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BETTER FINANCIAL RISK MANAGEMENT VIA A BETA EVALUATION MODEL - CASE OF FOUR BANKS IN VIETNAM DURING POST - LOW INFLATION

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Abstract

Because of the vital roles that commercial banks play in Vietnam, we conducted this study to evaluate the macro impacts of low inflation, the US-China trade war, and the COVID-19 pandemic on market risk (Beta CAPM) of four large listed banks in Vietnam that are part of a group of joint stock commercial banks: Eximbank (EIB), Sacombank (STB), Navibank (NVB), and Asia Commercial Bank (ACB), before and after being listed on a stock exchange.

We use both qualitative analysis and an OLS regression model to evaluate the effects of internal and external macro factors on the beta CAPM of these four large banks. Our findings show that the risk-free rate has a positive correlation with beta CAPM in all four bank cases. Last, the lending rate also has a positive correlation with beta CAPM in three cases and a negative correlation in one case (NVB). Hence, because market risk will increase if the lending rate increases, we would suggest the State Bank of Vietnam (SBV) and bank system control lending rates to not raise rates too much.

From this fact, the authors propose risk management plans and recommend macro policies. Research results can be applied to other emerging markets.

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ABBREVIATION: CPI: inflation; G: GDP growth; R: lending rate; Rf: risk-free rate; IM: industrial manufacturing.

1. Introduction

While banks in Vietnam are very profitable, they also face risks and challenges. After M&As, many banks need new risk management and corporate governance models. It is important to construct an effective risk model for banks as they are deeply connected with most industries in the market economy.

Risk management policies can be affected by internal factors and external factors, which include internal macro effects such as GDP growth, CPI, and interest rates and external macro effects such as the US–China trade war, crises, global economic conditions, and the COVID-19 pandemic.

Dinh Tran et al. (2021) find that macro indicators affect risks in the real estate and banking sectors (Huy, D. T. N., Loan, B. T., & Anh, P. T., 2020). While there are many models to estimate risks, and we contribute a risk model under macro effects within the scope of this study.

Therefore, we can build an econometric model using software Eviews to measure and evaluate the effects of the macro environment and other factors that impact bank market risk. Then, we can expand our quantitative model for risk estimation in the banking sector to other industries. We can use the traditional beta CAPM formula to calculate market risk, however for future research, we can develop a modern beta formula that is a weighted index that considers market value and stock prices compared to the traditional formula.

Risks in banking business are a broad concept and include market risk, liquidity risk, credit risk, and operational risk. Because of the vital role of commercial banks and their domino effects throughout the banking system and economy, it is important to evaluate the market risk of the big four joint stock commercial banks in Vietnam (ACB, STB, EIB, and NVB) during the post-low (L) inflation period of 2015-2020 until the US-China trade war and the COVID-19 pandemic.

The paper is organized by the introduction, research issues, literature review, methodology and data, main results, discussion, conclusion, and policy implications.

Research questions:
Question 1: What are the quantitative results of macro effects on bank risk?
Question 2: What are recommendations for bank risk policies?

2. Previous studies

Dimitrov (2006) documented a significantly negative association between changes in financial leverage and contemporaneous risk-adjusted stock returns.

Umar (2011) found that firms that maintain good governance structures have higher leverage ratios (47 percent) than firms with poor governance mechanisms per unit of profit. Chen et al. (2013) supported regulators' suspicions that overreliance on short-term funding and insufficient collateral compounded the effects of dangerously high leverage and resulted in undercapitalization and excessive risk exposure for Lehman Brothers. The model reinforces the importance of the relationship between capital structure and risk management. Gunaratha (2013) revealed that the degree of financial leverage across industries in Sri Lanka has a significant positive correlation with financial risk.

Mohamad et al. (2014) showed that financial risk is vital by using both return on asset and return on equity in the performance equation. This result also implied that we cannot avoid the inverse relation of financial risk and performance; therefore, a bank system must make a trade-off between risk and performance.

