Net Stable Funding Ratio, Contingent Convertible Capital, Covid-19 and Bank Profitability: Evidence from Non-linear Panel Relationship

Mohamed Saad Amroony*, M.H. Yahya, Siong Hook Law, Fakarudin Kamarudin and Nazrul Hisyam Ab Razak

Department of Accounting and Finance, Faculty of Economics and Management, Universiti Putra Malaysia, Malaysia

Abstract: The paper evaluates the effect of contingent convertible capital (cocos) on bank profitability between 2015 and 2020 using a dynamic system generalized method of moments (GMM) approach. The empirical findings indicate that (cocos) are positive and statistically significant, implying that more contingent convertible capital improves bank profitability. Additionally, bank profitability increases when the bank's net stable funding ratio (NSFR) increases and the interaction between liquidity (NSFR) and capital (COCOs) has a negative influence on bank profitability during the covid-19 pandemic. These findings hold true when an alternative proxy is used. This study provides insight into the role of contingent convertible capital in bank profitability for policymakers.

Keywords: NSFR; contingent convertible capital; covid-19; Tobin's Q; non-linearity
JEL: G01; G20; G21; G28; G32; G33

1. INTRODUCTION

Principles of bank balance sheet risk management had already existed at national levels before the 2007/08 financial crisis, but the Basel III rules published in late 2010 by the Basel Committee on Banking Supervision (Committee, 2011)proposed a more comprehensive set of global standards measures to address mismatches in both short-term and long-term capital and liquidity. The Basel Committee on Banking Supervision (BCBS 2013) strengthened bank liquidity risk management policies through post-crisis reforms (Basel III). By including the introduction of a quantity-based liquidity benchmark, namely "the Net Stable Funding Ratio "(NSFR). The main goal of the new liquidity standard is to prevent the maturity mismatches between a bank's assets and liabilities by promoting longer-term funding of the assets and activities of banking organizations by establishing a minimum acceptable amount of stable funding based on the liquidity of an institution's assets and activities over a one-year horizon (King, 2013).

The new rules also tighten the criteria for capital instruments to qualify as regulatory capital by taking four interrelated measures of capital requirements into account: the capital adequacy ratio, the Tier 1 capital ratio, the additional tier 1 capital ratio and Tier 1 common equity (Bitar, Pukthuanthong, & Walker, 2018). Additional Tier 1 or(AT1) capital instruments do not have a fixed maturity, such as preferred shares; these instruments must contain no inducement for the issuer to redeem them. Convertible se- cureties with a high contingent value (CoCos) are considered a significant component of additional tier1, and their structure is determined by their principal function as an easily accessible source of capital for a corporation during critical situations.[1] To provide a smooth transition for banks to the current stricter capital requirements, European regulation provides for a phase-in period until December 2021 during which qualifying amounts of former additional tier 1 instruments that do not meet the new standards are gradually lowered. From the bank's point of view, applying the Basel factors (net stable funding ratio and tier 1 capital and additional tier 1) is regarded as a restriction[2] where these factors narrow the selection of viable business, revenue, and risk strategies. Since a single item can influence several factors and often in various ways, requiring a realistic understanding of capital and liquidity management (Schmaltz, Pokutta, Heidorn, & Andrae, 2014). Accordingly, complying with the new rules to fulfill liquidity and capital adequacy, including (cocos) during the covid crisis, must be carefully evaluated regarding their effect on bank profitability and vice versa. Post-GFC regulatory revisions haven't been a resounding accomplishment since they may have weakened the banking system's liquidity source and functioned procyclically, exacerbating rather than calming market stresses. This record can be attributed in part to the fact that the measures were aimed at minimizing banking-related stress situations. Regulators built policy on the idea that crises will always be characterized by deposit and funding shortages, market illiquidity, and significant credit and market losses.

*Address correspondence to this author at Department of Accounting and Finance, Faculty of Economics and Management, Universiti Putra Malaysia, Malaysia; Tel: +218925107514: E-mail: muhammedlamroony@gmail.com

[1] Additional tier 1 coco (AT1CoCos) is defined as debt obligations with a contractually mandated quasi-automatic conversion mechanism. If a predetermined threshold is exceeded (trigger event), the instrument is either changed to common equity tier 1 instruments or the principal amount is written down (PWD).

[2] The paper by (Pfleiderer, 2013) provides a detailed assessment of whether rising bank capital is indeed expensive or not.

