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Abstract: This study assesses the dynamic relationship between macroeconomic factors and bank asset quality based on changes in the condition of stock market returns. A Generalized Method of Moments (GMM) model is employed, using panel data from 18 universal banks spanning the period 2007 to 2021. The analysis revealed that the real GDP growth rate, the average lending rate, and the real exchange rate represent a set of macroeconomic factors with a marked influence on banks' asset quality. In addition, a high inflation rate was found to exert an adverse effect on asset quality, as it affects borrowers' financial ability to meet loan repayment obligations. Furthermore, the study verified the existence of a positive relationship between market condition and asset quality, which implies that bank performance adapts to changes in market conditions as posited under the Adaptive Market Hypothesis (AMH). Bank managers should consolidate banks' asset bases during conditions of market stability to withstand periodic market fluctuations to boost trading momentum. Policy recommendations are suggested to foster a conducive business environment for bank stability.

Keywords: bank asset quality; real GDP; inflation; average lending rate; real exchange rate; changing market conditions

1. Introduction

Universal banks represent a focal component of the financial system for the intermediation and allocation of financial resources across the sectors of the economy to facilitate socio-economic development (Guru and Yadav 2019; Haralayya and Aithal, 2021). The efficiency of the banking industry is vital for the stability of the entire financial system within any economy. However, banks in Ghana, much like their international counterparts, continue to draw criticism for their persistent inability to exhibit superior performance in terms of returns on loans and advances, which constitute the main income-generating asset of banks (PwC 2019; Al Masud and Hossain 2021). Banks in Ghana nevertheless continue to experience an increase in the flow of investors' and depositors' funds, while universal banking, like other financial enterprises, is premised on the ability to outperform the market. According to the Bank of Ghana (BoG 2021), the combined assets of licensed universal banks stood at GHS 166.4 billion as of the middle of the third quarter of 2021, which represents a notable increase of 16.7 percent compared with the previous year's value of GHS 138.6 billion. Nonetheless, pertinent issues regarding high levels of non-performing loans, risk management, operational efficiency, and liquidity constraints, which have implications for the asset quality and trading stability of the banks, continue to cause concern among analysts and policymakers (PwC 2019; BoG 2021).

The asymmetric asset quality and funds flow interaction of banks distorts information efficiency and allows strategic investors to earn excess returns while assuming minimal risk, which deviates from the underlying assumptions of the Efficient Market Hypothesis (EMH). Explanations suggest that in a robust financial market, the prices of financial assets adequately reflect the available market

information on them. A trader can only achieve returns comparable to what the market generally offers, while an extraordinary return is possible only on the assumption of additional risk (Fama 2021). The relationship between inconsistent asset quality and funds flow suggests that their dynamics adapt to changes in market conditions and can be explained by the Adaptive Market Hypothesis (AMH). In terms of the AMH, the interaction between financial and economic variables is subject to changes in market conditions, and their characteristics therefore adapt to period market changeovers (Lo 2012). This activates human evolutionary tendencies such as overreaction, loss aversion, and cognitive bias among investors, who then exhibit trading behaviors that are contrary to established financial planning principles (Urquhart and McGroarty 2016). Arbitrageurs therefore adopt opportunistic strategies to achieve excess gains regardless of the direction of their current performance.

In the above context, the application of a nonlinear test tool and a conditional model is appropriate to obtain accurate inferences about the drivers of asset quality in Ghana. This is because most of the extant studies on the asset quality and performance of banks in Ghana have been conducted in the context of stable market conditions, with the analyses focused mainly on the effect of bank-specific dynamics on profitability (Boateng 2018; Mei et al. 2019; Bunyaminu et al. 2021). Banks, like other financial businesses, are sensitive to dynamic shocks which emanate from changes in macroeconomic factors such as GDP growth, inflation, interest rate and real exchange rate, while their performance is also linked to the condition of the market index, which calls for further analysis. Linear tools such as Ordinary Least Squares (OLS) and fixed and random effect techniques are inadequate as means to estimate reliable conclusions about the dynamics of bank asset quality, as these methods are underpinned by linear explanations posited under the EMH, which contradicts the normative guidelines of adaptation espoused under the AMH (Lo 2012). In this context, a dynamic panel model such as the Generalized Methods of Moments (GMM) system, which is a two-step system, is more suited to account for the effect of past asset quality on current asset quality in the context of changes in macroeconomic indicators, while considering the direction of the stock market conditions. The study is therefore underpinned by the theoretical framework of the AMH, as the interaction between asset quality and the macroeconomic variables adapts to changes in market conditions. The unconditional analysis of the dynamics of asset quality in Ghana remains unexplored in the literature, and therefore merits further investigation.

Consequently, aimed at assessing the effect of macroeconomic factors on the asset quality of banks, with due consideration of changes in the condition of stock market returns. Beyond the novelty of the study in testing the effect of market conditions on the asset quality of banks in Ghana, the findings provide a valuable toolkit for bank practitioners, analysts, investors, depositors, and policymakers who require bank data for the purposes of investment and analysis. Additionally, the analysis of the effect of bullish and bearish market conditions on the asset quality of banks represents an important impetus towards ensuring stability in the banking industry while engendering sustainable investments through banking, which makes the study a significant contribution to the literature on bank performance. Real GDP growth rate, average lending rate, and real exchange rate were found to be a set of macroeconomic factors with positive predictive influence on banks' asset quality, while an increase in inflation deteriorates asset quality because of an increase in operational overheads and a decline in borrowers' disposable income. The paper is structured as follows: Section 1 presents the theoretical framework and empirical literature review; section 2 provides a description of the research methodology and details of the data sources, sampling criteria and empirical model; Section 3 presents the results and discussion, and Section 4 contains the conclusion and suggestions regarding policy implications.