The table below summarizes previous studies relating to the topic of risk management under macro impacts:

Table 1. Summary of previous studies

Domestic studies	Authors name	Results, contents
1. Systemic risk and the problem of determining Beta coefficient in Vietnam	Vương Đức Hoàng Quân (2012)	Generally, in the first stage, the information from the Vietnam stock market is not sufficient in quantity and quality to estimate the beta coefficient using regression analysis of stock returns volatility compared to indices, which is the traditional method. VN-Index to value the listed companies and stocks.
2. Fama-French 3-Factor Model: The empirical evidence from the Ho Chi Minh City Stock Exchange	Trương Đông Lộc and Dương Thị Hoàng Trang (2014)	The research results show that stock earnings are positively correlated with market risk, firm size, and the book value to market value (BE/ME) ratio. In other words, the Fama - French 3-factor model is suitable in explaining the change in profits of stocks listed on HOSE.
3. The econometric model for stock prices in the period 2008-2011 - Case of stock prices ACB, VNIndex, risk free rate and S& P500	Đinh Trần Ngọc Huy (2015)	Analyse the impact of VNIndex and internal and external macro variables on the stock price of ACB.
4.The theory of average return of K. Marx and model of capital asset pricing	Nguyễn Thị Hường (2017)	The lack of beta in stock analysis is one limitation of Vietnam's stock market. However, as the market portfolio matures, beta will also keep pace with the development of the market.

Table 1. Summary of previous studies (continued)

Domestic studies	Authors name	Results, contents
5. Book chapter by Dinh Tran Ngoc Huy (2021, Springer Verlag book chapter) “Impacts of Internal and External Macro Factors on Firm Stock Price in An Econometric Model – A Case in Viet Nam Real Estate Industry”	Đinh Trần Ngọc Huy (2021)	Presenting a regression model analysing the impact of internal macro variables (inflation in Vietnam, lending rate, risk-free rate) and external (US inflation, exchange rate, S&P 500) on stock prices Vingroup is as follows: Stock price_VIC = -245.13 * Inflation_CPI + Lendingrate - 815.06*Rf_rate USD_VND_rate+0.07*SP500-372.08*Inflation_US, R2 = 0.84, SER = 19.7
6. Systemic risks in banking business - periods of crisis	Nguyễn Thanh Bé, Bùi Quang Hưng (2019)	The risk management system of commercial banks in Vietnam has received some attention in the past few years, but due to its structural and technical limitations, this system cannot meet the complex requirements of a modern commercial bank operating in the current risky environment.
7. Factors affecting the return rate of listed stocks from the Fama French 5-factor model	Trịnh Minh Quang et al. (2019)	Factors of market change strongly affect the share prices of large companies.

Table 1. Summary of previous studies (continued)

International studies	Authors name	Results
1. The Impact of Macroeconomic and Financial Variables on Market Risk: Evidence from International Equity Returns	Patro et al. (2002)	A number of variables including imports, exports, inflation, market capitalization, dividend yield, and a book-to-book price ratio significantly influence a person's world market risk at a national level.
2. Do economic factors influence stock returns? A firm and industry level analysis	Butt et al. (2010)	The results revealed that market returns are primarily changes in stock returns, but macroeconomic variables and industry-related variables add explanatory power in describing volatility of stock returns.
3. Macroeconomic factors and micro-level bank risk	Claudia et al. (2010)	The risk of about a third of US banks increases in response to monetary easing.
4. Impact of Macroeconomic Factors on Banking Index in Pakistan	Saeed và Akhter (2012)	Regression results show that exchange rate and short-term interest rate in the Karachi stock market have a significant impact on the banking index. Macroeconomic variables such as money supply, exchange rates, industrial production, and short-term interest rates and exchange rates have a negative effect on the banking index while oil prices have a positive effect on the banking index.

