

## Formulation Of Beta Capm Index With Weighted Average Methods And Market Risk Comparison Of Listed Banks During Post-Global Crisis Period 2011-2020

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### ABSTRACT

In emerging markets such as Vietnam, stock markets has been developing with fast growth and implies risk, hence, we need to focus on risk management strategies.

One of this study's purposes is to state formulation of weighted beta Capm index, a development from traditional beta Capm formula by Sharpe (1964) and Lintner (1965).

We chose 3 cases of market risk measures in listed banks in Vietnam including ACB – Asia commercial bank, NVB- Navibank (later became National citizen bank NCB) and Weighted beta index. We also select the post-global crisis time 2011-2020 in the survey to conduct market risk comparison among Vietnam banks.

By using OLS regression which is a reliable method, our research results tell that for internal effects, we see that CPI has negative correlation and IN has positive correlation with beta in all 3 cases (weighted beta, NVB beta and ACB beta).

In addition to, CPI, G, R and Rf have higher impacts on beta values.

Therefore, our study can be expanded for other markets.

**Key words:** weighted beta formulation, risk policies, Vietnam banks, beta CAPM, market risk comparison

**JEL:** M21, G30, G32, G38

### ABBREVIATION

Từ viết tắt	Nguyên nghĩa Tiếng Việt	Nguyên nghĩa Tiếng Anh
CAPM	Mô hình định giá tài sản vốn	Capital Asset Pricing Model

Ex_rate	Ty gia	Exchange rate
FDI	Đầu tư trực tiếp nước ngoài	Foreign Direct Investment
FIT	Minh bạch thông tin tài chính	Financial Information Transparency
R	Lãi suất cho vay	Lending rate
Rf	Lãi suất phi rủi ro	Risk free rate
SBV	Ngân hàng nhà nước Việt Nam	State Bank of Vietnam
NHTM	Ngân hàng thương mại	Commercial bank
OECD	Tổ chức Hợp tác và Phát triển Kinh tế	Organization for Economic Cooperation and Development
G	Tăng trưởng GDP	GDP growth

## 1.Introduction

First, There are many documents analyzing the factors affecting the stock market and stock prices. Some authors emphasize on macroeconomic indicators (e.g. Kaluge, 2019; Vigliarolo, 2020). Other authors point to external shocks, such as terrorist activity (Masood et al., 2020), changes in oil prices (Masood et al., 2019). Some authors point to the impact of industry and firm performance (Ahmed et al., 2018), dividend policy (Kumaraswamy et al., 2019).

Next, Quantitatively, risk is often assessed by looking at historical outcomes. In finance, standard deviation is a common measure associated with risk. Standard deviation provides a measure of the volatility of asset prices relative to their historical average over a given time frame.

## Research issue

What are implications for management from analysis and comparison of beta CAPM of three cases of market risk in banks ?

## 2. Literature review

Then, We summarize previous studies as follows:

Table 1 – Summary of previous studies

Arnes	2014	In case of Istanbul stock market,
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		Depending on the sector, the effects of changes in macroeconomic variables will also vary. However, for policymakers and legislators, our findings indicate that keeping interest rates low has been a good policy for the past 20 years.
Emilios	2015	Said about bank leverage and financial stability, mentioned Leverage cycles can cause financial instability and the impact of leverage constraints on bank governance performance.
Gay	2016	In paper about macro impacts on Russia, Brazil, India and China, stated Hypothetically, the relationship between exchange rate and stock prices should be positive.
Celebi and Honig	2019	In study of macro effects on Germany stock market, author stated The composite index (OECD), the Institute of Economic Research's Export Expectations index, the climate index, exports, the consumer price index CPI, as well as the 3-year German government bond yields have an impact delay to stock returns
Kumaresan	2019	In a study of Impact of macro on Starbucks, author stated Compared with the internal factors of the company, macroeconomic factors (exchange rates) have a greater influence on the performance of the company.
Huy, D.T.N, Loan, B.T.T, & Anh, P.T	2020	Suggest build risk model under macro effects for Vietcombank stock price in Vietnam

### 3. Methodology

### Method and Data

This study mainly use combination of quantitative methods and qualitative methods including synthesis, inductive and explanatory methods.

For quantitative analysis, the study is supported with OLS regression.

Data is collected from reliable internet sources and websites.