The COVID-19 syndrome was first reported on December 31, 2019, in Wuhan, China, and designated a pandemic by the WHO on March 11, 2020. The effect of this pandemic in the United States was catastrophic, with real GDP dropping by approximately 33% by the end of the second quarter of 2020 and an unemployment rate of 14.7% by April 2020 (X. Li, Feng, Zhao, & Carter, 2021). According to the Fed's July survey of senior loan officers, a sizable proportion of banks reported tightening credit standards for the majority of loan types and declining demand for commercial and industrial (C&I), commercial real estate, and consumer loans, and this has undoubtedly affected bank performance and profitability (Petras, 2020). The Covid-19 outbreak forced global banking supervisors to prolong the Basel-III reforms (commonly nicknamed Basel IV) from Jan 2022 to Jan 2023 in order to provide banks and regulators with the resources necessary to respond appropriately to the coronavirus pandemic (Brosens, Kosonen, & Schuller, 2021)

Questions have been raised about the combined effect of net stable funding ratio and capital (additional tier 1coco) during the covid 19 pandemic on bank profitability and their interaction effect on bank performance in MENA countries[3]. Answers to these questions contribute to policy in making accurate decisions regarding joint capital and liquidity and bank profitability in the context of emerging economies to address the problem of bank profitability, which takes a heavy toll on the economy and avoids any possible future crisis. However, most studies in the field of bank profitability have focused only on the relationship between bank capital and bank profitability in developed countries. So far, very little attention has been paid to the roles of net stable funding ratio and capital in banking in MENA countries. Accordingly, this study examines the correlation between funding liquidity, capital, and bank profitability in MENA countries between 2011-2020.

This paper makes several contributions. First, this paper extends the strand of the existing literature on the effects of net stable funding ratio and additional tier 1 capital (COCOs) on bank profitability, especially in emerging countries in MENA[4]. The result offers both governments and bank regulators insightful information to determine which variables are more effective for an increase in bank profitability in MENA countries. Second, it examines the interaction effect of NSFR and COCOs on bank profitability. This is consistent with the recent empirical literature showing a non-linear relationship between net stable funding ratio and bank profitability rather than a linear association. Third, our analysis method applies the dynamic system generalized method of moments (GMM). This econometric estimation is better than an ordinary least square (OLS) estimator, as it is robust, providing consistent and efficient estimates. It resolves the persistence of the inconsistent parameter estimation due to the lagged dependent variable (i.e., lagged bank profitability) or possible endogeneity issue arising from the explanatory variables (Harris & Mátyás, 2010; Nickell, 1981). Finally, we concentrate on a relatively long period, from 2011 to 2020. Using such a timeframe can potentially provide a deeper insight since systemic changes proposed by the most recent rules (Basel III) may take some time to take effect generally.

This study is highly relevant to the existing literature on bank funding liquidity(Dahir, Mahat, Razak, & Bany-Ariffin, 2019; Dietrich, Hess, & Wanzenried, 2014; Petras, 2020). However, our paper differs in three dimensions; (Dietrich et al., 2014) used the 2010 version of the net stable funding ratio (NSFR-2010) as the main interest variable, while this paper applies the latest 2014 version (NSFR-2014). In addition, they focused on the linear relationship between NSFR and bank profitability, whereas this paper sheds light on the interaction of NSFR and (AT1 cocos) in bank's profitability. Meanwhile, (Dahir et al., 2019) modeled the traditional, non-risk-based capital ratio (equity to total assets), while this study filled the gap by examining the use of AT1CoCos as a source of tier 1 capital as proposed by the latest regulations (Basel III) and identified their impacts on the bank profitability. Finally, our study contributed to the body of knowledge by shedding light on the effects of the COVID-19 pandemic on the real economy.

The rest of the paper is organized as follows: Section 2 shows the literature review and hypothesis development, Section 3 presents the model and data, Section 4 discusses our main empirical findings, and Finally, Section 5 presents the conclusion. And policy maker

2. EMPIRICAL LITERATURE AND HYPOTHESES DEVELOPMENT

The problem of how capital and liquidity interact during the covid-19 pandemic to determine bank profitability remains uncertain. This study develops a series of testable hypotheses to elucidate these relationships further. Although the literature frequently uses the common equity tier 1 (CET1) ratio as a proxy for bank capital[5], we analyze the influence of additional tier 1 capital ratios (COCOs) on bank profitability in conjunction with funding liquidity (NSFR).

