

STRESS TEST ON NEPALESE FINANCIAL INSTITUTIONS: AN IMPACT ANALYSIS OF COVID-19

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Abstract

Under the Basel framework banks are required to conduct stress test for their adequacy of capital. Nepal Rastra Bank has adopted and mandated the reduced model of stress testing framework. The study is carried out using reduced model of stress testing by measuring the impact in provision as a result of non-performing loans. This study investigates the changes in capital adequacy during stressed scenarios. The results suggest that the Capital Adequacy Ratio falls substantially when exposed to varied stressed scenarios. The study finds that Nepalese BFIs are heavily exposed to short-term lending facilities like Term Loan, Demand and other working capital loans, and Wholesaler and Retailer exposure. Although the findings are consistent with other similar studies, the Nepalese financial system is uniquely exposed to short-term financing facilities. Increasing margin requirements and credit rationing is recommended to ease the situation if and when the crisis persists. However, it should be known that this sensitivity analysis delves into capital adequacy and not profitability. This study contributes to existing literature and helps policymakers with analysis.

Keywords: *Stress Test, COVID-19, Capital Adequacy, Risk Management*

I. Introduction

Ever since its inception, the financial system has overseen many crises and turbulences. The 1997 Asian financial crisis, the global financial crisis of 2007-2008, the 2010 European sovereign debt crisis and recently Turkish currency and debt crisis since 2018 has all but highlighted the importance of financial system stability. Nepal's financial system has become increasingly unstable particularly after it adopted Financial and Economic liberalization since 1992. Shrestha (2005) found that financial liberalization has brought instability in the Nepalese financial sector and that the financial liberalization is positively associated with growth but negatively associated with financial stability. The instability of financial system brings alongside multitudes of risk and banks as a primary financial intermediary are hit the hardest. According to Kick & Koetter (2007), "Banking failures are different from non-financial corporations' failures, since a unique bank failure can put at risk the clients trust and trigger the collapse of the entire banking system. This is the reason why banks are more supervised and controlled by authorities." Stress Testing is intense but deliberate form of technique to determine the stability of the financial system pertaining particularly towards banks.

According to Blaschke, *et al.* (2001), "Stress testing describes a range of techniques used to assess the vulnerability of a portfolio to major changes in the macroeconomic environment or to exceptional, but plausible events." In the early 2000s authorities of major central banks considered the possibility of a system-wide exercises to analyze the complexities by aggregating results of different methodologies exercised by various banks. A Committee on the Global Financial System established a taskforce in 2001 to learn about the role of stress testing in risk management, which formally paved ways for stress testing tools at a global scale. The central bank of Nepal with assistance from World Bank and State Bank of Pakistan developed a reduced and more simplified version of the guideline of otherwise very complex BCBS guideline to assess

risk exposure of banks in Nepal. BCBS (2018) has outlined a guiding framework that must include objectives, governance, policies, processes, methodology, resources, and documentation that guide stress testing activities and facilitate the use, implementation, and oversight of stress testing frameworks. Following that, a guideline was formally laid down in 2012 by the central bank of Nepal with step by step methodologies to follow on. Capital Adequacy Ratio is the hallmark for Nepalese adaptation of the stress testing methodologies. Capital adequacy is the sufficiency of capital that works as a cushion for relevant risks as per regulatory guidelines.

Stress testing is a new concept in Nepalese financial system. Stress testing as a risk management tool is still in its infancy stage although as a compliance, quarterly tests are done and reported to the central authority. Due to the ongoing pandemic, frequent lockdown is imposed which ultimately has severe impact to the economy and the financial system. Can the banking system withstand the rise in interest rate? Is current CAR enough to withstand fluctuations in stock market? What happens if the certain loan portfolio collapses to non-performing loan? Can current capital withstand restructuring of various loan portfolio as mandated by central bank? These are some pertinent questions that arises during the pandemic. Therefore, this paper deals with the various stressors that impact the financial stability. The major objective of this paper is to test the financial stress on Nepalese financial institutions due to the COVID-19 outbreak. Furthermore, this paper has been extended as follows: Section II will be presented a brief literature review followed by data and methodology in section III, data analysis results and discussion in section IV, and final section V will present a quick summary and conclusion of this paper along with a policy recommendation.

