

Build Risk Policies in Commercial Banks with Internet Data - Case in Viet Nam in Industry 4.0

Nguyen Thanh Hai

PhD, Thuongmai University, Hanoi, Vietnam.

E-mail: nguyenthanhhai@tmu.edu.vn

Dinh Tran Ngoc Huy*

MBA, PhD Candidate, Banking University HCMC, Ho Chi Minh City, Vietnam.

E-mail: dtnhuy2010@gmail.com

Dao Thi Huong

Thai Nguyen University of Economics and Business Administration (TUEBA), Vietnam.

E-mail: dthuong2020@tueba.edu.vn

Phan Anh

PhD, Banking Academy, Hanoi, Vietnam.

E-mail: phananh@hvn.edu.vn

Leng Thi Lan

PhD, Thai Nguyen University of Agriculture and Forestry, Vietnam.

E-mail: lengthilan@tuaf.edu.vn

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Abstract

This study aimed to identify risk policies coming from comparing effects of beta determinants on beta of bank and weighted beta Capm index, a development from traditional beta Capm formula by Sharpe (1964) and Lintner (1965). Authors conducted this study in the period 2011-2020 and chose a big bank in Vietnam Asia commercial bank - ACB to estimate beta determinants effects.

Findings reveal that - CPI has negative correlation with two betas: ACB and weighted beta, second, Exchange rate also have tiny negative impact on two betas and third, ACB and weighted beta, And last but not least, IM and R have negative correlation with two betas Therefore, our study can be expanded for other markets.

Keywords

Weighted Beta Formulation, Risk Policies, Vietnam Banks, Beta CAPM, Market Risk Comparison.

JEL: M21, G30, G32, G38.

Introduction

First, we recognize the importance of building MIS system in bank system to enhance risk information and decision making processes.

Next, Trivellas and Santouridis (2013) stated during economic crisis, organizations' information processing capabilities are challenged by additional and diverse demands. In this context, banks attempt to develop and apply more sophisticated and comprehensive Management Information Systems (MISs), in order to exploit their innovation competences and build a sustainable competitive advantage.

Hence, we select a big listed bank in Vietnam financial market, Asia commercial bank - ACB to calculate and compare beta with weighted beta index during industry 4.0 with support of internet data.

Research Question

To what extent macro indicators affect beta CAPM and comparison results with weighted beta in banking industry?

Literature Review

Then, We summarize previous studies as follows:

Table 1 Summary of previous studies

Authors	Year	Contents, results
Huy, D.T.N	2015	Found out limited South Asian corporate governance and risk management standards for corporations
Santosa et al	2020	In Islamic banks, several variables have negatively correlation such as: GDP efficiency, Forex profitability, GDP-corporate governance... which implies managerial implications
Santis and Veken	2020	As financial stress rise as downside risk, financial indicators give warnings of severity of crisis
Giebe et al	2019	We can take advantage of Big data and Analytics as a progressive tool in order to offer services for banks.
Al-Adwan	2016	Stated that MIS of firms uner effects and need to improve service quality by improved policies to serve clients.
Huy, D.T.N,Loan, B.T.T, Anh, P.T	2020	Stated that it is necessary to enhance risk management processes at commercial banks in globalization

Methodology

Method and Data

Authors employ OLS regression for quantitative methods and also use qualitative methods including synthesis, inductive and explanatory methods.

Looking at Statistics Below, We See

- We experience standard dev get highest values in case of exchange rate and SP500 (figure 1 and 2).

	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

Figure 1 Weighted beta
(source: authors calculation and stock market)

	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

Figure 2 ACB
(source: authors calculation and stock market)

Main Results

Overall Results

We Find Out

- Correlation b.t beta ACB and IM higher than that b.t beta and exchange rate (figure 3).
- Correlation b.t weighted beta and IM higher than that b.t beta and G (figure 4).

Correlation Matrix										
	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

Figure 3 ACB beta and macro correlation
(source: authors calculation and stock market)

Correlation Matrix										
	WEIGHTE...	CPI	EX_RATE	G	IM	R	RF	SP500	TRADEBA...	VNIINDEX
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
VNIINDEX	0.378817	-0.554246	0.696179	0.012915	0.052526	-0.790059	-0.804579	0.949626	0.347578	1.000000