2. Literature Review

2.1. Theoretical Literature Review

Market fluctuations lead to contrarian investments, with bank depositors' and investors' stock-picking decisions being influenced by adaptive tendencies such as overreaction, risk aversion, and

overconfidence as against adherence to rational investment principles (Chen et al. 2018). Explanations posited in terms of the EMH imply that the prices of financial instruments such as banks' assets adequately reflect the available market information about them in instances where the financial system is informationally robust (Fama 2021). In such a case, excess returns are achieved only when an investor assumes a commensurate higher risk. However, periodic changeover in market conditions distorts the efficiency of the financial market and allows opportunistic traders to achieve extraordinary returns regardless of the direction of their current performance (Lo 2012). In this way, the dynamics of bank asset quality may extend beyond bank-level factors to include adaptation to changing market conditions as a means of sustaining trade momentum. In consequence, banks are able to attract investors' asset allocations despite their persistent inability to exhibit superior performance relative to the market amid significant operational inefficiencies. The banking industry, much like other subsectors of the economy, is subject to changes in fundamentals such as GDP growth, inflation, interest rate and exchange rate, while these factors drive the direction of bank performance (Batten and Vo 2019). These dynamics suggest the existence of a convex relationship between bank asset quality and funds flow, with asset owners allocating funds disproportionately across recently outperforming and underperforming banks. Nonlinear theorizing and modeling are therefore required as a way to obtain accurate inferences about their interaction.

In the above context, the AMH is suited to explaining the incongruous relationship between funds flow and asset quality in banks in Ghana. Proponents of evolutionary perspectives in financial planning explain that investors' responses to market updates such as risk aversion, overinvesting, and anxiety about expected returns are evidence of human evolution and adaptation to changing conditions (Madaan and Singh 2019). In this context, bank managers and investors alike adapt to switches in market conditions regarding return volatility and variability while they strategize to sustain trading momentum, as explained under the AMH (Mishra and Mishra 2023). Explanations posited under the AMH suggest that the interaction between economic variables is unlikely to be the same under conditions of uncertainty in the market, as their dynamics change over time (Lo 2012; Obalade and Muzindutsi, 2020). Thus, the AMH represents a bridging theory through which the unpredictable actions of humans and market robustness are linked (Lo 2004; Kumar 2018). In practice, investors take advantage of instability in market conditions to achieve extraordinary returns, as the informational efficiency of the financial market is distorted during such periods (Paramita et al. 2017). As a result, the linear explanations posited under the EMH become inadequate for theorizing about the asymmetric interaction between the asset quality and funds flow of banks. This is because behavioral hazards and reactionary tendencies may influence the trading decisions of bank investors and depositors under changing market conditions, while these dynamics are not factored by the underlying explanations of the EMH.

Accordingly, the application of linear test tools such as the OLS and fixed and random effects models to the analysis of the incongruous asset quality and funds flow relationship is inadequate for eliciting accurate inferences about their behavior. This is because the techniques are based on the EMH and are suited to stable market analysis, which contradicts the adaptive explanations posited under the AMH (Lo 2004; Fama 2021). As a result, conditional nonlinear modeling is required to obtain an accurate conclusion about the relationship between bank asset quality and cash flow, because the dynamics of banks' performance, comparable with other economic time series, is dependent on changes in market conditions which can be explained by the AMH. The normative guidelines of the AMH imply that the relationship between financial variables is contingent on periodic changes in market conditions, as systemic fluctuations affect the direction of their effect, which may activate adaptive trading and investment behaviors among asset managers and investors based on the current market trend (Lo 2012; Mushinada 2020).

2.2. Empirical Studies on the Effect of Macroeconomic Dynamics on Bank Asset Quality

The dynamics of banks' performance, much like other financial time series, are sensitive to changes in macroeconomic indicators and the condition of the stock market, where the return on banks' assets varies across market upturns and downturns (Bhimjee et al. 2016; O'Connell 2023).

Employing a system GMM technique, Arrawatia et al. (2019) analyzed the determinants of banks' asset quality in India, finding GDP growth and real interest rate to have a positive effect on asset quality and inflation to have a negative effect on asset quality. This evidence suggests that an increase in national productivity promotes the quality of banks' assets through the expansion of the market to support business growth and liquidity flow and to boost borrowers' ability to meet credit repayment commitments, which reduces the level of non-performing loans of banks. However, results obtained by Swamy (2017) showed GDP growth to have a negative effect on asset quality, with this effect being attributed to operational inefficiency and management laxity regarding loan recovery strategies as economic expansion allows investors and debtors to explore other avenues of asset allocation beyond banks. The positive effect of interest rates on asset quality documented by Arrawatia et al. (2019) indicates that an increase in lending rate implies an improvement in the returns on banks' assets, which reflects in enhanced interest margins. This evidence is, however, contradicted by more recent results obtained by Ogundipe et al. (2020), which suggest that an increase in lending rate implies a corresponding increase in non-performing loans and reflects a deteriorating spiral of asset quality.

The evidence obtained by Arrawatia et al. (2019) of the negative effect of inflation on asset quality is to be expected, as an increase in frequency brings about increases in the prices of goods and services, and the factors of production stagnate business growth and profitability while diminishing individuals' disposable income. In this way, the financial capacity of bank debtors is reduced, which has implications for the quality of banks' assets. While this result remains consistent with the explanations provided by Alhassan et al. (2014), it departs from the position adopted by Swamy (2017), who documents inflation as having a positive influence on bank asset quality. The study indicated that inflationary conditions allow banks to charge higher lending rates to improve interest income as a means to offset losses that may accrue from non-performing credits so as to sustain trading momentum. While the findings of the above analyses make important inferences about the effect of the specific economic indicators on asset quality, they do, however, account for the effect of the stock market returns on bank performance while changes in the market conditions can affect the quality of banks assets (Mensah and Premaratne 2018), which requires further analysis.