II. Literature reviews

Ghosh (2021) found that the banks with low capital, minimal liquidity ratio, high non-performing loans, low profitability, and portfolio with high exposure to risky sectors were more vulnerable to the pandemic irrespective of their balance sheet size. These banks have considerable profitability ratio but low capital base, high non-performing loans, and low short term liquidity facility that further exacerbates the situation. Thomä (2020) used the scenario analysis concept and toolbox developed for climate stress-test scenarios. The report has placed impact due to covid under three scenario archetypes: health effect; sentiment effect; and policy response. The report found that it was unlikely that COVID-19 will generate dire outcome without combination of ‘unlucky’ factors, such as higher mortality, panic sentiment at unprecedented scale, and the complete breakdown of basic principles of good governance. Patra & Padhi (2020) used the panel data models to evaluate stressed scenarios under three different categories of shock, vis-à-vis, baseline, medium and severe. The study found that much of the private banks could withstand the assumed crisis scenarios barring the few banks. Likewise, Acharya, et al. (2018) found that the banks significantly reduced their credit supply to the relatively risky borrower even though such high risk borrowers paid high spread rate. The findings did not support the Moral Hazard hypothesis meaning that banks were willing to decrease their credit risk. The empirical study used difference-in-difference (DID) methodology to study the effects on stress tests on the supplies of different types of credit. Equally significant, Hassan et al. (2016) used comparative methods to investigate changes in CAR under different stressed scenarios in Turkey. The stressed results are found to be more sensitive towards changes in exchange rate and increased non-performing loans. Dinabandhu (2012) used the Cholesky decomposition of indicators to evaluate the stressed credit quality and its impact on CAR. The multivariate analysis found that the minimum CAR could fall to 8-9 percent against the 16-17 percent of gross non-performing assets.

Accordingly, Blaschke, et al. (2001) recommends aggregation and re-pricing of portfolio and comparison of it with the present portfolio and adjustment to present portfolio and risk management techniques. The paper has established a decision sequence for the conduct of stress test for individual portfolio. Kick & Koetter (2007) also used an ordered logit approach to find that distress is increasingly less likely for well-capitalized, profitable banks and more likely for banks with low levels of total reserves and high shares of poor quality loans. The approach estimated each set of probabilities with high accuracy and confirms the necessity to account for varied distress events. Oura and Schumacher (2012) defined the necessity of stress testing to measure the vulnerability of financial portfolio. Similarly, Jorion (2006) differentiates between value-at-risk and stress testing in which value-at-risk calculates potential losses at normal market conditions whereas stress testing covers broader crisis scenario.

III. Methods

There are various models for stress testing depending on the nature of shock exposed, availability of data, regulatory mandate, and covariance of macroeconomy and individual portfolio. Blaschke, et al. (2001) places emphasis on dollar gap analysis, repricing model, duration model all based on multiple shock scenarios. Silva, P. (2018) uses a limited dependent variable model of econometrics by Woolridge (2012). Similarly, Jobst et al. (2013) describes three primary approaches for concurrent stress test; balance sheet; market price-based model and macro financial models. Nepal Rastra Bank on its 2012 Stress Testing Guidelines mandated all the commercial banks to conduct quarterly stress test under three categories: Credit Risk Stress Test; Market Risk Stress Test and Liquidity Risk Stress Test. A reduced and simplified model of provisioning was recommended to calculate the capital adequacy ratio to be compared with the pre shock capital adequacy ratio. This paper follows the reduced model on various shock exposures to balance sheet.

The secondary data were obtained from Financial Stability Reports and Annual Reports from 2019 (mid-July) to 2021 (mid-July) which was the period of pandemic. This study uses the reduced model recommended by the central bank of Nepal. The reduced model is geared towards approximation of CAR because of changes in provisioning.