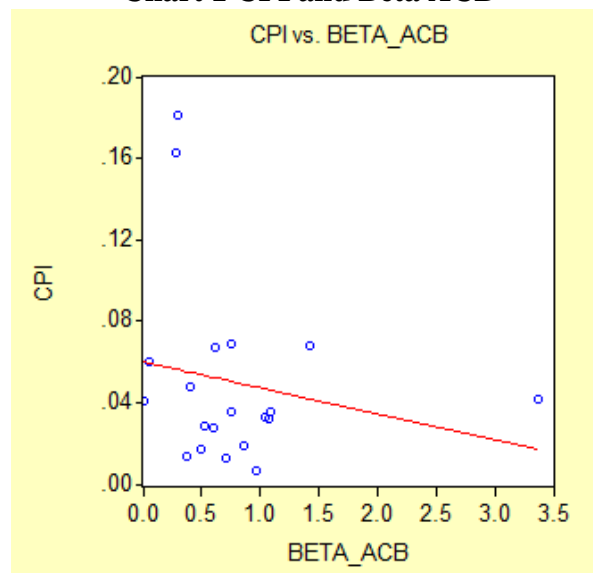
Figure 4 Weighted beta and macro correlation
(source: authors calculation and stock market)

Scatter Chart

We Find Out

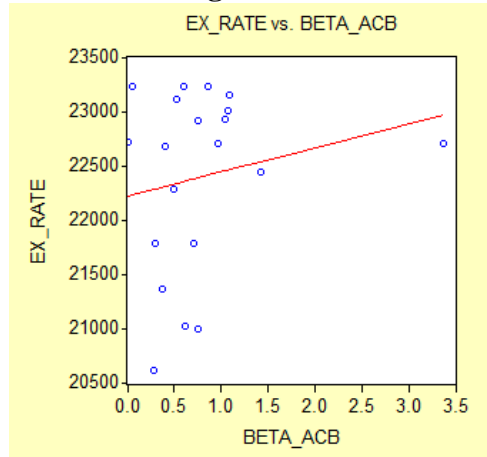
- Exchange rate, G and IM have positive correlation with beta.
- CPI, R and Rf have negative correlation with beta.

Chart 1 CPI and Beta ACB



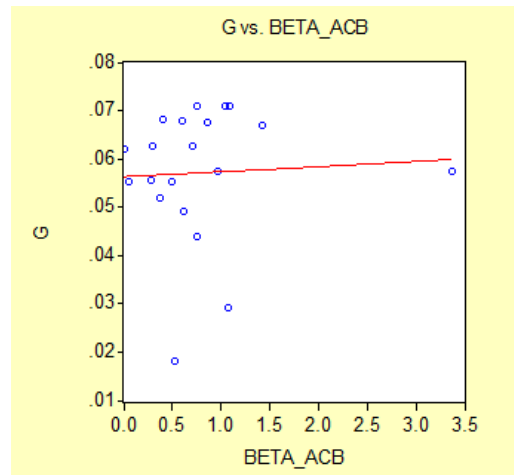
(source: authors calculation and stock market)

Chart 2 Exchange Rate and Beta ACB



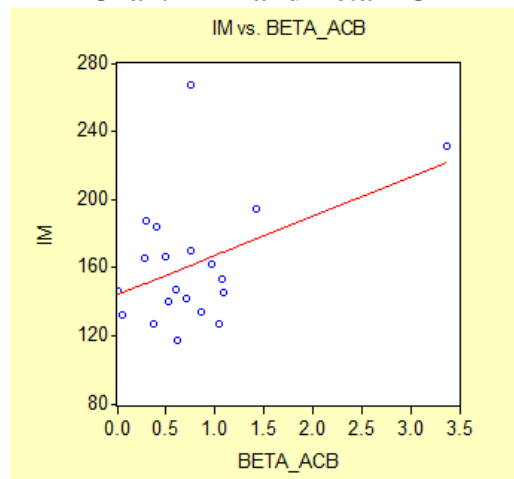
(source: authors calculation and stock market)

Chart 3 G and Beta ACB



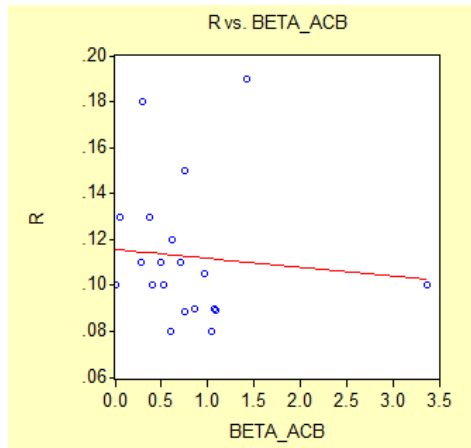
(source: authors calculation and stock market)

Chart 4 IM and Beta ACB



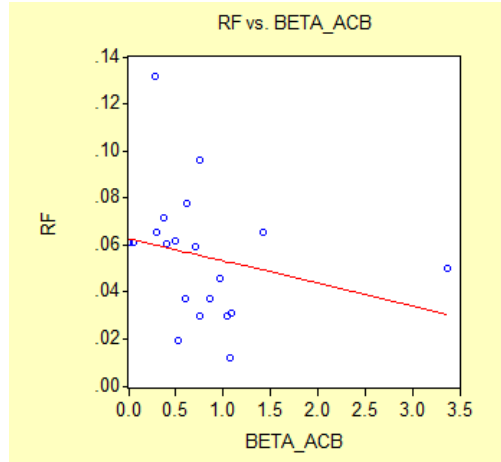
(source: authors calculation and stock market)