2.1. Net Stable Funding Ratio and Bank Profitability

The net stable funding ratio seeks to encourage more medium- and long-term funding of the bank's assets and activities, thus reducing the bank's maturity gap. To achieve the appropriate NSFR, banks must hold higher-rated securities and extend the wholesale funding maturity, which in effect decreases net interest margins by decreasing interest revenue while raising interest expenses (King, 2013), (Härle, Lüders, & Pepanides, 2010); anticipate that Basel III liquidity regulations would lower the return on equity of banks due to re-

[3] Since the global economic crisis, banks have been issuing AT1 bonds to raise capital and meet Basel III capital criteria. The consequence of COVID-19 on revenue has prompted banks in MENA countries to raise capital by attracting investors via bonds in order to improve their balance sheets. For further info please refer to https://www.marmoremena.com/deluge-of-bond-issues-by-gulf-banks-provides-capital-boost/ for additional information.

[4] Despite the reforms implemented to support financial markets, the MENA economy has remained a bank-based economy in which Banks continue to dominate the financial sector in the region. In addition to fostering competition, the majority of MENA countries' banking institutions have undergone significant changes, including financial liberalization.

[5] Previous literature did not include additional tier 1 contingent convertible capital (cocos) as a capital component that may be replaced for common equity tier 1 capital (CET1) or regulatory capital.

duced lending margins. According to existing literature, banks with high asset liquidity and funding stability should have low profits. So, our first hypothesis is a negative association between net stable funding ratio and bank profitability.

H1: net stable funding ratio is negatively associated with banks' profitability.

2.2. Contingent Convertible Capital AT1 (COCOs) and Bank Profitability

Contingent convertible capital (cocos) capital is primarily used to supplement the bank's going-concern capital in the event of a financial crisis. As with the common equity tier1 capital, contingent convertible capital (cocos) provides loss-absorbing capital and reduces bankruptcy costs. In particular, mitigate adverse incentives for value-reducing risk shifting and improving efficiency. A study conducted by (Albul & Tchistyi, 2016) found that CoCo bonds boost a bank's equity by improving the tax shield and minimizing bankruptcy expenses. Overall, the direct result is an increase in after-tax profits and a decrease in the cost of capital. (Chan & van Wijnbergen, 2016) Discussed the significance of Basel III supervision of CoCo bonds and adoption by the European banks through the CRR and Capital Requirements Directive (CRD) IV. (Goncharenko, 2016) conducted an investigation into the factors that influence the deployment of AT1CoCos. The findings indicate that banks with leverage exceeding 3% and those with capital limitations are more willing to issue CoCo bonds in larger quantities. (Petras, 2020) study whether bank profitability has a similar pattern using AT1 (coco) instead of CET1. Using a sample of 291 banks across 32 EEA countries. The result shows that bank profitability significantly increased. Theoretically, Adopting Contingent convertible capital (AT1 cocos) instead of common equity tier 1 (CET1) capital can provide positive aspects for banks, since these instruments provide a tax shelter as coupon payments are deductible and can act as loss absorption for bank equity during crisis times. Accordingly, we hypothesize the following

H2: Contingent convertible capital (cocos) is positively associated with banks' profitability

2.3. Covid-19 Pandemic and Bank Profitability

To limit the development of covid-19, governments worldwide implement complete lockdown procedures that accidentally drive businesses and consumers into solvency and liquidity problems (Bartik et al., 2020). Thus, the pandemic induced an abrupt and exogenous increase in the credit risk of borrowers worldwide. This study is related to the rapidly emerging literature regarding the impact of the COVID-19 epidemic on bank profitability. Several studies show that bank profitability is negatively associated with the covid-19 pandemic. From this perspective, (Acharya & Steffen, 2020; L. Li, Strahan, & Zhang, 2020) indicated a decline in total loans to all U.S. banks in the first quarter of the pandemic. (Carletti, Oliviero, Pagano, Pelizzon, & Subrahmanyam, 2020) Investigated the influence of the COVID-19 epidemic in a sample of 80,972 Italian firms' profitability, the result suggested that both equity and profitability are negatively associated with the epidemic. A similar analysis was carried out by Baker et al. (2020) on the impact of the COVID-19 shock on equity prices and on the profitability of US firms, the result revealing both negative and positive jumps in response to COVID-19. We have so concluded that, despite the massive government assistance and cash injections, the epidemic leads to reduced credit growth. This drives us to draw our third hypothesis positing that the relationship between the covid-19 epidemic and bank profitability is negative, as follows