Credit Risk Stress Test evaluates the increase in the level of non-performing loan that have adverse impact in the capital of the bank. When NPL level goes up, additional provision requirements have an adverse impact on the bank's capital adequacy ratio. Likewise, Market Risk Stress Test explains change in the market risk factor and the bank's capital position. Capital position may vary, when there is a change in the interest rate, equity prices and exchange rates. Changes in market variables particularly interest rate of both deposits and loans have direct impact in its profit. In accordance, Liquidity risk stress test assesses the banks' ability to discharge its liabilities during the stressed events. The bank with sufficient liquid assets will have strong liquidity strength. Below Table 1 highlights the procedure of stressing across various categories of shock.

Table 1. Reduced Model of Stress Testing (NRB- 2012)

CREDIT RISK STRESS TEST			
Magnitude of Shock	(B)BASELINE : 5%	(M)MEDIUM : 10%	(S)SEVERE : 15%
Increase in Provision	$a \times B \times 100\%$	$a \times M \times 100\%$	$a \times S \times 100\%$
Revised Capital Fund	Capital Fund - Increase in Provision		
Revised Risk Weightage Exposure	Risk Weighted Exposure - Increase in Provision		

Revised CAR	(Revised Capital Fund/Revised RWE) * 100%		
MARKET RISK STRESS TEST			
Magnitude of Shock	(B)BASELINE : 200bp	(M)MEDIUM : 400bp	(S)SEVERE : 800bp
Impact (-) in Profit	(a X B)/12	(a X M)/12	(a X S)/12
Revised Capital Fund	Capital Fund - Impact in Profit		
Revised CAR	(Revised Capital Fund/Revised RWE) * 100%		
LIQUIDITY RISK STRESS TEST			
Magnitude of Shock	(B)BASELINE : 5%	(M)MEDIUM : 10%	(S)SEVERE : 15%
Revised Deposits	a - (a X B)	a - (a X M)	a - (a X S)
Revised Liquid Fund	Liquid Fund - (a X B)	Liquid Fund - (a X M)	Liquid Fund - (a X S)
Liquidity Ratio	(Revised Liquid Fund/ Revised Deposits) * 100%		
Additional RWE	a X 0.01	a X 0.06	a X 0.11
Revised Risk Weighted Exposure	RWE + Additional RWE		
Revised CAR	(Revised Capital Fund/Revised RWE) * 100%		

Here “a” is the given portfolio to be exposed.

The credit, market and liquidity portfolio are stressed across three spectra: Baseline, Medium and Severe. Loan portfolios consisted of Demand & other working capital loan (WC), Term loan (TL), Overdraft facility (OD), Home Loan up to 1.5 crore (HL), Real Estate Exposure (RE), Hotel or Restaurant Exposure (H&R) and Wholesaler & Retailer Exposure (W&R); all stressed for 5%, 10% and 15%. Deposit (DEPR) and Lending interest rate (LIR) are exposed to 200 bp, 400 bp and 800 bp, increase and decrease respectively. Equity (FE) is exposed to 50% fall and withdrawal of deposit (WDEP) at 5%, 10% and 15%. The reduced model of sensitivity analysis is used because it is easier to understand and comfortable to replicate. Since it studies the in depth impact of a variable, the predictors are reliable and helps researcher in accurate identification for space of improvements. It is however bound by the limitation of not generating probabilistic distribution of changes.

IV. Data analysis results and discussion

Stress Testing quintessentially is a ‘what if’ scenario. Various assumptions were laid down to evaluate the overall resilience and standing of Nepalese BFIs’ capital adequacy, especially in view of the COVID pandemic. The pre-shock CAR stood at 14.29% in 2019, 14.16% in 2020 and 13.53% in 2021. The recommended minimum CAR as per the New Capital Adequacy Framework of central bank is 10%. Across 3 years stress testing yielded the following results:

