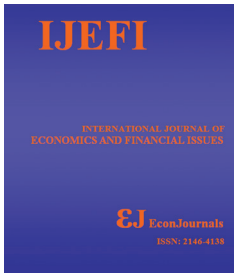

International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2020, 10(2), 81-86.

Causal Effect of Economic Indicators on Indian Automobile Sector

Rama Krishna Yelamanchili*

Department of Finance and Accounting, ICFAI Business School, IFHE-Hyderabad, Hyderabad, Telangana, India.
*Email: yrk@ibsindia.org

Received: 05 December 2019 **Accepted:** 06 February 2020 **DOI:** https://doi.org/10.32479/ijefi.9175

ABSTRACT

In this paper we examine the co-movement and casual relationship between economic indicators and automobile index. We postulate that leading and coincident economic indicators will help explain, cause, and predict movements in automobile index. To test our hypotheses we source data for four coincident indicators, namely index of industrial production (IIP); index of manufacture of motor vehicles, trailers and semi-trailers (MVI); index of manufacture of other transport equipment (TEI); and west texas intermediate (WTI) crude oil price, for leading indicator we use bombay stock exchange (BSE) sensitive index (SENSEX). We consider BSE's AUTO index as proxy for Indian Automobile Industry. We collect monthly data of our study variables from April 2012 to June 2019. We break our full sample into two sub-samples based on break point in AUTO index and run separate analysis for each sample period. We find significant contemporaneous co-movements between SENSEX and AUTO index. In contrast to our hypothesis AUTO index cause SENSEX in all the three sample periods. Granger test confirms this result with different lags. In addition, we also find evidence for causation from AUTO index to MVI and TEI with five and three lags respectively in our second sub-sample period. Our results indicate that automobile industry influence Indian stock markets and automobile industrial production. Our results suggest that policy makers and regulators should be vigilant in making policies pertaining to automobile industry and should consider the repercussions of their decisions, because wrong policy decisions about auto industry may hurt the Indian economy.

Keywords: Indian Economy, Indian Stock Markets, Automobile Industry Performance, Policy Implications, Regulatory Norms
JEL Classifications: G11, G18, E23, E32

1. INTRODUCTION

The Indian automobile industry is recognized as a "sunrise industry" as it has emerged as one of the fastest growing sectors over the last few years. The automobile sales in India have grown at a compounded annual growth rate of six percent over the period of FY11-FY17. This growth can be attributed to significant support the automobile industry received from Government of India (GOI) in the form of fully de-licensing, tax incentives for exports, and allowing 100% foreign direct investment (FDI) are few to mention. With such a kind of support the industry attracted FDI's worth USD 20.85 billion during the period April 2000 to December 2018. Along with these initiatives the industry also received support in the form of decrease in global fuel prices, easy access to loans from banks and non-banking financial institutions to customers, lower interest rates on loans, growing employment rate, income, and the economic wealth of Indian citizens. In Indian automobile industry major share belongs to two wheelers segment (80%), followed by passenger vehicles (14%), commercial vehicles (3%) and three-wheelers (3%). The Indian automobile industry contributes more than seven percent to the total GDP and provides employment to about 32 million people directly and indirectly. As per the GOI automotive mission plan (AMP) 2016-26, automobile industry's contribution to GDP is projected to increase to 12% from 7%. It is also expected that India will emerge as the world's third largest passenger vehicle market by 2021 and create approximately 65 million jobs.

As of July 2019 the Indian automobile industry's condition is quite dissimilar from its glorious past and horrifying the stakeholders. Since January 2018 the Bombay Stock Exchange's automobile sectorial index plunging rapidly with no sign of recovery in near future. Multiple policy shocks have impacted automobile sales in previous 2 years. Like demonetization, GST and emission norms adversely affected Indian automobile industry. The automobile industry is to invest Rs. 70,000 crore to comply with emission norms from BS-IV to BS-VI. Furthermore, in March 2016, the GOI set the country's ambitious target to have 100% electric vehicles fleet on road by 2030. Current scenario is that the Indian automobile industry contained slowdown after a near decade of exponential growth. Since preceding 2 years all the four automobile segments i.e., two wheelers, three wheelers, passenger vehicles, and commercial vehicles witness sharp decline in sales.