Beta CAPM, also known as market risk, is an important risk factor in the CAPM - capital asset pricing formula. The CAPM model was introduced independently by Jack Treynor (1961, 1962), William F. Sharpe (1964), John Lintner (1964) and Jan Mossin (1966), built on the foundation of previous research by Mr. Harry Markowitz on modern portfolio and diversification theory.

$$ER_i = R_f + \beta_i(ER_m - R_f)$$

Với:

$ER_i$  = return expected for asset i

$R_f$  = Risk free rate

$\beta_i$  = Beta CAPM of the investment (which is the sensitivity of excess asset yield expectations to market yield expectations)

$(ER_m - R_f)$  = market premium (difference between expected market return and risk-free rate)

$ER_i - R_f$  is risk premium

Then, authors develop a weighted beta formal as below:

Weighted Beta CAPM(time t) average = ( Beta of (Commercial bank i at time 0) + ... + Beta of bank i at time t) x market value of stock of (Commercial bank i at time t) / Total (Market value of stocks of banks)

Beta (Commercial bank i at time t) is calculated in traditional formula of Beta CAPM with weekly data.

Seeing descriptive statistics below, we see that:

- standard deviation of SP500 and exchange rate are highest values. (see figure 1, 2 and 3)
- standard deviation of G and  $R_f$  are lowest (see figure 1, 2)

**Figure 1- Weighted beta and macro descriptive stat**

	WEIGHTE...	CPI	EX_RATE	G	IM	R	RF	SP500	TRADEBA...	VNIINDEX
Mean	0.807500	0.049970	22394.20	0.057150	162.0550	0.112630	0.055213	2245.493	-75.16000	680.2135
Median	0.995000	0.035350	22700.00	0.059700	150.4000	0.102500	0.059850	2138.720	-125.0000	606.6300
Maximum	1.650000	0.181300	23230.00	0.070800	267.2000	0.190000	0.132000	3703.060	498.0000	1067.500
Minimum	-0.970000	0.006300	20618.00	0.018100	117.4000	0.080000	0.012200	1292.280	-1162.000	351.5500
Std. Dev.	0.601996	0.045765	837.4044	0.013917	36.96982	0.030423	0.027599	685.2655	402.1636	226.7034
Skewness	-1.311522	1.928654	-0.853154	-1.442505	1.394427	1.349477	0.911109	0.363508	-0.667135	0.267939
Kurtosis	4.866849	5.913603	2.379814	4.632589	4.628737	4.016835	4.234518	2.307065	3.848882	1.664441
Jarque-Bera	8.637903	19.47325	2.746765	9.157194	8.692074	6.931922	4.037095	0.840594	2.084063	1.725736
Probability	0.013314	0.000059	0.253249	0.010269	0.012958	0.031243	0.132848	0.656852	0.352737	0.421950
Sum	16.15000	0.999400	447884.0	1.143000	3241.100	2.252600	1.104250	44909.86	-1503.200	13604.27
Sum Sq. Dev.	6.885575	0.039794	13323677	0.003680	25968.59	0.017586	0.014472	8922186.	3072975.	976494.2

(source: author calculation and stock exchange)

**Figure 2- ACB beta and macro descriptive stat**

	BETA_ACB	CPI	EX_RATE	IM	G	R	RF	SP500	TRADEBA...	VNIINDEX
Mean	0.783500	0.049970	22394.20	162.0550	0.057150	0.112630	0.055213	2245.493	-75.16000	680.2135
Median	0.660000	0.035350	22700.00	150.4000	0.059700	0.102500	0.059850	2138.720	-125.0000	606.6300
Maximum	3.370000	0.181300	23230.00	267.2000	0.070800	0.190000	0.132000	3703.060	498.0000	1067.500
Minimum	0.010000	0.006300	20618.00	117.4000	0.018100	0.080000	0.012200	1292.280	-1162.000	351.5500
Std. Dev.	0.709383	0.045765	837.4044	36.96982	0.013917	0.030423	0.027599	685.2655	402.1636	226.7034
Skewness	2.473568	1.928654	-0.853154	1.394427	-1.442505	1.349477	0.911109	0.363508	-0.667135	0.267939
Kurtosis	10.01521	5.913603	2.379814	4.628737	4.632589	4.016835	4.234518	2.307065	3.848882	1.664441
Jarque-Bera	61.40608	19.47325	2.746765	8.692074	9.157194	6.931922	4.037095	0.840594	2.084063	1.725736
Probability	0.000000	0.000059	0.253249	0.012958	0.010269	0.031243	0.132848	0.656852	0.352737	0.421950
Sum	15.67000	0.999400	447884.0	3241.100	1.143000	2.252600	1.104250	44909.86	-1503.200	13604.27
Sum Sq. Dev.	9.561255	0.039794	13323677	25968.59	0.003680	0.017586	0.014472	8922186	3072975	976494.2