Table 2. Stress Test Results

Magnitude of Shock	BASELINE (5%)			MEDIUM (10%)			SEVERE (15%)		
	2019	2020	2021	2019	2020	2021	2019	2020	2021
WC	13.44%	13.28%	12.60%	12.57%	12.38%	11.65%	11.68%	11.46%	10.67%
TL	13.51%	13.26%	12.54%	12.72%	12.33%	11.53%	11.91%	11.39%	10.50%
OD	13.66%	13.55%	12.86%	13.02%	12.93%	12.18%	12.37%	12.30%	11.49%
HL	13.96%	13.84%	13.22%	13.63%	13.53%	12.90%	13.30%	13.21%	12.58%
RE	14.09%	13.96%	13.34%	13.88%	13.75%	13.14%	13.68%	13.55%	12.95%
H&R	14.12%	13.97%	13.34%	13.95%	13.79%	13.14%	13.78%	13.60%	12.95%
W&R	13.44%	13.33%	12.64%	12.57%	12.48%	11.74%	11.68%	11.61%	10.82%
DEPR	14.21%	14.08%	13.45%	14.13%	14.00%	13.37%	13.97%	13.84%	13.20%

LIR	14.13%	14.00%	13.36%	13.98%	13.84%	13.19%	13.67%	13.53%	12.86%
WDEP	14.14%	14.00%	13.38%	13.43%	13.25%	12.66%	12.78%	12.58%	12.01%
FE							14.29%	14.16%	13.53%

It is evident from Table 2 that, exposure to hotel or restaurant sector was minimum, so is the exposure to real estate sector. The biggest impact can be witnessed in Demand & Other Working Capital Loan, Term Loan and Wholesaler and Retailer Exposure. Eldomiaty, et al. (2016) suggests that non-performing loan and loan to deposit ratios have positive significance on bank's capital adequacy ratio. As the non-performing loan increased due to exposure, the immediate standing in short term lending portfolio saw a massive hit consistently in all 3 years. Similarly, the findings are consistent with stress test carried out by Hassan et al. (2016). However, much impact was not seen in fall in equity prices. Although, the results are consistent with previous studies, the Nepalese financial system is uniquely exposed to short term lending facilities. However, it should be known that land and houses work as a collateral in Nepal, and this study is not a simultaneous study. Monte Carlo simulation using stochastic approach is more suitable to draw multivariate simultaneous analysis.

Table 3. Descriptive Statistics of Stressed Test Result

Magnitude of Shock	Baseline Shock		Medium Shock		Severe Shock	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
WC	13.10%	0.0036	12.20%	0.0040	11.27%	0.0043
TL	13.10%	0.0041	12.19%	0.0049	11.27%	0.0058
OD	13.36%	0.0035	12.71%	0.0038	12.05%	0.0040
HL	13.67%	0.0033	13.35%	0.0032	13.03%	0.0032
RE	13.79%	0.0033	13.59%	0.0032	13.39%	0.0032
H&R	13.81%	0.0034	13.63%	0.0035	13.44%	0.0036
W&R	13.14%	0.0035	12.26%	0.0037	11.37%	0.0039
DEPR	13.91%	0.0033	13.83%	0.0033	13.67%	0.0034
LIR	13.83%	0.0034	13.67%	0.0034	13.35%	0.0035
WDEP	13.84%	0.0033	13.11%	0.0033	12.46%	0.0033
FE					13.99%	0.0033

Table 3 shows the descriptive statistics of variables based on panel data of 11 portfolios exposed on 3 categories of shock. Each portfolio has 3 observations from 2019 (mid-July) to 2021 (mid-July). In each category of shock, the mean average for WC, TL and W&R are the lowest. These three are the most hit sector during the COVID-19 pandemic.