In the given scenario, understanding the co-movements and causal relationship between economic indicators and automobile industry is an interesting topic to research. Our motivation for this research is propelled by certain contradicting facts about economic indicators and automobile industry. We notice that at one point of time there was dramatic growth in Indian automobile industry when economic indicators reported nominal growth. At other point of time automobile industry reported decline, whereas economic indicators reported positive growth. We also observe that slowdown in automobile industry gradually cause slowdown in industrial production and motor vehicles production. Our goal in this paper is to examine the co-movements and causal relationships between each of economic indicators and automobile index. We hypothesize that there will be significant relationship between economic indicators and auto index. We desire to assess these relationships in different points of time.

We present rest of the paper in multiple sections. In next section we present relevant literature. We then report the data, data sources and methodology adapted in this paper. Next, we present our preliminary data analysis followed by empirical results. We then conclude our paper with conclusion, and scope for further research.

2. LITERATURE REVIEW

Earlier studies those examine relationship between economic indicators and stock markets in different countries report mixed results and do not find agreement in their conclusions (Abu-Libdeh and Harasheh, 2011; Ahmed, 2008; Amith and Gabriele, 2018; Czapkiewicz and Stachowicz, 2016; Dasgupta, 2012, Gopinathan and Raja, 2019; Maio and Philip, 2015; Osamwonyi and Osagie, 2012). A paper by Jareño and Negrut (2016) find that US stock market exhibits a positive and significant relationship with the gross domestic product (GDP) and the IPI (Industrial Production Index) variables and a negative and statistically significant relationship with the unemployment and interest rate variables. A study by Lei and Vinod (2016) find that Shanghai A share market shares a long-run stochastic trend with the real economy and it has a small but negative influence on the real economy. Similarly, Dipendra (2017) report positive relationship between Nepalese broad market index (NEPSE) and real GDP and negative relationship between NEPSE Index and interest rate. Finally, Amarasinghe (2016) conclude that Industrial Production Index positively impact Beverage, Food and Tobacco Sector index. In Indian context Vashishtha et al. (2013) report moderate relationship between SENSEX and IIP during 2009-2010 and also report that relationship between SENSEX and WTI vary from year to year. In our search of literature we find limited research papers those examine the co-movements, casual relationship and predictive ability of economic indicators, industry specific industrial production indexes and automobile industry proxy. This paper tries to fill existing gap in the literature.

Objectives of the present paper are

1. To study the co-movements between economic indicators and AUTO index
2. To measure the causal relationship between economic indicators and AUTO index
3. To assess the predictive power of economic indicators about AUTO index.

Hypotheses

H_1: There will be significant co-movement between economic indicators and AUTO index.

H_2: Economic indicators cause movements in AUTO index.

H_3: Economic indicators will be able to predict the movements in AUTO index.

3. DATA AND METHODOLOGY

In this paper we consider six economic indicators of which three represent Indian automobile industry, two are broad economic indicators, and one is global economic indicator. As proxies for automobile industry we use BSE AUTO index which comprises 16 automobile stocks; index of manufacture of motor vehicles, trailers and semi-trailers index (MVI) which includes 7 items (Passenger cars, Commercial Vehicles, Bodies of trucks, lorries and trailers, Bodies/chassis of buses and minibuses, Auto components/spares and accessories, Axle, Rim [Wheel]); and Index of Manufacture of other transport equipment (TEI) which includes 6 items (Two-wheelers (motorcycles/scooters), Ship building and parts thereof, Railway coaches, Railway wagons, Railway locomotives, Bicycles - all types).