(source: author calculation and stock exchange)

**Figure 3- NVB beta and macro descriptive stat**

	BETA_NV	CPI	G	IM	R	RF	SP500	VNIINDEX	EX_RATE	TRADEBA...
Mean	0.432500	0.049970	0.057150	162.0550	0.112630	0.055213	2245.493	680.2135	22394.20	-75.16000
Median	0.360000	0.035350	0.059700	150.4000	0.102500	0.059850	2138.720	606.6300	22700.00	-125.0000
Maximum	3.540000	0.181300	0.070800	267.2000	0.190000	0.132000	3703.060	1067.500	23230.00	498.0000
Minimum	-1.590000	0.006300	0.018100	117.4000	0.080000	0.012200	1292.280	351.5500	20618.00	-1162.000
Std. Dev.	0.915595	0.045765	0.013917	36.96982	0.030423	0.027599	685.2655	226.7034	837.4044	402.1636
Skewness	1.508895	1.928654	-1.442505	1.394427	1.349477	0.911109	0.363508	0.267939	-0.853154	-0.667135
Kurtosis	8.731625	5.913603	4.632589	4.628737	4.016835	4.234518	2.307065	1.664441	2.379814	3.848882
Jarque-Bera	34.96549	19.47325	9.157194	8.692074	6.931922	4.037095	0.840594	1.725736	2.746765	2.084063
Probability	0.000000	0.000059	0.010269	0.012958	0.031243	0.132848	0.656852	0.421950	0.253249	0.352737
Sum	8.650000	0.999400	1.143000	3241.100	2.252600	1.104250	44909.86	13604.27	447884.0	-1503.200
Sum Sq. Dev.	15.92798	0.039794	0.003680	25968.59	0.017586	0.014472	8922186	976494.2	13323677	3072975

(source: author calculation and stock exchange)

## 4. Main results

### 4.1 Overall results

Next we analyze that:

- look at figure 4, we see correlation between beta ACB and IM higher than that b.t beta and G
- look at figure 5, correlation between beta NVB and IM also higher than that b.t beta and G
- look at figure 6, correlation between weighted beta and IM higher than that b.t beta and trade balance

**Figure 4 - ACB beta and macro correlation**

	BETA_ACB	CPI	EX_RATE	IM	G	R	RF	SP500	TRADEBA	VNIINDEX
BETA_ACB	1.000000	-0.197741	0.189232	0.441408	0.053454	-0.090726	-0.244251	0.219021	0.253213	0.282419
CPI	-0.197741	1.000000	-0.516593	0.184050	0.038007	0.547153	0.603133	-0.599312	-0.131135	-0.554246
EX_RATE	0.189232	-0.516593	1.000000	0.071635	0.145012	-0.470835	-0.851995	0.720764	0.048661	0.696179
IM	0.441408	0.184050	0.071635	1.000000	0.244021	0.128743	-0.019349	-0.074514	-0.083567	0.052526
G	0.053454	0.038007	0.145012	0.244021	1.000000	-0.040216	0.068575	-0.185033	-0.300285	0.012915
R	-0.090726	0.547153	-0.470835	0.128743	-0.040216	1.000000	0.484905	-0.756602	0.027941	-0.790059
RF	-0.244251	0.603133	-0.851995	-0.019349	0.068575	0.484905	1.000000	-0.846717	-0.277080	-0.804579
SP500	0.219021	-0.599312	0.720764	-0.074514	-0.185033	-0.756602	-0.846717	1.000000	0.375157	0.949626
TRADEBA	0.253213	-0.131135	0.048661	-0.083567	-0.300285	0.027941	-0.277080	0.375157	1.000000	0.347578
VNIINDEX	0.282419	-0.554246	0.696179	0.052526	0.012915	-0.790059	-0.804579	0.949626	0.347578	1.000000

(source: author calculation and stock exchange)