Using a one-step difference GMM approach, Al Masud and Hossain (2021) examined the determinants of non-performing loans to test the quality of bank assets in Bangladesh. Beyond bank-level dynamics, GDP growth, inflation, and interest rate were found to constitute a set of macroeconomic variables with important predictive effects on bank asset quality, all exerting positive influences on non-performing loans. Like the earlier findings of Arrawatia et al. (2019) regarding GDP growth, this evidence implies that economic growth engenders expansion of the market and promotes the rapid growth of businesses and individual incomes to support the ability of borrowers to meet debt service obligations. However, the position of Al Masud and Hossain (2021) and Arrawatia et al. (2019) on GDP growth and asset quality relations runs counter to the earlier results of De Bock and Demyanets (2012), who employed multiple panel regressions, including OLS, fixed effect, difference, and system GMM techniques to analyze the determinants of asset quality of banks across emerging markets.Their study documented a significant negative coefficient for the GDP growth variables under all the specified models, which implies that an increase in national productivity deteriorates the quality of banks' credit portfolios as a result of managerial inefficiencies and cyclical shocks.

The evidence of a positive effect of inflation on asset quality presented by Al Masud and Hossain is supported by the earlier explanation offered by Swamy (2017), which suggested that an increase in the prices of general goods and services and operational overheads presents an opportunity for banks to raise lending rates to enhance interest revenue to offset the accruing balances from impairment credits to ensure high asset quality. However, the evidence of a positive effect of interest rates on asset quality put forward by Al Masud and Hossain (2021) is contradicted by the findings of the earlier analysis of Ogundipe et al. (2020), who posit that a rise in the interest rates of banks drives deteriorating trends in the performance of loan portfolios. This is because higher lending rate charges stagnate the growth of businesses and individuals' disposable income, thus affecting the capacity of the borrower to honor loan repayment agreements to improve asset quality. Although the analysis

by Al Masud and Hossain (2021) highlights important dynamics of the effect of macroeconomic factors on asset quality, it does not capture the impact of exchange rate fluctuations and benchmark returns on asset quality, even though the performance of banks, much like any other financial variable, is subject to changes in market conditions (Tan, 2016; Altavilla et al., 2018); this situation therefore calls for further investigation.

Goyal et al. (2023) apply the two-step GMM technique for assessing the drivers of a non-performing asset to check the asset quality of banks across developing countries using a panel dataset spanning the period 2010 to 2020. The results of their study are similar to the findings of earlier analyses (Arrawatia et al. 2019; Al Masud and Hossain 2021), namely that the credit default portfolios of banks decline with economic growth, as an increase in productivity enhances the ability of borrowers to pay back loans on time as a result of improved cash flows. This reduces the level of non-performing loans and promotes the quality of banks' assets. In addition to the effect of economic growth, Goyal et al. (2023) document a negative relationship between inflation and asset quality, which implies an increase in price instability, which in turn affects the cost of business operations and individual livelihoods and thus deteriorates the financial capacity of borrowers to service loan repayment commitments; this consequently diminishes the quality of bank assets. This evidence is consistent with the earlier results obtained by Alhassan et al. (2014) and Arrawatia et al. (2019), which demonstrate that the financial capacity of bank debtors is adversely affected by systemic instability as a result of rising inflation, which suggests a negative implication for the asset quality of banks.

The findings of Goyal et al. (2023) thus provide an important impetus regarding explanations for the effect of specific macroeconomic indicators of GDP growth and inflation on asset quality. However, the analysis is limited in terms of providing explanations for the effect of interest rate and real exchange rate on asset quality, even though these factors are critical economic indicators with the potential to determine the direction of a bank's financial stability. Moreover, the study does not account for the time-varying effect of changes in market benchmark returns on asset quality while the performance of banks is linked to the performance of the stock market (Mensah and Premaratne 2018; Huy et al. 2020). As a result, further analysis is required to elicit explanations for the effect of the macroeconomic indicators on the asset quality of banks under changing stock market conditions. It is hypothesized in the study reported on in this paper that the sensitivity of assets to macroeconomic factors is more pronounced under bullish than under bearish market conditions.

3. Methodology

3.1. Data Sources and Sampling

A panel data review of 18 banks (operating with universal licenses) in Ghana spanning the period 2007 to 2021 was employed for the analysis. Data on market returns and macroeconomic indicators were obtained from the official websites of the Ghana Stock Exchange (GSE) and Bank of Ghana (BoG). The return of the market was proxied by the Ghana Stock Exchange All Share (GSE All-Share Index) and Composite Indices. The Ghana Stock Exchange employed the GSE All-Share Index as the exchange's market index until 2010. However, in 2011 the exchange replaced the GSE All-Share Index with the Ghana Stock Exchange Composite Index (GSECI) as the market benchmark. The sampling criteria in the study involved a minimum requirement of six (6) years of data for a bank to be included in the analysis, while the sample was selected based on data availability. Of the 23 universal banks in Ghana, 18 were included in the sample for analysis, and the selection of the sample period (2007 to 2021) was intended to capture the effect of the global financial meltdown as well as the recent banking sector clean-up in Ghana on asset quality.

