



The Determinants of India's Implied Volatility Index

Presented by: Kiran Pranesh K
Academic Mentor: Dr. Balasubramanian P

ABSTRACT

- This study examines the determinants of India's implied volatility index (VIX)
- The factors considered are Purchasing Managers Index (PMI), Business Confidence Index (BCI), Net activity of Foreign Institutional Investors (FII) and Net activity of Domestic Institutional Investors (DII)
- In this study Granger causality is used to find whether these factors cause India VIX
- This study confirms that only BCI has significant and positive impact with India VIX and other factors such as PMI, FII and DII do not have any significant impact on India VIX
- The results show that FII has a significant and negative impact on DII and hence these two factors do not have a significant impact on India VIX

RESEARCH QUESTION

What is the impact of variables - PMI, BCI, net activity of FII and DII on India's Implied Volatility Index (India VIX)?

INTRODUCTION

- Implied volatility index measures the expectation of market's volatility implied in the price of Options
- In India volatility index was constructed by National Stock Exchange of India Ltd (NSE) and is called as India VIX
- The factors considered here are ,
 - Purchasing Managers Index (PMI)
 - Business Confidence Index (BCI)
 - Net activity of FII
 - Net activity of DII
- Purchasing Managers Index (PMI) is an indicator of economic health of manufacturing sector; it is based on five major indicators: new orders, inventory levels, production, supplier deliveries and the employment environment
- Domestic institutional investors (DII) are those institutional investors which undertake investment in securities and other financial assets of the country they are based in
- Foreign institutional investors (FII) are those institutional investors which undertake investment in securities and other financial assets in other country
- Business Confidence Index (BCI) is based on enterprises assessment of production, orders and stocks, as well as its current position and expectation for immediate future

RESEARCH METHODOLOGY

- Daily closing prices of India volatility index are taken from NSE then calculated for monthly by taking weighted average of closing prices of each month
- Monthly index of BCI from OECD and PMI from HSBC
- Monthly Net FII and DII from NSE

PROPOSED METHODOLOGY

- Unit Root Test:** It tests whether a time series variable is non-stationary and possesses a unit root. The null hypothesis is generally defined as the presence of a unit root and the alternative hypothesis is either stationary or trend stationary
- Granger Causality test:** To find whether one time series data will be useful in forecasting another time series data (i.e. one time series data will cause another time series data). Granger Causality has an assumption that future cannot cause past but the past cause the past or future

FORMULAE

$$VIX_t = \sum_{i=0}^2 \alpha_i PMI_{t-i} + \sum_{j=0}^2 \beta_j VIX_{t-j} + \varepsilon_{1t}$$

$$PMI_t = \sum_{i=0}^2 \gamma_i PMI_{t-i} + \sum_{j=0}^2 \delta_j VIX_{t-j} + \varepsilon_{2t}$$

$$VIX_t = \sum_{i=0}^2 \alpha_i BCI_{t-i} + \sum_{j=0}^2 \beta_j VIX_{t-j} + \varepsilon_{1t}$$

$$BCI_t = \sum_{i=0}^2 \gamma_i BCI_{t-i} + \sum_{j=0}^2 \delta_j VIX_{t-j} + \varepsilon_{2t}$$

$$VIX_t = \sum_{i=0}^2 \alpha_i FII_{t-i} + \sum_{j=0}^2 \beta_j VIX_{t-j} + \varepsilon_{1t}$$

$$FII_t = \sum_{i=0}^2 \gamma_i FII_{t-i} + \sum_{j=0}^2 \delta_j VIX_{t-j} + \varepsilon_{2t}$$

$$VIX_t = \sum_{i=0}^2 \alpha_i DII_{t-i} + \sum_{j=0}^2 \beta_j VIX_{t-j} + \varepsilon_{1t}$$

$$DII_t = \sum_{i=0}^2 \gamma_i DII_{t-i} + \sum_{j=0}^2 \delta_j VIX_{t-j} + \varepsilon_{2t}$$

$\alpha_i, \beta_j, \gamma_i, \delta_j$ = coefficients of the model (i.e., the contributions of each lagged observation)

$\varepsilon_{1t}, \varepsilon_{2t}$ = are residuals (prediction errors) for each time series

