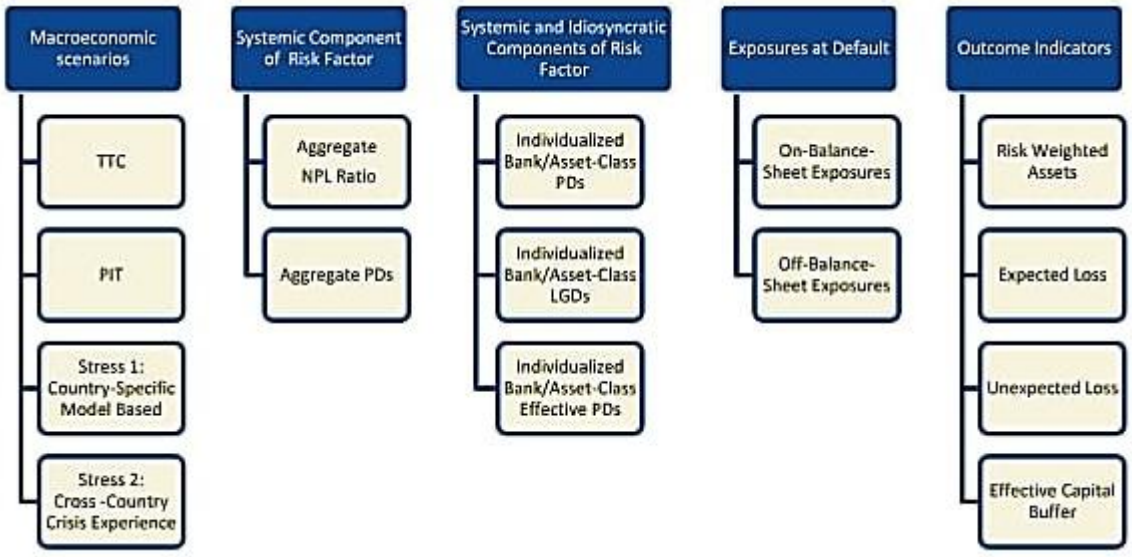

Fig. 1 Explanation Of The Key Components Of The Macroprudential Stress Assessment Approach Conceptually. [14]

II. STRESS SCENARIO BY COUNTRY

Generally speaking, any data or macroeconomic circumstances model available for the country of interest's economy can be used to generate a country-specific stress scenario. This type of model could be as simple as a Vector Autoregression (VAR), as sophisticated as an architectural econometric model, or as basic as a full-fledged Dynamics Stochastic General Equilibrium (DSGE) model.9. It is essential to configure the model in a way that makes it easy to calculate several step-ahead point and density predictions [11, 14]. Based on the model, an unfavourable or stressful condition may be identified by looking at the lower (or greater) tail value of the forecasted density.

2.1 Connecting Credit Risk Factors To Macroeconomic Scenarios

We establish a two-stage relationship between the elements of credit risk and the macroeconomic variables. In the first step, the reference TTC Probability values of Default (PDs) and Losses Given Default (LGDs) are connected to the steady-state reference point, or TTC macroeconomic scenario. NPLs and PDs are then connected to the usual PIT and Stress scenarios [15], which demonstrate the several departures from the steady-state TTC scenario. In normal circumstances, we utilize short-term multipliers from a fitted dynamical NPL regression to approximate the mapping; under stress, we employ long-term multipliers. Research shows that credit risk variables are far more susceptible to shifts in the macroeconomic environment in times of crisis than they are in prosperous times. Furthermore, it is believed that the differences in PDs under the Stress and PIT situations, where the TTC PDs again function as reference points, match the expected shifts in NPLs in each scenario [15, 16]. The aggregate PDs have now been linked to the systemic aspect of credit risk in the macroeconomic scenarios [16].

Table 1 Probabilities Of Default (Pds) And Loss Given Default (Lgds) That Are Selected Via The Cycle. [16]

Asset Class	CEBS-Group 1		CEBS-Group 2		Non-G10-Group 2	
Corporates	6.55	2.54	3.99	6.54	4.89	6.48
SMEs	1.65	6.51	3.48	2.59	6.48	9.85
Consumers mortgage Loans	2.65	4.55	6.55	6.49	9.55	2.45
Consumers Loans	2.98	2.65	2.87	2.58	2.55	6.21
Others consumers loans	4.65	22.6	5.64	6.21	6.24	2.48
Sovereigns	2.56	5.54	6.98	3.96	3.69	2.65
Banks	2.84	2.96	4.15	2.58	2.48	2.48

$$NPL_{t+1,N} = c = +p^{NPL_{t,n}} + \beta_1 \Delta yt + 1,n + \beta_2 \pi_t + 1,n + \beta_3 r_t + 1,n + \beta_3 \Delta_e + 1,n + \beta_3 Z_t + 1,n + \varepsilon_t + 1,n \quad \ldots\ldots 1$$