For broad market economic indicators we use BSE SENSEX which comprises 30 stocks of which six are auto stocks and the index of industrial production (IIP) which includes 23 manufacturing industries of which two are automobile manufacturing related with weightage of 6.6%. We source oil price from west texas intermediate (WTI), which is considered as global index for crude oil price. We source monthly data for these variables from April 2012 to June 2019. This time period is specifically chosen because IIP basket was revised in April 2012. To understand our data series we first plot them on graphs and run descriptive statistics. We notice that in AUTO index there is a break point in December 2017. From 2012M04 to 2017M12 the AUTO index surge swiftly and there after it shrink sharply with no signs of turn around. Taking this point into consideration we split our full sample into two sub-samples. First sub-sample comprise the period between 2012M04 and 2017M12 and second sub-sample comprise the

Table 1: Holding period returns for three sample periods

Holding period return (HPR)	AUTO	MVI	TEI	IIP	WTI	SENSEX
Full sample 2012M04-2019M06	68.18	−3.53	55.59	31.12	−47.10	127.47
Sub-sample-1 2012M04-2017M12	151.29	2.08	12.78	31.52	−43.98	96.65
Sub-sample-2 2018M01-2019M06	−30.99	−13.97	10.26	−1.59	−14.19	9.54

period between 2018M01 and 2019M06. We analyze full sample and two sub-samples separately to understand the co-movements, causation, and predictive ability.

4. PRELIMINARY RESULTS

For full sample period we find that BSE SENSEX gain 127%, IIP gain 31% and WTI drop 47%. On the other side AUTO index gain 68%, TEI gain 56%, and MVI shrink 4%. In our first sub-sample period we observe an interesting fact about AUTO index. During that period AUTO index gain whopping 192% and outperform SENSEX which gain 122%. In our second sub-sample period we find some other surprising result. During that period SENSEX surge 10% whereas AUTO index plunge by 31%. On the other side TEI surge 10% whereas MVI shrink 14% and IIP plunge two percent. We observe that during all the three sample periods there is a decline in oil price (Table 1). Results reveal that AUTO index as a leading economic indicator reflects investors' optimism during first sub-sample and reflects investors' pessimism in second sub-sample period.

Results of year wise analysis reveal that AUTO index report positive average daily returns until 2017 and from then report negative results. Next, except 1 year both the SENSEX and IIP report positive daily returns for the whole sample period. From results present in Table 2 we report high fluctuations in oil price and automobile industrial production indexes. These results indicate that there is a slowdown in auto industry since January 2018, subsequently this slowdown led to drop in industrial production in India.

We present descriptive statistics of daily returns in Table 3. Results disclose that TEI, which represents manufacturing of two-wheelers, bicycles, and railway coaches in India witness high volatility (σ >9%) with highest (25.12%) and lowest returns (−24.28%) among all the study variables. Similarly WTI oil price witness high volatility (σ >8%) and report continuous drop in prices in all the three sample periods. This result indicates that overall there is a decline in oil price. However, oil prices are prone to high swings. Among the six variables studied in this paper we find SENSEX as stable and report positive returns in all the three sample periods. On the other side MVI which is a proxy for passenger and commercial production in India, and AUTO index, the leading economic indicator of automobile industry report high volatility (σ >6%; σ >5% respectively) with mixed average daily returns. These two indexes report negative returns in second sub-sample period and showcase the general slowdown in automobile production, sales, and future growth in automobile sector. A comparison of daily returns of leading economic indicators reveals that during the first sub-sample period AUTO index outperform SENSEX and in second sub-sample period

Table 2: Year wise daily average returns from 2012 to 2019

Year	AUTO	MVI	TEI	IIP	WTI	SENSEX
2012	1.24	−1.57	1.26	1.05	−1.78	1.55
2013	0.73	−0.11	0.44	0.48	0.98	0.79
2014	3.66	0.56	0.42	0.46	−3.78	2.26
2015	0.04	0.40	0.40	0.41	−3.21	−0.37
2016	0.95	−0.56	−1.37	0.31	3.40	0.26
2017	2.41	2.02	2.62	0.75	1.02	2.11
2018	−1.91	−0.04	1.73	0.37	−0.95	0.58
2019	−2.40	−0.16	3.41	−0.16	1.91	1.52

SENSEX outperform AUTO index. In both of the sub-sample period SENSEX report positive returns, whereas AUTO index report positive returns in first sub-sample period and negative return in second sub-sample period. This result indicates that presently investors are optimistic about Indian economy but skeptic about growth of Indian automobile sector.