Table 1. Summary of previous studies (continued)

International studies	Authors name	Results
5. Impact of Macroeconomic Indicators on Stock Market Performance: The Case of The Istanbul Stock Exchange	Arnes (2014)	Their analysis indicated that investors interested in Turkey should not assume that past relationships will continue to exist in the future. The effects of changes in macroeconomic variables will also differ by sector. For policy makers and lawmakers, however, the findings indicate that keeping interest rates low has been a good policy for the past 20 years.
6. Bank Leverage Ratios and Financial Stability: A Micro- and Macroprudential Perspective	Emilios (2015)	The leverage cycle can cause financial instability and limited leverage on bank governance performance.
7. Effect of Macroeconomic Variables on Stock Market Returns for Four Emerging Economies: Brazil, Russia, India, and China	Gay (2016)	This study hypothesised that the relationship between the exchange rate and the security's price should be in the same direction.
8. The Impact of Macroeconomic Factors on the German Stock Market: Evidence for the Crisis, Pre- and PostCrisis Periods	Celebi and Honig (2019)	In Germany, the aggregate index (OECD), the Economic Research Institute's Export Expectations index, the climate index, exports, CPI, as well as the three-year German government bond yield has a delayed effect on stock returns.
9. Impacts of macro variables on Starbucks Corp.	Kumaresan (2019)	Compared to internal corporate factors, macroeconomic factors (e.g., exchange rate) have a greater effect on firm performance.

3. Methodology and data

3.1 Data:

We used data available online from reliable sources. Interest rates and exchange rate data were obtained from commercial banks. The risk free rate (Rf), GDP growth, and CPI were obtained from the Bureau of Statistics. Stock price and S&P 500 data were obtained from stock exchanges.

3.2 Method

First, we applied qualitative methods. We used analytical, synthesis, inductive, and explanatory methods, combined with the dialectical materialism method. We analysed the effects of variables in a changing macro context.

Second, we applied quantitative methods. Next, this study also used a regression model to measure macro effects on beta CAPM during the pre-L inflation period from 2011 to 2015.

We analysed the effects of nine macro variables on the market risk of listed commercial banks. Weekly stock price data from 2011-2015 for the four commercial banks from reliable sources were obtained to measure Beta and other macro data.

Beta CAPM is a function with nine macro variables as follows:

$$Y = f(x1, x2, x3, x4, x5, x6, x7, x8, x9) = ax1 + bx2 + cx3 + dx4 + ex5 + fx6 + gx7 + hx8 + ix9 + k$$

where (x1: GDP growth rate (g), x2: Risk-free rate Rf (i), x3: Loan interest rate (r), x4: Exchange rate (ex_rate), x5: S&P 500, x6: VNIndex, x7: trade balance, x8: industrial production index, and x9: CPI). We used Eviews software to run OLS regression.

4. Main findings

First, we examined the correlation of macro factors in the case of case NVB during the 2015-2020 period. We found that GDP growth and industrial production have a positive correlation with beta, whereas the S&P 500 and trade balance have a negative correlation with market risk.

Figure 1. Correlation matrix of macro variables, case NVB

Correlation Matrix

	BETA	CPI	EX_RATE	G	IM	R	RF	SP500	TRADEBA...	VNINDEX
BETA	1.000000	0.276498	-0.023089	0.108546	0.461634	0.019923	0.164197	-0.090031	-0.138181	0.045633
CPI	0.276498	1.000000	0.355839	0.084484	0.413563	-0.414518	-0.181729	0.255209	-0.220190	0.414535
EX_RATE	-0.023089	0.355839	1.000000	-0.085689	-0.083666	-0.775791	-0.724295	0.686922	0.531030	0.767832
G	0.108546	0.084484	-0.085689	1.000000	0.183953	-0.269621	0.461428	-0.451641	-0.519363	-0.057490
IM	0.461634	0.413563	-0.083666	0.183953	1.000000	0.092188	0.151470	-0.215029	-0.381226	0.008190
R	0.019923	-0.414518	-0.775791	-0.269621	0.092188	1.000000	0.639799	-0.670855	-0.392445	-0.877965
RF	0.164197	-0.181729	-0.724295	0.461428	0.151470	0.639799	1.000000	-0.834478	-0.664650	-0.821145
SP500	-0.090031	0.255209	0.686922	-0.451641	-0.215029	-0.670855	-0.834478	1.000000	0.841285	0.865637
TRADEBA...	-0.138181	-0.220190	0.531030	-0.519363	-0.381226	-0.392445	-0.664650	0.841285	1.000000	0.604758
VNINDEX	0.045633	0.414535	0.767832	-0.057490	0.008190	-0.877965	-0.821145	0.865637	0.604758	1.000000