RESULTS

Pairwise Granger Causality Tests			
Date: 01/18/17 Time: 00:49			
Sample: 2012M04 2016M05			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
PMI does not Granger Cause VIX	48	2.53682	0.0909
VIX does not Granger Cause PMI		1.50138	0.2343
BCI does not Granger Cause VIX	48	3.34154	0.0448
VIX does not Granger Cause BCI		0.47051	0.6279
FII does not Granger Cause VIX	48	0.65188	0.5261
VIX does not Granger Cause FII		1.38676	0.2608
DII does not Granger Cause VIX	48	0.80683	0.4529
VIX does not Granger Cause DII		1.69076	0.1964
BCI does not Granger Cause PMI	48	5.75829	0.0061
PMI does not Granger Cause BCI		0.16501	0.8484
FII does not Granger Cause PMI	48	2.08756	0.1364
PMI does not Granger Cause FII		0.12776	0.8804
DII does not Granger Cause PMI	48	2.02894	0.1439
PMI does not Granger Cause DII		0.07911	0.9241
FII does not Granger Cause BCI	48	0.57330	0.5679
BCI does not Granger Cause FII		0.73633	0.4848
DII does not Granger Cause BCI	48	0.46556	0.6309
BCI does not Granger Cause DII		0.27879	0.7581
DII does not Granger Cause FII	48	2.56726	0.0885
FII does not Granger Cause DII		3.53594	0.0379

Dependent Variable: FII				Dependent Variable: DII					
Method: Least Squares				Method: Least Squares					
Date: 01/18/17 Time: 22:03				Date: 01/18/17 Time: 22:04					
Sample: 2012M04 2016M05				Sample: 2012M04 2016M05					
Included observations: 50				Included observations: 50					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Variable	Coefficient	Std. Error	t-Statistic	Prob.
DII	-1.156571	0.087833	-13.16790	0.0000	FII	-0.674122	0.051194	-13.16790	0.0000
R-squared	0.743405	Mean dependent var	3927.914		R-squared	0.775013	Mean dependent var	-1147.635	
Adjusted R-squared	0.743405	S.D. dependent var	9780.124		Adjusted R-squared	0.775013	S.D. dependent var	7973.932	
S.E. of regression	4954.138	Akaike info criterion	19.87363		S.E. of regression	3782.260	Akaike info criterion	19.33383	
Sum squared resid	1.20E+09	Schwarz criterion	19.91187		Sum squared resid	7.01E+08	Schwarz criterion	19.37207	
Log likelihood	-495.8408	Hannan-Quinn criter.	19.88819		Log likelihood	-482.3457	Hannan-Quinn criter.	19.34839	
Durbin-Watson stat	1.215677				Durbin-Watson stat	1.176519			

CONCLUSIONS

- This study explored the determinants of India VIX for the period from April 2012 to March 2016
- Granger Causality test showed that Business Confidence Index (BCI) have positive and significant impact on India VIX while other factors such as PMI, FII and DII do not have much impact on India VIX
- FII and DII have negative association between them

REFERENCES

- Ayuningtyas, R., & Koesnandartoto, D. P. The Relationship between Business Confidence, Consumer Confidence, and Indexes Return: Empirical Evidence in Indonesia Stock Exchange
- Nikkinen, J., & Sahlström, P. (2015). Impact of Scheduled US Macroeconomic News on Stock Market Uncertainty: A Multinational Perspective
- Shaikh, I., & Padhi, P. (2013). Macroeconomic Announcements and the Implied Volatility Index: Evidence from India VIX. Margin: The Journal of Applied Economic Research, 7(4), 417-442
- Granger, C. W. J., & Aug, N. (2007). Investigating Causal Relations by Econometric Models and Cross-spectral Methods, 37(3), 424-438
- Phillips, P. C. B., & Mar, N. (2008). Time Series Regression with a Unit Root, 55(2), 277-301
- A. P. Kumar, V. Suresh, Balasubramanian, P., and Menon, V. Krishna, "Measuring stock price and trading volume causality among Nifty 50 stocks: The Toda Yamamoto Method", in International Conference on Advances in Computing, Communications and Informatics, ICACCI, Jaipur, Rajasthan, 2016
- D. Singh and Balasubramanian, P., "Price-Volume Relationship: Some Evidence from the Indian Stock Market", Vision: The Journal of Business Perspective, vol. 4, pp. 17-28, 2000
- Mall, M., Mishra, S., Mishra, P., & Pradhan, B. A study on relation between india vix and nifty returns
- Bagchi, D. (2012). Cross-sectional analysis of emerging market volatility index (India VIX) with portfolio returns. International Journal of Emerging Markets, 7(4), 383-396