3.2. Empirical Model

Following Alhassan et al. (2014), a dynamic panel two-step system GMM mode is employed to analyze the effect of macroeconomic factors on banks' asset quality under time-varying market conditions. From the literature, the one-step difference generalized method of moments (GMM) approach represents a more enhanced estimation technique because it accounts for the endogeneity

problems of simultaneity and unobserved heterogeneity associated with OLS models (Arellano and Bond 1991; Wintoki et al. 2012; Kripfganz and Schwarz 2019). However, the predictive ability of the one-step difference GMM is restricted where a small sample of data with limited time scope is employed for the analysis, as it generates all the parameters of the model simultaneously. The two-step system GMM approach is more robust than the difference GMM because the two-step system GMM approach does not allow misspecified assumptions on the time-invariant regressors to influence the estimation results for the coefficients of the time-varying variables (Roodman 2009; Arellano and Bond, 1991). Moreover, the two-step system GMM allows estimators to rely on transformations to eliminate unit-specific heterogeneity (Kripfganz and Schwarz, 2019). The dynamic panel model adopted is therefore represented as:

$$ASQ_{it} = \alpha_i + \beta_1 ASQ_{it-1} + \beta_2 RGDP_{t-1} + \beta_3 INFL_{t-1} + \beta_4 AVLR_{t-1} + \beta_5 RER_{t-1} + \beta_6 MKTCON_{t-1} + \varepsilon_{it}$$

where the dependent variable ASQ_{it} is the asset quality (ASQ) of bank i in time t. Asset quality is measured as the ratio of non-performing loans to total loan advances where a higher ASQ ratio value indicates a higher portfolio risk of bank assets (Banerjee and Velamuri 2015; Batten and Vo 2019). ASQ_{it-1} is the lag of bank $i's$ asset quality in time t-1 while $RGDP_{t-1}$, $INFL_{t-1}$, $AVLR_{t-1}$, RER_{t-1}, and $MKTCON_{t-1}$ represent real gross domestic product growth rate, inflation rate, average lending rate, real exchange rate, and market condition in time t-1 respectively. The error term of the equation is denoted by ε_{it}.

RGDP growth rate is incorporated in the analysis to account for the impact of economic growth on bank performance in terms of asset quality, as the resilience and growth potential of the market in which banks operate is reflected by the direction of GDP growth, which has implications for asset quality (Alhassan et al. 2014; Supriyono and Herdhayinta, 2019). The level of bank interest charges has implications for the sustainability of businesses and individual livelihoods, as high lending rates impede the expansion momentum of businesses. This impairs borrowers' ability to service loans on time, which in turn has a negative effect on the quality of banks' assets (Ahamed 2017; Arrawatia et al. 2019). The AVLR is included in the regression to estimate the effect of the average lending rates of banks on asset quality.

INFL is included in the analysis to capture the effect of the inflation rate on the asset quality of banks, as the frequency of increase of general goods and services is suggestive of the trend of the current macroeconomic environment, which drives the determination of lending rates and operational cost of banks (Alhassan et al. 2014; Salike and Ao 2017). The dynamics of inflation thus have important consequences for bank asset quality because the level of inflation (whether high or low) in the economy influences individual and corporate income, and hence determines borrowers' ability to meet credit repayment obligations to minimize loan impairments and improve asset quality. RER is incorporated in the analysis to estimate the impact of exchange rate volatility on the bank. From the literature, the stability of the macroeconomic environment is determined primarily by the rate at which the domestic currency is traded for foreign currencies (Kiganda 2014; Almaqtari et al. 2019). The domestic currency is expected to attract a higher exchange rate relative to its international counterparts and vice versa if the fundamentals are weak. Given that most universal banks engage in currency trade and foreign transactions for profit, any exchanges in the value of the domestic currency relative to the foreign currencies have implications for the general performance and asset quality of banks, especially regarding letters of credit issued on behalf of business clients.

Market condition (MKTCON) is incorporated into the equation as a dummy variable to test the effect of the stock market dynamics on the performance of banks in terms of asset quality. It is explained in the literature that the performance of universal banks is influenced by the return of the market index, as significant proportions of banks' assets are held in the portfolios traded on recognized stock exchanges (Tan 2016; Altavilla et al. 2018). Also, changes in the stock market returns have implications for the flow of depositors' funds to banks (Lin 2020). In this way, the performance of banks is affected by the return of the benchmark and volatilities which exert a predictive influence on bank profitability. The market condition variable MKTCON takes the value 1 if the return of the market in the past year is greater than zero, Rm, [t−1] >0, denoting a bullish condition, and assumes a value 0 if the market return in the past year [t − 1] is less than or equal to zero, Rm, [t − 1] ≤ 0, reflecting

a bearish condition (Fletcher 2000; Jun et al. 2014). Theoretically, a bullish market condition is explained as a period of sustained increase and less volatility in the returns of the financial assets on the market, whereas a bearish condition denotes a period of downward spiral and increased volatility in market returns (Lee et al. 2011; Amar et al. 2022). In the analysis conducted for the purpose of the study, a positive and significant value (coefficient) of the market condition variable (MKTCON) implied that the asset quality of banks exhibited higher sensitivity to the changes in the macroeconomics under bullish market conditions than under bearish conditions. A similar interpretation was posited for the sensitivity of asset quality to macroeconomic dynamics under changing market conditions if the value (coefficient) of the market condition variable was negative.

4. Results and Discussion

4.1. Descriptive Analysis

Table 1 provides descriptive statistics of the variables employed for the analysis. As can be observed from the table, a large difference exists between the maximum and minimum statistics of inflation (INFL) while asset quality (ASQ), real GDP growth rate (RGDP), the average lending rate (AVLR), and real exchange rate (RER) report moderate differences of 0.73 percent and 0.00 percent, 2.64 percent and -0.67 percent, 0.92 percent and 0.87 percent, and 1.80 percent and -0.03 percent, respectively.

Table 1. Descriptive statistics of variables.