Second, we examined the correlation of macro factors in the case of EIB during the 2015-2020 period. The S&P 500 and CPI have a positive correlation with beta, whereas Rf and lending rate have a negative correlation with market risk.

Figure 2. Correlation matrix of macro variables, case EIB

Correlation Matrix

	BETA	CPI	G	IM	R	RF	VNINDEX	EX_RATE	SP500	TRADEBA...
BETA	1.000000	0.154523	0.397123	0.508339	-0.321127	-0.084472	0.363124	0.158882	0.055543	-0.055641
CPI	0.154523	1.000000	0.084484	0.413563	-0.414518	-0.181729	0.414535	0.355839	0.255209	-0.220190
G	0.397123	0.084484	1.000000	0.183953	-0.269621	0.461428	-0.057490	-0.085689	-0.451641	-0.519363
IM	0.508339	0.413563	0.183953	1.000000	0.092188	0.151470	0.008190	-0.083666	-0.215029	-0.381226
R	-0.321127	-0.414518	-0.269621	0.092188	1.000000	0.639799	-0.877965	-0.775791	-0.670855	-0.392445
RF	-0.084472	-0.181729	0.461428	0.151470	0.639799	1.000000	-0.821145	-0.724295	-0.834478	-0.664650
VNINDEX	0.363124	0.414535	-0.057490	0.008190	-0.877965	-0.821145	1.000000	0.767832	0.865637	0.604758
EX_RATE	0.158882	0.355839	-0.085689	-0.083666	-0.775791	-0.724295	0.767832	1.000000	0.686922	0.531030
SP500	0.055543	0.255209	-0.451641	-0.215029	-0.670855	-0.834478	0.865637	0.686922	1.000000	0.841285
TRADEBA...	-0.055641	-0.220190	-0.519363	-0.381226	-0.392445	-0.664650	0.604758	0.531030	0.841285	1.000000

Third, we examined the correlation of macro factors in the case of the ACB during the 2015-2020 period. We see that GDP growth and CPI have a positive correlation with beta, whereas S&P 500 and trade balance have a negative correlation with market risk.

Figure 3. Correlation matrix of macro variables, case ACB

Correlation Matrix

	BETA	CPI	EX_RATE	G	IM	R	RF	SP500	TRADEBA...	VNINDEX
BETA	1.000000	0.303298	0.012087	0.014934	0.401882	0.011619	0.041136	-0.041440	-0.165660	0.050501
CPI	0.303298	1.000000	0.355839	0.084484	0.413563	-0.414518	-0.181729	0.255209	-0.220190	0.414535
EX_RATE	0.012087	0.355839	1.000000	-0.085689	-0.083666	-0.775791	-0.724295	0.686922	0.531030	0.767832
G	0.014934	0.084484	-0.085689	1.000000	0.183953	-0.269621	0.461428	-0.451641	-0.519363	-0.057490
IM	0.401882	0.413563	-0.083666	0.183953	1.000000	0.092188	0.151470	-0.215029	-0.381226	0.008190
R	0.011619	-0.414518	-0.775791	-0.269621	0.092188	1.000000	0.639799	-0.670855	-0.392445	-0.877965
RF	0.041136	-0.181729	-0.724295	0.461428	0.151470	0.639799	1.000000	-0.834478	-0.664650	-0.821145
SP500	-0.041440	0.255209	0.686922	-0.451641	-0.215029	-0.670855	-0.834478	1.000000	0.841285	0.865637
TRADEBA...	-0.165660	-0.220190	0.531030	-0.519363	-0.381226	-0.392445	-0.664650	0.841285	1.000000	0.604758
VNINDEX	0.050501	0.414535	0.767832	-0.057490	0.008190	-0.877965	-0.821145	0.865637	0.604758	1.000000

Fourth, we examined the correlation of macro factors in the case of the STB during the 2015-2020 period. We recognize that GDP growth and SP500 have a positive correlation with beta, whereas the risk free rate and trade balance have a negative correlation with market risk.