**Figure 5 - NVB beta and macro correlation**

Correlation Matrix										
	BETA_NVB	CPI	G	IM	R	RF	SP500	VNINDEX	EX_RATE	TRADEBA
BETA_NVB	1.000000	-0.054978	0.123137	0.458956	-0.193655	-0.089748	0.165736	0.236004	0.010875	0.021384
CPI	-0.054978	1.000000	0.038007	0.184050	0.547153	0.603133	-0.599312	-0.554246	-0.516593	-0.131135
G	0.123137	0.038007	1.000000	0.244021	-0.040216	0.068575	-0.185033	0.012915	0.145012	-0.300285
IM	0.458956	0.184050	0.244021	1.000000	0.128743	-0.019349	-0.074514	0.052526	0.071635	-0.083567
R	-0.193655	0.547153	-0.040216	0.128743	1.000000	0.484905	-0.756602	-0.790059	-0.470835	0.027941
RF	-0.089748	0.603133	0.068575	-0.019349	0.484905	1.000000	-0.846717	-0.804579	-0.851995	-0.277080
SP500	0.165736	-0.599312	-0.185033	-0.074514	-0.756602	-0.846717	1.000000	0.949626	0.720764	0.375157
VNINDEX	0.236004	-0.554246	0.012915	0.052526	-0.790059	-0.804579	0.949626	1.000000	0.696179	0.347578
EX_RATE	0.010875	-0.516593	0.145012	0.071635	-0.470835	-0.851995	0.720764	0.696179	1.000000	0.048661
TRADEBA	0.021384	-0.131135	-0.300285	-0.083567	0.027941	-0.277080	0.375157	0.347578	0.048661	1.000000

(source: author calculation and stock exchange)

**Figure 6 - Weighted beta and macro correlation**

Correlation Matrix										
	WEIGHTE	CPI	EX_RATE	G	IM	R	RF	SP500	TRADEBA	VNINDEX
WEIGHTE	1.000000	-0.605333	0.362479	0.201180	0.274567	-0.159547	-0.516579	0.350132	0.216079	0.378817
CPI	-0.605333	1.000000	-0.516593	0.038007	0.184050	0.547153	0.603133	-0.599312	-0.131135	-0.554246
EX_RATE	0.362479	-0.516593	1.000000	0.145012	0.071635	-0.470835	-0.851995	0.720764	0.048661	0.696179
G	0.201180	0.038007	0.145012	1.000000	0.244021	-0.040216	0.068575	-0.185033	-0.300285	0.012915
IM	0.274567	0.184050	0.071635	0.244021	1.000000	0.128743	-0.019349	-0.074514	-0.083567	0.052526
R	-0.159547	0.547153	-0.470835	-0.040216	0.128743	1.000000	0.484905	-0.756602	0.027941	-0.790059
RF	-0.516579	0.603133	-0.851995	0.068575	-0.019349	0.484905	1.000000	-0.846717	-0.277080	-0.804579
SP500	0.350132	-0.599312	0.720764	-0.185033	-0.074514	-0.756602	-0.846717	1.000000	0.375157	0.949626
TRADEBA	0.216079	-0.131135	0.048661	-0.300285	-0.083567	0.027941	-0.277080	0.375157	1.000000	0.347578
VNINDEX	0.378817	-0.554246	0.696179	0.012915	0.052526	-0.790059	-0.804579	0.949626	0.347578	1.000000

(source: author calculation and stock exchange)

## 4.2 OLS Regression results

In below section, we run OLS for 1 factor and see that:

- because coefficient calculated of -1.3.06, CPI and beta ACB has negative correlation (see figure 7)
- because coefficient calculated of 0.008, IM and beta ACB has positive correlation (see figure 8)
- because coefficient calculated of 0.0008, VNIndex and beta ACB has positive correlation (see figure 9)
- because coefficient calculated of -7.9, CPI and weighted beta has negative correlation (see figure 10)
- because coefficient calculated of 0.004, IM and weighted beta has positive correlation (see figure 11)
- because coefficient calculated of 0.001, VNIndex and weighted beta has positive correlation (see figure 12)