	ASQ	RGDP	INFL	AVLR	RER
Mean	0.048	1.543	12.632	0.894	1.113
Maximum	0.733	2.635	19.300	0.917	1.798
Minimum	0.003	-0.673	7.900	0.869	-0.031
Standard deviation	0.072	0.801	3.526	0.012	0.585
Observations	231	231	231	231	231

Source: Authors' estimations (2023

4.2. Correlation Analysis

Table 2 presents the correlation matrix and variance inflation factor of the independent variables. From the literature, correlation analysis is conducted to determine the presence of multicollinearity issues among the independent variables, as highly intercorrelated regressors would generate spurious estimation results (Dormann et al. 2013; Gieure et al. 2019). Furthermore, correlation analysis helps to establish the association between the independent variables to determine how changes in one directly affect the other. A correlation value of 0.7 and below is indicative of the non-existence of multicollinearity problems between the independent variables. From Table 2, the highest correlation value (0.61) is reported between the average lending rate (AVLR) and inflation (INFL); this is below the acceptable level of 0.7. The highest value (2.56) of the variance inflation factor (VIF) reported for AVLR falls within the theoretically accepted limit of 10 and below (Saeed 2014). The problem of multicollinearity among the regressors is eliminated to ensure the reliability of model estimates. Beyond the multicollinearity considerations, there exist important correlations between the independent variables. Inflation (INFL) reports a negative correlation with real GDP growth rate (RGDP), which implies that increased inflation impedes economic growth. This is consistent with the position taken in the literature that high inflation rates hamper a business's ability to expand because of an increase in operational costs (Salike and Ao 2017). This contracts economic growth because of low productivity. Likewise, the real exchange rate (RER) reports negative correlations with RGDP, INFL, and AVLR. These relationships imply that exchange rate volatility affects economic growth adversely and causes the prices of goods and services to rise while it exerts downward pressure on the interest earnings of banks. It is known from the literature that increased fluctuation in the

exchange rate causes significant instability in the macroeconomic fundamentals and affects the performance of businesses (Almaqtari et al. 2019). It can be observed from Table 2 that the AVLR reports positive relationships with RGDP and INFL, indicating that an increase in the lending rates of banks drives economic growth, as the interest earnings and revenue of the banks improve, enhancing the general productivity of the economy. In much the same way, an increase in loan interest helps to moderate the increase in the prices of goods and services, as the amount of money in circulation in the economy is reduced. As explained in the literature, this keeps the rate of inflation at a slower pace (Taylor 2019).

Table 2. Correlation matrix.

	RGDP	INFL	AVLR	RER	VIF
RGDP	1.000				1.543
INFL	−0.211***	1.000			2.061
AVLR	0.269***	0.608***	1.000		2.558
RER	−0.443***	−0.148**	−0.519***	1.000	1.651

Source: Authors' estimations (2023). Note: *** and ** denote 1% and 5% significant levels, respectively.

4.3. Discussion of the Effect of Macroeconomic Dynamics on Bank Asset Quality under Different Market Conditions

Table 3 presents the system GMM model estimates for the effect of macroeconomic factors on bank asset quality under changing market conditions. From the table, lagged asset quality reports an insignificant negative relationship with current asset quality. This result implies that the past asset quality of the bank does not influence its future asset quality. This evidence contradicts the earlier results obtained by Alhassan et al. (2014), who found a significant positive relationship between lagged asset quality and non-performing loans and identified deteriorating credit portfolios as adversely affecting the performance of banks.

Scholars explain that the direction of GDP growth indicates the size of the economy and the potential for market growth (Supriyono and Herdhayinta 2019). This has implications for the performance of banks in terms of their ability to recover loan principals with interest from borrowers in the context of prevailing economic conditions. From Table 3, the variable for the real gross domestic product (RGDP) reports a significant positive coefficient. This result suggests that a significant increase in national productivity drives an impressive trend in banks' asset quality. This evidence is expected, and it confirms the general position taken in the literature that improved GDP boosts individual income while providing opportunities for business sustainability and rapid expansion (Alam et al. 2021). This supports borrowers' ability to service loans on time, thereby minimizing non-performing loans and enhancing asset quality.

From Table 3, the inflation rate reports a significant negative relationship with asset quality. This suggests that an increase in the inflation rate adversely affects the asset quality of banks. This evidence is consistent with the general position taken in the extant literature regarding the effect of inflation on the dynamics of bank performance (Athanasoglou et al. 2005; Sahyouni and Wang 2018). Business growth is supported by a conducive microeconomic environment where the cost of doing business is moderated by low prices of inputs and infrastructure to ensure profitability because of low inflation. However, a high inflation rate impedes the performance momentum of banks. This is because the income flow of individual and corporate borrowers is deteriorated by the high cost of living and operational overheads, which affect borrowers' ability to meet debt servicing obligations to banks (Sahyouni and Wang 2018). Ultimately, this leads to the accumulation of more non-performing loans and, consequently, poor asset quality.

Aside from the administrative charges and risk profiles of borrowers, universal banks set lending rates based primarily on the policy rate of the central bank to ensure operational stability and profitability (Heider et al. 2019). This means that an increase in the lending rate (interest on loans) improves bank profit margins while ensuring that adequate returns are generated on existing assets

to offset losses accruing from non-performing and impaired loans. As can be observed in Table 3, the variable for the average lending rate (AVLR) reports a significant positive coefficient. This evidence implies that an increase in banks' interest on loans drives an impressive impact on asset quality. As explained earlier above, higher lending rates improve banks' interest income, and trading supports stability (Al Masud and Hossain 2021). However, sustained higher lending rate charges can be counterproductive to the performance of the bank. High interest rates hamper the growth of businesses and disposable income of individual and corporate borrowers, thus impairing their ability to settle loan repayments on time, which reduces the quality of banks' assets (Ogundipe et al. 2020).

From Table 3, the variable for the real exchange rate (RER) reports a significant positive coefficient under asset quality. This evidence indicates that an increase in the price of foreign currencies relative to the domestic currency promotes bank asset quality and is consistent with the earlier analysis of Alhassan et al. (2014), who found a positive relationship between real exchange rate and asset quality. Through currency trade, the asset quality of banks is bolstered where there is a significant disparity between the price of foreign and domestic currencies, which requires borrowers to pay a higher price at commercial rates from banks. In this context, the higher currency interest charges by the banks driven by exchange rate volatility increase their interest income margins on assets and reinforce bank stability under unstable market conditions. However, persistence in exchange rate volatility tends to stagnate bank performance, as the operational cost is increased because forex fluctuations drive inflation (Almaqtari et al. 2019).