4.1. Stationarity Test Results

We run a battery of stationarity tests to examine the presence of unit root in our series. We apply ADF, DF-GLS, and KPSS tests. ADF and DF-GLS test the hypothesis of non-stationary and KPSS tests the hypothesis of stationary. We find our series as non-stationary at their level. We then calculate log returns of all the series and then rerun the stationary tests. Results indicate series as stationary at I(1). We present results of stationarity tests in Table 4. We carry out further analysis on log returns series.

4.2. Correlation Results

In Table 5 we present correlation results. Results reveal significant positive correlation between leading economic indicators (SENSEX and AUTO index) and among coincident economic indicators (IIP, MVI, and TEI) for all the three sample periods. We observe that WTI oil price do not correlate with any of the economic variables considered in this paper. In second sub-sample period we observe significant negative correlation between AUTO index and MVI; and AUTO index and TEI. These correlations support results of descriptive statistics, where we observe high decline in AUTO index returns, moderate decline in MVI index and positive return in TEI index. This indicate that there is a negative sentiment among investors about future returns and growth of automobile industry and this pessimism is reflected in slowdown in passenger and commercial vehicles manufacturing and sales. However, the effect on TEI is not significant due to presence of other industrial items in its list.

4.3. Causality Tests Result

As we find significant correlation between AUTO index and SENSEX, we are curious to know the causal relationship between these two leading economic indicators. We run Granger causality tests with different lag periods and present results in Table 6. For

Table 3: Descriptive statistics of daily returns

Full sample period (2012M05-2019M06)						
Descriptive statistic	**AUTO**	**MVI**	**TEI**	**IIP**	**WTI**	**SENSEX**
Minimum	−16.65	−16.04	−24.28	−12.62	−21.77	−7.51
Maximum	13.56	11.55	25.12	13.61	23.85	10.17
Mean	0.77	0.16	0.95	0.48	−0.39	1.03
Std. dev.	5.66	6.33	9.32	5.70	8.30	3.90
Skewness	−0.29	−0.40	−0.11	−0.07	−0.25	0.00
Kurtosis	3.31	2.71	2.93	3.08	3.37	2.57
Observations	86	86	86	86	86	86
First sub-sample period (2012M05-2017M12)						
Descriptive statistic	**AUTO**	**MVI**	**TEI**	**IIP**	**WTI**	**SENSEX**
Minimum	−16.65	−16.04	−24.28	−11.94	−21.77	−7.51
Maximum	13.56	11.55	20.10	13.61	23.85	10.17
Mean	1.52	0.22	0.59	0.55	−0.49	1.07
Std. dev.	5.58	6.20	9.10	5.47	8.43	3.85
Skewness	−0.34	−0.42	−0.21	−0.04	−0.10	0.01
Kurtosis	3.48	2.77	2.82	3.19	3.43	2.74
Observations	68	68	68	68	68	68
Second sub-sample period (2018M01-2019M06)						
Descriptive statistic	**AUTO**	**MVI**	**TEI**	**IIP**	**WTI**	**SENSEX**
Minimum	−13.11	−14.69	−15.64	−12.62	−19.49	−6.26
Maximum	7.38	10.43	25.12	12.93	10.06	7.82
Mean	−2.08	−0.08	2.29	0.20	0.00	0.90
Std. dev.	5.16	6.99	10.25	6.69	8.03	4.21
Skewness	−0.38	−0.33	0.11	−0.08	−0.92	−0.01
Kurtosis	3.02	2.48	2.98	2.66	3.16	2.06
Observations	18	18	18	18	18	18