**Figure 7 - ACB beta and OLS for CPI**



Dependent Variable: BETA\_ACB  
 Method: Least Squares  
 Date: 07/30/21 Time: 11:43  
 Sample: 1 20  
 Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-3.065105	3.581384	-0.855844	0.4033
C	0.936663	0.239891	3.904531	0.0010
R-squared	0.039102	Mean dependent var		0.783500
Adjusted R-squared	-0.014282	S.D. dependent var		0.709383
S.E. of regression	0.714430	Akaike info criterion		2.259977
Sum squared resid	9.187395	Schwarz criterion		2.359550
Log likelihood	-20.59977	F-statistic		0.732468
Durbin-Watson stat	2.005085	Prob(F-statistic)		0.403334

(source: author calculation and stock exchange)

**Figure 8 - ACB beta and OLS for IM**

Dependent Variable: BETA\_ACB  
 Method: Least Squares  
 Date: 07/30/21 Time: 11:45  
 Sample: 1 20  
 Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IM	0.008470	0.004058	2.087066	0.0514
C	-0.589076	0.673720	-0.874363	0.3934
R-squared	0.194841	Mean dependent var		0.783500
Adjusted R-squared	0.150110	S.D. dependent var		0.709383
S.E. of regression	0.653976	Akaike info criterion		2.083148
Sum squared resid	7.698326	Schwarz criterion		2.182721
Log likelihood	-18.83148	F-statistic		4.355845
Durbin-Watson stat	2.608506	Prob(F-statistic)		0.051374

**Figure 9 - ACB beta and OLS for VNIndex**

Dependent Variable: BETA\_ACB

Method: Least Squares

Date: 07/30/21 Time: 11:46

Sample: 1 20

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VNIINDEX	0.000884	0.000708	1.249051	0.2276
C	0.182379	0.506018	0.360419	0.7227
R-squared	0.079761	Mean dependent var		0.783500
Adjusted R-squared	0.028636	S.D. dependent var		0.709383
S.E. of regression	0.699152	Akaike info criterion		2.216742
Sum squared resid	8.798643	Schwarz criterion		2.316316
Log likelihood	-20.16742	F-statistic		1.560129
Durbin-Watson stat	2.179967	Prob(F-statistic)		0.227647

(source: author calculation and stock exchange)

**Figure 10 - Weighted beta and OLS for CPI**

Dependent Variable: WEIGHTED\_BETA

Method: Least Squares

Date: 07/30/21 Time: 12:06

Sample: 1 20

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-7.962612	2.467873	-3.226508	0.0047
C	1.205392	0.165305	7.291918	0.0000
R-squared	0.366428	Mean dependent var		0.807500
Adjusted R-squared	0.331230	S.D. dependent var		0.601996
S.E. of regression	0.492302	Akaike info criterion		1.515191
Sum squared resid	4.362506	Schwarz criterion		1.614765
Log likelihood	-13.15191	F-statistic		10.41036
Durbin-Watson stat	1.604015	Prob(F-statistic)		0.004681

(source: author calculation and stock exchange)

**Figure 11 - Weighted beta and OLS for CIM**



Dependent Variable: WEIGHTED\_BETA

Method: Least Squares

Date: 07/30/21 Time: 12:06

Sample: 1 20

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IM	0.004471	0.003691	1.211447	0.2414
C	0.082970	0.612677	0.135422	0.8938
R-squared	0.075387	Mean dependent var		0.807500
Adjusted R-squared	0.024020	S.D. dependent var		0.601996
S.E. of regression	0.594722	Akaike info criterion		1.893193
Sum squared resid	6.366492	Schwarz criterion		1.992767
Log likelihood	-16.93193	F-statistic		1.467604
Durbin-Watson stat	1.225657	Prob(F-statistic)		0.241389

(source: author calculation and stock exchange)

**Figure 12 - Weighted beta and OLS for VNIndex**

Dependent Variable: WEIGHTED\_BETA

Method: Least Squares

Date: 07/30/21 Time: 12:07

Sample: 1 20

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VNIINDEX	0.001006	0.000579	1.736611	0.0995
C	0.123258	0.414278	0.297525	0.7695
R-squared	0.143502	Mean dependent var		0.807500
Adjusted R-squared	0.095919	S.D. dependent var		0.601996
S.E. of regression	0.572397	Akaike info criterion		1.816670
Sum squared resid	5.897480	Schwarz criterion		1.916243
Log likelihood	-16.16670	F-statistic		3.015816
Durbin-Watson stat	1.242469	Prob(F-statistic)		0.099539

(source: author calculation and stock exchange)