The direction of the market index returns has important implications for the performance and asset quality of banks. This is because a significant proportion of banks' investments are held in assets traded on market exchanges, while investors' reactions to changes in market trends affect banks' asset flows, thus implying a close connection between the dynamics of the stock market and bank performance (Shahzad et al. 2019). From Table 3, the market condition variable (MKTCON) reports a significant positive relationship with asset quality. This result is expected and suggests that an increase in benchmark return drives a positive trend in the quality of banks' assets. The finding verifies the position taken in the literature that the performance of banks is linked to the direction of the market condition, where the return on bank assets and quality is boosted under bullish conditions, but deteriorates under bearish conditions (Bhimjee et al., 2016; Altavilla et al., 2018; Lin 2020). Moreover, this evidence supports the study's hypothesis that the sensitivity of asset quality to macroeconomic factors is more evident under bullish than under bearish conditions.

Table 3. Effect of macroeconomic dynamics on asset quality under different market conditions.

Independent Variables	Dependent Variable: ASQ		
	Coefficients	Standard Errors	P-values
ASQ_{t-1}	-0.188	0.122	0.124
RGDP	0.022**	0.009	0.014
INFL	-0.325**	0.137	0.018
AVLR	0.981***	0.362	0.007
RER	0.270***	0.089	0.002
MKTCON	0.074**	0.032	0.021
AR (2) test (p-value)	0.302		
Hansen test of over-identification (p-value)	0.371		
Diff-in-Hansen test of Exogeneity (p-value)	0.629		

Source: Authors' estimations (2023). Note: *** and ** denote 1% and 5% significant levels, respectively.

5. Conclusion

The study was conducted to examine the effect of macroeconomic factors on asset quality under different market conditions in Ghana. Using panel data of 18 universal banks for the period 2007 to 2021, a dynamic panel system GMM model was used for the analysis. Real GDP growth rate, the average lending rate and the real exchange rate were found to exert considerable predictive influence on banks' asset quality, considering changes in market conditions. This implies that real economic growth enhances business expansion and individuals' purchasing power to support the ability of the various categories of borrowers to meet loan repayment obligations on time, and to promote the asset quality of banks. The evidence for average lending rate and real exchange rate indicates that the return on banks' trading assets improves under high-interest regimes of industry, as well as periods of significant depreciation of the domestic currency where the banks sell foreign currencies at premium prices to corporate and retail clients. The interest income achieved by banks because of the increased volatility in the exchange rate and high loan interests serves as a stabilization buffer to offset losses that may accrue from impaired and non-performing loans.

In addition, an increase in the inflation rate exerts depressing pressure on the banks' asset quality, as frequent hikes in the prices of general goods and services deteriorate the cash flows of businesses and individuals owing to the high cost of operation and reduction in the value of consumers' disposable income. This affects borrowers' ability to honor the contracted timelines for loan repayments and thus sustain the quality of banks' assets. Furthermore, the market condition was found to have a positive relationship with bank asset quality. This evidence verifies the close connection between the direction of benchmark return and the performance of banks. It further affirms that the interaction between macroeconomic dynamics and asset quality changes in line with changes in market conditions, which supports the normative guidelines of the Adaptive Market Hypothesis.

As a policy recommendation, it is suggested that banks' efforts should focus on ensuring managerial efficiency while they consolidate their asset base during periods of market stability. This is because changes in market conditions can exert a spillover effect on bank performance as the level of non-performing loans worsens. Also, banks should exercise maximum constraint in the implementation of loan interest and foreign currency sale charges, as higher charges can affect borrowers' capacity to service loan repayment commitments on time, which has implications for asset quality. Moreover, policymakers should ensure that a conducive macroeconomic environment is sustained, as changes in the systemic factors suggest a predictive influence on the direction of bank performance and asset quality.

Future research could test the time-varying effect of non-performing loans on the financial stability of banks, as the explanations regarding the drivers of banks' stability remain inconclusive, and further investigations are therefore called for. This subject was not dealt with in the study under review, as it falls outside the objective and focus of the current analysis. Future studies could refine the results of this study by using high-frequency data such as monthly and quarterly data points; the study reported on in this paper was limited in this regard owing to the availability of data from the sampled banks.

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References

1. Ahamed, Mostak M. 2017. Asset quality, non-interest income, and bank profitability: Evidence from Indian banks. *Economic Modelling* 63: 1–14. https://doi.org/10.1016/j.econmod.2017.01.016

2. Alam, Md Shabbir, Rabbani, Mustafa Raza, Tausif, Mohammad, Rumzi Tausif, and Abey, Joji. 2021. Banks' performance and economic growth in India: a panel cointegration analysis. *Economies 9*: 38. https://doi.org/10.3390/economies9010038

3. Alhassan, Abdul Latif, Charles Andoh, and Anthony Kyereboah-Coleman. Asset quality in a crisis period: An empirical examination of Ghanaian banks. *Review of Development Finance* 4: 50–62. https://hdl.handle.net/10520/EJC153261

4. Almaqtari, Faozi, A., Al-Homaidi, Eissa, A., Tabash, Mosab, I., and Farhan, Najib, H. 2019. The determinants of profitability of Indian commercial banks: A panel data approach. *International Journal of Finance & Economics* 24: 168–185. https://doi.org/10.1002/ijfe.1655

5. Al Masud, Abdullah, and Hossain, Mohammad, A. 2021. Determinants of Non Performing Loan (NPL): A Case of an Emerging Economy. *Southeast Business Review* 10: 46–60.