H3: the covid-19 epidemic is negatively associated with banks' profitability

2.4. Interaction Effect of Liquidity and Capital and Bank profitability

Most of the new empirical literature on the interrelations of bank capital and liquidity has yet to establish robust findings. From this perspective (Distinguin, Roulet, & Tarazi, 2013) explored the association between capital and liquidity and concluded that when banks are suffered from illiquidity, they tend to increase their regulatory capital buffer level. The findings also showed that banks decrease their regulatory capital by generating additional liquidity. (Imbierowicz & Rauch, 2014) Find that although both credit risk and liquidity risk increase bank failure risk, when experienced jointly, these two types of risk can either amplify or offset each other. According to (Imbierowicz & Rauch, 2014), while both credit and liquidity risk raise bank failure risk, they can either amplify or negate one another. (Birn et al., n.d.) Evaluated the combined effect of Basel III's four constraints (risk-based capital, leverage capital, NFSR, and LCR). They concluded that banks would handle their liquidity positions more effectively under joint constraints by increasing their stable deposit funding rather than liquid asset investments. Using pre-Basel III data, (DeYoung, Distinguin, & Tarazi, 2018) examined how U.S. commercial banks' liquidity was affected in response to negative capital shocks; the results revealed that a minimum capital constraint naturally mitigates liquidity risk. The BCBS regulators recommend that financial institutions be required to maintain a higher proportion of capital and liquid assets, which provide protection from a bank run. In response to these regulations, financial institutions and economies have to bear a heavy cost in terms of lower profitability and slower economic activities.

H4: interaction of liquidity and capital will have an adverse impact on profitability

Table **1** summarizes the primary empirical studies examining the impact of (NSFR), AT1 (COCOs) and profitability.

3. METHODOLOGY AND DATA SET:

3.1. Data Collection

In order to perform this study, data on 137 banks from 16 Middle Eastern and North African (MENA) states were gathered from the oribs bank focus database from 2011 to 2020. Data were acquired solely from MENA banks with sufficient data to calculate our variables of interest, especially with Basel III ratios.

3.2. Methodology

In the banking literature, the persistence of bank profitability over time results in changes in the following year's profit (Athanasoglou, Brissimis, & Delis, 2008; Goddard, Liu, Molyneux, & Wilson, 2013). [6] Therefore Fixed or random effects are not suited for estimation due to endogeneity, unobserved heterogeneity, correlation between regressors and the lagged dependent variables. (Bond, 1991) proposed the dynamic GMM model in order to overcome these concerns by differencing all regressors and applying GMM techniques (Hansen, 1982). In order To analyze the influence of the interaction of contingent convertible capital (COCOs) and net stable funding ratio (NSFR) on bank profitability in the MENA countries, this study adopts a two-step systems GMM model. Therefore, the empirical model is re-specified as follows

$$Inprofitability_{it} = \alpha + \beta 1 Inprofitability_{t-1} + \beta 2 InNSFR_{it} + \beta 3 InCOCOs_{it} + \beta 5 InX'_{it} \beta 6\ dummy'_{it} + uit \quad (1)$$

We broaden the model by accounting for the interaction effect of net stable funding ratio and additional tier1 (COCOs) on bank profitability. As a result, the empirical model is re-specified:

$$Inprofitability_{it} = \alpha + \beta 1 Inprofitability_{t-1} + \beta 2 InNSFR_{it} + \beta 3 InCOCOs_{it} ++ \beta 4 InNSFR * COCOs_{it} + \beta 5 InX'_{it} \beta 6\ dummy'_{it} + uit \quad (2)$$

where the dependent variables on the left-hand side refer to the bank profitability indicator Tobin's *q* ratio in country j in year t, while $Profitability_{t-1}$ is the lagged bank performance, NSFR, AT1COCOs, X presents the vector of bank-specific and control variables, dummy refers to covid-19 pandemic yearly dummies, and uit is a residual term.

3.3. Data Description and Measures

Dependent variable indicator: James Tobin introduced the Tobin's Q ratio to evaluate a company's market value to its holdings (assets). Consistent with the extant literature, we follow the previous empirical studies of (Liang, Ching, & Chan, 2013; Ur Rehman, Aslam, & Iqbal, 2021) to determine the Tobin's Q ratio of the bank as an indicator of bank performance.