Table 1 Result Of NPL Regression Estimate. [15, 16]

Variable	Estimate	Std. Error	p-value	95% Confidence Interval
NPL ratio (t-1)	0.989	0.978	0.66	[0.659; 0.896]
GDP growth	0.551	0.645	0.909	[0.226; 0.489]
Inflation	-0.579	0.258	0	[0.419; 0.549]
Real interest rate	0.548	0.978	0.659	[0.978; 0.489]
Constant	0.621	0.684	0	[0.648; 0.549]
Adj. R-squared	0.659	*H0: No resid AR(1) Z = – 1.98; Prob > Z = 0.895*		
F	0.44	*H0: No resid AR (2) Z = – 0.59; Prob > Z = 0.596*		
Number of ovesrvations	216	*Sargan test of over –identified restriction:*		
Number of countries	87	*Chi2 (16) = 20.25: Prob > Chi 2 (16) = 0.895*		

$$Indirect\ FX = \begin{cases} (\Delta e^{s}_{t+1} - \Delta e^{(TTC)\times \alpha^{FX}_{i,t}} & if\ \Delta e^{s}_{t+1} < \Delta e^{TTC}\ (depreciation) \\ 0 & if\ \Delta e^{s}_{t+1} \geq \Delta e^{TTC}\ (depreciation) \end{cases} \quad \ldots\ldots 2$$

2.2 Including Features Particular To Banks: The Non-Traditional Aspect Of Credit Risk

To generate a measure of the relative aggressiveness of lending by banks, we use Data on Credit (EAD) development for each bank and asset category prior to the apex of the previous credit cycle, or the most recent positive growth in credit if the present period is in a revival [16, 17]. In this case, the goal is to measure, in relation to the overall system-wide

average, the quality of the underwriting criteria used by the various banks in each asset type [17]. This is predicated on the idea that looser underwriting requirements are linked to more aggressively lending.

$$PD_{i,j}^{S} = \underset{aggregate}{PD_i^S} + \{K \times \frac{individual\ bank\ level\ effect}{(CG_{i,t} - median\ (CG_i))} \ if\ CG_i > median\ (CG_i) \\ (\max(CG_i) - median\ (CG_i)) \quad otherwise \quad .....3$$

III. EMPIRICAL APPLICATION

Using information from a group of banks in an Eastern European nation, this part provides an empirical application of the suggested stress testing methodology [17, 18]. Since it is irrelevant to the objectives of our study, we do not reveal the identity of the participating bank or the nation in the stress test [18]. The empirical application's sole goal is to demonstrate the practical applications of the stress test, the data that must be recorded, and the interpretation and implementation of the results in a policy setting [18, 19].

Table 3 Stress Situations Involving Baseline Pit, And Ttc.

Macroeconomic Scenarios	TTC	Future (t+1)			
		PIT	Stress VAR	Stress Int.	Pre Stress Int.
NPL ratio (%)	10.9 %	12.6 %	10.6 %	2.66 %	3.66 %
GDP growth % change	3.6 %	14.5 %	1.65 %	2.14 %	2.54 %
Inflation % change	5.9 %	2.64 %	2.66 %	5.66 %	6.96 %
Real Interest rate %	9.64 %	4.21 %	2.36 %	9.54 %	2.48 %
Exchange rate (LCU/EUR % change	2.65 %	2.69 %	4.59 %	5.15 %	6.26

3.1 Bank Level Data

Data on the amount of foreign currency expressed lending (SFX) and bank levels, if available, are needed to construct the idiosyncratic (bank specific) risk component as outlined in Section 4 because they provide information on the credit growth at the peak of the most recent financing cycle or positive credit increase. The annual loan increase for each asset category among the ten banks undergoing investigation as of the end of 2007 is summarized in Table 4 below. [20, 21].