6. Altavilla, Carlo, Miguel Boucinha, and José-Luis Peydró. 2018. Monetary policy and bank profitability in a low interest rate environment. *Economic Policy* 33: 531–586. https://doi.org/10.1093/epolic/eiy013

7. Amar, Amine, B., Stéphane, Goutte, and Mohammad, Isleimeyyeh. 2022. Asymmetric cyclical connectedness on the commodity markets: Further insights from bull and bear markets. *The Quarterly Review of Economics and Finance* 85: 386–400. https://doi.org/10.1016/j.qref.2022.04.009

8. Arrawatia, Rakesh, Varun, Dawar, Debasish, Maitra, and Saumya, Ranjan, D. 2019. Asset quality determinants of Indian banks: Empirical evidence and policy issues. *Journal of Public Affairs* 19: e1937. https://doi.org/10.1002/pa.1937

9. Arellano, Manuel, and Stephen Bond. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The review of economic studies* 58: 277-297. https://doi.org/10.2307/2297968

10. Athanasoglou, Panayiotis, P., Brissimis, Sophocles. N., and Delis, Matthaios, D. 2008. Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of International Financial Markets, Institutions and Money 18*: 121–136. https://doi.org/10.1016/j.intfin.2006.07.001

11. Banerjee, Sreejata, and Malathi, Velamuri. 2015. The conundrum of profitability versus soundness for banks by ownership type: Evidence from the Indian banking sector. *Review of Financial Economics* 26: 12–24. https://doi.org/10.1016/j.rfe.2015.04.001

12. Batten, Jonathan, and Vo, Xuan V. 2019. Determinants of bank profitability—Evidence from Vietnam. *Emerging Markets Finance and Trade 55*: 1417–1428. https://doi.org/10.1080/1540496X.2018.1524326

13. Bhimjee, Diptes, C., Sofia, Ramos. B., and José, Dias, G. 2016. Banking industry performance in the wake of the global financial crisis. *International Review of Financial Analysis* 48: 376–387. https://doi.org/10.1016/j.irfa.2016.01.005

14. Boateng, Kwadwo. 2018. Determinants of Bank Profitability: A Comparative Study of Indian and Ghanaian Banks. Journal of *Emerging Technology and Innovative Research* 5. SSRN Electronic Journal. Available at Available at SSRN: https://ssrn.com/abstract=3358818 (Accessed 29 March 2022)

15. BoG. 2021. Bank of Ghana annual report and financial statements. Retrieved from https://www.bog.gov.gh/news/2021-annual-report-and-financial-statements/ (Accessed 11 September 2022).

16. Bunyaminu, Alhassan, Ibrahim Nandom Yakubu, and Shani Bashiru. 2021. The Effect off Financial Leverage on Profitability: An Empirical Analysis of Recapitalized Banks in Ghana. *International Journal of Accounting & Finance Review* 7: 93-102. https://doi.org/10.46281/ijafr.v7i1.1227

17. Chen, Qiwei, Xiuping, Hua, and Ying, Jiang. 2018. Contrarian strategy and herding behaviour in the Chinese stock market. *The European Journal of Finance* 24: 1552–1568. https://doi.org/10.1080/1351847X.2015.1071715

18. Dormann, Carsten F., Elith, Jane, Bacher, Sven, Buchmann, Carsten, Carl, Gudrun, Carré, Gabriel, Jaime, Garcia R., Marquez et al. 2013. Collinearity: a review of methods to deal with it and a simulation study evaluating their performance. *Ecography, 36*: 27–46. https://doi.org/10.1111/j.1600-0587.2012.07348.x

19. Fama, Eugene F. 2021. Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance* 25: 383–417. https://doi.org/10.2307/2325486

20. Fletcher, Jonathan. 2000. On the conditional relationship between beta and return in international stock returns. *International Review of Financial Analysis* 9: 235–245. https://doi.org/10.1016/S1057-5219(00)00030-2

21. Gieure, Clara, Maria del Mar Benavides-Espinosa, and Salvador Roig-Dobón. 2019. Entrepreneurial intentions in an international university environment. *International Journal of Entrepreneurial Behaviour and Research* 25: 1605-1620. https://doi.org/10.1108/IJEBR-12-2018-0810

22. Goyal, Shikha, Jaya, Mamta, Prosad, Nandita, Mishra, and Nikita, Singhal. 2023. Non-performing Assets and Institutional Quality Indicators: Evidence from Developing Countries. *Vision*, 1–13. https://doi.org/10.1177/09722629221145805

23. Guru, Biplab Kumar, and Yadav, Inder, S. 2019. Financial development and economic growth: panel evidence from BRICS. *Journal of Economics, Finance and Administrative Science 24*: 113–126. https://doi.org/10.1108/JEFAS-12-2017-0125

24. Haralayya, Bhadrappa, and *Sreeramana,* Aithal, P. 2021. Implications of banking sector on economic development in India. *George Washington International Law Review* 7: 631–642.

25. Heider, Florian, Farzad, Saidi, and Glenn, Schepens. 2019. Life below zero: Bank lending under negative policy rates. *The Review of Financial Studies* 32: 3728–3761. https://doi.org/10.1093/rfs/hhz016

26. Huy, Dinh, T., Ngoc, Bui, T., Thu, Loan, and Tuan, Anh, P. 2020. Impact of selected factors on stock price: a case study of Vietcombank in Vietnam. *Entrepreneurship and Sustainability Issues* 7: 2715.

27. Jun, Xiao, Mingsheng, Li, and Jing, Shi. 2014. Volatile market condition and investor clientele effects on mutual fund flow performance relationship. *Pacific-Basin Finance Journal* 29: 310–334. https://doi.org/10.1016/j.pacfin.2014.05.002

28. Kiganda, Evans, O. 2014. Effect of macroeconomic factors on commercial banks profitability in Kenya: Case of equity bank limited. *Journal of Economics and Sustainable development* 5: 46–56.