Table 4: Stationary test results

Variable	ADF		DF-GLS		KPSS	
	t-statistic	Prob.*	t-statistic	Result	LM-stat.	Result
Auto	−9.58	0.00	−0.89	Stationary	0.32	Stationary
MVI	−8.24	0.00	−0.72	Stationary	0.19	Stationary
TEI	−8.55	0.00	−0.65	Stationary	0.21	Stationary
IIP	−8.12	0.00	−0.06	Stationary	0.02	Stationary
WTI	−6.73	0.00	−5.31	Stationary	0.11	Stationary
SENSEX	−10.48	0.00	−1.93	Stationary	0.05	Stationary

DF-GLS test critical values: 1% level-2.57, 5% level-1.94, 10% level-1.62. KPSS asymptotic critical values*: 1% level-0.74, 5% level-0.46, 10% level-0.35

full sample period we reject the hypothesis of AUTO does not Granger cause SENSEX at 5% level of significance (F = 4.30, P = 0.04). Except this causation we do not find evidence for any other causation in our full sample. For the first sub-sample period and second sub-sample period we reject the hypothesis of AUTO does not Granger cause SENSEX at 10% level of significance (F = 2.31, P = 0.07; F = 4.06, P = 0.06). In addition to these causation, for our second sub-sample period we reject the hypotheses of AUTO does not Granger cause MVI (F = 6.92, P = 0.01) and AUTO does not Granger cause TEI (F = 14.48, P = 0.00). The causality test results indicate that AUTO index causes SENSEX in all the three samples, and two automobile industrial production indexes in second sub-sample. In brief, our Granger causality test results indicate that for full sample period and second sub-sample period AUTO index cause SENSEX with one period lag, and in first sub-sample period with four period lag. This result contradicts our hypothesis about causation. We hypothesize that causation moves from SENSEX to AUTO index. However, Granger causality test results indicate that AUTO index causes SENSEX. In addition to this causation, in second sub-sample period AUTO index Granger cause MVI and TEI with five and three lags respectively. As we find causation happen from AUTO index to SENSEX, MVI, and TEI, we consider AUTO index as explanatory variable in regression analysis. We run regression analysis for contemporaneous period and for lagged periods and present results in Tables 7 and 8.

4.4. Empirical Results

Regression results reveal that for the full sample period there is a significant positive co-movement between AUTO and SENSEX index ($\beta = 1.14$, $R^2 = 0.62$, F = 137.33, P = 0.00). We find similar results in our two sub-samples also. However, the coefficient and coefficient of determination values are different. For first sub-sample OLS results are $\beta = 1.23$, $R^2 = 0.72$, F = 167.07, P = 0.00, and for second sub-sample OLS results are $\beta = 0.83$, $R^2 = 0.46$, F = 13.80, P = 0.00. These results indicate that during our first sub-sample period AUTO index is aggressive and move ahead than the SENSEX and in our second-sample period it is defensive and move slowly than the SENSEX.

As we got evidence of causation happening from AUTO index to SENSEX and from AUTO index to automobile industrial production indexes, we try to measure the predictive ability

Table 5: Cross order correlation among study variables

Full sample period (2012M05 to 2019M06)						
	AUTO	MVI	TEI	IIP	WTI	SENSEX
AUTO	1	−0.07	−0.06	−0.10	0.08	0.79**
MVI		1	0.65**	0.62**	0.08	0.09
TEI			1	0.34**	0.03	0.05
IIP				1	−0.04	0.03
WTI					1	0.17
SENSEX						1
First sub-sample period (2012M05 to 2017M12)						
	AUTO	MVI	TEI	IIP	WTI	SENSEX
AUTO	1	0.04	0.07	−0.04	0.15	0.85**
MVI		1	0.69**	0.60**	−0.04	0.14
TEI			1	0.48**	−0.11	0.13
IIP				1	−0.03	0.07
WTI					1	0.19
SENSEX						1
Second sub-sample period (2018M01 to 2019M06)						
	AUTO	MVI	TEI	IIP	WTI	SENSEX
AUTO	1	−0.529*	−0.475*	−0.35	−0.18	0.680**
MVI		1	0.542*	0.683**	0.518*	−0.07
TEI			1	−0.04	0.536*	−0.20
IIP				1	−0.06	−0.08
WTI					1	0.09
SENSEX						1

*Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed)

Table 6: Granger causality test results

Full sample: 2012M05 2019M06				
Granger causality	**Obs**	**Lag**	**F-statistic**	**Prob.**
AUTO does not granger cause SENSEX	85	1	4.30	0.04
AUTO does not granger cause MVI	85	1	1.51	0.22
AUTO does not granger cause TEI	83	3	1.13	0.34
AUTO does not granger cause IIP	83	3	1.29	0.28
AUTO does not granger cause WTI	84	2	0.92	0.40
Sub-sample 1: 2012M05 2017M12				
Granger causality	**Obs**	**Lag**	**F-statistic**	**Prob.**
AUTO does not granger cause SENSEX	64	4	2.31	0.07
AUTO does not granger cause MVI	67	1	1.56	0.22
AUTO does not granger cause TEI	65	3	1.17	0.33
AUTO does not granger cause IIP	66	2	1.92	0.15
AUTO does not granger cause WTI	66	2	2.94	0.16
Sub-sample 2: 2018M01 2019M06				
Granger causality	**Obs**	**Lag**	**F-statistic**	**Prob.**
AUTO does not granger cause SENSEX	18	1	4.06	0.06
AUTO does not granger cause MVI	18	5	6.92	0.01
AUTO does not granger cause TEI	18	3	14.48	0.00
AUTO does not granger cause IIP	18	1	0.27	0.61
AUTO does not granger cause WTI	18	4	2.00	0.18

Table 7: Contemporaneous regression results

Sample period	Ind. var.	Depdt. var.	Obs.	Beta	R-squared	Adj. R-squared	Std. err.	F-stat.	Prob.
2012M05 2019M06	AUTO	SENSEX	86	0.54	0.62	0.62	2.42	137.33	0.00
2012M05 2017M12	AUTO	SENSEX	68	0.58	0.72	0.71	2.06	167.07	0.00
2018M01 2019M06	AUTO	SENSEX	18	0.55	0.46	0.43	3.18	13.80	0.00
2018M01 2019M06	AUTO	MVI	18	−0.72	0.28	0.23	6.10	6.20	0.02
2018M01 2019M06	AUTO	TEI	18	−0.94	0.23	0.18	9.30	4.66	0.04

of AUTO index of economic indicators. We find evidence of predictive ability of AUTO index with five lags about SENSEX in our first sub-sample period ($\beta = 0.15$, $R^2 = 0.06$, $F = 3.61$, $P = 0.06$) and with two lags in our second sub-sample period ($\beta = -0.46$, $R^2 = 0.36$, $F = 9.05$, $P = 0.01$). Similarly, for our second sub-sample period we find evidence of predictive ability of AUTO

Table 8: Lagged regression results

Sample period	Ind. var.	Depdt. var.	Obs.	Beta	R-squared	Adj. R-squared	Std. err.	F-stat.	Prob.
2012M07 2019M06	AUTO(−2)	SENSEX	84	−0.11	0.03	0.02	3.77	2.38	0.13
2012M10 2017M12	AUTO(−5)	SENSEX	63	0.15	0.06	0.04	3.62	3.61	0.06
2018M03 2019M06	AUTO(−2)	SENSEX	16	−0.46	0.36	0.32	3.47	9.05	0.01
2018M04 2019M06	AUTO(−4)	MVI	14	−0.35	0.08	0.02	6.91	1.41	0.25
2018M03 2019M06	AUTO(−2)	TEI	16	1.23	0.44	0.40	7.92	12.52	0.00

index about TEI with two lags ($\beta = 1.23$, $R^2 = 0.44$, $F = 12.52$, $P = 0.00$). These results indicate that AUTO index has predictive power of SENSEX and TEI.