Figure 4. Correlation matrix of macro variables, case STB

Correlation Matrix										
	BETA	CPI	EX_RATE	G	IM	R	RF	SP500	TRADEBA...	VNINDEX
BETA	1.000000	0.353970	0.076729	0.022481	0.407735	-0.074980	-0.059826	0.043162	-0.089834	0.182394
CPI	0.353970	1.000000	0.355839	0.084484	0.413563	-0.414518	-0.181729	0.255209	-0.220190	0.414535
EX_RATE	0.076729	0.355839	1.000000	-0.085689	-0.083666	-0.775791	-0.724295	0.686922	0.531030	0.767832
G	0.022481	0.084484	-0.085689	1.000000	0.183953	-0.269621	0.461428	-0.451641	-0.519363	-0.057490
IM	0.407735	0.413563	-0.083666	0.183953	1.000000	0.092188	0.151470	-0.215029	-0.381226	0.008190
R	-0.074980	-0.414518	-0.775791	-0.269621	0.092188	1.000000	0.639799	-0.670855	-0.392445	-0.877965
RF	-0.059826	-0.181729	-0.724295	0.461428	0.151470	0.639799	1.000000	-0.834478	-0.664650	-0.821145
SP500	0.043162	0.255209	0.686922	-0.451641	-0.215029	-0.670855	-0.834478	1.000000	0.841285	0.865637
TRADEBA...	-0.089834	-0.220190	0.531030	-0.519363	-0.381226	-0.392445	-0.664650	0.841285	1.000000	0.604758
VNINDEX	0.182394	0.414535	0.767832	-0.057490	0.008190	-0.877965	-0.821145	0.865637	0.604758	1.000000

Next, we run the regression:

For NVB external factors:

The figure below tells us that trade balance has a negative correlation with beta, while exchange rate and S&P 500 have a positive correlation with market risk.

Table 2. External macro effects on NVB beta CAPM

Variables	Coefficient	Std. Error
Ex rate	0.0001	0.0001
Trade balance	-0.0006	0.0002
SP500	8.62E	0.0001
C	-2.5	23.9
R-squared	0.02	
SER	1.15	
Akaike info criteria	3.38	

Source: author estimation and stock exchange

For NVB internal factors:

The figure below shows that Rf and industrial production have a positive correlation with beta, while CPI, lending rate, and GDP growth have a negative correlation with market risk.

Table 3. Internal macro effects on NVB beta CAPM

Variables	Coefficient	Std. Error
CPI	-1.02	43.2
G	-19.9	50.1
IM	0.009	0.01
R	-9.4	130.5
Rf	51.5	68.3
VNIndex	0.003	0.007
C	-3.9	17.3
R-squared	0.31	
SER	1.2	
Akaike info criteria	3.5	

Source: author estimation and stock exchange

For EIB – external factors:

The figure below shows that exchange rate and S&P 500 have a positive correlation with beta, while trade balance has a negative correlation with market risk of EIB.

Table 4. External macro effects on EIB beta CAPM

Variables	Coefficient	Std. Error
Ex_rate	0.00026	0.0006
Trade balance	-0.0005	0.001
SP500	0.0002	0.0008
C	-5.2	13.4
R-squared	0.05	
SER	0.6	
Akaike info criteria	2.2	

Source: author estimation and stock exchange)

For EIB – internal factors:

The figure below shows that GDP growth, lending rate and Rf have a positive correlation with beta, while CPI has a negative correlation with market risk of EIB.