3.3. Measures of Explanatory Variables

Net stable funding ratio (NSFR) is the ratio of a bank's available stable funding (ASF) divided by its required stable funding (RSF), which is required to be at least 100 percent; we contribute to the body of knowledge by adopting the latest version of the NSFR[7].

$$NSFR = \frac{available stable funding}{required stable funding}$$

Contingent convertible capital (COCOs): following (Petras, 2020), our study measured (COCOs) capital by dividing the additional tier1 CoCos (AT1CoCos) to tier 1 capital. AT1CoCos represents the amount of fully loaded additional tier1 capital provided by CoCo bonds. Aside from that, total tier 1 capital for the bank includes common equity tier 1 capital and many other types of additional tier 1 capital, all of which are being phased out over time. A significant advantage of using this assessment approach is that it directly reflects the concept that substituting fully loaded additional tier 1 capital (AT1) for common equity tier 1(CET1) capital might be desirable. It is not dependent on the amount of risk-weighted assets (RWAs) held, nor does it merely reflect greater total capital ratios in the financial statements.

$$COCOs = \frac{AT1CoCos}{Tier1 capital}$$

Bank Size was employed as a control variable. In order to be able to link bank profitability, COCOs, NSFR and the COVID-19 pandemic era. Our concept of bank size in this study is equal to the natural log of total bank assets, which implies that larger banks perform better.

Income diversification represents the ratio of net noninterest income to net operating income. It is anticipated that revenue diversification and bank profitability will have a positive relationship.

The ratio of loan loss reserves to total non-performing loans is used to calculate loan loss reserves. Furthermore, this research involves a dummy variable to account for the current COVID-19 crisis in order to evaluate its effect on bank profitability in the MENA region. This dummy is set to 1 in the event of the COVID-19 crisis and 0 in all other cases. Variable definitions and data sources are provided in Appendix A

4. EMPIRICAL RESULTS AND DISCUSSION

4.1. Summary Analysis

The following table (Table **2**) summarizes the descriptive statistics for all variables included in the ensuing panel regressions. Except for dummy variables, all variables have been winsorized at the 1% and 99 per cent levels to avoid the effects of outliers.

The mean value of bank Tobin's Q is 0.147 %, which is between 0% and 0.664%, with a standard deviation of 0.94%, suggesting that bank Tobin's Q in MENA countries grows 0.147 % annually. The net stable funding ratio (NSFR) average is 0.986%, with a variability of 5.51%, and ranges between -0.092% and 200. Contingent convertible (CoCo) mean value is 0.869% with a standard deviation of 0.229%. Over the period 2011-2020, bank size has the highest mean and standard deviation with a mean score of 9.3percent. Both

[6] Numerous banks do not supply the essential amount of detail of the Basel III contingent convertible capital (cocos) and the net stable funding ratio to the orbis Bankfocus database, mainly because these actions were not mandatory prior to the BCBS's current rule proposal 2014. As a result, this article extended the existing literature by examining a new time period up to 2020.

[7] Despite numerous literatures on bank profitability, only a limited number of studies examined the impact of Basel III liquidity on banks' profitability using the latest version of the (NSFR_2014). Due to Basel regulation changing nature, this study fills the gap by calculating the (NSFR 14), using the most recent technical document (BCBS, 2014)

Table 1. Descriptive Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
Tobin's q	1360	.147	.094	0	.664
NSFR	1370	.986	5.517	.092	200.134
COCO	1362	.869	.299	0	2.198
NSFR*COCO	1362	.91	5.54	0	200.134
NNI	1366	3.461	.456	-.943	9.659
LLR/-NPL	1349	4.539	.599	2.589	7.139
total assets	1365	9.321	1.628	4.07	12.548

Note: The sample covers 137 banks in 16 countries. Variable definitions are provided in Appendix A

Table 2. Matrix of Correlations.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tobin's q	1.000						
NSFR	0.003	1.000					
COCOs	-0.041	0.032	1.000				
NNI	0.104	0.011	0.016	0.012	1.000		
LLR/NPL	0.135	-0.026	0.010	-0.025	-0.020	1.000	
total assets	-0.007	-0.043	-0.074	-0.046	-0.025	0.055	1.000

Notes: Tobin's Q= bank profitability; NSFR =net stable funding ratio COCOs AT1 contingent convertible capital; NNI = Net interest income ; LLRNPL = loan loss reserves/non-performing loans; total assets = bank size.

revenue diversification and the loan loss reserves range from -.943per cent to 9.659 and from 2.589 to 7.139 respectively.