29. Kripfganz, Sebastian, and Schwarz, Claudia. 2019. Estimation of linear dynamic panel data models with time-invariant regressors. *Journal of Applied Econometrics 34*: 526–546. https://doi.org/10.1002/jae.2681

30. Lee, Jen-Sin, Chin-Tai, Kuo, and Pi-Hsia, Yen. 2011. Market states and initial returns: Evidence from Taiwanese IPOs. *Emerging Markets Finance and Trade* 47: 6–20. https://doi.org/10.2753/REE1540-496X470201

31. Lin, Leming. 2020. Bank deposits and the stock market. *The Review of Financial Studies* 33: 2622–2658. https://doi.org/10.1093/rfs/hhz078

32. Lo, Andrew W. 2012. Adaptive markets and the new world order (corrected May 2012). *Financial Analysts Journal 68*: 18–29. https://doi.org/10.2469/faj.v68.n2.6

33. Madaan, Geetika, and Sanjeet, Singh. 2019. An analysis of behavioral biases in investment decision-making. *International Journal of Financial Research* 10: 55–67. https://doi.org/10.5430/ijfr.v10n4p55

34. Mei, Cheng, L., Takyi, Kwabena, N., Richard, Barfi, and Mandella, Osei-Assembly, B. Credit risk and bank profitability of commercial banks in Ghana. *International Journal of Research and Development* 4, no. 12: 74–83. https://doi.org/10.36713/epra3836

35. Mensah, Jones, O., and Gamini, Premaratne. 2017. Dependence patterns among Asian banking sector stocks: a copula approach. *Research in International Business and Finance* 41: 516–546. https://doi.org/10.1016/j.ribaf.2017.07.169

36. Mishra, *Pramod, K.,* and Mishra, Sudhir, K. 2023. Do banking and financial services sectors show herding behaviour in Indian Stock Market amid COVID-19 pandemic? Insights from quantile regression approach. *Millennial Asia*, *14*: 54–84. https://doi.org/10.1177/09763996211032356

37. Mushinada, Venkata, N. C. 2020. How do investors behave in the context of a market crash? Evidence from India. *International Journal of Emerging Markets* 15 (6), 1201–1217. https://doi.org/10.1108/IJOEM-05-2019-0357

38. Obalade, Adefemi A., and Muzindutsi, Paul F. 2020. Validating the adaptive market hypothesis in the Tunisian stock market. *International Journal of Trade and Global Markets* 13: 42–51.

39. O'Connell, Michael. 2023. Bank-specific, industry-specific and macroeconomic determinants of bank profitability: evidence from the UK. *Studies in Economics and Finance* 40: 155–174. https://doi.org/10.1108/SEF-10-2021-0413

40. Ogundipe, Adeyemi, S., Abolade, Francis, A., and Adebayo, Olaoye, S. 2020 Interest rates and loan performance of deposit money banks in Nigeria. *International Journal of Economics and Business Review* 8: 13–20. ttps:/doi.org/10.36713/epra2012

41. Paramita, Santi, V., Bahri, Jafar, and Ifan, Wicaksana, S. 2017. Market timing and stock selection performance of mutual fund in bull and bear market condition. *International Journal of Monetary Economics and Finance* 10: 309–321. https://doi.org/10.1504/IJMEF.2017.087483

42. PwC. 2019. Ghana banking survey 2019. Retrieved from https://www.pwc.com/gh/en/assets/pdf/ghana-banking-survey-2019.pdf (Accessed 12 October 2022).

43. Roodman, David. 2009. How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal*, *9*(1), 86–136. https://doi.org/10.1177/1536867X0900900106

44. Saeed, Muhammad S. 2014. Bank-related, industry-related and macroeconomic factors affecting bank profitability: A case of the United Kingdom. *Research Journal of Finance and Accounting* 5: 42–50.

45. Sahyouni, Ahmad, and Wang, Man. 2018. The determinants of bank profitability: does liquidity creation matter?. *Journal of Economics and Financial Analysis* 2: 61–85. http://dx.doi.org/10.1991/jefa.v2i2.a18

46. Salike, Nimesh, and Biao, Ao. Determinants of bank's profitability: role of poor asset quality in Asia. *China Finance Review International* 8: 216–231. https://doi.org/10.1108/CFRI-10-2016-0118

47. Shahzad, Syed, Jawad, H., Thi, Hong, Van, H., and Jose, Arreola, H. 2019. Risk spillovers between large banks and the financial sector: Asymmetric evidence from Europe. *Finance Research Letters* 28: 153–159. https://doi.org/10.1016/j.frl.2018.04.008

48. Supriyono, RA., and Herdhayinta, Heyvon. 2019. Determinants of Bank Profitability: The case of the regional development bank (BPD Bank) in Indonesia. *Journal of Indonesian Economy and Business 34*: 1–17. https://doi.org/10.22146/jieb.17331

49. Swamy, Vighneswara. 2017. Determinants of bank asset quality and profitability: An empirical assessment. *Applied Economics Quarterly* 63: 97–135. https://doi.org/10.3790/aeq.63.1.97

50. Tan, Yong. 2016. The impacts of risk and competition on bank profitability in China. *Journal of International Financial Markets, Institutions and Money* 40: 85–110. https://doi.org/10.1016/j.intfin.2015.09.003

51. Taylor, John B. 2019. Inflation targeting in high inflation emerging economies: Lessons about rules and instruments. *Journal of Applied Economics* 22: 103–116. https://doi.org/10.1080/15140326.2019.1565396

52. Urquhart, Andrew, and Frank McGroarty. 2016. Are stock markets really efficient? Evidence of the adaptive market hypothesis. *International Review of Financial Analysis* 47: 39–49. https://doi.org/10.1016/j.irfa.2016.06.011

53. Wintoki, Babajide M., Linck, James S., and Netter, Jeffry M. 2012. Endogeneity and the dynamics of internal corporate governance. *Journal of Financial Economics* 105: 581–606. https://doi.org/10.1016/j.jfineco.2012.03.005