Table 4 An Overview Of The Annual Credit Growth And The Percentage Of Loans Denominated In Foreign Currencies For Every Category Of Asset. [21]

Asset Class	Growth in Credit annually in 2008			2010 Share of Share FX Exposures		
	Min	Median	Max	Min	Median	Max
Corporates	-0.55 %	0.84 %	0.56 %	0.66 %	0.88 %	0.55 %
SMEs	0.54 %	0.99 %	0.44 %	0.98 %	0.54 %	0.99 %
Consumers mortgage Loans	-0.85 %	0.65 %	0.96 %	0.47 %	0.97 %	0.98 %
Consumers Loans	-0.44 %	0.28 %	0.58 %	0.88 %	0.49 %	0.47 %
Others consumers loans	-0.96 %	0.97 %	0.99 %	0.99 %	0.89 %	0.89 %
Sovereigns	0.88 %	0.65 %	0.68 %	0.65 %	0.88 %	0.99 %
Banks	0.96 %	0.88 %	0.87 %	0.87 %	0.99 %	0.49

IV. THE STRESSFUL RESULTS OF TESTING

4.1 Total Outcomes For The Financial System

The financial system's overall stress test results are shown in Table 1 [21]. Table 7 (under the Current Regulatory CAR heading) has summaries of the banks' current regulatory CARs at the top [21, 22]. The system wide averages are again

determined by the median value and the asset weighted mean. The standard deviation [22] captures the dispersion of the banks' current regulatory CARs. The financial system's regulation minimum CAR is 8%, and its CAR insolvency threshold is 2% [22, 23].

Table 1 Summary Of Aggregate Stress Test Results. [23, 24]

Current regulatory CAR (as of end -2010)				
Banks host Regulatory CATs (Banking System)				
Capital Buffer % Asset weighted Mean	14.96%			
Capital buffer % Median	19.65%			
Capital buffer % St. Dev.	4.8%			
Minimum Regulatory CAR	6.9%			
AR insolvency Thresholds	4.5%			
Economic Risk Based Approach (as of end-2011)				
Regulatory CATs are hosted by banks (Banking System)	**TTC**	**PIT**	**Stress VAR**	**Stree Int.**
Capital Buffer % - Asset weight mean	10.99	15.64	14.5	2.68
Capital buffer % Median	11.5	11.54	19.6	0.5
Capital Buffer % St. Dev.	19.5	10.6	18.9	11.5
Undercapitalization % of Profits	11.2	19.5	14.5	19.8
# of Banks with Effective Capital Buffer < 8%	16.5	19.5	16.3	11.5
#of Banks with Effective Capital Buffer < 3%	5.2	11.5	14.2	1.08
Losses Anticipated by Provisions in Banking Systems	**TTC**	**PIT**	**Stress VAR**	**Stress Int.**
Number of Under –Provision Banks	1	1	1	1
% of Expected Losses	-36.59	-64.59	-68.99	-95.64
% of Capital (Tier 1+Tier 2)	-22.54	-64.55	-64.55	-99.54
% of Capital (Tier 1)	-19.65	-35.69	-28.99	-25.98

Using historical audit data, it is possible to generate exposures to loans overall or in specific asset classes. To estimate the most recent credit growth period, aggregate historical data from the central bank or the regulator may be available [25]. The year-over-year fluctuations in credit exposures stated in external audit reports may be used to calculate the particular PDs based on the scaling factor and to estimate credit growth at the individual bank level throughout the period of interest and in specific asset classes [26, 27]. Information from audit reports can also be used to quantify indirect credit risks associated with foreign exchange exposures [28]. As said in the paragraph that follows Equations [29, 30], provided that the data is at least available at the bank level, the suggested framework may include data particularly in the lack of asset class level data. The audit reports include contain general and particular provisions for loan loss reserves as well as Tier 1 and Tier 2 capital.

V. CONCLUSION

In order to demonstrate the use and features of the macroprudential stress testing technique, this article used real data for a group of banks in Eastern Europe. The novel aspects of the proposed macroprudential stress testing were motivated by the effects of the global financial crisis on Eastern Europe. We shown in the section on empirical application how the suggested method might be used to efficiently identify systemic and unique risk indicators for assessing the relative resilience of individual banks to economic hazards as well as their financial soundness. The suggested approach is helpful for tracking and evaluating systemic risks that affect the banking industry overall by combining measurements of outcome indicators under the three distinct macroeconomic scenarios that are looked at.

Future research initiatives should concentrate on calculating the reaction functions of the banking industry and policymakers to changing circumstances regarding the banking system's solvency on its balance sheet. In order to create dynamic stress tests—which would allow stress testers to examine the response pattern of some significant the macroeconomic situation and bank-specific variables to various shocks that hit the economy and the banking system—future research should concentrate on connecting these response mechanisms to the real economy. However, it is crucial to emphasize that, in contrast to pure macroeconomic models that incorporate an aggregate financial sector, bank-level granularity—which policymakers find valuable—should be preserved in order to ensure the application of any newly proposed policies.

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