The degree of correlation between the explanatory variables included in the dynamic panel regression analysis is shown in Table **3**. The matrix demonstrates that, on average, the correlation between all the variables is low, implying that multicollinearity issues are either minor or nonexistent. Multicollinearity is a concern when the correlation is more than 0.80 (Sufian, 2009), which is not the case in this situation.

4.2. Interaction Effect of the Net Stable Funding Ratio (NSFR) and Contingent Convertible Capital (AT1 Cocos) on Bank Profitability

In Table **4**, we present the findings of the generalized method of moment (two-step sys GMM) that examines the bank profitability in MENA countries during 2011-2020. The findings demonstrate that the lagged dependent variable is positive and statistically significant at the 5% level, implying that bank Tobin's Q is persistent in MENA countries. This persistence suggests that bank Tobin's Q continues yearly when an explanatory variable is considered.

The net stable funding ratio (NSFR) has a coefficient of 0.04 and is statistically significant at the 5% significance level. It positively affects bank profitability, as a 1% increase in net stable funding ratio results in a 0.04 percent increase in bank performance behaviour in MENA economies. Concerning the extent of this effect, these findings are conceptually consistent with relevant literature and support the theory that banks with higher liquidity will have a lower funding cost, which expands profit margins (Bordeleau & Graham, 2010). However, the findings do not corroborate H1.

With regard to contingent convertible capital AT1 (COCOs), the outcomes indicate that capital is positively associated with bank profitability in MENA countries; it has a statistically significant effect on bank profitability at the 5% level, which also suggests that a 1% increase in AT1 (COCOs) increases bank profitability by 0.029 percent. These results are consistent with the "expected bankruptcy cost hypothesis," which asserts that banks with more capital significantly increase their profitability (Berger, 1995; Petras, 2020), and these findings support H2.

The study contributes to the current body of knowledge by examining the interaction effect of NSFR and AT1 (COCOs) on bank profitability. In other words, we evaluate whether increasing the bank net stable funding ratio strengthens or deteriorates the link between contingent convertible capital and bank profitability in MENA countries from 2011 to 2020.

The effect of contingent convertible capital on bank profitability is negative and statistically significant at the 5% level, implying that increased funding liquidity (NSFR) has an adverse influence on the relationship between contingent convertible capital (COCOs) and bank profitability; thus, these results support H3.

Table 3 Two-Step System GMM Output Without Covid Pandemic.

Tobin's Q	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
L. Tobin's Q	.942	.041	23.12	0	.863	1.022	***
NSFR	.04	.015	2.72	.007	.011	.069	***
COCO	.029	.011	2.57	.01	.007	.051	**
NSFR*COCO	-.04	.015	-2.72	.006	-.069	-.011	***
llrnpl	0	0	-0.30	.763	0	0	
nni	0	0	-5.09	0	0	0	***
ltotalassets	-.001	.001	-2.17	.03	-.002	0	**
time2	-.035	.005	-7.73	0	-.044	-.026	***
time4	-.021	.005	-4.06	0	-.031	-.011	***
time5	-.047	.005	-9.62	0	-.057	-.038	***
time6	-.025	.004	-5.70	0	-.034	-.017	***
time9	-.013	.006	-2.21	.027	-.024	-.001	**
time10	-.059	.007	-7.86	0	-.074	-.044	***
Constant	.008	.016	0.50	.62	-.023	.039	
Mean dependent var	0.145	SD dependent var	0.091				
Number of obs	1200.000	Chi-square	43138.319				
*** p<.01, ** p<.05, * p<.1							

Notes: Regression model results demonstrate the interaction between NSFR, COCOs, and bank profitability. Estimates are based on the two steps GMM approach (2sys). The data represent a panel of the MENA banking systems. In order to account for the lags and instruments, the estimates were run with 1196 observations.

The bank total assets (size) coefficient is (-0.01) and is statistically significant at the 5% level in all parameters. The results suggest that bank size has an adverse effect on bank profitability in MENA. This association implies that large banks in MENA countries are less profitable as compared to small banks. These findings show that major banks are better equipped to limit their credit activity to shrink their assets; this result is consistent with (Goddard, Molyneux, & Wilson, 2004; Roulet, 2017). Additionally, revenue diversification is negative and statistically insignificant at (-.02), whilst loan loss reserves are statistically insignificant with bank profitability. These findings, however, are consistent with prior studies.