Chart 5 R and Beta ACB



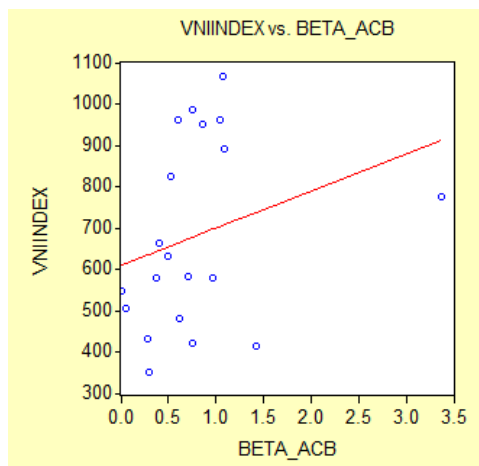
(source: authors calculation and stock market)

Chart 6 Rf and Beta ACB



(source: authors calculation and stock market)

Chart 7 VNIndex and Beta ACB



(source: authors calculation and stock market)

OLS Regression Results

Looking at Figures Below, We See

- We experience two betas and CPI have negative correlation (figure 5 and 6).
- We experience IM and two betas have positive correlation (figure 7 and 9).
- We experience VNIndex and two betas have positive correlation (figure 8 and 10).

Dependent Variable: BETA_ACB
 Method: Least Squares
 Date: 08/02/21 Time: 10:35
 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

Figure 5 ACB beta and OLS for CPI
 (source: authors calculation and stock market)

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

Figure 6 Weighted beta and OLS for CPI
 (source: authors calculation and stock market)

Dependent Variable: BETA_ACB
 Method: Least Squares
 Date: 08/02/21 Time: 10:36
 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 7 ACB beta and OLS for IM
 (source: authors calculation and stock market)

Dependent Variable: BETA_ACB
 Method: Least Squares
 Date: 08/02/21 Time: 10:36
 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

Figure 8 ACB beta and OLS for VNIndex
 (source: authors calculation and stock market)

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

Figure 9 Weighted beta and OLS for IM
 (source: authors calculation and stock market)

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

Figure 10 Weighted beta and OLS for VNIndex (source: authors calculation and stock market)

Dependent Variable: WEIGHTED_BETA
 Method: Least Squares
 Date: 07/30/21 Time: 12:08
 Sample: 1 20
 Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-8.916889	2.273000	-3.922961	0.0012
G	5.956406	7.576047	0.786216	0.4432
IM	0.005955	0.002899	2.054018	0.0567
C	-0.052423	0.560658	-0.093502	0.9267
R-squared	0.538462	Mean dependent var		0.807500
Adjusted R-squared	0.451924	S.D. dependent var		0.601996
S.E. of regression	0.445670	Akaike info criterion		1.398382
Sum squared resid	3.177954	Schwarz criterion		1.597529
Log likelihood	-9.983825	F-statistic		6.222235
Durbin-Watson stat	2.184356	Prob(F-statistic)		0.005275

Figure 11 Weighted beta and OLS for 3 factors (source: authors calculation and stock market)

Dependent Variable: WEIGHTED_BETA
 Method: Least Squares
 Date: 07/30/21 Time: 12:09
 Sample: 1 20
 Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-10.65680	2.656781	-4.011171	0.0011
G	6.719505	7.490770	0.897038	0.3839
IM	0.005769	0.002861	2.016737	0.0620
R	4.835300	3.972177	1.217292	0.2423
C	-0.523555	0.674495	-0.776218	0.4497
R-squared	0.579957	Mean dependent var		0.807500
Adjusted R-squared	0.467945	S.D. dependent var		0.601996
S.E. of regression	0.439108	Akaike info criterion		1.404176
Sum squared resid	2.892240	Schwarz criterion		1.653109
Log likelihood	-9.041759	F-statistic		5.177651
Durbin-Watson stat	2.312520	Prob(F-statistic)		0.007999

Figure 12 Weighted beta and OLS for 4 factors (source: authors calculation and stock market)