5. CONCLUSION

In this paper we analyze the co-movements, causation, and predictive power of economic indicators about automobile industry proxy. Our analysis report mixed results. First, we notice significant positive co-movement between SENSEX and AUTO index at contemporaneous level, but, the strength of association vary from one sample period to another sample period. Second, we do not find any contemporaneous co-movements between AUTO index and economic indicators (IIP, MVI, TEI, and WTI). Third, in contrast to our hypothesis we observe that AUTO index cause SENSEX, and automobile industry production indexes. Fourth, with different time lags, AUTO index is able to predict the movements in SENSEX and TEI. In our second sub-sample period we observe that shrink in AUTO index gradually affected TEI. AUTO index as a leading indicator of performance and future expectations of automobile industry shrink sharply during this period and the repercussions are visible in the form of slowdown in production of passenger vehicles, commercial vehicles, two-wheelers and auto components. The repercussions happen with 2 months of time lag. On the other hand SENSEX remain stable and report positive returns. This is because of investors' optimism towards economic development of the country, political and economic stability, which lead SENSEX to reach newer heights and report life time high index value during first half of year 2019.

In our analysis we observe that Indian automobile industry is facing turbulent times since 2017 and the industry woes still continue. We perceive that increase in wealth creation in the country, general increase in industrial production and substantial decrease in oil prices do not help auto industry to recover. We opine that Indian automobile industry is in transition stage because of GOI's new policies, stringent regulatory and emission norms. In turn these adversely affect automobile manufacturers cost of production, cost of sales, sales, and the bottom line. In this paper we consider AUTO index as a proxy for automobile industry. However, considering multiple segments and multiple manufacturing companies in automobile industry, future research should focus on co-movements and causal relationships between economic indicators and individual firms belong to each segment.

REFERENCES

Abu-Libdeh, H., Harasheh, M. (2011), Testing for correlation and causality relationships between stock prices and macroeconomic variables: The case of palestine securities exchange. International Review of Business Research Papers, 7(5), 141-154.

Ahmed, S. (2008), Aggregate economic variables and stock markets in India. International Journal of Finance and Economics, 14, 141-164.

Amarasinghe, A.A.M. (2016), A study on the impact of industrial production index (IPI) to beverage, food and tobacco sector index with special reference to Colombo stock exchange. Procedia Food Science, 6, 275-278.

Amith, V.M., Gabriele, S. (2018), Macroeconomic indicators and their impact on stock markets in Asian 3: A pooled mean group approach. Cogent Economics and Finance, 6, 1-14.

Czapkiewicz, A., Stachowicz, M. (2016), The long-run relationship between the stock market and main macroeconomic variables in Poland. Managerial Economics, 17(1), 7-15.

Dasgupta, R. (2012), Long-run and short-run relationships between BSE sensex and macroeconomic variables. International Journal of Finance and Economics, 95, 135-150.

Dipendra, K. (2017), Stock market responses to macroeconomic dynamics: Testing for long-run equilibrium in Nepal. International Journal of Current Innovation Research, 3(12), 936-946.

Gopinathan, R., Raja, S.D.S. (2019), Stock market and macroeconomic variables: New evidence from India. Financial Innovation, 5(29), 1-17.

Jareño, F., Negrut, L. (2016), US stock market and macroeconomic factors. The Journal of Applied Business Research, 32(1), 325-340.

Lei, P., Vinod, M. (2016), Stock market development and economic growth: Empirical evidence from China. Monash Business School Discussion Paper, 16(16), 1-35.

Maio, P., Philip, D. (2015), Macro variables and the components of stock returns. Journal of Empirical Finance, 33, 287-308.

Osamwonyi, I.O., Osagie, E.I.E. (2012), The relationship between macroeconomic variables and stock market index in Nigeria. Journal Economics, 3(1), 55-63.

Vashishtha, S.D., Umed, S., Rajesh, K. (2013), A study of relationships between S and P BSE-sensex and economic growth rates. International Journal of Marketing, Financial Services and Management Research, 2(7), 1-5.