**Figure 13 - NVB beta and OLS for CPI**

Dependent Variable: BETA\_NVb

Method: Least Squares

Date: 07/30/21 Time: 11:57

Sample: 1 20

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-1.099926	4.708447	-0.233607	0.8179
C	0.487463	0.315385	1.545612	0.1396
R-squared	0.003023	Mean dependent var		0.432500
Adjusted R-squared	-0.052365	S.D. dependent var		0.915595
S.E. of regression	0.939262	Akaike info criterion		2.807195
Sum squared resid	15.87983	Schwarz criterion		2.906768
Log likelihood	-26.07195	F-statistic		0.054572
Durbin-Watson stat	2.186665	Prob(F-statistic)		0.817926

(source: author calculation and stock exchange)

**Figure 14 - NVB beta and OLS for IM**

Dependent Variable: BETA\_NVb

Method: Least Squares

Date: 07/30/21 Time: 11:57

Sample: 1 20

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IM	0.011367	0.005186	2.191644	0.0418
C	-1.409500	0.860991	-1.637066	0.1190
R-squared	0.210641	Mean dependent var		0.432500
Adjusted R-squared	0.166787	S.D. dependent var		0.915595
S.E. of regression	0.835760	Akaike info criterion		2.573688
Sum squared resid	12.57290	Schwarz criterion		2.673261
Log likelihood	-23.73688	F-statistic		4.803302
Durbin-Watson stat	3.001899	Prob(F-statistic)		0.041798

(source: author calculation and stock exchange)

**Figure 15 - NVB beta and OLS for VNIndex**

Dependent Variable: BETA\_NVB

Method: Least Squares

Date: 07/30/21 Time: 11:58

Sample: 1 20

Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
VNIINDEX	0.000953	0.000925	1.030389	0.3165
C	-0.215852	0.661598	-0.326259	0.7480
R-squared	0.055698	Mean dependent var		0.432500
Adjusted R-squared	0.003237	S.D. dependent var		0.915595
S.E. of regression	0.914112	Akaike info criterion		2.752912
Sum squared resid	15.04082	Schwarz criterion		2.852486
Log likelihood	-25.52912	F-statistic		1.061700
Durbin-Watson stat	2.326994	Prob(F-statistic)		0.316475

(source: author calculation and stock exchange)

Next we look at below tables:

Table 2 - Run OLS for external factors and comparison

	Coefficient		
	Weighted beta	NVB beta	ACB beta
Exchange rate	0.00022	-0.0003	0.0001
SP500	5.11E	0.0005	-1.56E
Trade balance	0.00026	-0.0002	0.0004
C	-4.3	6.06	-2.5
SER	0.17	0.96	0.7
Akaike info criteria	1.98	2.9	2.3

(source: author calculation and stock exchange)

Table 3 - Run OLS for 3 internal factors and comparison

	Coefficient		
	Weighted beta	NVB beta	ACB beta
CPI	-8.9	-2.8	-4.4
G	5.9	0.7	-3.0
IM	0.005	0.01	0.009
C	-0.05	-1.4	-0.4
R-squared	0.53	0.23	0.27
SER	0.44	0.87	0.65

<i>Akaike info criteria</i>	1.39	2.7	2.1
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(source: author calculation and stock exchange)

Table 4 - Run OLS for 4 internal factors and comparison

	<i>Coefficient</i>		
	<i>Weighted beta</i>	<i>NVB beta</i>	<i>ACB beta</i>
<i>CPI</i>	-10.6	-0.1	-4.4
<i>G</i>	6.7	-0.4	-3.0
<i>IM</i>	0.005	0.01	0.009
<i>R</i>	4.8	-7.6	-0.01
<i>C</i>	-0.5	-0.6	-0.4
<i>R-squared</i>	0.57	0.27	0.27
<i>SER</i>	0.43	0.87	0.67
<i>Akaike info criteria</i>	1.4	2.7	2.2

(source: author calculation and stock exchange)

Table 5 - Run OLS for 5 internal factors and comparison

	<i>Coefficient</i>		
	<i>Weighted beta</i>	<i>NVB beta</i>	<i>ACB beta</i>
<i>CPI</i>	-8.9	-0.9	-3.7
<i>G</i>	7.8	-1.0	-2.5
<i>IM</i>	0.005	0.01	0.009
<i>R</i>	6.06	-8.2	0.5
<i>Rf</i>	-5.7	2.7	-2.4
<i>C</i>	-0.3	-0.7	-0.3
<i>R-squared</i>	0.61	0.27	0.28
<i>SER</i>	0.43	0.9	0.69
<i>Akaike info criteria</i>	1.4	2.8	2.3