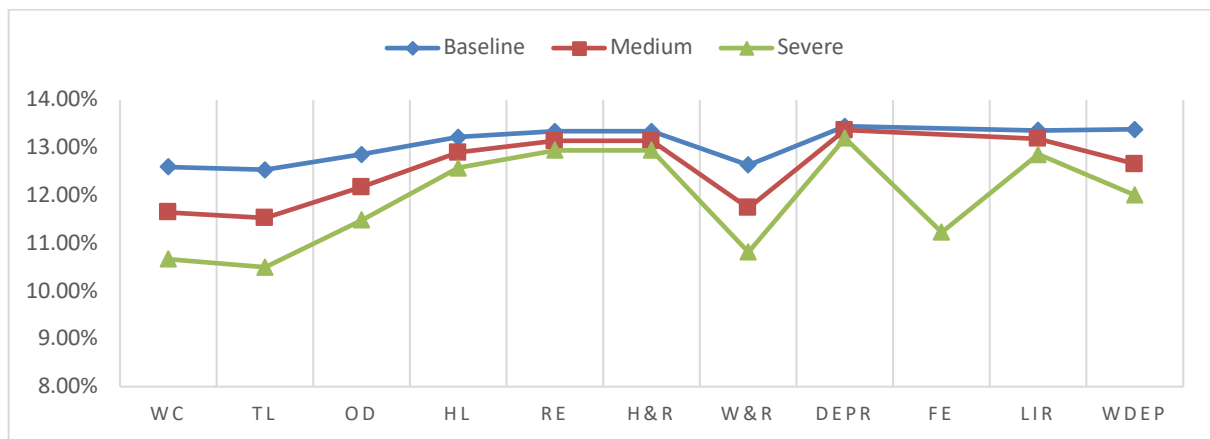


Exhibit 1. Stressed CAR% of 2021

Source: Author's own development based on stress test of 2021 using Excel

Singh, *et al* (2021) found no positive correlation between CAR and non-performing loans in Nepal, which means that individual banks in Nepal will disburse short term loans to fuel their profitability growth irrespective of fall in their CAR. The figure at Exhibit 1 merely discounts the motivation to propel necessary changes, given the higher profit spread earned from such short term lending facilities.

V. Summary and Conclusion.

After economic liberalization throughout the 90s, Nepal has seen manifold rise in its financial institutions. It has created systematic and unsystematic risk supported by integration to global financial system. As a result, adequate capital is necessary to sustain crisis and unfortunate scenarios. The purpose of this study was to identify the risk exposure of Nepalese financial institutions using reduced model of stress testing. The sensitivity analysis is carried out using data sourced from annual financial reports and financial stability report published by the central bank. It was found that Nepalese financial system is uniquely exposed to short term lending facilities like Term Loan, Demand and other working capital loan and Wholesaler and retailer exposure. This may necessitate the central bank to lay down tools for refinancing or restructuring the loans. It may also push BFIs to reschedule their assets or else new problem of excessive non-banking assets may arise and managing such assets may cause difficulties in their banking activities. Liquidity has and will always remain a problem for Nepalese financial system with or without pandemic situation fueled by over financing in short term loans like demand, term, and wholesaler/retailer loan. Managing the over leverage towards working capital financing may ease the liquidity shortage. A strict credit rationing or margin requirement is required to prevent the worst case scenario, which otherwise might necessitate recapitalization of the banking industry.

Reduced model of stress test doesn't account for the probability of occurrence of such categorized events simultaneously. So, VAR model, stochastic simulation, Monte Carlo simulation and reverse stress testing etc. can be more useful. This study prioritizes capital, however individual BFIs should also use profit as an examining parameter and evaluate the impact on distributable profits at the end of every quarter. Baudino, *et al.* (2018) has identified three pillars for stress test – governance, implementation, and outcome. Internal stress should be built on that for increased transparency and accountability. Governance iteratives, its implementation and outcome must all be measured to ensure the strong foundational basis for comprehensive risk management. Basel Committee on Banking Supervision (2017) found that both banks and regulating authorities have

made significant advances in methodologies and infrastructure for stressed test. It has now become a core tool for supervision and macroprudential policy making.

This study would be useful for studying the readiness of the Nepalese BFIs to withstand varied crisis scenarios such as the COVID pandemic. It can also be useful for regulatory authorities and policy maker to analyze the recapitalization need of the Nepalese financial system. It contributes to the existing literature of Nepal.

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