4.3. Role of the Global Covid-19 Pandemic Crisis-Bank Profitability in MENA Countries

Another interesting question is whether the interaction between covid-19 pandemic and AT1 (COCOs) on bank profitability differs between regular and crisis times. The COVID-19 pandemic has disastrous repercussions on both supply and demand. To stop the spread of COVID-19, various countries enforced quarantine and even lockdowns. Globally, all non-essential firms closed, putting many small and medium-sized businesses at risk of financial difficulties and bankruptcy (Hu & Zhang, 2021). To that end in the second empirical part of this study, we apply a non-linear panel regression model to assess the impact of interaction AT1CoCos and bank profitability with considering the effect of the recent covid 19 pandemic crises

The finding of table **4** reveals that during the covid pandemic crisis, increases in contingent convertible capital (AT1 COCOs) reduced bank profitability. This result is supported by theoretical arguments that suggest that although high capital requirements shield banks against unexpected losses, they can also constrain banks' lending ability because equity financing is prohibitively expensive, eventually reducing bank profitability (Kanga, Murinde, & Soumaré, 2020).

4.4. Robustness Tests

This paper conducted robustness tests to analyze if the empirical findings hold as employing different proxy of bank profitability. The paper uses the net interest margin (NIM) as an alternative measure of bank profitability. The net interest margin is calculated by the difference between weighted average yields on assets (interest income) and liabilities (interest expense) - also known as the bankers' markup (Allen, 1988). The study follows the previous empirical studies of (Dietrich et al., 2014; King, 2013). To determine the bank's net interest margin, the study uses the gap between interest income and interest expense to total assets.

Table **6** presents the empirical results of the two-step system GMM estimator employing alternative measures of bank profitability.

Table 5. Two-Step System GMM During the Covid Pandemic.

Tobin's Q	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
L. Tobin's Q	.921	.037	25.02	0	.848	.993	***
COCO*covid	-.031	.004	-6.86	0	-.039	-.022	***
LLR/NPL	0	0	-0.55	.583	0	0	
NNI	0	0	-4.35	0	0	0	***
ltotal assets	-.001	.001	-1.13	.257	-.002	.001	
time2	-.025	.004	-5.91	0	-.034	-.017	***
time3	.014	.005	3.03	.002	.005	.023	***
time5	-.036	.004	-8.55	0	-.045	-.028	***
time6	-.013	.004	-3.73	0	-.02	-.006	***
time8	.011	.004	2.61	.009	.003	.019	***
Constant	.022	.009	2.37	.018	.004	.04	**
Mean dependent var	0.145	SD dependent var	0.091				
Number of obs	1200.000	Chi-square	33426.444				
*** p<.01, ** p<.05, * p<.1							

Table 6. Using an Alternative Proxy (Robustness Tests).

NIM	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
L.NIM	.969	.048	20.28	0	.876	1.063	***
NSFR	.311	.196	1.59	.113	-.074	.696	
COCO	.242	.114	2.13	.033	.019	.464	**
NSFR*COCO	-.311	.197	-1.58	.114	-.696	.075	
LLRNPL	0	0	-0.16	.87	0	0	
NNI	0	0	-2.65	.008	0	0	***
ltotalassets	-.002	.012	-0.16	.871	-.025	.021	
time2	.078	.041	1.88	.06	-.003	.158	*
Constant	-.148	.223	-0.66	.508	-.585	.29	
Mean dependent var	3.068	SD dependent var	1.275				
Number of obs	1209.000	Chi-square	13432.616				
*** p<.01, ** p<.05, * p<.1							

Notes: NIM= net interest margin; NSFR =net stable funding ratio COCOs AT1 contingent convertible capital; NNI = Net interest income ; LLRNPL = loan loss reserves/non-performing loans; total assets = bank size.

The empirical evidence indicates that no change has occurred. The interaction effect of net stable funding ratio (NSFR) and AT1 COCOs on bank profitability remains negative and significant. Likewise, the relationship between bank additional tier 1 (AT1 COCOs) and the covid-19 pandemic is negative and statistically significant at the 1% significance level, implying an increase in contingent convertible capital AT1 (COCOs) during the pandemic contributes to a decrease in bank profitability. Thus, the net interest margin proxy matches our earlier Tobin's Q proxy results, indicating that our empirical findings are robust and maintained. In other words, the coefficients of increased tier 1 capital (COCOs) and their interaction effects with NSFR on bank profitability remain statistically significant and consistent throughout the pandemic.