Dependent Variable: BETA_ACB
 Method: Least Squares
 Date: 08/02/21 Time: 10:37
 Sample: 1 20
 Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-4.482644	3.348274	-1.338792	0.1994
G	-3.049143	11.16000	-0.273221	0.7882
IM	0.009771	0.004271	2.287837	0.0361
C	-0.401717	0.825885	-0.486408	0.6333
R-squared	0.278767	Mean dependent var		0.783500
Adjusted R-squared	0.143535	S.D. dependent var		0.709383
S.E. of regression	0.656501	Akaike info criterion		2.173071
Sum squared resid	6.895897	Schwarz criterion		2.372218
Log likelihood	-17.73071	F-statistic		2.061406
Durbin-Watson stat	2.822340	Prob(F-statistic)		0.145774

**Figure 13 ACB beta and OLS for 3 factors
 (source: authors calculation and stock market)**

Dependent Variable: BETA_ACB
 Method: Least Squares
 Date: 08/02/21 Time: 10:38
 Sample: 1 20
 Included observations: 20

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CPI	-4.477096	4.102361	-1.091346	0.2923
G	-3.051576	11.56657	-0.263827	0.7955
IM	0.009772	0.004417	2.212162	0.0429
R	-0.015417	6.133478	-0.002514	0.9980
C	-0.400215	1.041494	-0.384270	0.7062
R-squared	0.278767	Mean dependent var		0.783500
Adjusted R-squared	0.086438	S.D. dependent var		0.709383
S.E. of regression	0.678031	Akaike info criterion		2.273071
Sum squared resid	6.895894	Schwarz criterion		2.522004
Log likelihood	-17.73071	F-statistic		1.449428
Durbin-Watson stat	2.822606	Prob(F-statistic)		0.266460

**Figure 14 ACB beta and OLS for 4 factors
 (source: authors calculation and stock market)**

Next We See OLS Results in Tables Below

Table 2 OLS for 5 factors

	Coefficient	
	Weighted beta	ACB beta
CPI	-8.9	-3.7
G	7.8	-2.5
IM	0.005	0.009
R	6.06	0.5
Rf	-5.7	-2.4
C	-0.3	-0.3
R-squared	0.61	0.28
SER	0.43	0.69
Akaike info criteria	1.4	2.3

(source: authors calculation and stock market)

Table 3 OLS for 6 Factors

	Coefficient	
	Weighted beta	ACB beta
CPI	-9.0	-4.0
G	8.5	0.5
IM	0.005	0.009
R	7.0	4.7
Rf	-4.3	3.5
SP500	8.73E	0.0003
C	-0.7	-2.1
R-squared	0.62	0.29
SER	0.44	0.71
Akaike info criteria	1.5	2.4

(source: authors calculation and stock market)

Table 4 OLS for 7 factors

	Coefficient	
	Weighted beta	ACB beta
CPI	-9.0	-4.4
G	7.7	-4.1
IM	0.004	0.008
R	7.3	6.7
Rf	-4.2	3.8
SP500	-1.39E	-0.0001
VNIndex	0.0003	0.001
C	-0.7	-1.9
R-squared	0.62	0.31
SER	0.46	0.73
Akaike info criteria	1.6	2.5

(source: authors calculation and stock market)

Table 5 OLS for 8 factors

	Coefficient	
	Weighted beta	ACB beta
CPI	-8.7	-4.3
G	14.7	-2.9
IM	0.005	0.008
R	5.9	6.5
Rf	-14.0	2.1
SP500	0.0002	-0.0001
VNIndex	-0.0006	0.001
Exchange rate	-0.0003	-6.85E
C	8.0	-0.4
R-squared	0.68	0.31
SER	0.44	0.76
Akaike info criteria	1.5	2.6

(source: authors calculation and stock market)

Discussion

During Post-global Crisis 2011-2020

We recognize that from tale 5:

- CPI has negative correlation with two betas: ACB and weighted beta.
- Exchange rate also have tiny negative impact on two betas - ACB and weighted beta.
- And IM and R have negative correlation with two betas.

Conclusion

We analyze that because:

- CPI has negative correlation with two betas: ACB and weighted beta, hence, we need not to reduce CPI too much. Then, Exchange rate also have tiny negative impact on two betas - ACB and weighted beta, hence we can increase exchange rate little, and IM and R have negative correlation with two betas, so we need to increase IM.

Constructing Reliable Risk Data with Digital Technology in Industry 4.0

With digital technology taking the throne, all businesses are looking for a smart, efficient and professional data management solution. This dilemma has been completely solved as technology advances. Good data management will help businesses increase productivity, increase efficiency in processing operations and increase operational value. To manage data, businesses must conduct a series of different jobs. This includes the collection, synthesis, storage, preservation and use of data. The data needed for the operations of the business will include the set of information that needs to be stored by the business.

Enterprises need to build a clear and methodical data management process. The correct identification of business processes will help businesses increase professional work efficiency, help analyze and make more accurate and correct decisions in the process of operation. Good management of enterprise data also helps businesses have enough information to analyze, make operational decisions and plan development strategies, increasing competitiveness in the market.

Limitation of Research

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

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