(source: author calculation and stock exchange)

Table 6 - Run OLS for 6 factors and comparison

	<i>Coefficient</i>		
	<i>Weighted beta</i>	<i>NVB beta</i>	<i>ACB beta</i>
<i>CPI</i>	-9.0	-1.3	-4.0
<i>G</i>	8.5	2.8	0.5

<i>IM</i>	0.005	0.01	0.009
<i>R</i>	7.01	-3.0	4.7
<i>R<sub>f</sub></i>	-4.3	10.1	3.5
<i>SP500</i>	8.73E	0.0004	0.0003
<i>C</i>	-0.7	-2.9	-2.1
<i>R-squared</i>	0.62	0.29	0.29
<i>SER</i>	0.44	0.96	0.7
<i>Akaike info criteria</i>	1.5	3.0	2.4

(source: author calculation and stock exchange)

Table 7 - Run OLS for 7 factors and comparison

	<i>Coefficient</i>		
	<i>Weighted beta</i>	<i>NVB beta</i>	<i>ACB beta</i>
<i>CPI</i>	-9.0	-1.2	-4.4
<i>G</i>	7.7	2.7	-4.1
<i>IM</i>	0.004	0.02	0.008
<i>R</i>	7.3	-3.2	6.7
<i>R<sub>f</sub></i>	-4.2	10.2	3.8
<i>SP500</i>	-1.39E	0.0003	-0.0001
<i>VNIndex</i>	0.0003	0.0001	0.001
<i>C</i>	-0.7	-2	-1.9
<i>R-squared</i>	0.62	0.4	0.31
<i>SER</i>	0.46	0.5	0.73
<i>Akaike info criteria</i>	1.6	3.0	2.5

(source: author calculation and stock exchange)

Table 8 - Run OLS for 8 internal factors and comparison

	<i>Coefficient</i>		
	<i>Weighted beta</i>	<i>NVB beta</i>	<i>ACB beta</i>
<i>CPI</i>	-8.7	-0.9	-4.3
<i>G</i>	14.7	12.5	-2.9
<i>IM</i>	0.005	0.01	0.008
<i>R</i>	5.9	-4.8	6.5
<i>R<sub>f</sub></i>	-14.0	-3.8	2.1
<i>SP500</i>	0.0002	0.0008	-0.0001

<i>VNIndex</i>	<i>-0.0006</i>	<i>-0.001</i>	<i>0.001</i>
<i>Exchange rate</i>	<i>-0.0003</i>	<i>-0.0005</i>	<i>-6.85E</i>
<i>C</i>	<i>8.0</i>	<i>9.7</i>	<i>-0.4</i>
<i>R-squared</i>	<i>0.68</i>	<i>0.34</i>	<i>0.31</i>
<i>SER</i>	<i>0.44</i>	<i>0.97</i>	<i>0.76</i>
<i>Akaike info criteria</i>	<i>1.5</i>	<i>3.0</i>	<i>2.6</i>

(source: author calculation and stock exchange)

#### 4. Discussion

##### During post-global crisis time: 2011-2020 period

For internal effects, we see that CPI has negative correlation and IN has positive correlation with beta in all 3 cases. (table 8)

In addition to, CPI, G, R and Rf have higher impacts on beta values. (see table 8)

For external effects, we see that exchange rate and trade balance have higher effects on market risk than SP500. (see table 2)

#### 5. Conclusion

Because CPI has negative correlation and IM has positive correlation with beta in all 3 cases, relevant agencies need to control CPI not increase too much as well as increasing IM toward benefits for managing risk.

Al-Quaisi (2011) studied the Amman stock market in Jordan, which is considered representative of the emerging Arab financial markets. and found that a number of factors including size, financial leverage, government deficits, and inflation rates significantly affect the value of a firm's systematic risk.

Huy, DTN et al (2020) have presented research showing that GDP growth rate and lending interest rate and risk-free rate increase have a significant impact on VCB stock price appreciation with high impact coefficient. First, the second is a decrease in the exchange rate, and finally the S&P 500 is slightly lower.

#### Limitation of research

We can expand our research model for other industries and other markets.

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