5. CONCLUSION

This paper examines the relationships among net stable funding ratio, additional tier1 capital (COCOs), covid-19 pan-

demic, and bank profitability. The sample comprises 137 banks operating in MENA countries from 2011 to 2020.

The non-linear adopted technique allowed us to investigate the interaction impact between COCOs and NSFR on bank profitability; something policymakers must address. Furthermore, the findings enabled us to comprehend the COVID-19 implications vis-`a-vis and the relationship between this relationship based on the expected bankruptcy cost theory. The two-step system GMM model used in this study also controls for endogeneity.

The results reveal that bank profitability positively correlates with AT1 and NSFR, implying that the banks with higher capital and liquidity buffers significantly increase their profitability. The findings also indicate that bank profitability shrinks with the interaction of bank net stable funding ratio and contingent convertible capital (AT1 COCOs), .implying that increased funding liquidity (NSFR) has an adverse influence on the relationship between contingent convertible capital (COCOs) and bank profitability by 0.028 in the absence of a covid pandemic. The results also evidenced that the interaction effect of COCs during covid-19 pandemic had adverse and significant effects on bank profitability in MENA countries. A robustness test was carried out utilizing alternative metrics of bank profitability. The interaction term coefficients and the covid-19 dummy maintained identical to the primary outcomes, providing similar parameter estimates and significant levels.

This study adds to the existing body of knowledge in various ways. First, this study establishes that the interaction effect of bank additional tier 1 capital (AT1) on bank profitability depends on the bank's net stable funding ratio (NSFR); this indicates a non-linear link between increased additional tier 1 and bank profitability. Additionally, this paper examines a new geographic region; prior research has concentrated on the European Union and the United States. As a result, there is much uncertainty surrounding the effects of a COVID-19 era on a bank's profitability in MENA countries. The paper's findings are particularly significant for policymakers, considering the regulatory adjustments that followed the 2008-09 financial crisis. To ensure the financial system's stability, policymakers adopt different standards for banks' liquidity and capital requirements; the Empirical results demonstrate that the Federal Reserve approach should take care of exempting small banks from the liquidity requirements of Basel III, particularly during difficult periods (covid-19 pandemic).

This paper may also serve as a springboard for future work. The existing model could be extended to more nations, focusing on those with and without prior bank liquidity restrictions; the factors of increasing additional Tier 1 capital (AT1 COCOs) for banks could also be modelled. In either scenario, this research serves as an initial step highlighting a crucial, albeit elementary, relationship pertinent to bank regulation.

AUTHOR STATEMENT

As confirmed, our study is based on authentic research and has not been published or authored anywhere else. All the authors who contributed to this paper declare that there is no conflict of interest with any other individual or entity.

DECLARATION OF COMPETING INTEREST

There is no conflict of interest.

APPENDIX A (VARIABLE DEFINITIONS AND DATA SOURCES)

Table 7. Summary of Variables.

Variable	Type	Data Source	Description	References	Expected Sign
Tobin's Q	profitability	Orbis bank focus database	$\frac{\text{market value of the bank}}{\text{total assets}}$	(Liang et al., 2013; Ur Rehman et al., 2021)	-
Net interest margin (NIM)	profitability	Orbis bank focus database	$\frac{net\ interest\ income}{total\ averagea\ assets}$	(Dietrich et al., 2014; King, 2013)	-
Net stable funding ratio (NSFR)	Liquidity as defined by the new Basel III document of October 2014	Orbis bank focus database	The ratio of available stable funding to required stable fined as defined by the Basel III document of December 2014[8]	(BCBS, 2014)	negative
contingent convertible capital (cocos)	Capital as defined by Basel III	Orbis bank focus database	$\text{COCOs} = \frac{\text{AT1CoCos}}{\text{Tier1 capital}}$	(Petras, 2020)	positive

Net interest income (NNI)	Bank characteristics	Orbis bank focus database	$\frac{\text{net noninteres t income}}{\text{net operating income}}$	(X. Li et al., 2021)	Positive
Bank size	Bank characteristics	Orbis bank focus database	(natural logarithm of total assets)	(Roulet, 2017)	Positive/negative
Loan loss reserves	Bank characteristics	Orbis bank focus database	$\frac{\text{loan loss reserves}}{\text{non - performing loans}}$	(Dietrich et al., 2014)	*Positive*

This table summarizes all variables, definitions, and anticipated influence on profitability. The sign "+" indicates a positive expected effect, whereas the sign "-" indicates a negative expected effect. The expected effect is derived from prior researches.

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