Table 5. Internal macro effects on EIB beta CAPM

Variables	Coefficient	Std. Error
CPI	-13.9	19.2
G	14.1	22.3
IM	0.006	0.005
R	18.5	58.1
Rf	3.5	30.4
VNIndex	0.002	0.003
C	-4.4	7.7
R-squared	0.5	
SER	0.5	
Akaike info criteria	1.9	

Source: author estimation and stock exchange

For STB – external factors

The figure below shows that the exchange rate and SP 500 have a positive correlation with beta, while trade balance has a negative correlation with the market risk of STB.

Table 6. External macro effects on STB beta CAPM

Variables	Coefficient	Std. Error
Ex_rate	6.39E	0.0005
Trade balance	-0.0007	0.001
SP500	0.0003	0.0007
C	-1.3	12.4
R-squared	0.05	
SER	0.6	
Akaike info criteria	2.08	

Source: author estimation and stock exchange

For STB- internal factors

The figure below shows that all factors, namely, Rf, VNIndex, GDP growth, lending rate and Rf, have a positive correlation with the beta of STB.

Table 7. Internal macro effects on STB beta CAPM

Variables	Coefficient	Std. Error
CPI	9.7	24.1
G	2.7	27.9
IM	0.003	0.006
R	23.1	72.8
Rf	1.5	38.1
VNIndex	0.001	0.003
C	-3.4	9.6
R-squared	0.24	
SER	0.6	
Akaike info criteria	2.3	

Source: author estimation and stock exchange

For ACB – external factor

We see from the figure below that trade balance also has a negative correlation with beta, while the other two factors have a positive correlation with it.

Table 8. External macro effects on ACB beta CAPM

Variables	Coefficient	Std. Error
Ex_rate	6.92E	0.0008
Trade balance	-0.001	0.001
SP500	0.0004	0.0016
C	-1.8	18.5
R-squared	0.06	
SER	0.8	
Akaike info criteria	2.8	

Source: author estimation and stock exchange

For ACB – internal factors

We find from the figure below that GDP growth has a negative correlation with beta, while most of the other factors have a positive correlation with it.

Table 9. Internal macro effects on ACB beta CAPM

Variables	Coefficient	Std. Error
CPI	10.4	36.9
G	-6.1	42.8
IM	0.006	0.01
R	1.32	111.5
Rf	9.2	58.4
VNIndex	0.0006	0.005
C	-1	14.8
R-squared	0.19	
SER	1.04	
Akaike info criteria	3.2	

Source: author estimation and stock exchange

5. Discussion and conclusion

Comparing the above data, we see that GDP growth has a positive correlation with market risk in two cases and a negative correlation with market risk in two cases (NVB, ACB). CPI also has a positive correlation with market risk in two cases and a negative correlation in two cases (EIB, NVB). The risk-free rate has a positive correlation with beta CAPM in all four bank cases. Last but not least, the lending rate also has a positive correlation with beta CAPM in three cases and a negative correlation in one case (NVB). (see above tables)

Because market risk will increase if the lending rate increases, we would suggest that the State Bank of Vietnam and the bank system control lending rates, esp. not increasing too much.

Additionally, the Ministry of Finance and relevant government agencies also need to control inflation properly.

Management implications

The bank system might consider building a suitable risk management model to estimate the impacts of macro variables on market risk and other bank risks.

It is necessary to enhance the role of risk supervision and control according to the risk management process.

Practical scientific values of research

Market risk (beta CAPM) is a type of systematic risk that will be affected by many macroeconomic fluctuations both domestically, such as inflation, lending interest rates, and VNIndex, and abroad, such as import and export, trade trade balance, and exchange rate. Therefore, risk determination is meaningful as one of the important health indicators in terms of risk for both commercial banks and securities companies, comparing this index over time and compared with other industry groups in the economy such as banking and other sectors: real estate, construction, and trade will contribute to identifying increased risks to have appropriate risk management policies and plans.

Because the banking market is an important market of the financial market and the Vietnamese economy, the risk measurement for the two groups of commercial banks and listed securities companies is important for both management at the corporate level and macroeconomic management at the state level.

Research limitation

We can add more factors, such as FDI and public debt, to our regression model to measure macro effects.

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